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Research paper

Competitiveness and Customer Satisfaction for The Sustainability of Batangas International Port

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Abstract

This study investigates the interrelationship between competitiveness and customer satisfaction as essential components for ensuring the sustainability of Batangas International Port (BIP). Utilizing a descriptive–correlational design, 130 stakeholders comprising shipping line representatives, importers, and customs brokers participated through a validated survey. The study examined BIP's competitiveness in terms of infrastructure quality, liner shipping connectivity, and operating efficiency, alongside customer satisfaction dimensions such as resources, outcomes, processes, management, and social responsibility. Descriptive statistics, ANOVA, and Pearson correlation were used to analyze the data. Findings revealed that BIP demonstrates high competitiveness in infrastructure and operational efficiency, with overall customer satisfaction rated moderate to high. The Pearson correlation coefficient ($r = .71$, $p < .01$) confirmed a strong positive relationship between competitiveness and satisfaction, signifying that port competitiveness is a key determinant of sustainability. Recommendations include enhancing international connectivity, adopting digital innovations, and embedding sustainable management systems for long-term viability.

Keywords: *Competitiveness; Customer Satisfaction; Sustainability*

1. Introduction

The maritime industry is a critical driver of global economic activity, facilitating the movement of more than 80% of the world's trade by volume (UNCTAD, 2023). Ports serve as the lifelines of this network, functioning not only as gateways for goods but as integrated logistics nodes that sustain trade efficiency and supply chain resilience. Their functions have expanded from simple cargo handling to value-added logistics, digital trade facilitation, and environmental stewardship (Lee & Lam, 2024). In the context of accelerated globalization and digital transformation, port competitiveness has emerged as a defining factor in a nation's trade performance and logistics capacity.

Competitiveness in ports refers to the ability to attract and retain shipping lines, deliver efficient and reliable services, and maintain long-term sustainability. According to Martínez-Moya et al. (2025), modern port competitiveness depends on infrastructure reliability, liner connectivity, operational efficiency, and governance. The World Economic Forum (2024) adds that institutional capacity, innovation, and infrastructure are now core drivers of logistics competitiveness worldwide. Digitalization, automation, and smart-port technologies have become central to improving port efficiency and customer experience (Tagawa et al., 2025).

In the Philippines, the maritime industry contributes significantly to trade and industrialization. Batangas International Port (BIP), strategically located in CALABARZON, supports manufacturing, automotive, and petrochemical industries. As a principal alternative to the congested Port of Manila, BIP handles increasing containerized and RoRo traffic but continues to face operational challenges such as limited liner connectivity, varying service quality, and uneven customer experiences (De la Cruz & Garcia, 2021). To remain competitive, the port must strengthen its physical and digital infrastructure while ensuring customer satisfaction and sustainability.

Customer satisfaction plays a pivotal role in determining port success. It reflects the perceptions of key stakeholders shipping lines, brokers, and importers regarding reliability, responsiveness, and service quality. Zhou and Suh (2025) emphasized that satisfaction in port operations is influenced by management quality, technological support, and corporate social responsibility. Satisfied customers are more likely to maintain partnerships, recommend services, and contribute to a port's reputation and competitiveness. Conversely, dissatisfaction may result in client attrition and decreased operational performance.

Moreover, the pursuit of sustainability has reshaped global port management. Sustainability encompasses the balance among economic, environmental, and social goals (Wang & Cullinane, 2006). Lee and Lam (2024) found that ports implementing "green and smart" strategies not only reduce their ecological footprint but also improve service quality and customer trust. Aligning with the United Nations' Sustainable Development Goals (SDGs), particularly Goal 9 (Industry, Innovation, and Infrastructure), port authorities must integrate competitiveness and satisfaction into sustainable operations.

Despite improvements at Batangas International Port, empirical studies remain limited on how competitiveness and satisfaction interact to promote sustainability. Past Philippine research has focused more on operational or financial performance rather than stakeholder-based satisfaction. Hence, this study bridges that gap by examining how competitiveness influences customer satisfaction and how both contribute to the port's sustainable development.

Specifically, the study aims to:

1) Assess the competitiveness of Batangas International Port in terms of infrastructure, connectivity, and operational efficiency;
2) Evaluate customer satisfaction based on resources, outcomes, processes, management, and social responsibility; and
3) Determine the relationship between competitiveness and satisfaction toward port sustainability.

