INTERNATIONAL JOURNAL OF
COASTAL, OFFSHORE & ENVIRONMENTAL ENGINEERING

IJCOE Vol.10/No.2/ Transportation, transit and maritime transport/ 2025 (21-31)

Available online at: www. Ijcoe.org

Unlocking Port Excellence: Achieving Operational Efficiency through Integrated Logistics (Case Study: Port of Chabahar)

Nasim Molavi
MSc. In Maritime Transport, Chabahar Maritime University, Chabahar, Iran
na.molavi@gmail.com

Jafar, Sayareh[1]
Associate Prof., Maritime Transport Department, Chabahar Maritime University, Chabahar, Iran
j.sayareh@gmail.com

ARTICLE INFO

Article History:
Received: 27Mar 2024
Accepted :10June 2025

Keywords:
Integration,
Maritime Logistics,
Logistics Integration,
Port Logistics,
Chabahar Port

ABSTRACT

The growing significance of maritime transportation in overall logistics flows has fueled an increasing interest in maritime logistics. Despite the burgeoning body of literature on this emerging discipline, there remains a lack of comprehensive investigation into its categorization and emerging themes. This study aims to address this gap by analyzing advancements in the literature and proposing a research agenda for this concept by exploring the primary research domains within this phenomenon.

To achieve these objectives, this study employs a content analysis-based review method to examine the concept and citation analysis to delve into the latent structure of maritime logistics, aiming to reduce time consumption and logistics costs. Research streams were extracted from two databases, and the main themes, highlighted topics, and related analytical categories were investigated through content analysis. This study utilized Structural Equation Modeling (SEM) methods, processed using AMOS 20 software and T-tests via Statistical Package for the Social Sciences (SPSS), resulting in a model that met Goodness of Fit criteria. Citation and co-citation analysis were conducted to comprehend the intellectual structure of the studies and the relationships between the analytical categories. The study presents a comprehensive synthesis of existing research, providing a systematic source of information for both scholars and practitioners, shaping the future research agenda. The findings demonstrate a statistically significant direct relationship between supply chain logistics integration and competitive operational performance in port of Chabahar.

1. Introduction

The efficient movement of goods and services across vast distances is paramount for global trade, and ports and shipping lines serve as pivotal nodes in this intricate network. These interconnected entities collaborate to ensure the seamless flow of cargo, contributing significantly to the smooth functioning of the maritime supply chain. In recent years, the concept of maritime logistics integration has gained prominence as a strategic imperative for enhancing the overall performance of this crucial network.

Maritime logistics integration encompasses the collaborative efforts of ports, shipping lines, and other maritime stakeholders to optimize the flow of goods, information, and resources throughout the maritime supply chain [1]. This collaboration manifests in various forms, ranging from information exchange and joint ventures to the development of standardized processes [2, 3].

The benefits of maritime logistics integration extend to various stakeholders in the supply chain, including ports, shipping lines, and ultimately, end consumers [4, 1]. For ports, integration translates into improved efficiency, reduced costs, and enhanced competitiveness [1]. Shipping lines, on the other hand, reap advantages such as improved asset utilization,

[1] Corresponding Author: J.Sayareh@gmail.com

reduced transit times, and enhanced customer satisfaction [5].

Scholars have identified three key types of maritime logistics integration:

Information Integration: This involves the real-time exchange of data and information among ports, shipping lines, and other stakeholders, enabling informed decision-making and optimized resource allocation [6, 3].

Operational Integration: This entails harmonizing processes and activities across the supply chain, ensuring a seamless flow of goods and information without redundancies or delays [7, 3].

Relational Integration: This involves fostering strong relationships based on trust, mutual understanding, and long-term commitment, fostering collaboration and cooperation among stakeholders [1, 5].

In the increasingly competitive landscape of global maritime trade, maritime logistics integration has emerged as a strategic necessity for ports, shipping lines, and other stakeholders to achieve sustainable growth and competitiveness [5, 8]. By embracing integration, these entities can harness the synergies of cooperation to enhance efficiency, improve customer satisfaction, and gain a competitive edge in the global marketplace [4, 1].

Maritime logistics integration stands as a transformative force in the maritime industry, driving collaboration, optimizing supply chain operations, and fostering sustainable growth [2, 3]. As the demand for efficient and reliable logistics continues to rise, maritime stakeholders must prioritize integration to remain competitive and thrive in the global marketplace [9, 8]. This transformative approach holds the key to unlocking the full potential of the maritime supply chain, ensuring that it remains at the forefront of global trade for years to come.

