

Service Quality Dimension and Service Characteristics of Digitalized Carrier Transactions in National Capital Region: Basis for Enhanced Customer Service

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Abstract

This study aimed to examine the relationship between service quality dimensions and service characteristics influencing importer satisfaction with digitalized carrier transactions, as a basis for enhancing customer service within the logistics and maritime sector. Guided by service quality and customer satisfaction frameworks, a quantitative, descriptive–correlational research design was employed using structured survey questionnaires administered to purposively selected importers operating in the National Capital Region (NCR) of the Philippines. The service quality dimensions analyzed included responsiveness, speed, reliability, and value, while service characteristics covered customer service representatives, ocean transport, and digital systems. Descriptive and inferential statistical techniques were used to assess satisfaction levels, perceived difficulties, and relationships among variables. Results indicated that importers were generally satisfied with responsiveness, speed, and reliability, with value emerging as the strongest contributor to overall satisfaction. Service quality dimensions were found to significantly influence satisfaction with ocean transport and digitalization, while no significant relationship was observed with customer service representative performance. Despite favorable satisfaction levels, challenges related to communication gaps, system integration issues, customer service coordination, and delayed notifications were identified and were found to be systemic rather than dependent on importer size. The study concludes that while digitalized carrier transactions deliver substantial operational value, improvements in system interoperability, real-time communication, and alignment between digital platforms and customer service functions are necessary to enhance adoption and overall importer satisfaction.

Keywords: Carrier transactions, Customer service, Digitalization, Importer satisfaction, Logistics, Ocean transport, Service characteristics, Service quality dimensions

1. Introduction

Digital transformation driven by Artificial Intelligence (AI), Big Data Analytics, Cloud Computing, and the Internet of Things (IoT) has fundamentally altered global logistics and maritime operations by reshaping how firms manage speed, visibility, and customer value in service delivery. Carrier transactions covering booking, documentation, communication, tracking, and payment have increasingly shifted from manual, paper-based processes to automated digital systems designed to improve responsiveness, reliability, and operational consistency. These changes reflect the broader emphasis of organizations on strengthening service performance through structured quality management practices and standardized operational controls, where accuracy, timeliness, and compliance are treated as critical drivers of customer satisfaction and trust (Gamit et al., 2024). At the same time, the growing expectation for seamless digital platforms and cashless systems has further increased demand for efficient transaction completion, clear documentation flow, and real-time service updates, particularly in sectors where customers closely evaluate service convenience and transaction security (Santos, 2023). As transaction processes become more digitized, importer experience becomes increasingly shaped by how effectively carriers provide accessible, transparent, and consistent service encounters across each stage of delivery.

Despite strong progress in global shipping markets, developing economies such as the Philippines continue to experience uneven digital adoption across logistics-related processes. Digital transformation in local settings is frequently influenced by system readiness, organizational capability, infrastructure constraints, and limited integration of automated tools into end-to-end operational routines, which can affect service continuity and customer confidence (Binaluyo et al., 2024). This creates a service environment where importers may encounter variations in transaction speed, documentation accuracy, response time, and reliability depending on how digital tools are implemented and maintained. Importantly, the quality of service delivery in administrative and transaction-based systems is often evaluated through observable performance outcomes such as responsiveness, assurance, reliability, and the ability to resolve concerns efficiently which collectively shape satisfaction and perceived service value (De Lara & Santos, 2024). In practical terms, delays in document processing, limited system transparency, and inconsistent customer communication can weaken importer experience even when core transport services are available.

From a service management perspective, digitalization influences importer satisfaction not only through the speed of transactions but also through the consistency of service characteristics that define the customer experience. Research emphasizes that documentation issues and gaps in digital processes can disrupt workflow continuity and stakeholder coordination, resulting in service dissatisfaction and reduced perceived reliability (Jacoba et al., 2025). Similarly, organizations that pursue transformation strategies often face transitional challenges that require process alignment, performance monitoring, and customer-oriented service improvements to ensure that digital adoption translates into measurable service outcomes (Santos, 2023). In this context, the present study examines how the digitalization of carrier transactions influences importer satisfaction in the National Capital Region (NCR), with specific attention to service quality dimensions and service characteristics that shape customer experience, transaction confidence, and perceived value in logistics-related service encounters. Focusing on importer perspectives, the study provides practical insights on how carrier digital systems contribute to service effectiveness and customer satisfaction within a developing economy logistics environment.

1.1 Digitalization of Carrier Transactions and Importer Service Experience in the Philippine Logistics Industry

The logistics and maritime sectors are undergoing rapid digitalization to meet increasing demands for operational efficiency, cost reduction, and service transparency. Digital carrier transactions enable real-time communication, automated documentation, and faster financial settlements, aligning with customer satisfaction determinants in liner shipping identified by Yuen and Van Thai (2015). However, despite these advancements, Philippine logistics—especially among NCR-based importers—continues to face constraints related to infrastructure limitations, digital literacy gaps, and resistance to technological change (Hirata, 2019). The COVID-19 pandemic accelerated the need for digital logistics solutions, yet smaller importers in the Philippines remain dependent on manual systems, resulting in delays, errors, and dissatisfaction. While global carriers such as Maersk have established benchmarks through live tracking and electronic documentation, adoption gaps persist between international shipping firms and local importers. These gaps underscore the importance of examining how digitalized carrier transactions affect service quality and customer satisfaction in the Philippine context (Uvet, 2020; Manita et al., 2020; Paladin et al., 2024).

1.2 Empirical Themes on Service Quality Dimensions and Service Characteristics in Digitalized Logistics

Existing literature consistently identifies responsiveness, speed, reliability, and value as core service quality dimensions influencing customer satisfaction in digitalized logistics environments (Yuen & Van Thai, 2015; Kang & Kim, 2009). Digital technologies such as AI, IoT, and blockchain enhance operational efficiency, transparency, and trust while reducing delays and errors (Xu et al., 2024; Rane, 2023; Surucu-Balci et al., 2024). However, challenges persist, particularly regarding insufficient infrastructure, lack of interoperability, cybersecurity risks, and limited stakeholder readiness (Chen et al., 2021; Ahmed & Rios, 2022; Afshan et al., 2024). Studies further emphasize the mediating role of service characteristics—customer service representatives, ocean transport operations, and digital platforms—in shaping service quality outcomes and satisfaction (Brzozowska et al., 2023; Hirata, 2019; Rharoubi & Talmenssour, 2022).

1.3 Digitalized Shipping and Logistics in the Global, National, and NCR Importer Context

Globally, logistics digitalization has enabled real-time data sharing, predictive analytics, and integrated supply chain coordination. In contrast, the Philippine shipping industry faces structural and institutional challenges that limit digital maturity, particularly among NCR importers who rely heavily on carrier transactions for international trade. Nationally, disparities between multinational shipping firms and local stakeholders have created a digital divide that affects service efficiency and competitiveness (Altuntaş Vural et al., 2020; Almeida, 2023). At the local level, NCR importers encounter operational disruptions due to outdated systems, limited interoperability, and uneven adoption of digital tools, reinforcing the need for localized empirical evidence to guide digital transformation strategies in developing economies.

1.4 Service Quality and Digital Transformation Frameworks in Shipping and Logistics

This study is grounded in service quality and customer satisfaction theories applied to shipping and logistics. Kang and Kim (2009) emphasize responsiveness as a primary determinant of customer satisfaction, while Yuen and Van Thai (2015) highlight reliability and timeliness as drivers of loyalty in liner shipping. Hirata et al. (2019) extend these perspectives by demonstrating how digital technologies enhance operational efficiency and perceived service value. Together, these frameworks support the examination of how digitalized carrier transactions influence service quality dimensions—responsiveness, speed, reliability, and value—through service characteristics such as customer service representatives, ocean transport efficiency, and digital systems.

