A HYBRID MACHINE LEARNING AND OPTIMISATION-BASED MODEL FOR PREDICTING THE SUCCESS OF BUSINESS-TO-CONSUMER SOFTWARE DEVELOPMENT PROJECTS IN INDONESIA

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ASIA e UNIVERSITY

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ABSTRACT

Despite the strategic importance of software projects, recent Standish Group findings indicate that only 35% achieve successful completion, with a substantial portion encountering delays or outright failure. Motivated by this challenge, this research aims to advance the predictive capability of software project success by developing an integrated artificial intelligence-based model, contextualized within B2C E-Business software projects in Indonesia. Employing a mixed-methods design, the study first identifies 28 critical success factors through empirical investigation, highlighting elements such as evaluation progress, realistic scheduling, human resource competency, project planning, and risk management. Building on these findings, a predictive framework is constructed by integrating machine learning algorithms with advanced optimization and data handling strategies. Specifically, Support Vector Machines (SVM) enhanced by Aquila Optimization demonstrate superior performance, achieving a predictive accuracy of up to 94.29% on datasets synthesized and balanced through Generative Adversarial Networks (GANs) and hybrid resampling techniques (SMOTE + Tomek Links). To translate predictive insights into actionable guidance, Shapley Additive Explanations (SHAP) are employed to quantify the contribution of each factor, enabling targeted recommendations for mitigating project risks. This study's primary contributions lie in (i) methodologically integrating feature identification, synthetic data augmentation, imbalance handling, hyperparameter optimization, and explainable AI into a cohesive predictive pipeline; (ii) applying this integrated approach within the underexplored context of Indonesian B2C E-Business projects; and (iii) delivering practical decision-support insights that enhance project planning, thereby reducing the likelihood of costly failures. The proposed framework not only elevates predictive accuracy but also reinforces managerial strategies through data-driven prioritization of project factors, offering a robust tool to improve software project success rates in similar contexts.

Keywords: Critical success factors, software project, project management, software project prediction, software project success prediction models

APPROVAL

This is to certify that this thesis conforms to acceptable standards of scholarly presentation and is fully adequate, in quality and scope, for the fulfilment of the requirements for the Degree of Doctor of Philosophy.

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DECLARATION

I hereby declare that the thesis submitted in fulfilment of the requirements for the Degree of Doctor of Philosophy is my own work and that all contributions from any other persons or sources are properly and duly cited. I further declare that the material has not been submitted either in whole or in part, for a degree at this or any other university. In making this declaration, I understand and acknowledge any breaches in this declaration constitute academic misconduct, which may result in my expulsion from the programme and/or exclusion from the award of the degree.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES