

Driving Value and Improving Efficiency: Digital Fuel Measurement as a Strategic Enabler in State-Owned Logistics — a Case Study of Limosin at Elnusa Petrofin

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ABSTRACT

This study examines the digital transformation of fuel logistics within Indonesian state-owned enterprises (SOEs), focusing on the implementation of LIMOSIN (Liquid Monitoring System) at Elnusa Petrofin. Despite global advances in IoT-enabled measurement systems, Indonesian fuel distribution continues to rely on manual dipstick measurement, handwritten logs, and fragmented reconciliation processes. Using a qualitative case study approach supported by the Technology Acceptance Model (TAM), Resource-Based View (RBV), VRIO, and Cost-Benefit Analysis (CBA), this research analyzed the operational, behavioral, and strategic implications of adopting digital fuel measurement systems. Findings reveal that LIMOSIN significantly improves accuracy, transparency, and traceability but faces adoption barriers due to low perceived ease of use, limited system integration, and institutional constraints typical of SOEs. Strategically, LIMOSIN positions Elnusa Petrofin toward greater client trust and differentiation in B2B logistics. The study contributes theoretical and managerial insights into digital adoption within emerging market SOEs and provides recommendations to strengthen readiness and strategic alignment.

KEYWORDS B2B Strategy; Digital fuel measurement; logistics transparency; SOE transformation; technology adoption.



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INTRODUCTION

The logistics sector in Indonesia faces increasing complexity due to geographic dispersion, regulatory fragmentation, and the heavy reliance on state-owned enterprises to facilitate distribution activities. Fuel logistics, in particular, play a central role in maintaining national energy stability. However, many operational workflows depend on legacy measurement techniques that were designed decades ago and have not evolved alongside modern digital capabilities (Barney, 1991; Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Westerman, Bonnet, & McAfee, 2014). Manual dipstick measurement, for example, continues to be a dominant method despite its susceptibility to environmental factors, human error, and variations in interpretation. As Indonesia expands industrial operations across multiple regions, the pressure to deliver accurate, transparent, and verifiable fuel distribution data becomes increasingly urgent. Digital fuel measurement systems, such as LIMOSIN, offer a significant leap toward real-time monitoring, operational accuracy, and audit readiness. However, the adoption of digital technologies in SOEs is not linear and depends greatly on cultural, bureaucratic, and structural dynamics that shape organizational behavior (Anderson, Narus, & van Rossum, 2006; Anggraeni, 2021; Bai, 2019; Baptista, Kim, & Kumar, 2022; Brynjolfsson & Hitt, 2000).

From a theoretical standpoint, the Technology Acceptance Model provides an important lens through which user attitudes are understood. Perceived usefulness (PU) among Elnusa Petrofin staff was consistently high, with respondents noting clear improvements in accuracy, transparency, and reporting (Christopher, 2016). Nevertheless, perceived ease of use (PEOU) remained problematic due to manual input requirements, inconsistent connectivity, and a lack of intuitive interface design. The gap between PU and PEOU is emblematic of many digital transformation efforts in SOEs, where enthusiasm for innovation is tempered by inadequate infrastructure support and unfamiliarity with digital workflows (Tang & Veelenturf, 2019). The Unified Theory of Acceptance and Use of Technology reinforces these insights by highlighting the importance of facilitating conditions such as training availability, leadership support, and alignment of KPIs (Al Mashalah, Hassini, Gunasekaran, & Bhatt, 2022; Gu, Yang, & Huo, 2021; Raut, Mangla, Narwane, Dora, & Liu, 2021; Yang, Fu, & Zhang, 2021).

