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From Problematic Projects to Smart Solutions: A Literature Review on the Role of AI in Modern Project Management

Theresia Avila Bria [1]*, Joko Suparmanto [1], Onisius Loden [1], Lodia Semaya Amnifu [1], Engelbertha N. Bria Seran [2]
[1] *Politeknik Negeri Kupang, Indonesia*
[2] *Universitas Katolik Widya Mandira, Indonesia*

thessabria12@gmail.com*

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Abstract

Despite extensive methodological progress, project failure rates remain persistently high across sectors such as construction, information technology, and public infrastructure. This study employs a Systematic Literature Review (SLR) based on the PRISMA framework, analyzing 78 peer-reviewed articles published between 2015 and 2025 from databases including Scopus, Web of Science, IEEE Xplore, ScienceDirect, and SpringerLink. The review identifies three primary categories of factors contributing to project failures: (i) organizational shortcomings such as weak planning, limited stakeholder engagement, and ineffective risk governance; (ii) external disruptions linked to market volatility, regulatory changes, and environmental instability; and (iii) technical and operational deficiencies, including reactive monitoring and resource mismanagement. Within this context, Artificial Intelligence (AI) emerges as a transformative enabler in project management. AI applications are grouped into four domains: early risk detection and prediction, decision support and optimization, real-time monitoring and control through IoT and analytics, and systematic learning from failed projects using knowledge-driven approaches. While the literature emphasizes AI's role in achieving project success, this study highlights its corrective and recovery potential for failing projects. The paper proposes reframing AI not only as a success enabler but as a critical tool for failure prevention and recovery. Future research should prioritize empirical validation, hybrid human–AI decision-making models, and cross-sectoral applications to strengthen AI's role in building adaptive and resilient project management frameworks.

Keywords: Project Management, Problematic Projects, Artificial Intelligence, Risk Prediction, Project Recovery

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INTRODUCTION

Project management is widely recognized as essential for organizational success, especially in sectors such as construction, IT, and public infrastructure. However, despite advancements in tools and methodologies, failure rates remain high. Asiedu & Ameyaw report persistent delays, budget overruns, and cancellations across projects [1], while the Project Management Institute estimates that 11% of investments are lost due to poor project performance driven by cost escalation, delays, and scope issues [2]. These recurring challenges reflect ongoing inefficiencies that undermine stakeholder confidence and strategic outcomes.

Multiple factors contribute to problematic projects. Internal issues—such as weak planning, limited stakeholder engagement, poor communication, and inadequate risk management—are common contributors [3], while external pressures like regulatory uncertainty and market dynamics further exacerbate risks [4]. Compounding this, traditional monitoring tools often fail to provide timely insights, limiting early corrective action [5]. As a result, project success rates, particularly in complex environments, have seen little improvement over the past two decades.

At the same time, Artificial Intelligence (AI) has emerged as a transformative enabler. Technologies including machine learning, NLP, and predictive analytics allow organizations to process large and dynamic project data sets [6]. In project management, AI has demonstrated potential to enhance early risk detection, resource optimization, and real-time performance tracking [7]. Unlike traditional descriptive tools, AI offers predictive and prescriptive capabilities to support proactive decision-making [8].

Despite growing interest, existing literature largely focuses on AI's role in improving project success—highlighting efficiency and innovation [9]. Limited research examines how AI can help prevent, detect, or recover from failing projects, even though failure-driven learning and recovery strategies are critical in practice. This gap is especially relevant in high-risk industries, where construction megaprojects frequently exceed budgets by over 50% [10], and software projects often fail to meet expectations or completion targets [11]. Emerging AI solutions—such as automated risk analytics and predictive modeling—may provide a path toward earlier detection and recovery for troubled projects [12].

Therefore, this paper seeks to: (1) review and categorize causes of problematic projects, (2) synthesize existing AI-driven approaches addressing these challenges, and (3) identify research gaps and future directions for leveraging AI in improving outcomes of troubled projects. This perspective shifts AI from being seen solely as a success driver to a strategic tool for navigating and correcting failure.