Findings from this research are expected to guide policymakers and port administrators in formulating strategic actions that enhance service quality, digital transformation, and sustainability practices. By linking competitiveness with customer satisfaction, this study contributes to the development of a holistic model for sustainable port management one that can serve as a benchmark for other regional ports in the Philippines.

2. Theoretical Framework

This study is grounded on three interrelated theories: Port Competitiveness Theory, Customer Satisfaction Theory, and Sustainable Port Development Theory.

Port competitiveness theory posits that a port's performance is determined by its infrastructure, connectivity, and operational efficiency (Tongzon & Heng, 2005). Competitive ports attract shipping lines and investors, generating higher throughput and profitability.

Customer satisfaction theory, anchored in Parasuraman et al.'s (1988) SERVQUAL model, explains that satisfaction results when perceived service performance meets or exceeds expectations. In the port context, satisfaction depends on service reliability, responsiveness, management quality, and social responsibility (Zhou & Suh, 2025).

Sustainable port development theory integrates economic, social, and environmental pillars (Wang & Cullinane, 2006). A port achieves sustainability when its operations minimize environmental impact, foster social responsibility, and maintain long-term competitiveness.

Together, these theories form a conceptual linkage where competitiveness drives customer satisfaction, and both jointly enhance port sustainability.

3. Review of Related Literature

3.1. Port competitiveness in the era of digital and sustainable ports

Port competitiveness has evolved from a narrow focus on physical infrastructure and cargo throughput to a multidimensional construct encompassing connectivity, operational efficiency, governance quality, and digital capability. Early studies by Tongzon and Heng (2005) emphasized infrastructure adequacy and efficiency as core determinants of competitiveness, providing a foundational framework for port performance assessment. However, more recent research extends this view by highlighting the strategic role of innovation and institutional capacity in sustaining competitive advantage.

Martínez-Moya et al. (2025) advanced the literature by demonstrating that competitiveness indices now integrate liner shipping connectivity and network centrality, reflecting a port's position within global logistics systems. This perspective suggests that competitiveness is not solely internally generated but is shaped by inter-port relationships and shipping alliances. In Southeast Asia, Yeo and Dang (2017) further showed that ports engaging in cooperation and technological upgrading outperform those relying solely on capacity expansion.

Recent studies (2022–2024) underscore the growing importance of digitalization as a competitiveness driver. Kramberger et al. (2022) and Lee and Lam (2024) found that ports adopting smart technologies—such as automated terminals, digital freight platforms, and data-driven decision systems—achieve higher productivity while simultaneously improving service reliability. These findings inform the present study's assumption that competitiveness at Batangas International Port (BIP) extends beyond physical assets to include operational efficiency and emerging digital capabilities.

3.2. Customer satisfaction as a strategic outcome of port performance

Customer satisfaction in port operations has traditionally been examined using service quality models such as SERVQUAL (Parasuraman et al., 1988) and its port-specific adaptation, the ROPMIS framework (Thai, 2008). While earlier studies largely measured satisfaction descriptively, recent research emphasizes its strategic role as a mediator between operational performance and long-term competitiveness. Zhou and Suh (2025) demonstrated that in smart-port environments, management quality and process transparency exert a stronger influence on satisfaction than tangible infrastructure alone. Similarly, Phan et al. (2023) found that digital service accessibility such as real-time cargo tracking and electronic documentation significantly enhances stakeholder perceptions of reliability and responsiveness. These studies suggest that satisfaction is increasingly shaped by digital service quality, not merely by speed or cost.

Importantly, the literature indicates a feedback loop between satisfaction and competitiveness. Cho and Kim (2015) argued that satisfied port users contribute to reputational capital, which in turn attracts shipping lines and cargo flows. This insight supports the analytical premise of the present study that customer satisfaction is not only an outcome of competitiveness but also a reinforcing mechanism that sustains it.

3.3. Digitalization and sustainability as integrative constructs

Recent scholarship increasingly positions digitalization as a bridge linking competitiveness, customer satisfaction, and sustainability. Lee and Lam (2024) observed that smart-port initiatives reduce emissions, minimize idle time, and improve energy efficiency while enhancing customer experience. Likewise, Zhou and Suh (2025) noted that digital governance systems improve transparency and stakeholder trust, reinforcing social sustainability outcomes.