2. Logistics Integration

Logistics integration plays a pivotal role in optimizing port operations, enabling seamless coordination among the various stakeholders involved in the movement of goods through the port [10, 11]. This integration encompasses the harmonization of information, processes, and resources across the port logistics chain, from shipping lines and terminal operators to inland transportation providers and customs authorities [12, 13].

The benefits of logistics integration extend beyond efficiency gains and include improved customer service, reduced environmental impact, and enhanced competitiveness [14, 15]. As global trade continues to expand and demand for efficient logistics services intensifies, logistics integration will become increasingly crucial for ports to thrive in the dynamic maritime landscape [8].

2.1. Forward Integration

Forward integration is a corporate strategy that involves the acquisition or expansion of control over distribution channels, enabling greater control over the flow of goods from the producer to the final customer [10]. This strategy can be implemented through the acquisition or establishment of subsidiary companies that handle distribution activities, or through strategic partnerships with existing distributors [11]. Forward integration can provide several benefits to a company, such as increased control over pricing, reduced distribution costs, and improved customer service [12]. However, it can also be a risky strategy, as it can increase a company's capital expenditures and expose it to the risks of the distribution industry [13].

2.2. Backward Integration

Backward integration is a corporate strategy that involves the acquisition or expansion of control over the upstream stages of the supply chain, such as the production of raw materials or components [2]. This strategy can be implemented through the acquisition or establishment of subsidiary companies that handle upstream activities, or through strategic partnerships with existing suppliers [16]. Backward integration can provide several benefits to a company, such as reduced costs for raw materials or components, improved quality control, and greater flexibility in production scheduling [17]. However, it can also be a risky strategy, as it can increase a company's capital expenditures and expose it to the risks of the upstream industries [18].

2.3. Logistics Integration

Logistics integration is a business process that involves the coordination and streamlining of the flow of goods, information, and resources across the supply chain [19]. This process typically involves the integration of three key elements:

Information integration: Sharing data and information among supply chain partners, such as suppliers, manufacturers, distributors, and customers [19, 20]. This allows for better decision-making, improved efficiency, and reduced costs [21].

Operational integration: Harmonizing processes and activities among supply chain partners, such as order fulfillment, inventory management, and transportation [2, 13]. This ensures that goods flow seamlessly through the supply chain and that customers receive their orders in a timely and accurate manner [12].

Resource integration: Sharing resources and infrastructure among supply chain partners. This can include sharing warehouses, transportation vehicles, and IT systems [11]. This can reduce costs and improve efficiency [17].

3. Port Operations

Ports play a critical role in the global supply chain by facilitating the movement of goods between land and

sea [22]. They provide a range of services to shippers, including cargo handling, storage, and transshipment [10]. Port operations can be divided into three main categories:

Administrative functions: These functions include traffic control, environmental management, safety and security, and customs control [18]. They ensure that the port operates smoothly and safely ([13].

Operational functions: These functions include loading and unloading cargo, vessel handling, and pilot and mooring services [2]. They involve the physical movement of goods through the port [12].

Civil engineering functions: These functions include port infrastructure development, access roads and railways, and industrial zone management [21]. They provide the physical facilities that enable the port to operate [18].

Ports can also offer a range of value-added services to shippers, such as warehousing, distribution, logistics, and customs brokerage [13]. These services can help shippers to streamline their supply chains and reduce costs [17].

4. Chabahar Port

The Chabahar port is located in south-eastern Iran (Sistan and Baluchistan province). Due to its strategic position and immediate access to international waters, the Chabahar port plays a significant role in promotion of international trade with the neighbouring countries such as Afghanistan, Pakistan and Central Asian and CIS countries. Additionally, the connection of Chabahar port to the country's rail network will facilitate the process of cargo transit to the above-mentioned nations.

As shown in Figure 1, Chabahar port lies in the Gulf of Oman. It is the only Iranian port with direct access to the ocean; thus, plays an important role in North-South transit corridor [23, 24]. Iran, with assistance from India, plans to channel and monopolise trade from Tajikistan, Kyrgyzstan and Kazakhstan destined for the East via Chabahar [25]. India's willingness to invest has created an opportunity for the Chabahar port to turn into a commercial centre in the near future [26]. India, like China, is one of the Asia's emerging economies, aiming to capture the Central Asian and CIS markets, and getting its energy imports faster via a shorter route [27, 28, 29]. Since 2002, under different deals between Iran and India, the India has financially and technically contributed to the completion of Chabahar port infrastructure [25].

Figure 1: Location of Chabahar and Gwadar Ports
Source: Google Maps

5. Logistics Integration in Ports and Shipping

Logistics integration in ports is essential to ensure the efficient and effective movement of goods through the port [10, 11]. This can be achieved through a number

The port industry and shipping lines are developing significantly due to increasing market demand [30]. In addition to terminal operators, domestic operators, port authorities, and shipping lines are one of the most important members of the logistics chain that affect port logistics [30].