METHOD

The adopted methodology for this study is a Systematic Literature Review. Therefore, this method will be adhering to the principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework that guide a systematic process in identifying, screening, and synthesizing studies on a particular subject [13]. Application of the guidelines also ensures this review has limited bias and enhances the replicability of the findings.

Table 1. Screening and Selection Process of Literature Review

Stage	Description	Number of Records
Identification	Records retrieved from databases (Scopus, WoS, IEEE Xplore, ScienceDirect, SpringerLink)	1,024
Screening	After de-duplication, records screened on title and abstract; irrelevant studies excluded	714
Eligibility (Full-text)	Full-text articles assessed against inclusion and exclusion criteria	142
Inclusion (Final Set)	Studies meeting all criteria & included in synthesis	78

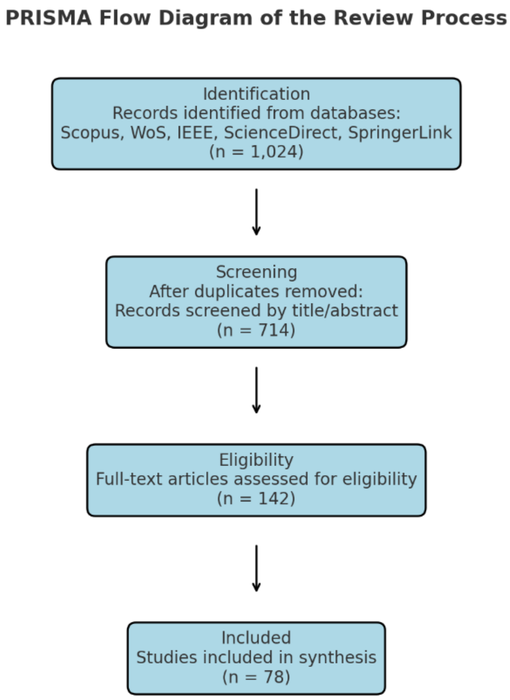

Figure 1. PRISMA Flow Diagram of the Review Process

This is a PRISMA-diagram of the systematic selection of articles. In total, 1,024 records from five databases were identified: Scopus, Web of Science, IEEE Xplore, ScienceDirect, and SpringerLink. After removal of duplicates, it was down to 714 unique records that were screened by title and abstract. Finally, full texts of 142 articles were assessed for eligibility; 78 of these were found to meet the study's criteria for inclusion and synthesized in this review.

RESULT AND DISCUSSION

Problematic Projects: Causes A Synthesis of the Literature

Regardless of several decades of research in project management, the number of troubled projects remains consistently high. Many studies have shown that few projects go awry due to a single cause but as a result of the interaction of organizational vulnerabilities, exogenous shocks, and technical failures. Drawing on these elements in construction, information technology, and infrastructure identifies common patterns destroying project performance. Causes in problematic projects are, in this section, categorized as internal organizational, external environmental, technical and operational, and cross-industry.

1. Factors: Internal Organizational

These are only some of the most consistent and avoidable reasons for project failure. Literature underlines that the core reasons for a troubled project include poor planning, unrealistic scheduling, and insufficient budgeting [14, 15, 16]. When risk assessments are superficial, managers tend to underestimate complexity and uncertainty, creating plans that cannot withstand real-world challenges. Besides, ineffective governance structures fail to clearly outline authority to decide, hence fragmented responsibilities with interventions being late when problems crop up.

Another persisting problem is poor communication among stakeholders, which often results in misunderstandings of the project's goals and deliverables. Scope creep, which is the inclusion of requirements that were not planned, also results directly from poor communication and a lack of alignment among stakeholders. This is according to [15]. These internal flaws denote some organizations' structural defects and pinpoint that the reason for poor project governance lies in an unlinked strategic objective. Without proper internal controls, a project can easily fail even before external or technical factors arise.