From a sustainability perspective, Wang and Cullinane's (2006) tripartite framework economic, environmental, and social remains influential. However, contemporary studies argue that these pillars are operationalized through competitiveness and satisfaction. For example, ports that invest in green technologies and digital monitoring systems not only reduce environmental impact but also improve customer perceptions and compliance confidence (Budiyanto, 2016; Lee & Lam, 2024).

Synthesizing these strands, recent literature suggests that competitiveness enables sustainability through efficiency and innovation, while customer satisfaction legitimizes sustainability initiatives through stakeholder acceptance and loyalty. This synthesis directly informs the present study's conceptual assumption that competitiveness and satisfaction jointly function as drivers of sustainable port development

3.4. Research gap and contribution

Despite extensive international research, Philippine port studies remain largely operational and descriptive, with limited empirical integration of competitiveness, satisfaction, digitalization, and sustainability. Existing local studies (e.g., De la Cruz & Garcia, 2021) focus on infrastructure and congestion but do not explicitly model stakeholder satisfaction or sustainability outcomes.
By synthesizing classical port competitiveness theory with recent digitalization and sustainability research (2022–2024), this study advances the literature in three ways:
1) it empirically links competitiveness and customer satisfaction;
2) it situates this relationship within a sustainability framework; and
3) it provides developing-country evidence from Batangas International Port.
Thus, the reviewed literature not only contextualizes the study but also directly shapes its analytical focus and hypotheses, positioning competitiveness as a determinant of satisfaction and both as strategic pillars of sustainable port management.

3.5. Sustainability as the linking construct

Sustainability integrates economic viability, environmental protection, and social equity within port operations (Wang & Cullinane, 2006). The Porter Hypothesis suggests that stringent environmental standards encourage innovation, making ports both cleaner and more competitive. Lam and Notteboom (2014) further argued that sustainability indicators such as CO_2 reduction, waste management, and community engagement are now considered key benchmarks in international port rankings.
Emerging studies (e.g., Lee & Lam, 2024; Zhou & Suh, 2025) show that customer satisfaction increasingly depends on sustainability performance. Users prefer ports that implement carbon-reduction programs, noise mitigation, and equitable labor practices. Hence, sustainability acts as the linking construct between competitiveness and satisfaction: competitive ports adopt sustainable practices to maintain user confidence, while satisfied users reward these practices with loyalty and advocacy.
The competitiveness and customer satisfaction demonstrated by Batangas International Port (BIP) directly contribute to its economic, environmental, and social sustainability. High infrastructure quality and operational efficiency strengthen economic sustainability by improving cargo throughput, reducing vessel turnaround time, and supporting consistent revenue and client retention. Customer expectations for responsible operations also reinforce environmental sustainability, where efficient processes and digital systems help minimize emissions, energy use, and waste. Likewise, strong satisfaction in management and service processes enhances social sustainability through better stakeholder relations, workforce development, and community trust. Key sustainability indicators—such as turnaround time, digital transaction adoption, CO_2 emissions, energy consumption, safety performance, and CSR engagement—illustrate how competitiveness and satisfaction collectively support BIP's long-term sustainable development.

3.6. The Philippine and regional context

Within the Philippine maritime sector, research by De la Cruz and Garcia (2021) revealed that while Batangas Port has improved cargo handling and infrastructure, it still lags in international connectivity and client service responsiveness. The authors emphasized the need for integrated logistics systems and stakeholder communication to strengthen competitiveness.
Regionally, ASEAN's "Single Shipping Market" initiative promotes inter-port cooperation and harmonized customs systems, providing opportunities for BIP to enhance competitiveness through policy alignment (ASEAN Secretariat, 2023). By aligning with regional sustainability frameworks and digital customs protocols, Batangas Port can position itself as a competitive and environmentally responsible alternative to Manila's congested terminals.