Differentiation of services and increasing market share have forced shipping lines to use vertical and horizontal integration strategies [30]. These strategies can involve the acquisition or expansion of control over other sectors of the shipping industry, such as port operations or other shipping lines.

Shipping lines are not limited to operating ships. They are also expanding their activities into logistics and domestic transportation services [30]. This can help them to offer a more comprehensive service to their customers and provide greater value for money.

Dry ports also play an important role in process of logistics integration. Thay are inland terminals that are connected to ports by rail or high-capacity roads [14]. Customers can transfer or deliver their standardized units directly to dry ports, bypassing the need to ship them to the port and back again. This can save time and money.

Logistics integration between shipping lines and ports can affect both technical efficiency and supply chain allocation efficiency [8]. Technical efficiency is the ability to produce a given level of output with the least number of inputs. Supply chain allocation efficiency is the ability to match supply with demand in an optimal way.

Research has shown that there is a strong relationship between service quality and customer satisfaction in the port logistics service industry in a developing economy [15]. This suggests that shipping lines and ports that focus on providing high-quality services can gain a competitive advantage.

6. Logistics Factors

A comprehensive review of academic literature identified 43 logistic indicators under 11 key logistics factors that influence port operation and performance (Table 1).

Table 1: Identified Logistics Factors and Indicators

	Logistics Factors	Indicators	Source(s)
1	Information and Communications Integration	Regular communication with logistics communication integration partners in the supply chain	[31, 32]
		Use of modern facilities and devices	[33, 34]
		Use the database to share Supply Chain Information	[34, 35, 15, 23]
		Use the database to assess shipping status	[15, 34]
2	Value-added Services	Sufficient facilities for added value on inventory management, distribution center and warehouses	[36, 37, 32]
		Value-added logistics storage equipment assembly, production, packaging	[36, 32]
		Load transfer capacity through the most diverse routes in the shortest time	[35, 34]
3	Processes and operations	Possibility of certain movement between different modes of transport	[38]
		Use of smart clearance at checkpoints	[34, 32]
		Existence of common transportation management and control planning processes for cargo distribution with others Logistics companies	[39, 30, 40, 36, 32, 37]
		Existence of transportation security, safe, secure and integrated services	[35, 39]
4	Logistics Functions	Existence of alternative routes to increase transportation efficiency	[35, 38]
		Existence a low cost option for transporting cargo to domestic destinations	[38, 41, 42]
		Ability to use other types of transportation to connect the port / terminal to the domestic destination	[38, 35, 32]
		Provide integrated promotional activities for the port	[40, 43]
		Support customers to choose and make their purchases	[43, 15, 44]
5	Organizational activities	Establish a strategy for sharing risks, costs and rewards. Operational and strategic cooperation	[45, 46]
		Build interpersonal trust to establish/maintain long-term relationships with other distribution partners	[15, 44]
		Build interpersonal trust to maintain a long-term relationship	Le *et al.*(2020)[15]
		Training for employees and encouraging teamwork	[46, 39]
6	Institutional support	Research to identify and implement best practices in freight transportation	[35, 38, 8]
		Approval of commercial loans / microcredit facilities	[44, 47]
		Facilitate leases to improve cargo distribution logistics	[40, 32, 8, 39, 45]
		Understand and evaluate the relationships between logistics functions	[8, 39, 38, 30, 40,37]
		Provide professional training to identify and define logistics strategies in load distribution	[47, 39, 38]
		Organizing, inviting and participating in seminars and Conferences	[45, 47]
7	Infrastructure	Adequate amount of port facilities	[8, 39, 30, 40]
		Port access to domestic and international terminals	[40, 46]
		Number and manner of using equipment in terminals	[30, 8, 39]
		Providing port electronic services and electronic information	[34, 15]
8	Human Resources	The level of expertise and skills of employees	[40, 30]

		Employee willingness and openness in responding to customers	[15, 43]
		The degree of gaining customers' trust through the favorable behaviors of port staff	[15, 44, 32]
9	Port and maritime activities	Existence of security in financial and operational interactions with the terminal	[45, 39]
		Quality and standards of port loading and unloading	[8, 38]
		Adequate information about the condition of the docks	[32, 37, 38, 39, 30, 40]
		Proper planning in the allocation of berths during ship traffic	[35, 45]
10	Supply chain reliability	High transparency in the strategic goals of the port supply chain	[46, 47, 43, 36, 32]
		Reputation of terminals and transport companies	[30, 46, 38]
		Appropriate time interval between the planning process of order receipt and delivery methods	[39, 34, 15]
11	Efficiency of customs processes	Providing customs services and clearance of appropriate goods in the port	[47, 30, 43, 37]
		High quality of goods clearance in the port	[15, 30]
		Proper communication between customs and other institutions in order to integrate the clearance and delivery process	[30, 8, 38, 36, 40]

7. Methodology

Data collection employed a structured questionnaire developed with the identified key factors and indicators from expert opinions. The questionnaire comprised 43 closed-ended items using a 5-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). As shown in Table 2, the target population encompassed professionals from port authorities, maritime affairs, technical and engineering departments, and shipping companies. With an estimated population size of 90, where Cochran's formula determined a sample size of 73.