2. External Environmental Factors

Projects operate within wider socio-economic and political domains and are therefore susceptible to exogenous shocks. Empirical research has continuously identified economic instability for instance, inflation and fluctuating foreign exchange rates as a shock to project finance and procurement, as stated by Reddy Anireddy (2024) [16]. Political instability and the frequent alteration of rules and regulations also bring in uncertainty, especially for large infrastructure projects that involve multi-year commitments. These are generally beyond the control of the project manager but do have a significant impact on the performance of the project.

Environmental conditions further complicate these external challenges, especially in construction and infrastructure projects. Natural hazards, such as extreme weather events, earthquakes, or floods, may disrupt the schedule, increase costs, and even compromise safety. Stakeholder conflicts, especially in public infrastructure projects, are another form of external disruption that involves competing interests of the government, contractors, and local communities in hindering project progress [19,20,21,22]. These external factors underscore the importance of resilient project planning and adaptive strategies that allow organizations to adjust to dynamic environments.

3. Factors: Technical and Operational

Most of the technical and operational reasons are closely linked to the tools, methods, and practices applied during project implementation. Most traditional project monitoring and control systems are more descriptive and less predictive in nature, allowing limited scope for the managers to perceive early warning signals. This inadequacy becomes all the more pertinent in big and complex projects where delays and cost overruns start slowly and snowball into unmanageable proportions. Technical complexity and integration problems are among the leading causes related to system failure in IT projects [23].

Poor design quality, inaccurate site data, and weak resource management commonly lead to frequent rework and cost escalation in the construction industry. Similarly, safety planning is insufficient, leading to accidents that cascade into harm for workers and disruptions to schedules and budgets. In both IT and construction, technical shortcomings are exaggerated by the fast speed at which technology changes, with the quick rendering of tools or methodologies obsolete. Resolution of these challenges requires more advanced systems such as predictive AI-enabled tools capturing early warnings about potential breakdowns in operations.

4. Cross-Sectoral Patterns

While the specific manifestations of project failure vary, several general patterns can be distilled from the literature. Perhaps the most common involves systematic underestimation of uncertainty. In most cases, organizations usually assume that effective risk management eliminates uncertainty, leading them to be overconfident in the project schedules and budgets. Underestimation, in turn, is closely associated with the reactive management style that is, one in which managers act only after a problem becomes critical. Hald et al. 2025 [24] argue that such reaction, on one hand, reduces the capacity to prevent cascading failures across the dimensions of the project.

Another cross-sectoral pattern is the limited organizational learning from past project failures. Despite abundant evidence of recurring causes, many organizations fail to institutionalize knowledge gained from previous problematic projects [25, 26, 27, 28]. This results in repeated mistakes, particularly in industries where high employee turnover disrupts continuity of expertise. The persistence of these patterns highlights the need for adaptive learning mechanisms. In this context, Artificial Intelligence offers opportunities to systematically analyze past project data, identify hidden patterns, and support continuous organizational learning thus reducing the recurrence of failure [12][29].

Table 2. Factors Contributing to Project Failures in Different Domains

Category	Specific Causes	Domains Most Affected	Key References
Internal Factors	Poor planning; unrealistic budgeting; weak governance; ineffective communication; scope creep	IT, Construction, Infrastructure	(Haenlein & Kaplan, 2019) [6]
External Factors	Economic volatility; political/regulatory shifts; stakeholder conflict; environmental risks	Infrastructure, Public Projects	(Reddy Anireddy, 2024) [16]
Technical/Operational	Lack of real-time monitoring; inadequate design; integration complexity; resource mismanagement	IT, Construction	(Adriana N Dugbartey, 2025; Westenberger et al., 2021) [4]
Cross-Sectoral Patterns	Underestimation of risk; reactive problem-solving; repeated failures due to lack of learning	All domains	(Shafqat et al., 2022) [30]

5. Consequences

Understanding the multitasking causes of problematic projects is crucial for any evaluation of the potential contribution of Artificial Intelligence. Many of the identified causes such as poor planning, lack of real-time monitoring, and adopting reactive approaches are areas where AI can bring substantial added value. For instance, predictive analytics help to tackle underestimation of risks, machine learning can detect anomalies in project performance, and case-based reasoning enables organizations to learn from past failures. More about such relationships will be presented in Section 4.

