

INTEGRASI *LARGE LANGUAGE MODEL* DAN *RETRIEVAL-AUGMENTED GENERATION* GEMINI SEBAGAI AI ASSISTANT SISTEM MANAJEMEN PROYEK *TALL STACK*

NABILLA TSANI AYASI

H1D022058

ABSTRAK

Manajemen proyek menghadapi tantangan kompleksitas data dan kebutuhan interaksi cerdas di era digital, di mana sistem konvensional kurang adaptif terhadap informasi *real-time* dan *Large Language Model* (LLM) murni mengalami halusinasi. Penelitian ini bertujuan mengembangkan AI Assistant berbasis *Retrieval-Augmented Generation* (RAG) dengan Gemini API pada sistem manajemen proyek TALL Stack (Tailwind CSS, Alpine.js, Laravel, Livewire) untuk meningkatkan interaktivitas, akurasi, dan produktivitas. Metode penelitian menggunakan pendekatan *prototyping*, meliputi identifikasi kebutuhan, desain (*flowchart*, DFD level 0-3, *ERD*, *PDM*), implementasi *prototype* web fungsional, *refinement*, dan evaluasi melalui *black box testing*, metrik *Precision/Recall/F1-score*, serta *user-based evaluation* via kuesioner kepada staf CV Jenderal Solusi Digital. Objek penelitian adalah sistem manajemen proyek berbasis web dengan fitur AI Assistant (*chatbot*, pembuatan proposal/fitur/laporan otomatis). Hasil menunjukkan sistem berhasil diimplementasikan dengan akurasi respons AI tinggi (*Precision* 98,75%, *Recall* 97,81% *F1-score* 98%), seluruh fungsi *black box testing* valid 100%, dan kepuasan pengguna 4,13/5 melalui *user-based evaluation*. Selain itu, sistem menunjukkan efisiensi penggunaan melalui otomatisasi berbasis konteks *database real-time*. Integrasi LLM-RAG Gemini pada TALL Stack terbukti efektif mendukung transformasi digital manajemen proyek dengan interaktivitas superior dan akurasi terverifikasi.

Kata kunci: Gemini, *Large Language Model*, Manajemen Proyek, *Retrieval-augmented Generation*, *TALL Stack*

INTEGRATION OF LARGE LANGUAGE MODELS AND RETRIEVAL-AUGMENTED GENERATION GEMINI AS AN AI ASSISTANT FOR TALL STACK PROJECT MANAGEMENT SYSTEM

**NABILLA TSANI AYASI
H1D022058**

ABSTRACT

Project management faces challenges related to data complexity and the need for intelligent interaction in the digital era, where conventional systems are less adaptive to real-time information and pure Large Language Models (LLMs) are prone to hallucinations. This study aims to develop an AI Assistant based on Retrieval-Augmented Generation (RAG) using the Gemini API within a TALL Stack (Tailwind CSS, Alpine.js, Laravel, Livewire) project management system to enhance interactivity, accuracy, and productivity. The research method adopts a prototyping approach, encompassing requirements identification, design (flowcharts, DFD levels 0–3, ERD, PDM), implementation of a functional web prototype, refinement, and evaluation through black box testing, Precision/Recall/F1-score metrics, and user-based evaluation via questionnaires administered to staff of CV Jenderal Solusi Digital. The research object is a web-based project management system featuring an AI Assistant (chatbot, automated proposal/feature/report generation). The results indicate that the system was successfully implemented, achieving high AI response accuracy (Precision 98.75%, Recall 97.81%, F1-score 98%), 100% valid results in black box testing, and a user satisfaction score of 4.13/5 from the user-based evaluation. In addition, the system demonstrates operational efficiency through automation based on real-time database context. The integration of Gemini LLM-RAG within the TALL Stack is proven effective in supporting the digital transformation of project management with superior interactivity and verified accuracy.

Keywords: Gemini, Large Language Model, Manajemen Proyek, Retrieval-augmented Generation, TALL Stack