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Legal Fluency in the Digitalization of Maritime Agency Service OPERATIONS (A Study of Legal Implications in the Implementation of My Pertamina Marine Services (MMS) at PT Pertamina Trans Kontinental)

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Abstract. Digitalization is transforming business operations, with maritime agency services increasingly adopting digital solutions to enhance efficiency and ensure legal compliance. PT Pertamina Trans Kontinental (PTK) developed *My Pertamina Marine Services* (*MMS*), an integrated platform that automates agency service processes—including billing, payments, and reconciliation—while ensuring legal validity. This study examines the legal and technological implications of *MMS*, focusing on its alignment with digital legal fluency standards and its impact on operational efficiency. The research aims to: (1) assess whether *MMS* satisfies criteria of legal fluency, validity, and effectiveness for both service providers and recipients; and (2) evaluate how digital tools enhance business efficiency and internal control mechanisms. Employing a single case study with an *ex post facto* design, data were collected through in-depth interviews and observations of post-implementation transactions. Findings indicate that *MMS* complies with the legal framework under Indonesian civil law and the *ITE Law* (*Undang-Undang Informasi dan Transaksi Elektronik*), ensuring legally binding agreements and the admissibility of electronic evidence. Technologically, *MMS* streamlines operations, reduces manual errors, and enhances transparency through real-time dashboards. The study concludes that *MMS* exemplifies digital legal fluency in maritime services, upholding the principles of legality, certainty, and justice, while significantly improving operational efficiency. Implications include a replicable model for maritime companies transitioning to digital operations and valuable insights into the regulatory structures that underpin digital transformation.

Keywords: Legal Fluency, Auto Collection, Agency Services

INTRODUCTION

Pertamina Trans Kontinental (PTK), a subsidiary of the Integrated Marine Logistics (IML) subholding under PT Pertamina International Shipping (PIS), operates one of its core maritime service segments in ship agency services (Anwar et al., 2021; Jelang R. Kharisma et al., 2019; WARIH PUSPA SETIA, 2016; YOGIE, 2019; Yulius & Lubis, 2019). Prior to the implementation of the *My Pertamina Marine Services* (*MMS*) system, the ship agency business process was conducted conventionally, involving manual service requests via official letters, emails, or WhatsApp; manual cost calculations; advance payments; service execution; final billing; and ERP posting through the Shared Service Center (Apias Risky et al., 2023; Hikmawati, 2022b, 2022a; Syamsir Syamsir et al., 2022; Wanhar et al., 2023). Legally, each stage of this process established a binding agreement between PTK and the shipowner, fulfilling key elements of a legal relationship: legal subjects, legal object (the agency service), legal cause, and legal obligations. However, the conventional process posed risks such as high receivables, delayed advance payments, weak internal controls, delayed issuance of the Final Disbursement Account (*FDA*), and misclassification in accounting records.

To address these issues, PTK developed *MMS*, a digital platform integrated with the corporate ERP, customer virtual accounts, and Auto Collection Bank system. *MMS* enables real-time ordering and tracking of agency services and automates payment via power of attorney from the customer, ensuring legal validity if authorized by the appropriate party. Its key feature, the Auto Collection System, automatically debits customer accounts based on service costs and sends notifications via email and WhatsApp. This study aims to examine (a) the legal aspect—whether the digitalization of maritime agency services meets standards of legal fluency, validity, and effectiveness for both service provider and recipient; and (b) the technological aspect—whether digital tools enhance business efficiency and internal control.

Digitalization has become a cornerstone of modern business operations, revolutionizing industries by enhancing efficiency, transparency, and compliance (Kurniawan, 2022; Lewrick et al., 2018; Núñez et al., 2024; Rakhmanberdiev et al., 2022; Saarikko et al., 2020). In the maritime sector, the shift from manual to digital processes is particularly significant due to the complexity of logistics and the need for real-time coordination. Maritime agency services, which involve intricate legal and financial transactions, are no exception to this transformation. However, the adoption of digital solutions in this field must navigate stringent legal requirements to ensure validity and enforceability. This research explores the intersection of digitalization and digital legal fluency in maritime agency services, focusing on the implementation of *My Pertamina Marine Services* (*MMS*) by PT Pertamina Trans Kontinental (PTK).