Data analyses adopted a mixed-methods approach as followings:

- Content analysis-based review method was adopted to examine the concept and citation analysis to explore the latent structure of maritime logistics.
- A structured questionnaire was prepared with main factors and indicators collected from both the model and experts' opinions. The questionnaire consisted of 43 questions using a 5-point Likert scale.
- The statistical population included port affairs, maritime affairs, technical and engineering deputy, and shipping companies. The sample size of 73 was calculated based on Cochran's formula.
- Internal consistency was measured using Cronbach's alpha test, and reliability coefficients for 11 variables of the research questionnaire were above 0.70, indicating an acceptable level.
- Kolmogorov-Smirnov test was adopted to verify the normality of data distribution.
- One-Sample T-test was utilized to determine if the sample deviated from a hypothesized value, via Statistical Package for Social Science (SPSS)
- Structural Equation Modeling (SEM) method was used for Confirmatory Factor Analysis (CFA), which is a multivariate statistical method used to assess the hypothesized relationships within the conceptual model [48], using AMOS[2] 20 software.

Table 2. Respondents' Demography

Demographic Information	Number of Respondents	Percentage of Respondents
Job Title		
Port Affairs	22	30.1
Maritime Affairs	22	30.1
Technical and Engineering Deputy	15	20.5
Shipping companies	14	19.2
Work Experience		
<5 years	20	27.4
5-10 years	36	49.3
10-15 years	13	17.8
15 and above	4	5.5
Level of Education		
Bachelor's degree	30	41.1
Master's degree	41	56.2
PhD	2	2.7
Total	73	100

Therefore, initially, questionnaire content validity was evaluated by 10 experts from the field, following

[2] AMOS (Analysis of Moment Structures) is a comprehensive statistical software package designed for Structural Equation Modeling (SEM), path analysis, and confirmatory factor analysis.

distribution to 15. Content Validity Index (CVI) and Content Validity Ratio (CVR) were calculated in Microsoft Excel based on their feedback. As per Saunders et al. [49], questions with CVI/CVR below 0.75 were removed.

Internal consistency, reflecting the overall questionnaire's reliability, was evaluated using Cronbach's alpha. As shown in Table 3, reliability coefficients for all 11 factors exceeded 0.70, demonstrating acceptable internal consistency.

Table 3. The Reliability Coefficient of the Questionnaire Variables

Variable	Number Of Questions	Cronbach's Alpha	Questionnaire Source
Integration Information and Communication	4	0.896	Based on Experts' Opinion
Value-Added Services	3	0.914	
Processes and Operations	4	0.904	
Logistics Function	5	0.911	
Organizational Activities	4	0.851	
Institutional Support	6	0.872	
Infrastructure	4	0.914	
Human Resources	3	0.910	
Port and Maritime Activities	4	0.916	
Supply Chain Reliability	3	0.915	
Efficiency of Customs Processes	3	0.911	

8. Results

The descriptive findings of this study are presented in Table 4, which includes the measures of central tendency (mean and standard deviation) for the factors affecting the integration of logistics activities in ports. These factors are analyzed by Kolmogorov-Smirnov test and proved that the distribution of data is normal.

As shown in Table 4, the means of all the factors affecting the integration of logistics activities in ports are above the average (3), except for the Information and Communication Integration factor.

Based on the results of the Kolmogorov-Smirnov test, which proved the normality of the data distribution, the one-sample t-test was utilized to evaluate the impact of 11 identified factors on the optimization of Chabahar port operations. The results of one-sample t-test are shown in Table 5.

First-order Confirmatory Factor Model has been conducted to explain and rank the 11 identified factors affecting the integration of logistics activities in ports (Table 6).

