

Peningkatan Pengendalian Sibernetik melalui Pemanfaatan *Artificial Intelligence* dan *Internet of Things* dalam Pengelolaan Perkeretaapian di Indonesia

ABSTRAK

Penelitian ini menganalisis integrasi Artificial Intelligence (AI) dan Internet of Things (IoT) dalam meningkatkan efektivitas cybernetic controls pada Sistem Pengendalian Manajemen (SPM) PT Kereta Api Indonesia (PT KAI). Sistem pengendalian yang ada masih bersifat reaktif dan berbasis data historis, sehingga belum mampu memberikan umpan balik real-time dalam menghadapi gangguan operasional, khususnya pada perawatan lokomotif dan keselamatan perlintasan sebidang. Penelitian ini menggunakan pendekatan kualitatif dengan paradigma interpretivisme melalui observasi lapangan, wawancara semi-terstruktur dengan sembilan informan, serta analisis dokumen perusahaan. Hasil penelitian menunjukkan bahwa integrasi AI dan IoT memungkinkan transformasi cybernetic control menjadi sistem yang adaptif dan prediktif melalui penerapan predictive maintenance, deteksi anomali, dan pemantauan keselamatan berbasis sensor. Selain itu, pendekatan augmented intelligence menegaskan bahwa AI berperan sebagai pendukung keputusan yang memperkuat kapasitas manajerial, bukan menggantikan peran manusia. Penelitian ini berkontribusi pada literatur SPM dengan menawarkan model integrasi AI-based cybernetic controls dalam konteks BUMN infrastruktur serta memberikan rekomendasi praktis untuk meningkatkan efisiensi dan keselamatan operasional.

Kata Kunci : *Artificial Intelligence, Internet of Things, Cybernetic Control, Sistem Pengendalian Manajemen, Predictive Maintenance, Keselamatan Perkeretaapian, Augmented Intelligence, PT Kereta Api Indonesia.*

ABSTRACT

This study examines the integration of Artificial Intelligence (AI) and the Internet of Things (IoT) to enhance cybernetic controls within the Management Control System (MCS) of PT Kereta Api Indonesia (PT KAI). Existing control practices remain reactive and historically driven, limiting real-time feedback in addressing operational disruptions, particularly in locomotive maintenance and railway crossing safety. Adopting an interpretivist qualitative approach, the study draws on field observations, semi-structured interviews with nine informants, and document analysis. The findings reveal that AI and IoT integration transforms cybernetic controls into adaptive and predictive systems through predictive

maintenance, anomaly detection, and sensor-based safety monitoring. The study also highlights the role of augmented intelligence, positioning AI as a decision-support mechanism that strengthens managerial judgment rather than replacing human involvement. This research contributes to the Management Control System literature by proposing an AI-based cybernetic control framework in the context of state-owned infrastructure enterprises and offers practical implications for improving operational efficiency and safety performance.

Keyword : Artificial Intelligence, Internet of Things, Cybernetic Control, Management Control System, Predictive Maintenance, Railway Safety.