1.5 Research Gaps in Digitalized Carrier Transactions and Importer Satisfaction in the NCR

Despite extensive global research on logistics digitalization, limited empirical studies focus on carrier transaction digitalization in developing countries, particularly from the importer's perspective in the Philippines. Existing studies primarily examine advanced economies or large shipping hubs, leaving NCR-specific service quality dynamics underexplored. This study addresses this gap by empirically analyzing how service characteristics influence service quality

dimensions and importer satisfaction, while also identifying challenges faced by importers transitioning to digitalized carrier systems (Rharoubi & Talmenssour, 2022; Al Tera et al., 2024).

1.6 Alignment of Digitalized Carrier Transactions with Relevant Sustainable Development Goals (SDGs)

This research aligns with SDG 8 – Decent Work and Economic Growth by examining how digitalized logistics services enhance trade efficiency and importer competitiveness. It supports SDG 9 – Industry, Innovation and Infrastructure through its focus on digital transformation, technological adoption, and infrastructure challenges in maritime logistics. Additionally, the study contributes to SDG 12 – Responsible Consumption and Production by highlighting paperless transactions, operational efficiency, and data-driven logistics processes that reduce waste and inefficiencies.

1.7 Contribution of Digitalized Carrier Transactions to Multidisciplinary Sustainability

The study contributes to socio-economic sustainability by supporting inclusive digital participation for both large and small importers. It advances technological sustainability by identifying barriers and enablers of digital logistics adoption. From an institutional and policy sustainability perspective, findings provide evidence-based insights for policymakers and regulators to design supportive frameworks that enhance digital readiness and fair competition. Ultimately, improving digitalized carrier transactions strengthens community resilience, trade efficiency, and long-term sustainability within the Philippine logistics ecosystem.

2. Material and methods

2.1 Research Design

The study adopted a quantitative research design to objectively examine the relationships among service quality dimensions, service characteristics, and importer satisfaction with digitalized carrier transactions. Quantitative methods were selected to generate measurable and statistically analyzable data necessary for testing the study hypotheses, particularly the relationships between responsiveness, speed, reliability, value, and service characteristics such as customer service, ocean transport, and digitalization. Structured questionnaires were used to collect standardized responses from importers in the NCR who actively engaged in digitalized carrier transactions, allowing for statistical validation of relationships between independent and dependent variables and facilitating hypothesis testing.

2.2 Locale of the Study

The study was conducted in the National Capital Region (NCR) of the Philippines, focusing on importers located in accessible commercial areas such as Parañaque, Makati, and Manila. The NCR was selected due to its concentration of importers engaged in international trade and its relevance as a logistics and economic hub. The locale provided a suitable context for examining importer experiences with digitalized carrier transactions within the Philippine shipping and logistics sector.

2.3 Respondents of the Study

The respondents consisted of importers operating in the NCR who utilized digitalized carrier transaction systems. Participants were drawn from the top ten importers listed in Bureau of Customs records to ensure that respondents possessed sufficient experience and operational involvement in digitalized shipping transactions. Respondents were professionals responsible for supervising or coordinating logistics and transport operations and were therefore capable of providing informed assessments of service quality dimensions and service characteristics. Only importers with direct experience in digitalized carrier transactions were included, while those outside the NCR or without digitalized transaction exposure were excluded to maintain relevance and focus.

2.4 Sample and Sampling Procedure

Purposive sampling was employed to select respondents based on their experience and knowledge of digitalized carrier transactions. This sampling approach ensured that participants could provide valid and relevant data aligned with the study objectives. Following Gay and Diehl (1992), the sample represented at least 10% to 20% of the target population to achieve meaningful representation. Although the study aimed to survey ten importers, eight completed the questionnaire, while two declined participation due to confidentiality concerns and availability constraints. Despite this, the participating importers provided sufficient data to address the study objectives and test the proposed hypotheses.

2.5 Research Instrument

Data were collected using a structured questionnaire developed in Microsoft Word format and administered in digital or printed form. The instrument consisted of closed-ended questions and Likert-scale items designed to measure importer perceptions of service quality dimensions, including responsiveness, speed, reliability, and value, as well as service characteristics such as customer service representatives, ocean transport, and digitalization. The questionnaire also assessed levels of digital engagement, ease of system use, and overall satisfaction with digitalized carrier transactions. Although qualitative perceptions were captured, all responses were quantified to support statistical analysis and objective measurement of importer satisfaction.