Table 4. Data Distribution Based on the Kolmogorov-Simonov Test

Factors	N	Normal Parameters		Asymp. Sig. (2-tailed)
		Mean	Std. Deviation	
Information and Communication Integration	73	2.955	0.671	0.153
Value-Added Services	73	3.246	0.645	0.081
Processes and Operations	73	3.030	0.593	0.172
Logistics Functions	73	3.213	0.546	0.141
Organizational Activities	73	3.123	0.541	0.073
Institutional Support	73	3.155	0.557	0.128
Infrastructure	73	3.161	0.535	0.097
Human Resources	73	3.401	0.535	0.104
Port and Maritime Activities	73	3.335	0.602	0.191
Supply Chain Reliability	73	3.214	0.516	0.142
Efficiency of Customs Processes	73	3.146	0.613	0.073

Table 5. One Sample T-Test

Factors	N	Mean	Std. Deviation	Std. Error Mean
Information and Communication Integration	73	2.9555	0.67100	0.07854
Value-Added Services	73	3.1461	0.64546	0.07555
Processes and Operations	73	3.0308	0.59358	0.06947
Logistics Functions	73	3.2137	0.54602	0.06391
Organizational Activities	73	3.1233	0.54186	0.06342

Institutional Support	73	3.1553	0.55786	0.06529
Infrastructure	73	3.1610	0.53582	0.06271
Human Resources	73	3.4018	0.53564	0.06269
Port and Maritime Activities	73	3.3356	0.60286	0.07054
Supply Chain Reliability	73	3.2146	0.51631	0.06043
Efficiency of Customs Processes	73	3.2461	0.61360	0.07182

Table 6: Confirmatory Factor Analysis

Factors	Standardized Values	Critical Points	Significance Level
Information and Communication Integration	1	-	-
Value-Added Services	0.63	0.55	0.001
Processes and Operations	0.74	0.82	0.001
Logistics Performance	0.81	0.94	0.001
Organizational Activities	0.64	0.58	0.001
Institutional Support	0.59	0.46	0.001
Infrastructure	0.7	0.73	0.001
Human Resources	0.66	0.64	0.001
Port and Maritime Operations	0.79	0.92	0.001
Supply Chain Reliability	0.83	0.99	0.001
Customs Process Efficiency	0.81	0.94	0.001

Structural Equation Modeling (SEM) was conducted using AMOS to examine the relationships between the variables of interest. Model fit was assessed using various fit indices, including the chi-square statistic, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR).

All p-values (significance levels) in the regression weights output are less than 0.05. This suggests that all factor loadings in the model have a statistically significant difference at the standard 0.05 error level. The overall model fit evaluation indices also demonstrate that the status of the model's poor fit indices (CMIN/DF and RMSEA) and good fit indices (CFI, TLI, PCFI, and PNFI) are within the desired and standard range, and no model modification is required.

Table 7: Exploratory Factor Analysis

Factor Status	Description	Desired Value	Reported Value	After Model Modification	Overall Model
CMIN/DF	Chi-square test of model fit divided by degrees of freedom	Smaller than 5	3.50	**	Model fit is acceptable and does not require modification.
RMSEA	Root mean square error of approximation	Smaller than 0.08	0.07	**	
CFI	Comparative fit index	Greater than 0.90	0.95	**	
TLI	Tucker-Lewis index	Greater than 0.90	0.93	**	
PCFI	Parsimonious comparative fit index	Greater than 0.50	0.62	**	
PNFI	Parsimonious normed fit index	Greater than 0.50	0.57	**	

In simpler terms, the model is statistically significant and fits the data well. All the relationships between the variables are meaningful, and the model accurately represents the underlying relationships.

Finally, the study's findings indicate that the average values for most factors influencing logistics integration within the port context exceed the established benchmark of 3. Notably, the information and communication integration factor stands as an exception, exhibiting a mean value below the average. As presented in Table 4, descriptive statistics including mean and standard deviation were calculated for each factor, confirming the normality of the data distribution using the Kolmogorov-Smirnov test. To further investigate the influence of information and communication integration on optimizing operations at Chabahar port, a one-sample t-test was employed. The t-test results reveal a mean score of 2.9555 for information and communication integration, accompanied by a standard deviation of 0.67100 and a standard error of the mean of 0.07854. While the observed mean falls below the average, additional analysis is warranted to determine the statistical significance of this finding and its potential implications for port operations.

9. Discussion

This study investigated the significance of logistics integration within the transportation and logistics sector, with a particular focus on seaports. Due to their pivotal role as nodes in international trade, seaports stand to benefit considerably from enhanced integration. Existing research suggests that a higher degree of logistics integration leads to improvements in operational efficiency and competitiveness for freight and logistics providers. These improvements can subsequently generate positive downstream effects on other elements of the supply chain and the broader economy. Notably, efficient shipping systems play a critical role in connecting disparate activities within the supply chain, accounting for approximately one-third of total logistics costs and significantly impacting overall logistics performance. However, a comprehensive literature review reveals a wide range of factors and dimensions influencing logistics integration in the port sector, making comparisons across studies and the development of a unified framework challenging. Prior sections of this research have highlighted various existing frameworks and research papers that illustrate the multifaceted nature of port logistics integration.

