

ABSTRACT

The digital transformation of the coal mining industry requires a robust communication network to support real-time monitoring, autonomous machinery, and data-driven decision-making in complex open-pit environments. This study proposes an LTE-Wi-Fi overlay network method that combines LTE broad coverage and mobility with Wi-Fi localized capacity to ensure connection stability and redundancy. Network planning was carried out using capacity-based and coverage-based approaches, simulated with Forsk Atoll (LTE) and Ekahau Site Survey (Wi-Fi), with performance evaluation covering RSRP, SINR, throughput, and connection quality, as well as CAPEX and OPEX analysis. Results show LTE achieving 100% E-RAB success, throughput above 94%, 100% handover success, RSRP coverage of 92.43%, and SINR of 98.40%. The overlay network reduced operational internet service costs by 49%, eliminated accident-related expenses within two months, and increased productivity to 151% of the target. These findings demonstrate that the LTE-Wi-Fi overlay method is a strategic, reliable, and cost-effective solution to drive sustainable digital transformation in Indonesia's coal mining sector.

Keywords: LTE, Wi-Fi, Overlay Network, Digital Transformation, Coal Mining, Network Planning, IoT Integration, Real-Time Monitoring, Autonomous , Machinery, Mining Safety.