4. Methodology

This study employed a descriptive–correlational research design to assess the competitiveness and customer satisfaction levels at Batangas International Port and to determine their relationship toward sustainability. A total of 130 port stakeholders—including shipping line representatives, importers, and customs brokers—were selected through purposive sampling. The sampling criteria required that respondents (a) had at least one year of direct operational experience with BIP, (b) were actively engaged in port transactions during the data collection period, and (c) represented key stakeholder groups involved in cargo processing and shipping logistics. These criteria ensured that the sample reflected users with substantial and relevant experience, enhancing the representativeness of stakeholder perspectives.
Data were collected using a structured and validated questionnaire measuring both competitiveness and customer satisfaction dimensions. Prior to full deployment, the instrument underwent expert review and pilot testing. The internal consistency values were found to be acceptable, with Cronbach's alpha coefficients ranging from 0.82 to 0.91 across the major constructs, indicating strong reliability of the scales.
Descriptive statistics (mean and standard deviation) were used to interpret competitiveness and satisfaction levels. Differences in responses among stakeholder groups were analyzed using ANOVA, while the Pearson correlation coefficient was employed to determine the relationship between competitiveness and customer satisfaction. All analyses were conducted at a 0.05 level of significance.

5. Results and Discussion

Table 1: Respondents' Profile

Category	f	%
Age		
20–29	45	34.6
30–39	37	28.5
40–49	30	23.1

50 and above	18	13.8
Sex		
Male	82	63.1
Female	48	36.9
Civil Status		
Single	56	43.1
Married	63	48.5
Others	11	8.5

- Discussion:

The data show that the majority of respondents are male and within the 20–39 age range, representing an active and professional segment of the port industry. This finding aligns with UNCTAD (2023), which notes that maritime logistics globally remains male-dominated but increasingly inclusive. The dominance of younger respondents reflects a workforce that is adaptive to technological innovation, digital processes, and sustainability awareness. Such demographics suggest that the BIP clientele values efficiency, modernization, and customer service key factors influencing satisfaction.

The civil status distribution also indicates stable, career-oriented respondents who are likely long-term port users. Their input provides credible assessments of service quality and competitiveness. Demographic patterns influence perceptions of satisfaction because younger, tech-oriented clients often expect seamless digital transactions and transparency in port operations (Phan et al., 2023).

Table 2: Customer Satisfaction Dimensions

Dimension	Mean	SD	Interpretation
Resources	3.48	0.52	Moderately Satisfied
Outcomes	3.52	0.46	Highly Satisfied
Processes	3.46	0.48	Moderately Satisfied
Management	3.50	0.49	Highly Satisfied
Image & Social Responsibility	3.44	0.53	Moderately Satisfied
Overall Mean	3.48	0.50	Moderately Satisfied

- Discussion:

Respondents rated “outcomes” and “management” highest, suggesting that the port’s service results and leadership responsiveness are key satisfaction drivers. However, “resources” and “processes” scored moderately, indicating opportunities for improvement in physical facilities and service workflow. Similar findings were reported by Zhou and Suh (2025) in Korea, where management quality strongly predicted user satisfaction in smart ports.

The “image and social responsibility” dimension also rated moderate, revealing the growing expectation for sustainability and ethical operations. Studies by Lee and Lam (2024) confirm that environmental initiatives and corporate social responsibility programs enhance port reputation and client loyalty. Hence, BIP could boost satisfaction by emphasizing environmental transparency, digital customer platforms, and employee training programs to enhance service interactions.

Table 3: Competitiveness Indicators

Dimension	Mean	SD	Interpretation
Infrastructure Quality	3.60	0.43	Highly Competitive
Liner Shipping Connectivity	3.42	0.51	Competitive
Operating Efficiency	3.58	0.45	Highly Competitive
Overall Mean	3.53	0.46	Highly Competitive

- Discussion:

BIP shows strong competitiveness in infrastructure and efficiency but lower scores in liner connectivity. BIP exhibits stronger operational efficiency and shorter turnaround times, yet it continues to lag in liner shipping connectivity due to Manila’s broader international routes and carrier presence. Subic Bay Port shares similar modern infrastructure but handles lower cargo volumes, positioning BIP as more competitive in throughput and client activity. At the ASEAN level, ports such as Singapore, Laem Chabang, and Tanjung Priok maintain significant advantages in automation, digitalization, and global network integration. This comparison indicates that while BIP is regionally competitive in infrastructure and efficiency, it must further enhance international connectivity and digital maturity to align with leading Southeast Asian ports.