AI Applications in Overcoming Project Challenges

Artificial Intelligence has become a catalytic driver in project management, bringing with itself solutions to old, nagging problems causing projects to go haywire. In contrast to conventional techniques that are heavy on descriptive reporting and subjective human judgment, AI offers predictive and prescriptive competencies. This ability enables managers to identify early warnings, make near-optimal decisions, and systematically learn from past failures. This section classifies AI applications based on their use in four project management domains: early risk detection and prediction, decision support and optimization, monitoring and control, and learning from failed projects.

1. Early Risk Detection and Prediction

It is below the line that perhaps the most appealing area of AI application lies in identifying risks before they snowball into catastrophic project failures. Machine learning models trained on historical data from projects can predict with high accuracy the probability of potential overruns regarding cost, delays in schedules, and defects in quality. For example, random forests and gradient boosting are two widely used supervised learning algorithms that have been applied to forecast schedule slippages for both construction and IT projects with a view to enabling managers to take contingency resources well in advance [12].

It plays a critical role in risk detection using NLP. These algorithms analyze vast volumes of project documentation that are unstructured, like meeting minutes, progress reports, and stakeholder communications, to reveal warning signals that would have gone unnoticed otherwise. In other words, the capability of capturing "hidden risks" from textual data extends the reach of project monitoring beyond quantified measures into a more holistic understanding of project health.

2. Decision Support and Optimization

AI has also proved very efficient in managerial decision-making, such as resource allocation and scheduling. Traditional project scheduling methods like CPM or PERT are usually not able to cope with uncertainty and changes in dynamic environments. Their ability to dynamically optimize the scheduling by reinforcement learning or genetic algorithms will answer by self-modification of resource allocations in order to reduce delays and cost escalation. The manager will be able to simulate different scenarios and set the most resilient course of action for the given circumstances [31, 32, 33, 34].

AI-augmented DSS further strengthens the capability of a project manager in the evaluation of competing constraints regarding different project compromises. For example, multiobjective optimization models allow managers to balance time, cost, and quality simultaneously. This proactive capability will make decision-making, which has been so far an after-the-fact process, predictive and adaptive in practice. Such systems may form the backbone for realigning failing plans in troubled projects and serve to restore performance.

3. Follow-up and Control

Another domain in which AI has been very useful is real-time monitoring and control. By embedding AI in devices, specifically IoT devices, the project team has the ability to continuously monitor progress, safety conditions, and resource usage in projects. For example, AI-powered computer vision systems have been installed in construction sites to monitor whether workers are adhering to safety measures and also to detect deviations from planned workflows. [35, 36, 37] This will reduce dependence on manual inspections and immediate feedback will be provided to project managers.

Big data analytics integrated into AI empowers detection of anomalies in project performance indicators. As opposed to waiting for monthly reports, managers can have real-time dashboards with things auto-flagged where an anomaly differs from expected trends. This proactive monitoring increases the timeliness and accuracy of interventions by preventing small matters from growing into problematic outcomes of the project. Finally, the paradigm of AI-driven monitoring at the level of performance indicators will go from lagging to leading.

4. Learning from Project Failure

Probably one of the most underexplored but highly valued uses of AI in this regard is how it can facilitate organizational learning from failed projects. Traditional project management typically treats failures as isolated events, with limited institutionalization of lessons learned. AI systematizes this process through techniques like Case-Based Reasoning, where new project challenges are compared to past cases and solutions recommended based on historical outcomes [38, 40, 41]. This ensures that lessons from failures are not lost but effectively feed into future project strategies.