2.6 Data Gathering Procedure

Prior to full deployment, the questionnaire underwent pilot testing with a subset of importers to assess clarity, relevance, and feasibility. Feedback from the pilot test informed revisions to enhance instrument reliability and validity. After finalization, the survey was distributed through face-to-face interaction or electronic formats. Permission was obtained from participating companies, and informed consent was secured from all respondents. Completed questionnaires were recorded and organized in spreadsheet format to facilitate systematic data processing and analysis. Reliability testing using Cronbach's Alpha was conducted following pilot testing to ensure internal consistency of the instrument.

2.7 Data Analysis Techniques

Collected data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics were applied to summarize importer perceptions of service quality dimensions and service characteristics through measures of central tendency, variability, frequency, and percentage distribution. Inferential statistics, including multiple regression analysis, were used to determine the influence of service characteristics on service quality dimensions in testing Hypothesis H_{01} . T-tests or analysis of variance (ANOVA) were employed to assess differences in challenges encountered by importers, addressing Hypothesis H_{02} . Statistical analysis was conducted using Microsoft Excel or SPSS to ensure accuracy and efficiency in data processing and interpretation.

2.8 Ethical Considerations

The study adhered to ethical research principles emphasizing integrity, confidentiality, and voluntary participation. Respondent privacy and anonymity were safeguarded in compliance with the Data Privacy Act of 2012 (RA 10173). Informed consent was obtained through the provision of information sheets and consent forms outlining study objectives, procedures, risks, and benefits. Participation was voluntary, with respondents free to withdraw at any time. Data were securely stored, anonymized, and reported in aggregate form. The researcher declared no conflict of interest, and no incentives were provided to participants. The study posed minimal risk, primarily limited to the time required to complete the questionnaire, while offering potential benefits through contributions to improved logistics service quality and customer satisfaction.

3. Results and Discussion

3.1 Level of Satisfaction of Selected Importers

3.1.1 Responsiveness

The findings indicate that responsiveness recorded the lowest overall satisfaction among the service quality dimensions, with respondents generally reporting satisfactory but not outstanding experiences. Importers valued timely responses from customer service representatives and real-time transaction updates, while system-level responsiveness such as automated notifications and speed of issue resolution received lower ratings. These results suggest that while human support functions adequately, system-driven responsiveness remains an area requiring improvement. The results imply that responsiveness in digitalized logistics systems depends not only on personnel but also on automation and real-time data integration. Technological advancements such as AI, IoT, and distributed ledger technologies are increasingly used to enhance system responsiveness and decision-making efficiency (Lehmacher, 2021; Nagy et al., 2023). However, insufficient system integration and real-time data assimilation continue to limit effective alert management and issue escalation, reinforcing the need for better digital coordination and automated ticketing systems (Joshi et al., 2024; Qi, 2023; Kryvenko, 2024).

3.1.2 Speed

Results show that importers were generally satisfied with the speed of digitalized carrier transactions, particularly in real-time shipment tracking and transaction processing. However, dispute resolution and error correction processes were perceived as slower, indicating weaknesses in handling exceptions despite efficiency in routine operations. These findings suggest that while digital platforms effectively support standard logistics workflows, they require further refinement in managing irregularities. Technologies such as blockchain-based smart contracts and AI-driven trade facilitation systems have demonstrated potential to accelerate dispute resolution and processing timelines (Subhan et al., 2024; LI, 2024; Wang, 2024). Nonetheless, interoperability and implementation costs remain key constraints in fully realizing these benefits (Elahi Nezhad et al., 2024; Chen, 2024).

3.1.3 Reliability

Reliability emerged as one of the stronger service quality dimensions, with respondents expressing high confidence in system security, data privacy, and platform stability. However, accuracy of automated documentation and transaction validation received comparatively lower evaluations, signaling persistent concerns over error-free outputs. The discussion highlights that while system uptime and security foster trust, documentation accuracy remains critical for compliance and operational efficiency. Blockchain-enabled smart contracts have been shown to reduce human error and enhance process validation in logistics systems (Liaqat et al., 2024; Tadi, 2024). Moreover, blockchain integration strengthens data integrity

and mitigates fraud risks in digital supply chains, especially when complemented by robust cybersecurity frameworks (Ran et al., 2024; Odimarha et al., 2024).