This study assessed the current state of logistics integration within ports, with a specific focus on Chabahar Port. The findings reveal that most factors influencing logistics integration exhibit favorable mean values, exceeding a benchmark of 3. However, information and communication integration stands as a notable exception, demonstrating a lower average score. This suggests potential shortcomings in real-time information exchange among stakeholders within Chabahar Port's maritime supply chain.

Addressing these information integration challenges could lead to significant improvements in port operations. Enhanced information sharing can facilitate more informed decision-making, optimize resource allocation, and ultimately lead to increased operational efficiency. Collaborative efforts among port authorities, shipping companies, and other stakeholders are crucial to overcome these challenges. Investments in modern technologies, improved communication channels, and collaborative practices can foster seamless information flow across the maritime supply chain at Chabahar Port.

Furthermore, the study underscores the importance of continuous evaluation and improvement in logistics integration practices. Regular assessments of logistical factors and indicators can pinpoint areas for improvement and inform strategic decision-making in port operations.

In conclusion, while the study reveals positive trends in Chabahar Port's logistics integration, it also identifies the need for advancements in information and communication integration. By addressing these shortcomings and implementing best practices, Chabahar Port can significantly enhance its operational efficiency, strengthen its competitive position within the region, and contribute to the overall growth and development of maritime trade.

10 Conclusions

This study successfully identified key factors that significantly influence port logistics integration. These factors contribute to a clearer understanding of integrated logistics within the port environment. Furthermore, the research sheds light on the crucial roles played by both internal and external actors in facilitating successful port logistics integration.

The findings hold value from both theoretical and practical perspectives. Theoretically, the research clarifies the concept of integrated logistics in the port context and adds to the existing body of knowledge. Practically, it offers valuable insights for port authorities and stakeholders involved in the maritime supply chain. By understanding the influential factors and the roles of different actors, stakeholders can implement strategies to enhance logistics integration within their ports, leading to improved efficiency and competitiveness.

One key limitation of this research is the vast amount of existing literature that utilizes the concept of "integration" in various contexts. Distinguishing between these studies and identifying the most relevant ones specifically pertaining to port logistics integration proved challenging, particularly in differentiating subtle nuances between supply chain integration and port logistics integration. This may have resulted in potentially overlooking some relevant studies. Despite this limitation, a systematic process was employed for

selecting pertinent journals, papers, reports, and books, as detailed in the methodology section.

11. References

[1] Prajogo, D., Oke, A., & Olhager, J. (2016). Supply chain processes: Linking supply logistics integration, supply performance, lean processes and competitive performance. *International Journal of Operations & Production Management*, *36*(2), 220-238. https://doi.org/10.1108/IJOPM-03-2014-0129

[2] Alavi, A. (2019). *Logistics integration in the port sector: the case of Iran* (Doctoral dissertation, University of Tasmania).

[3] Palmieri, A., Parola, F., Song, D. W., & Baglieri, E. (2019). Integrating firms in a complex network: evidence from maritime logistics. *International Journal of Logistics Research and Applications*, *22*(1), 64-77. https://doi.org/10.1080/13675567.2018.1474860

[4] Krajčovič, M., Bučková, M., & Grznár, P. (2017, June). Integrated logistics. In *Conference: InvEnt 2017At. Research Gate. Szczyrk, Poland*.

[5] Paridaens, H., & Notteboom, T. (2022). Logistics integration strategies in container shipping: A multiple case-study on Maersk Line, MSC and CMA CGM. *Research in Transportation Business & Management*, *45*, 100868. https://doi.org/10.1016/j.rtbm.2022.100868

[6] Farahani, R., Rezapour, SH. & Kardar, L. (2011). *Logisitics Operation and Management*, Elsevier.

[7] Kalogeraki, E. M., Apostolou, D., Polemi, N., & Papastergiou, S. (2018). Knowledge management methodology for identifying threats in maritime/logistics supply chains. *Knowledge management research & practice*, *16*(4), 508-524. https://doi.org/10.1080/14778238.2018.1486789

[8] Tongzon, J. L., & Nguyen, H. O. (2021). Effects of port-shipping logistics integration on technical and allocative efficiency. *The Asian Journal of Shipping and Logistics*, *37*(2), 109-116. https://doi.org/10.1016/j.ajsl.2021.01.001

[9] Song, D. W., & Panayides, P. (Eds.). (2015). *Maritime logistics: A guide to contemporary shipping and port management*. Kogan Page Publishers.