Similarly, AI-enabled knowledge management systems identify recurrent patterns of failures across many projects and provide insights beyond the level of a single case study. For example, clustering algorithms can show hidden correlations between project contexts and outcomes, underpin a deeper understanding of systemic risks. Such applications move organizations from a reactive to a learning-oriented culture, reducing the likelihood of repeating mistakes

Table 3. Mapping Project Challenges to AI Solutions and Expected Impacts

Cause of Problematic Projects	AI Application	Expected Impact
Poor planning & unrealistic scheduling	Machine Learning (predictive models); Reinforcement Learning	Early identification of unrealistic timelines; optimized scheduling adjustments
Ineffective communication & stakeholder misalignment	NLP-based analysis of reports/emails	Detection of miscommunication; improved stakeholder alignment
Economic & regulatory uncertainties	Predictive analytics; Scenario-based DSS	Simulation of alternative strategies; adaptive planning
Technical complexity & integration issues	AI-based optimization & anomaly detection	Early detection of integration risks; automated problem-solving recommendations
Lack of real-time monitoring	IoT + AI (computer vision, anomaly detection)	Continuous performance tracking; proactive interventions
Limited organizational learning from failures	Case-Based Reasoning; AI-enhanced knowledge management	Systematic reuse of past lessons; prevention of repeated mistakes

5. Implications

The reviewed literature demonstrates that AI has the potential to address many of the recurring causes of project failure. By offering predictive insights, adaptive decision-making, real-time monitoring, and systematic learning, AI shifts project management from reactive problem-solving toward proactive control and continuous improvement. However, these benefits are contingent upon data quality, organizational readiness, and the interpretability of AI models. The following section (Section 5) discusses the strengths, limitations, and gaps of current AI applications in project management.

DISCUSSION

The synthesis of literature reveals that Artificial Intelligence (AI) holds substantial promise in addressing the recurring challenges of problematic projects. By enhancing predictive capabilities, enabling adaptive decision-making, and supporting organizational learning, AI provides tools that extend beyond the descriptive limits of traditional project management. However, while AI applications demonstrate notable strengths, they also face significant limitations that constrain their impact. This section discusses the strengths, limitations, and research gaps identified in the reviewed studies.

A primary strength of AI lies in its predictive and proactive capacity. Unlike conventional project management tools that rely on lagging indicators such as post-hoc reports, AI models can anticipate risks before they manifest. For example, machine learning algorithms can predict cost overruns and delays, enabling project teams to deploy preventive measures. This predictive dimension represents a paradigm shift from reactive problem-solving to proactive control. Another strength is AI's ability to integrate and analyze diverse datasets at scale. Through big data analytics and NLP, AI can process structured metrics (e.g., cost, time, resource allocation) alongside unstructured data (e.g., emails, reports, meeting notes). This holistic approach provides project managers with richer insights into project health, supporting more accurate and timely decision-making.

Furthermore, the adaptability of AI algorithms allows them to continuously improve through feedback loops, enhancing their reliability over time. Despite these strengths, several limitations are evident in current applications. First, data dependency remains a critical barrier. High-quality, comprehensive datasets are essential for training robust AI models, yet many organizations struggle with fragmented, inconsistent, or incomplete data collection practices. In developing contexts, the lack of digital infrastructure further restricts data availability, limiting AI adoption. Second, AI models often face challenges of interpretability and trust. Complex algorithms such as deep learning generate highly accurate predictions but are frequently criticized as "black boxes." This lack of transparency creates skepticism among project managers and stakeholders, reducing their willingness to rely on AI-driven recommendations. Additionally, organizational resistance to change and the absence of skilled personnel to manage AI systems further hinder implementation. The literature also reveals significant gaps in the current knowledge base. First, while numerous studies apply AI to optimize successful projects, relatively few focus explicitly on project recovery and failure management. This success bias overlooks the potential of AI as a corrective mechanism in troubled projects, where interventions are most needed. Second, most AI applications are concentrated in specific industries particularly IT and construction leaving cross-sectoral insights underexplored. For example, public sector projects, which are often highly prone to delays and cost overruns, have received limited attention in AI-driven project management research.