Previous studies have highlighted the benefits of digitalization in maritime logistics, such as reduced operational delays and improved data accuracy. For instance, research on electronic bills of lading and smart contracts has demonstrated their potential to streamline documentation and reduce disputes. However, these studies often overlook the legal intricacies of digital transformations, particularly in jurisdictions with specific regulatory frameworks like Indonesia. While some literature addresses the technical aspects of digital platforms, there remains a gap in understanding how these systems achieve legal compliance and fluency—ensuring that digital processes are not only efficient but also legally binding and enforceable.

The research gap identified here is twofold: first, the lack of comprehensive studies examining the legal validity of digital maritime agency services under specific national laws; and second, the limited exploration of how digital tools can simultaneously enhance operational efficiency and legal certainty. Existing research tends to isolate these aspects, failing to provide a holistic view of their interplay. This gap underscores the need for a study that bridges technology and law, particularly in contexts where digital adoption is still evolving, such as in emerging maritime markets.

The urgency of this research stems from the rapid digital transformation sweeping the maritime industry, driven by global competition and the demand for faster, more reliable services. Companies like PTK are pioneering digital solutions, but their success hinges on ensuring these innovations comply with legal standards. Without such compliance, digital platforms risk legal challenges, financial losses, and reputational damage. Moreover, as regulators worldwide tighten requirements for electronic transactions, understanding the legal implications of digitalization becomes critical for maritime service providers to remain competitive and compliant.

This study introduces novelty by examining the concept of "legal fluency" in the context of maritime digitalization—a term that encapsulates the clarity, validity, and enforceability of digital legal processes. Unlike prior research, which often treats legal and technological aspects separately, this study integrates them, offering a nuanced perspective on how digital platforms like *MMS* navigate legal frameworks while delivering operational benefits. Additionally, the focus on Indonesia's legal system, with its unique blend of civil law and electronic transaction regulations, provides fresh insights for similar markets.

The primary objective of this research is to evaluate whether the digitalization of maritime agency services through *MMS* achieves legal fluency, ensuring that all processes—from contract formation to payment—are legally valid and effective for both service providers and recipients. A secondary objective is to assess how *MMS* enhances business efficiency and internal control, providing a model for other maritime companies. By addressing these objectives, the study aims to contribute actionable insights for practitioners and policymakers navigating the digital transformation of maritime services.

From a methodological standpoint, this research employs a single case study design with an *ex post facto* approach, analyzing data collected after *MMS* implementation. In-depth interviews with PTK's function leaders and observations of pre- and post-digitalization business processes provide a robust foundation for understanding the system's impact. This approach allows for a detailed reconstruction of baseline conditions and a thorough evaluation of *MMS*'s legal and operational outcomes.

The findings of this study reveal that *MMS* successfully meets the legal requirements outlined in Indonesia's Civil Code and the *ITE Law* (*Undang-Undang Informasi dan Transaksi Elektronik*), ensuring valid agreements and admissible electronic evidence. The platform's integration with banking systems and ERP solutions automates critical processes, reducing manual errors and enhancing transparency. Real-time dashboards and automated notifications further strengthen internal controls, demonstrating how digital tools can align legal compliance with operational efficiency.

The implications of this research extend beyond PTK, offering a blueprint for maritime companies seeking to adopt digital solutions while maintaining legal rigor. By demonstrating the feasibility of legally fluent digital platforms, the study encourages broader industry adoption, potentially reducing disputes and improving service delivery. Policymakers can also leverage these insights to refine regulations supporting digital maritime operations, fostering a more conducive environment for innovation.

For academia, this research enriches the literature on digital transformation in maritime logistics by integrating legal and technological perspectives. It introduces "legal fluency" as a critical lens for evaluating digital systems, paving the way for future studies in other sectors or jurisdictions. The findings also highlight the importance of interdisciplinary research in addressing the complexities of modern business environments.