3.1.4 Value

Value received the highest satisfaction ratings among all service quality dimensions, with importers perceiving the platform as cost-effective, productivity-enhancing, and strategically beneficial. Respondents recognized the platform's contribution to competitiveness, operational cost reduction, and long-term business objectives. These results affirm the role of digital platforms as value-creation tools in logistics. Digital adoption has been linked to productivity gains and improved competitiveness through cost optimization and data-driven pricing strategies (Burinskienė & Daškevič, 2024; Andru, 2024; Weiguo et al., 2024). However, maximizing value realization requires workforce training to fully leverage digital capabilities (Marinov & Lisenyi, 2024).

3.2 Level of Difficulties of Selected Importers

The results reveal that customer service representatives were perceived as slightly difficult to deal with, primarily due to limited proactivity and slower issue resolution despite clear guidance on platform use. Ocean transport services were generally not perceived as difficult, with accurate tracking and fair costs noted, although timely communication during unforeseen delays remained a concern. Digital solutions were viewed as efficient and supportive of daily operations, but system interoperability posed notable challenges. The discussion indicates that service difficulties stem from gaps in proactive support, real-time communication, and system integration. AI-enabled virtual assistants and business process re-engineering can enhance responsiveness and reduce service delays (Ganesh et al., 2024; Gabriel, 2022). In ocean transport, effective notification systems and information accuracy are critical determinants of satisfaction (Papară & Schirliu, 2024; Paidi et al., 2020; Revina et al., 2024). While IT-driven logistics innovation improves competitiveness, system integration remains complex and resource-intensive (Nour, 2022; Alakaş & Eren, 2022; Tran-Dang et al., 2025; Zaman, 2024).

3.3 Service Characteristics Impact on Service Quality Dimensions

Regression analysis shows that service quality dimensions do not significantly predict customer service representative performance, indicating that importer evaluations of CSRs may depend on interpersonal factors beyond responsiveness, speed, reliability, and value. In contrast, service quality dimensions collectively explained a moderate proportion of variance in ocean transport satisfaction, with perceived value emerging as the only significant predictor. For digital solutions, the relationship was stronger, with value again identified as the most influential determinant. These findings suggest that perceived value is the dominant driver of satisfaction in digitalized logistics services. Empathy, assurance, and communication quality shape customer service evaluations beyond traditional service metrics (Setiono & Hidayat, 2022; Akinyemi & Onukwulu, 2024; Sheth et al., 2024). Consistent with prior studies, value perception plays a crucial role in port and transport service satisfaction, while other dimensions show limited predictive power (Pedraza-Rodriguez et al., 2023; Ariyanto & Astuti, 2023; Sukati et al., 2024). Digital platforms that emphasize cost efficiency and strategic benefits strengthen trust and long-term commitment (Kawa & Zdrenka, 2023).

3.4 Challenges Faced by Importers in Using Digitalized Carrier Transactions

The results indicate that the most common challenges encountered by importers were system integration, communication gaps, and delayed notifications. Additional issues included slow dispute resolution, potential data integrity risks, system downtime, and processing inefficiencies. These challenges reflect systemic weaknesses in real-time information exchange and platform interoperability. The discussion underscores that communication silos and outdated infrastructures contribute significantly to customer dissatisfaction in logistics systems (Johnson, 2025; Al Saidi & Ayadi, 2025; Quiroga-Amaya, 2024). Data integration difficulties persist due to fragmented systems and lack of standardization, increasing costs and delays (Reynolds, 2024; Mohandas et al., 2023). While automation and IoT offer real-time risk mitigation, adoption barriers related to cost and skills remain substantial (Manjunadh & Manoj, 2024; Bao, 2025).