Finally, there is a lack of empirical studies that validate AI frameworks in real-world project environments. Many existing contributions remain at the conceptual or prototype level, without sufficient testing in live projects. This gap highlights the need for longitudinal case studies and pilot implementations that demonstrate the tangible benefits and limitations of AI in practice.

Overall, AI applications demonstrate both promise and constraint. Their strengths predictive power, integration of diverse data, and adaptive learning offer valuable tools for preventing and mitigating project failures. However, limitations related to data quality, interpretability, and organizational readiness restrict their full potential. Bridging the identified research gaps requires a more balanced focus on failure-based learning, cross-sectoral analysis, and empirical validation. The next section (Section 6) outlines future research directions that can advance the role of AI from a supportive tool to a transformative framework for managing problematic projects.

Future research in this domain should move beyond the predominant focus on Artificial Intelligence (AI) for project optimization and success-oriented outcomes to address its potential role in detecting, preventing, and recovering problematic projects. One critical direction is the development of AI frameworks specifically designed for project recovery, including systems capable of recommending corrective actions, re-baselining schedules, and reallocating resources once early warning indicators emerge. Equally important is the integration of AI with emerging digital technologies such as Building Information Modeling (BIM), the Internet of Things (IoT), and blockchain, which may enable more comprehensive monitoring, automation, transparency, and real-time decision support.

The discussion also identified key research gaps, including the lack of explicit focus on project recovery, limited cross-sectoral studies, and insufficient empirical validation of AI frameworks in real-world projects. Future research directions were proposed to address these gaps, emphasizing the development of AI frameworks for recovery, integration with technologies such as BIM, IoT, and blockchain, and the advancement of hybrid human–AI decision-making models. Furthermore, extending AI applications to developing economies and conducting longitudinal case studies will be essential for ensuring both global relevance and practical applicability. In conclusion, this review contributes to the growing discourse on AI in project management by shifting the focus from success-oriented applications to the management of problematic projects. By embracing AI not only as a tool for efficiency but also as a mechanism for failure prevention and recovery, project management can evolve into a more resilient and adaptive discipline. For both scholars and practitioners, the challenge ahead lies in bridging the gap between conceptual potential and empirical validation, ensuring that AI becomes an integral component of modern project management practice.

Future studies should also consider applications in developing economies, where project failures are often more frequent and consequential; such contexts require AI models that operate effectively despite limited data availability, weak digital infrastructure, and socio-political complexity. Another promising area involves hybrid human–AI decision-making models that balance AI-driven predictive and prescriptive analytics with managerial judgment, helping avoid overreliance on opaque automated systems while leveraging their analytical capacity. Expanding research across sectors beyond IT and construction—such as healthcare, energy, and public administration—would generate comparative insights into failure patterns and sector-specific applications. Additionally, empirical validation remains limited, as many existing models are conceptual or experimental; therefore, future work should prioritize real-world case studies, longitudinal research, and industry-based testing. Collectively, advancing these directions will support the transition from fragmented AI applications toward integrated, context-aware, and empirically grounded frameworks capable of transforming AI from a supportive tool into a strategic mechanism for preventing failure and strengthening resilience in project management practice.

CONCLUSION

This review has examined the persistent problem of project failures and explored how Artificial Intelligence (AI) can contribute to transforming problematic projects into smart solutions. Drawing from 78 peer-reviewed studies published between 2015 and 2025, the analysis highlighted that the causes of troubled projects are multifaceted, encompassing internal organizational shortcomings, external environmental disruptions, and technical or operational deficiencies. Across sectors such as construction, IT, and infrastructure, these factors manifest in recurring patterns of poor planning, reactive management, and limited organizational learning.

The findings reveal that AI applications offer substantial promise in mitigating these challenges. Specifically, AI enables early risk detection and prediction**,** decision support and optimization**,** real-time monitoring and control., and systematic learning from past failures**.** By moving beyond descriptive reporting, AI provides predictive and prescriptive insights that empower managers to intervene proactively rather than reactively. Nevertheless, limitations related to data dependency, model interpretability, and organizational resistance underscore the need for caution and contextual adaptation.

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