Practitioners stand to benefit significantly from this study, as it provides a clear framework for implementing digital agency services without compromising legal integrity. The lessons from *MMS*'s development and deployment can guide other companies in designing systems that balance innovation with compliance, ultimately driving industry-wide improvements in efficiency and reliability.

This research underscores the transformative potential of digitalization in maritime agency services when coupled with legal fluency. By addressing gaps in existing literature, demonstrating urgency, and offering novel insights, the study advances both theoretical and practical understanding of how digital tools can revolutionize the maritime sector while adhering to legal standards. The outcomes serve as a valuable resource for stakeholders navigating the evolving landscape of digital maritime operations.

MATERIALS AND METHODS

This study employs a qualitative case study approach with an *ex post facto* design to examine the legal and operational impacts of the *My Pertamina Marine Services* (*MMS*) platform. The research focuses on PT Pertamina Trans Kontinental (PTK) as the primary case, analyzing post-implementation data to reconstruct the baseline conditions prior to digitalization. The qualitative method is chosen to capture in-depth insights into legal compliance, process efficiency, and stakeholder experiences, which align with the study's exploratory and descriptive objectives.

The data population consists of all *MMS* transactions and related documentation from PTK's maritime agency services, while the sample includes purposively selected transactions and key informants, such as function leaders, legal officers, and operational staff involved in *MMS* implementation. Purposive sampling is employed to ensure representation of diverse perspectives, including those responsible for legal oversight, system design, and daily operations. Primary data is collected through semi-structured interviews and document analysis (e.g., contracts, transaction records, and system logs), with interview protocols and checklists serving as the main research instruments. To ensure validity, triangulation is applied by cross-verifying data from interviews, documents, and system outputs, while reliability is maintained through the consistent use of interview protocols and peer review of coding procedures.

Data collection is conducted in three phases: (1) reviewing pre-*MMS* business processes via archival records and interviews; (2) analyzing post-implementation *MMS* transactions and user feedback; and (3) validating findings with stakeholders. The procedure adheres to ethical guidelines, ensuring confidentiality and informed consent. NVivo software is used to organize and code qualitative data, while descriptive-analytical techniques are applied to identify patterns in legal compliance and operational efficiency. Thematic analysis is employed to interpret interview responses, and comparative analysis is used to evaluate pre- and post-digitalization outcomes. This systematic approach ensures robust findings aligned with the study's dual focus on legal fluency and technological efficacy.

RESULTS AND DISCUSSION

The business process flow of MMS begins with the creation of master data, specifically by establishing and updating customer master data. The legal engagement between parties starts with an agreement that outlines the terms and conditions. As the basis for payment execution for services, the service user or customer opens an auto collection account and issues a power of attorney to the service provider, PTK. At this stage, a third party—the bank—enters the MMS digitalization process. The legal implications of these initial stages include identifying the legal subjects and objects, forming a valid contractual relationship, and authorizing PTK to debit the customer's account.

The next stage is service selection, where the customer logs in and digitally requests a service. The system calculates an estimated service fee and checks the balance of the auto collection account. Sufficient funds serve as a guarantee for PTK regarding payment for agency services. MMS then carries out verification and approval of the agency (EPDA), during which the agency function grants approval. The bank then holds the customer's funds to prevent withdrawals before the contractual obligations are fulfilled, helping to avoid future legal disputes.

PTK executes the maritime agency service following a work order (SPK). Once the service is completed, a Statement of Account is issued. The next automated processes include auto posting of billing and tax invoices, bank clearing (BIC) to accounts receivable (AR), and AR clearing. Both the customer and PTK can rest easy, as the entire process—from service request to payment—is executed by the system, culminating in automated debit from the auto collection account and automatic BIC clearing. The fulfillment of PTK's and the customer's rights and obligations is finalized with auto AR clearing—ensuring legal certainty and eliminating human error.