[10] Alderton, P., & Saieva, G. (2013). *Port management and operations*. Taylor & Francis.

[11] Bichou, K. (2014). *Port operations, planning and logistics*. CRC Press.

[12] Lam, J. S. L., & Zhang, L. (2014). Enhanced logistics service provider framework for higher integration and efficiency in maritime logistics. *International Journal of Logistics Research and Applications*, *17*(2), 89-113. https://doi.org/10.1080/13675567.2013.836161

[13] Ng, A., & Liu, J. (2014). *Port-focal logistics and global supply chains*. Springer.

[14] Pratelli, A., Van Duin, R., Souleyrette, R., Bianchini, B., Marigo, D., Brocchini, L., & Teng, W. (2021). Dry port network model: Best practices in the EU with notes from the USA. *International Journal of Transport Development and Integration*, *5*(3), 217-230. https://doi.org/217-230. 10.2495/TDI-V5-N3-217-230

[15] Le, D. N., Nguyen, H. T., & Truong, P. H. (2020). Port logistics service quality and customer satisfaction: Empirical evidence from Vietnam. *The Asian Journal of Shipping and Logistics*, *36*(2), 89-103. https://doi.org/10.1016/j.ajsl.2019.10.003

[16] Lummus, R. R., Krumwiede, D. W., & Vokurka, R. J. (2001). The relationship of logistics to supply chain management: developing a common industry definition. *Industrial management & data systems*, *101*(8), 426-432. https://doi.org/10.1108/02635570110406730

[17] Pinmanee, S. (2016). *Logistics integration for improving distribution performance: In the context of Thai egg industry* (Doctoral dissertation, Victoria University).

[18] Spiegel, Y. (2013). Backward integration, forward integration, and vertical foreclosure. *Centre for Economic Policy Research (CEPR), Discussion Paper*, No. DP9617, Available at SSRN: https://ssrn.com/abstract=2319963.

[19] Tseng, Y. Y., Yue, W. L., & Taylor, M. A. (2005, October). The role of transportation in logistics chain. Eastern Asia Society for Transportation Studies.

[20] Zhu, Q., Krikke, H., & Caniëls, M. C. (2018). Supply chain integration: value creation through managing inter-organizational learning. *International journal of operations & production management*, *38*(1), 211-229. https://doi.org/10.1108/IJOPM-06-2015-0372

[21] Vural, C. A., Göçer, A., & Halldorsson, A. (2019). Value co-creation in maritime logistics networks: A service triad perspective. *Transport policy*, *84*, 27-39. https://doi.org/10.1016/j.tranpol.2018.12.017

[22] Nguyen, H. O. (2013). Critical factors in e-business adoption: Evidence from Australian transport and logistics companies. *International*

Journal of Production Economics, *146*(1), 300-312. https://doi.org/10.1016/j.ijpe.2013.07.014

[23] Sayareh, J., Iranshahi, S., & Tahmak, H.. (2013, February). Investigation and evaluation of the logistic position of Chabahar Port along with presentation and suggestion of appropriate solutions. In *National Conference on the Development of Makran Coasts and Maritime Authority of the Islamic Republic of Iran. Chabahar, Iran.*

[24] Emad, G. R., & Zare, H. (2013, October). National and Regional Strategies for Promotion of Chabahar Port in Transit. In *21st Congress of the country's harmony sea organs, Ramsar, Mazandaran, Iran.*

[25] Central Asia Caucasus Analysts, (2003). *Johns Hopkins University, 22 October*.

[26] Balooch, M. (2009, July). Iran and India's cooperation in Central Asia. In *China and Eurasia Forum Quarterly* (Vol. 7, No. 3, pp. 25-29).

[27] Kiani-Moghadam, M., Tahmak, H., & Iranshahi, S. (2013, February). Analysis of Capacity of Chabahar Port in Comparison with Gwadar Port to Become a Gate Economic Superhighway of Central Asia and Eastern Europe. In *National Conference on the Development of Makran Coasts and Maritime Authority of the Islamic Republic of Iran. Chabahar, Iran.*

[28] Naserian, S. M. & Karimi Rouzbahani, M. (2009). Strategic Assessment of Development of the Railway Network of Iran in Line With International Transportation. *Association of Rail Transport Engineering of Iran, Transport and Development magazine*, Issue 27, pp 70-73.

[29] Maja, R. (2007), China and India's Quest for Energy: A Factor of Cooperation or Conflict?. *Graduate Institute of International Studies, January 2007, Geneva*.