Applying the Resource-Based View, LIMOSIN demonstrates clear potential as a value-generating capability. The system is aligned with the organization's strategic need to modernize operations, reduce losses, and improve client trust (Frank, Dalenogare, & Ayala, 2019; Hosseini, Ivanov, & Dolgui, 2019; Verhoef et al., 2021). However, digital capabilities do not automatically translate into competitive advantage unless they are rare, difficult to imitate, and embedded within organizational routines. Competitors within the Pertamina ecosystem or external private logistics providers can implement similar digital measurement systems, thereby limiting LIMOSIN's rarity and inimitability. The VRIO analysis suggests that LIMOSIN remains valuable but falls short of conferring sustained competitive advantage until adoption becomes universal and system outputs are embedded into operational and reporting SOPs (AlNuaimi, Singh, Ren, Budhwar, & Vorobyev, 2022; Papanagnou, Seiler, Spanaki, Papadopoulos, & Bournlakis, 2022; Warner & Wäger, 2019).

Cost-Benefit Analysis provides additional analytical insight. Although initial investment costs may appear substantial including hardware installation, software development, training, and IT support the long-term financial returns are significant. Reductions in measurement discrepancies, shorter billing cycles, minimized disputes with clients, and reductions in manpower for reconciliation collectively contribute to improved profitability and operational efficiency. However, long-term benefits do not align with the annual budgeting logic common in SOEs, making it difficult for decision-makers to justify upfront expenditures. This mismatch creates a strategic dilemma where innovation is recognized as necessary but delayed due to institutional constraints.

The strategic implications of LIMOSIN extend beyond operational improvements. In B2B logistics markets, transparency, traceability, and auditability are increasingly recognized as sources of competitive differentiation. Clients such as mining companies, power producers, and government institutions demand real-time data to support internal governance and risk management. LIMOSIN enables Elnusa Petrofin to respond to these market expectations, shifting the company's value proposition toward enhanced service quality and customer intimacy. This strategic repositioning aligns with global trends in logistics digitalization where service differentiation is achieved not solely through cost efficiency but through the ability to provide accurate, verifiable, and actionable information to clients.

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Literature Review

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The urgency of this research is underscored by the Indonesian government's broader push for SOE transformation and digitalization to enhance national competitiveness. Without a clear understanding of the barriers and enablers of digital adoption in critical sectors like fuel logistics, substantial investments in technology may fail to deliver the expected returns. The persistent reliance on manual, inefficient processes pose a risk to national energy security and economic stability. Therefore, investigating the real-world implementation of a digital system like LIMOSIN is crucial to provide evidence-based insights that can guide future digitalization policies and investments within SOEs.

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METHOD

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RESULT AND DISCUSSION

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CONCLUSION

LIMOSIN is a digital fuel measurement and monitoring system that holds strategic value for Elnusa Petrofin. Based on the Technology Acceptance Model (TAM), staff demonstrated high perceived usefulness (PU) due to improved accuracy, transparency, and reporting quality. However, perceived ease of use (PEOU) remained low due to the need for manual input, connectivity issues, and a less intuitive interface. UTAUT confirmed that successful adoption is influenced by facilitating conditions such as training, leadership support, and KPI alignment. From a Resource-Based View (RBV) perspective, LIMOSIN is valuable and supports operational modernization and increased client trust. However, the system does not yet provide a sustainable competitive advantage because it is easily replicated and not yet fully embedded in operational SOPs. A VRIO analysis indicates that LIMOSIN is valuable but will not become a source of unique advantage until widespread adoption and full integration into organizational routines. The Cost-Benefit Analysis reveals that the initial investment is substantial (hardware, software, training, support), but the long-

term benefits are significant: reduced measurement discrepancies, faster billing cycles, fewer disputes, and labor efficiency. Obstacles arise because the logic of annual budgeting in state-owned enterprises tends to hinder funding for long-term innovation. Strategically, LIMOSIN enables service differentiation in the B2B logistics market through increased transparency, traceability, and auditability. This aligns with the global trend of logistics digitalization and institutional clients' need for real-time data for internal control and risk management. In an industrial context, Indonesia's complex logistics sector, based on legacy practices such as error-prone manual measurements using dipsticks is in dire need of transformation. Digital systems like LIMOSIN offer the answer, but their success is heavily influenced by cultural factors, bureaucracy, and organizational structures within state-owned enterprises, which make the adoption process non-linear.

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