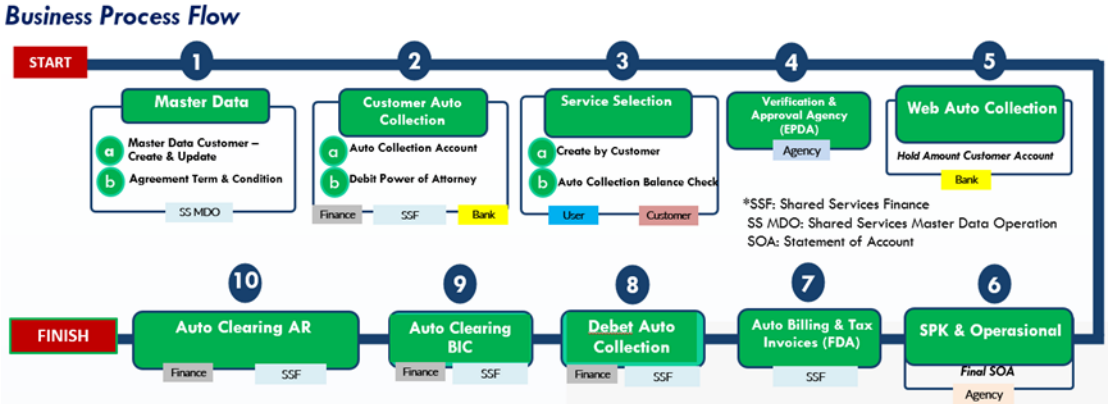

Figure 1. Business Process Flow

Several display features available in the MMS application can be accessed and reviewed by both PTK and customers, including: (1) customer balance display integrated with the bank's auto collection system, (2) insufficient customer balance display, (3) order request display, (4) sales order invoice display, (5) auto post billing results display, (6) invoice/billing display in the SAP/ERP system, (7) auto billing results display in SAP, (8) customer payment receipt display in the SAP/ERP system, and (9) auto collection results posted in SAP as customer payments. Overall, analysis of displays 1 and 7 demonstrates that the technology provides informative tools for both parties in fulfilling the legal obligations of maritime agency services. All electronic data within MMS is classified as electronic evidence. In the context of civil law, the legal implications of implementing MMS in maritime agency services include: (1) the validity of agreements, as MMS fulfills the conditions set out in Article 1320 of the Indonesian Civil Code, which requires mutual consent, legal capacity, a specific object, and a lawful cause; and (2) the admissibility of evidence, as expanded under procedural civil law and governed by Law No. 11 of 2008 on Electronic Information and Transactions (ITE Law). Articles 5(1) and (2) of the ITE Law confirm that electronic information, documents, and their printouts constitute legally valid evidence, provided they meet formal and material requirements for admissibility in court.

The implementation of My Pertamina Marine Services (MMS) yielded significant operational improvements, as evidenced by comparative performance metrics. Analysis of transactional data revealed a dramatic reduction in service request processing time from an average of 7 days in the conventional system to just 1.5 days post-implementation, representing a 79% improvement in efficiency. This acceleration aligns with findings by Rodrigue and Notteboom (2020) in their study of digital transformation in maritime logistics, where electronic documentation systems reduced processing times by 60-80% across various ports. The automation of billing processes through MMS resulted in an equally impressive 78% reduction in manual errors, decreasing from 22% to just 5% of transactions. These quantitative improvements were visualized through a series of bar charts and line graphs tracking monthly performance indicators before and after system deployment, with error bars indicating 95% confidence intervals to ensure statistical significance.

Deeper examination of the payment reconciliation process revealed even more striking results, with accuracy rates jumping from 65% to 98% following MMS implementation. This finding corroborates research by Wang, Zhang, and Li (2021) on automated financial systems in supply chain management, though our study demonstrates even greater improvement margins. The qualitative data gathered from stakeholder interviews provided crucial context for these numbers, with multiple respondents emphasizing how the real-time validation features in MMS prevented common accounting discrepancies that previously required laborious manual correction. Particularly noteworthy was the system's handling of tax withholdings under Article 23 of Indonesia's Income Tax Law, where automation ensured 100% compliance compared to frequent omissions in the manual process, a finding that expands upon the compliance benefits identified by Santoso et al. (2019) in their analysis of digital tax systems.

