

An AHP–Fuzzy–Machine Learning Approach for Selecting Project Management Methodologies and Digital PM Ecosystems

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Abstract

Modern projects operate under increasing levels of uncertainty, cross-functional dependency, regulatory complexity, and rapid technological evolution. Traditional predictive project management methodologies such as PRINCE2 and PMP continue to provide strong governance and planning capabilities for infrastructure and compliance-driven projects, while agile methodologies support adaptability and iterative delivery in innovation-oriented environments. Simultaneously, organizations face challenges in selecting appropriate digital project management ecosystems such as Primavera, Jira, cplace, and Concerto, each optimized for different operational contexts.

This paper proposes the Intelligent Project Agility Assessment Framework (IPAAF), a hybrid decision-support framework integrating Analytic Hierarchy Process (AHP), fuzzy logic, and machine learning to evaluate project agility requirements and recommend suitable project management methodologies and software ecosystems. Within IPAAF, a Project Agility Index (PAI) is developed using weighted multi-criteria analysis based on project characteristics including scope variability, stakeholder complexity, budget volatility, risk exposure, compliance intensity, innovation requirements, and cross-functional collaboration.

The framework combines AHP-derived criteria weighting, fuzzy inference systems for uncertainty handling, and supervised machine-learning models for methodology and software recommendation. Comparative analysis is performed across Primavera, Jira, cplace, and Concerto in relation to predictive and adaptive project environments.

The proposed framework demonstrates that governance-intensive infrastructure projects align more effectively with Primavera and Concerto under predictive methodologies, whereas innovation-driven and engineering R&D environments benefit from adaptive ecosystems such as Jira and cplace. The study contributes a quantitative and intelligent project governance framework capable of supporting organizational decision-making under uncertain and dynamic project conditions.

Keywords

Project Agility, AHP, Fuzzy Logic, Machine Learning, Agile Project Management.