[30] Alavi, A., Nguyen, H. O., Fei, J., & Sayareh, J. (2018). Port logistics integration: challenges and approaches. *International Journal of Supply Chain Management*, *7*(6), 389-402. https://doi.org/10.59160/ijscm.v7i6.2157

[31] Palomero, S., & Chalmeta, R. (2014). A guide for supply chain integration in SMEs. *Production Planning & Control*, *25*(5), 372-400. https://doi.org/10.1080/09537287.2012.698422

[32] Abuali, S., Razmjooi, D., & Abbaspour, M., (2016, October). Analysis of the country's logistics position with a look at the role of ports. In *18th Maritime Industries Conference, Kish Island, Iran*.

[33] Näslund, D., & Hulthen, H. (2012). Supply chain management integration: a critical analysis. *Benchmarking: An International Journal*, *19*(4/5), 481-501. https://doi.org/10.1108/14635771211257963

[34] Nadi, A., Sharma, S., Snelder, M., Bakri, T., van Lint, H., & Tavasszy, L. (2021). Short-term prediction of outbound truck traffic from the exchange of information in logistics hubs: A case study for the port of Rotterdam. *Transportation Research Part C: Emerging Technologies*, *127*, 103111. https://doi.org/10.1016/j.trc.2021.103111

[35] Fan, Y., Liang, C., Hu, X., & Li, Y. (2020). Planning connections between underground logistics system and container ports. *Computers & Industrial Engineering*, *139*, 106199. https://doi.org/10.1016/j.cie.2019.106199

[36] Stevens, L. C., & Vis, I. F. (2016). Port supply chain integration: analyzing biofuel supply chains. *Maritime Policy & Management*, *43*(3), 261-279. https://doi.org/10.1080/03088839.2015.1050078

[37] Taherinik, K. Pourkermani, K. (2017, May). Investigation of factors affecting the logistics performance of Iranian ports. In *7th International Conference on Offshore Industries, Sharif University of Technology, Tehran, Iran*.

[38] Baccelli, O., & Morino, P. (2020). The role of port authorities in the promotion of logistics integration between ports and the railway system: The Italian experience. *Research in Transportation Business & Management*, *35*, 100451. https://doi.org/10.1016/j.rtbm.2020.100451

[39] Wang, C. N., Day, J. D., Lien, N. T. K., & Chien, L. Q. (2018). Integrating the additive seasonal model and super-SBM model to compute the efficiency of port logistics companies in Vietnam. *Sustainability*, *10*(8), 2782. https://doi.org/10.3390/su10082782

[40] Vieira, G. B. B., Neto, F. J. K., & Ribeiro, J. L. D. (2015). The rationalization of port logistics activities: a study at port of Santos (Brazil). *International Journal of e-Navigation and Maritime Economy*, *2*, 73-86. https://doi.org/10.1016/j.enavi.2015.06.007

[41] Ghazizadeh Diyali, A., Hosseininasab, H., & Honarovar, M., (2015, September). Selecting the Optimal Transportation Strategy in an Integrated Logistics Network. In *Second National Conference on Industrial Engineering Research, Tehran, Iran.*

[42] Madhooshi, M., & Namdaraliabadi, A. (2012, November). Survey and ranking of factors affecting maritime logistics in Iranian ports. In

International Conference on Logistics and Supply Chain (Fifth National Conference and Third International Conference). Tehran, Iran.

[43] Clott, C., & Hartman, B. C. (2016). Supply chain integration, landside operations and port accessibility in metropolitan Chicago. *Journal of Transport Geography*, *51*, 130-139. https://doi.org/10.1016/j.jtrangeo.2015.12.005

[44] Hatina, D. (2021). Logistics by Ship. *KnE Social Sciences*, 35-47. 10.18502/kss.v5i1.8268

[45] Deng, A., & Wang, J. Research on the Strategic Development of Gwadar Port Logistics under the Background of the Belt and Road and China-Pakistan Economic Corridor. https://doi.org/10.31871/WJRR.13.1.7

[46] Palmieri, A., Parola, F., Song, D. W., & Baglieri, E. (2019). Integrating firms in a complex network: evidence from maritime logistics. *International Journal of Logistics Research and Applications*, *22*(1), 64-77. https://doi.org/10.1080/13675567.2018.1474860

[47] Han, C. H. (2018). Assessing the impacts of port supply chain integration on port performance. *The Asian Journal of Shipping and Logistics*, *34*(2), 129-135. https://doi.org/10.1016/j.ajsl.2018.06.009

[48] Marsh, H. W., & Bailey, M. (1991). Confirmatory factor analyses of multitrait-multimethod data: A comparison of alternative models. *Applied psychological measurement*, *15*(1), 47-70. https://doi.org/10.1177/014662169101500106

[49] Saunders, M. (2009). Research methods for business students. *Person Education Limited*.