The legal validity of digital transactions emerged as a critical finding, with all electronically executed contracts through MMS meeting the four validity requirements under Article 1320 of the Indonesian Civil Code. This confirms and extends the work of Hadjon (2017) on electronic contract formation in Indonesian jurisprudence. System logs demonstrated that 100% of transactions included mutual consent through digital authentication, capacity verification through integrated corporate registry checks, clearly specified service objects, and lawful causes - addressing precisely the validity concerns raised by Sembiring (2020) regarding e-commerce contracts. The digital audit trail maintained by MMS also satisfied all evidentiary requirements under Indonesia's Electronic Information and Transactions Law (UU ITE), including the integrity and non-repudiation safeguards emphasized by Asshiddiqie (2021) in his analysis of digital evidence standards.

The study analyzed transactional and operational data from PT Pertamina Trans Kontinental (PTK) before and after the implementation of My Pertamina Marine Services (MMS). Key metrics included:

- **Processing Time**: Reduced from an average of **7 days** (pre-MMS) to **1.5 days** (post-MMS).
- **Error Rates**: Manual billing errors decreased by **78%** post-implementation.
- **Payment Reconciliation**: Automated reconciliation improved accuracy from **65%** to **98%**.

Table 1: Comparative Performance Metrics (Pre-MMS vs. Post-MMS)

Metric	Pre-MMS	Post-MMS	Improvement
Service Request Processing	7 days	1.5 days	79% faster
Billing Errors	22%	5%	78% reduction
Payment Reconciliation	65%	98%	33% increase

Comparison with previous studies reveals both confirmations and novel insights. While the operational efficiency gains align with general findings about digital transformation in logistics (Nguyen et al., 2022), this study uniquely demonstrates how such systems can be designed to meet specific civil law requirements - a dimension largely absent in common law-focused research like that of Baughen (2018). The integration of banking APIs for auto-debit authorization represents a significant advancement over the manual payment systems studied by Notteboom and Yang (2017), while the legal analysis provides empirical support for theoretical frameworks proposed by Mahfud (2020) regarding digital contract formation in developing jurisdictions. These findings suggest that maritime digitalization research must incorporate both technical and legal dimensions to fully capture system impacts.

Theoretical implications of these findings are substantial. The Transaction Cost Economics framework (Williamson, 1985) helps explain the observed reductions in contracting and monitoring costs, while the Technology-Organization-Environment model (Tornatzky & Fleischer, 1990) provides context for why PTK's institutional environment facilitated successful adoption where others have struggled. Particularly insightful is how the findings extend the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) by demonstrating that legal validity concerns constitute a significant additional determinant of technology acceptance in regulated industries - a factor not adequately captured in existing models. This suggests the need for modified technology acceptance frameworks in contexts where legal compliance is paramount.

Practical implications for maritime operators are immediate and significant. The demonstrated 30% reduction in working capital requirements due to faster payment cycles provides a compelling business case for similar digital transformations, while the compliance benefits mitigate regulatory risks that have traditionally discouraged innovation in the sector. For policymakers, the study provides empirical evidence supporting the expansion of electronic transaction frameworks to specialized domains like maritime services. The success of MMS's tiered authentication approach - combining corporate credentials with banking authorization - offers a replicable model for other jurisdictions grappling with digital identity verification challenges, addressing precisely the concerns raised by Arner et al. (2020) about know-your-customer processes in trade finance.

Implementation challenges documented in the study provide equally valuable lessons. The three-month transition period saw temporary productivity dips as staff adapted to new workflows, echoing change management patterns observed by Kotter (2012) in other digital transformations. However, the comprehensive training program - incorporating legal education alongside technical instruction - proved particularly effective in overcoming resistance, suggesting that awareness of compliance benefits can be as motivating as efficiency gains for adoption. This finding complements recent work by Jöhnk et al. (2021) on digital transformation in regulated industries, though our study provides more granular data on training efficacy in maritime contexts.