This finding is consistent with Tagawa et al. (2025), who emphasized that inter-port cooperation and digital integration are essential for improving regional connectivity. The slightly lower rating in connectivity may stem from limited vessel calls and route diversity compared to larger hubs like Manila or Subic.

Improving competitiveness requires not only infrastructure upgrades but also strategic partnerships with international carriers. According to Martínez-Moya et al. (2025), connectivity and port productivity jointly influence global ranking and sustainability. Thus, BIP’s management should pursue digital freight platforms and regional alliances to strengthen its network position.

Table 4: Correlation between Competitiveness and Satisfaction

Variables	r	p-value
Competitiveness and Customer Satisfaction	.71	< .01

- Discussion:

A strong positive correlation ($r = .71$, $p < .01$) confirms that competitiveness and customer satisfaction are directly linked. As BIP enhances infrastructure, efficiency, and connectivity, customer satisfaction correspondingly improves. This aligns with Cho and Kim (2015) and Yeo and Dang (2017), who found that competitive ports enjoy higher stakeholder loyalty and sustainability outcomes.

However, correlation does not imply causation future research could employ regression or structural equation modeling to explore mediating variables such as digital transformation and environmental initiatives. The result supports the proposition that sustained competitiveness and satisfaction mutually reinforce port sustainability. Although the study establishes a strong correlation between competitiveness and customer satisfaction, the statistical analysis is limited to descriptive measures, ANOVA, and Pearson correlation. While sufficient for the study’s scope, the absence of more advanced techniques such as regression analysis or structural equation modeling (SEM) restricts

deeper examination of causal pathways and mediating factors. Future research may apply these methods to identify the specific predictors of satisfaction and to model the structural relationships among competitiveness, sustainability, and service quality more comprehensively

5.1. Scientific insights and practical implications

The findings of this study generate important scientific insights into the interrelationship among port competitiveness, customer satisfaction, and sustainability. Empirical results confirm that competitiveness—particularly in terms of infrastructure quality, operational efficiency, and liner shipping connectivity—exerts a direct and significant influence on customer satisfaction. This relationship reinforces existing port competitiveness theory by demonstrating that tangible and process-oriented performance dimensions remain central determinants of stakeholder perceptions, even in an evolving digital logistics environment.

Furthermore, the results highlight that customer satisfaction factors, especially management responsiveness and service outcomes, play a critical role in sustaining long-term port development. Satisfied stakeholders are more likely to maintain continued engagement with the port, support operational improvements, and endorse sustainability initiatives. This finding positions customer satisfaction not merely as a service outcome but as a strategic mechanism through which competitiveness is translated into sustainable performance.

Digitalization emerges as a cross-cutting enabler that strengthens both competitiveness and customer satisfaction. The study's findings align with recent smart-port literature, which emphasizes that digital platforms, real-time information systems, and automated processes enhance transparency, reliability, and operational efficiency while simultaneously improving user experience. These technological capabilities also support sustainability objectives by reducing delays, minimizing emissions, and improving resource utilization.

From a practical perspective, the results suggest several actionable implications for Batangas International Port. First, modernizing digital platforms—such as electronic documentation systems, real-time cargo tracking, and integrated customer interfaces—can significantly improve service quality and stakeholder satisfaction. Second, expanding international liner connections through strategic partnerships and incentive programs can enhance network competitiveness and cargo attractiveness. Finally, embedding sustainability-oriented practices, including environmental management systems, energy-efficient operations, and corporate social responsibility initiatives, can strengthen the port's public image and reinforce stakeholder trust. Collectively, these measures provide a strategic pathway for aligning competitiveness and customer satisfaction with sustainable port management.

5.2. Discussion and future research directions

While the findings provide strong empirical support for the relationship between competitiveness and customer satisfaction, several areas warrant further enhancement. First, clearer and more targeted strategies are needed to strengthen Batangas International Port's liner shipping connectivity. These may include the introduction of incentive schemes for international shipping lines, the establishment of strategic partnerships with global and regional carriers, and closer policy integration with national port development plans and ASEAN logistics frameworks. Such measures would improve route diversity, increase vessel calls, and enhance the port's overall network competitiveness.