3.5 Significant Differences Among Selected Importers in Terms of Challenges Encountered

Comparative analysis revealed that larger importers experienced greater challenges related to system integration, communication, and notifications, while smaller importers faced more issues with dispute resolution and platform usability. Despite these variations, statistical testing showed no significant differences in overall challenge levels between importer groups. These findings suggest that challenges in digitalized carrier transactions are systemic rather than size-dependent. Common barriers such as communication inefficiencies, interoperability gaps, and notification delays affect all importers similarly (Ruel et al., 2023; Hojnik & Hudek, 2023). Organizational maturity, infrastructure readiness, and workforce skills play critical roles in digital adoption success (Manjunadh & Manoj, 2024; Phuong & Huy, 2024; Muthutantrige et al., 2023).

3.6 Proposed Improvements to Further Enhance Customer Service

The results indicate that improving responsiveness through automated notifications, escalation protocols, and service-level agreements would significantly enhance importer satisfaction. Integrating AI for dispute tracking, predictive analytics, and

system testing can further improve speed and efficiency. Strengthening reliability through document verification, data backup, and cybersecurity measures is also essential. The discussion emphasizes that effective digital transformation requires balancing technological advancement with human-centered strategies. While system integration, APIs, and automated workflows can minimize manual intervention, customer service quality also depends on training in empathy, communication, and analytical skills. Addressing communication, integration, and notification challenges through collaborative standards and stakeholder coordination can create a more customer-centric and resilient digital logistics ecosystem, reinforcing the strategic value of digitally enabled carrier transactions.

4. Conclusion & Recommendations

The study concludes that digitalized carrier transactions generally meet the expectations of selected importers in the National Capital Region in terms of service quality, with responsiveness, speed, and reliability rated at satisfactory levels and value emerging as the strongest determinant of overall satisfaction. While digital platforms and ocean transport services function effectively, challenges persist in system-driven responsiveness, documentation accuracy, communication, integration, and notification timeliness. Regression results indicate that service quality dimensions do not significantly influence customer service representative performance, whereas they significantly affect satisfaction with ocean transport and digitalization, with perceived value as the sole significant predictor. The absence of statistically significant differences in challenges across importer groups confirms that these issues are systemic rather than firm-specific, underscoring the need for coordinated, industry-wide improvements in digital logistics operations.

Based on the findings, shipping lines and digital platform providers are encouraged to sustain acceptable performance in responsiveness, speed, and reliability while prioritizing enhancements in proactive notifications, documentation accuracy, and real-time communication. Customer service effectiveness may be strengthened through targeted training focused on proactive engagement and timely issue resolution, supported by closer alignment between digital systems and human support. Given the central role of perceived value, efforts should focus on improving cost transparency, operational efficiency, and consistency of service delivery. To address prevalent challenges related to communication, integration, and notifications, industry-wide adoption of interoperable systems, standardized communication protocols, and real-time alert mechanisms is recommended. Continuous system upgrades, user training, feedback-driven refinements, and collaborative engagement among shipping lines, technology providers, and regulators are necessary to support sustainable digital adoption and long-term customer service excellence.

Compliance with ethical standards

This study was conducted in accordance with accepted ethical research principles, with particular emphasis on integrity, confidentiality, and voluntary participation. The rights, privacy, and well-being of respondents were respected throughout the research process, and all data were handled responsibly to ensure ethical consistency with the study's methodology.

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Conflict of interest statement

The researcher declares that there were no conflicts of interest in the conduct of this study. The research was carried out independently and without influence from any external organization, institution, or commercial entity.

Statement of ethical approval

No formal ethics committee or institutional review board approval was indicated for this study. Ethical conduct was ensured through adherence to established research ethics principles and compliance with applicable data privacy regulations.

Statement of informed consent

Informed consent was obtained from all participants prior to data collection. Respondents were provided with information sheets outlining the study's purpose, procedures, potential risks, and benefits. Participation was voluntary, and respondents were informed of their right to withdraw at any time without penalty. Data confidentiality and anonymity were maintained in accordance with the Data Privacy Act of 2012 (RA 10173).

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