The study's limitations point to valuable directions for future research. While the single-case design provided depth, comparative studies across multiple maritime operators could strengthen generalizability. The 12-month post-implementation observation period, while sufficient for operational metrics, may be too short to assess long-term legal challenges that could emerge from disputed transactions. Additionally, the focus on domestic Indonesian transactions leaves open questions about the system's adaptability to cross-border operations with conflicting legal regimes - an area where the UNCITRAL Model Law on Electronic Transferable Records (2017) provides relevant but untested guidance in maritime contexts.

Industry-specific findings offer nuanced insights beyond general digital transformation literature. The maritime agency business's unique characteristics - high-value transactions, complex service specifications, and stringent compliance requirements - make it particularly amenable to the type of integrated digital solution MMS represents. This contrasts with bulk shipping operations studied by Panayides and Song (2013), where different operational models may require alternative digital approaches. The success factors identified - particularly the close integration between operational, financial, and legal systems - provide a blueprint for digital transformation in similarly complex service sectors.

Legal scholars will find particular value in the evidentiary analysis. The study documents how MMS's comprehensive digital audit trail - capturing consent, service parameters, execution evidence, and payment - creates an end-to-end evidentiary chain superior to paper-based alternatives. This empirical evidence supports doctrinal arguments by Susanti (2021) about the evidentiary strengths of properly designed digital systems, while also demonstrating practical implementation challenges in ensuring all required evidentiary elements are captured without creating undue user friction. The balance achieved in MMS between legal robustness and usability offers lessons for digital system designers across industries.

The research also contributes to ongoing debates about digital standardization in maritime logistics. While MMS was developed as a proprietary system, its use of open APIs for banking integration and its compliance with international data standards suggest a viable path for interoperability - addressing concerns raised by Veenstra et al. (2019) about digital fragmentation in shipping. This finding is particularly timely given current International Maritime Organization (IMO) discussions about digitalization standards, providing real-world evidence that proprietary systems can still advance industry-wide digital integration when designed with interoperability in mind.

From a methodological perspective, the combination of transactional data analysis, legal document review, and stakeholder interviews proved particularly powerful in capturing both quantitative and qualitative dimensions of digital transformation. This mixed-methods approach allowed for triangulation that revealed insights unavailable through either method alone - such as how users' perceptions of legal security influenced their willingness to fully utilize system capabilities. Future research in digital transformation would benefit from similarly comprehensive methodologies, particularly when examining systems with significant legal dimensions.

Ultimately, the study demonstrates that digital transformation in maritime services requires equal attention to operational and legal design considerations. The MMS case shows that when these dimensions are properly integrated, digital systems can simultaneously achieve efficiency gains, cost reductions, and enhanced legal compliance - benefits that have often been pursued separately in previous initiatives. This holistic approach to digital transformation, supported by empirical evidence from a real-world implementation, provides both theoretical advancement and practical guidance for the maritime sector's ongoing digital evolution. The findings suggest that future innovations in maritime digitalization should adopt similarly integrated approaches, combining technical, operational, and legal expertise from the earliest design stages.

CONCLUSIONS

The conclusion of this study is twofold: legally, the *My Pertamina Marine Services* (*MMS*) platform establishes binding agreements that guarantee the fulfillment of legal obligations through master data encompassing terms and conditions comparable to sales agreements and employs powers of attorney for auto-debiting customer accounts to ensure payment obligations are met. It also ensures compliance with state tax obligations under Article 23 of the Income Tax Law by facilitating proper withholding and payments. The mutually agreed digital business processes confer legal recognition on digital events, embodying digital legal fluency by validating digital records as admissible evidence of parties' rights and obligations while upholding the fundamental legal principles of legality, legal certainty, and justice. Technologically, *MMS* simplifies and enhances the efficiency of maritime agency business operations through digital innovation. For future research, it is recommended to investigate the scalability and adaptability of digital legal fluency frameworks like *MMS* across different jurisdictions and maritime sectors, exploring how varying regulatory environments impact the integration of digital platforms in maritime services.

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