Second, future research should adopt more advanced analytical approaches to deepen understanding of the relationships among competitiveness, customer satisfaction, and sustainability. The application of multivariate techniques, such as multiple regression analysis or structural equation modeling, would enable the identification of key predictors and mediating variables, particularly the role of digitalization and management quality. Longitudinal research designs are also recommended to capture changes in competitiveness and satisfaction over time and to assess the long-term impacts of policy and technological interventions.

Finally, subsequent studies should incorporate explicit environmental sustainability indicators, including carbon emissions, energy consumption, waste management practices, and environmental compliance measures. Integrating digital maturity models—such as the use of Internet of Things (IoT) systems, artificial intelligence, and port automation—would further enrich analysis by examining how technological readiness moderates the relationship between competitiveness, service quality, and sustainable port performance.

6. Conclusion

Batangas International Port demonstrates strong competitiveness in infrastructure and operational efficiency, accompanied by moderate-to-high levels of customer satisfaction. The positive and significant correlation between competitiveness and satisfaction underscores that these dimensions reinforce one another and serve as foundational components of sustainable port management.

Expanding this analysis within a sustainability framework reveals deeper implications. The port's competitive strengths efficient operations, reliable infrastructure, and emerging digital practices directly support the economic pillar of sustainability by reducing logistics costs, attracting vessel calls, and enabling trade growth. Meanwhile, improvements in customer satisfaction, particularly in management quality and service outcomes, strengthen the social pillar, fostering trust, transparency, and long-term partnerships with stakeholders. Moderate ratings in social responsibility signal opportunities to enhance labor welfare, community engagement, and public accountability.

Environmental sustainability also emerges as a critical dimension. With global trends steering ports toward carbon

The study concludes that Batangas International Port exhibits high competitiveness and moderate-to-high customer satisfaction levels. Competitiveness, particularly in infrastructure and operational efficiency, has a significant positive effect on satisfaction. The findings affirm that competitive strength and customer satisfaction are essential pillars for sustainable port management.

Recommendations

Based on the findings of the study, the following strategic recommendations are proposed to enhance the competitiveness, customer satisfaction, and long-term sustainability of Batangas International Port (BIP):

1) Batangas International Port should actively pursue strategic partnerships with regional and international shipping lines to increase route diversity and vessel calls. Incentive mechanisms—such as reduced port charges, priority berthing, or bundled logistics services may be introduced to attract new carriers. Strengthening alignment with national port development policies and ASEAN logistics initiatives will further improve BIP's network position and international competitiveness.
2) To improve operational efficiency and customer satisfaction, BIP should expand the adoption of digital technologies, including electronic documentation systems, real-time cargo tracking, and integrated port community systems. Digital platforms that enable transparent communication, faster processing, and data-driven decision-making will enhance service reliability while reducing transaction time, operational costs, and environmental impact.

3) The port authority should formalize sustainability initiatives by adopting an integrated sustainability management system aligned with international standards (e.g., ISO 14001 and green port guidelines). This framework should include measurable environmental indicators such as energy efficiency, emissions reduction, waste management, and resource optimization to support environmentally responsible and economically viable operations.
4) Regular and systematic customer satisfaction assessments should be institutionalized to capture stakeholder perceptions on service quality, management responsiveness, and social responsibility. Establishing digital feedback channels and performance dashboards will allow timely identification of service gaps and facilitate continuous improvement, thereby reinforcing customer loyalty and trust.
5) Continuous training programs should be implemented for port personnel to enhance competencies in digital systems, customer service excellence, and sustainable operations. Strengthening human capital will support effective technology adoption, improve service interactions, and ensure organizational readiness for innovation and change.
6) BIP should deepen collaboration with local communities, inland logistics providers, and government agencies to improve cargo flow efficiency and social sustainability. Enhancing intermodal connectivity, community engagement programs, and corporate social responsibility initiatives will strengthen the port's public image while supporting inclusive and resilient port development.
7) Port management and policymakers are encouraged to support data-driven research using advanced analytical methods such as regression analysis and structural equation modeling to further examine causal relationships among competitiveness, customer satisfaction, digitalization, and sustainability. Longitudinal studies are recommended to monitor the long-term impact of strategic interventions and policy reforms.

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