ABSTRACT

Industrial revolution 4.0 information technology development brings significant transformation in higher education. Artificial Intelligence (AI) emerged as key technology enabling faster, accurate analysis for strategic decision-making. According to Verified Market Research (2024), AI educational technology market will reach USD 84.73 billion by 2031 with 45.21% growth. This research develops AI-integrated student competition dashboard at Faculty of Industrial Engineering Telkom University using Waterfall methodology for improved monitoring and strategic analysis.

The addressed problem is current dashboard system limitations in FRI environment, where existing dashboard presents basic visualization without deep analytical capabilities or natural language interaction. The system lacks interactive features, making it challenging for faculty management to obtain strategic recommendations. Additionally, absence of AI integration prevents automated insights needed for effective strategies.

Research employs Waterfall Model with four-layer architecture: Presentation Layer using Laravel framework with authentication and role-based access control, Intelligence Layer using Flowise AI integrated with OpenAI GPT-4o, Visualization Layer using Google Looker Studio, and Data Layer using Aiven MySQL Cloud Database with star schema. Research data comprises 649 historical competition records from 2021-2024 undergoing cleaning using Python, reducing from 26 to 21 columns.

Results demonstrate successful integration of interactive visualization with AI chatbot understanding Indonesian queries. System evaluation shows automated testing with 25 successful test cases, 100% User Acceptance Testing success rate, and System Usability Scale score of 90 points categorized as A+. The system provides enhanced monitoring capabilities, democratized information access, and real-time data-driven strategic decision-making support.

Keywords—Dashboard, Artificial Intelligence, Waterfall Model, Student Competition, Flowise AI, Natural Language Interface