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Factors Affecting the Use of E-Port in Cai Mep - Thi Vai Seaport Cluster, Ba Ria-Vung Tau Province

Do Thanh Phong^{a✉}, Le Manh Tan^b

^a Baria-Vungtau University, Vung Tau and 790000, Vietnam

^b Long An International Port Operations and Management JSC, Long An province and 82522, Vietnam

ABSTRACT

The rapid development of the shipping industry and the growing significance of digitization have placed immense pressure on port operators to enhance operational efficiency through digital transformation and the implementation of E-Port systems. In light of this, the objective of this study is to identify and examine the factors that influence E-Port utilization within the Cai Mep - Thi Vai port cluster, aiming to advance the logistics and seaport sectors in Ba Ria - Vung Tau province, Vietnam. To achieve this, a comprehensive mixed-method approach consisting of a literature review, surveys, and interviews, was employed to gather comprehensive data. The findings demonstrate that transportation, infrastructure, finance, telecommunications, information technology, and human resources significantly impact E-Port utilization. Understanding the relative importance of these factors is crucial for optimizing logistics operations and facilitating informed decision-making. The insights gained from this research provide valuable guidance for policymakers, port operators, and stakeholders, empowering them to enhance E-Port utilization. Ultimately, this study contributes to an improved understanding of the factors that shape E-Port utilization, thereby propelling advancements within the logistics and seaport sectors.

Keywords: Cai Mep - Thi Vai seaport, E-Port, logistics, Information technology.

✉ Corresponding author: Do Thanh Phong, Baria-Vungtau University, Viet Nam Association for Logistics Manpower Development (VALOMA) Tel.: +84 (0) 913172525.

Email address: dophongbrvt1@bvu.edu.vn

✉ Corresponding author. Le Manh Tan, Long An International Port Operations and Management JSC (LAIP), Tel.: +84(0) 937960889.

Email address: tanle@longanport.com

1. Introduction

The Cai Mep - Thi Vai Seaport Cluster in Ba Ria-Vung Tau Province has become a crucial hub in Vietnam's logistics sector [1]. With the rapid growth of the shipping industry and the increasing importance of digitalization, it is essential to understand the factors influencing the utilization of E-Port in this cluster. In recent years, the shipping industry has experienced significant advancements driven by the ubiquity of the Internet and information technology [8]. However, the Russia-Ukraine conflict has disrupted businesses, particularly logistics enterprises and port operators [5]. The escalating freight rates and high logistics costs in Vietnam further highlight the urgent need to identify the factors affecting E-Port utilization [20]. Limited infrastructure, information systems, administrative procedures, transportation processes, and resources contribute to these rising costs. In this context, integrating digital technology, specifically through E-Port solutions, presents a practical and transformative approach for port operators to improve efficiency and maintain competitiveness.

In order to tackle these urgent challenges and capitalize on the opportunities brought about by digital transformation, it is crucial to examine the factors that impact the utilization of E-Port in the Cai Mep - Thi Vai Seaport Cluster. By researching these factors, we aim to provide insights into how transportation means, transportation infrastructure, finance, telecommunications, information technology, and human resources impact the utilization of E-Port in this cluster. Understanding these factors will enable us to identify areas for improvement and develop effective strategies to enhance E-Port utilization. Through this research, we seek to contribute to the ongoing efforts in the logistics industry and provide valuable recommendations for policymakers, port operators, and stakeholders to promote the efficient use of E-Port in the Cai Mep - Thi Vai Seaport Cluster.

In the subsequent sections, we will provide an overview of the Cai Mep - Thi Vai areas, conduct a comprehensive literature review, outline our research model, detail our methodology, and present the findings on the factors influencing E-Port utilization. Through thoroughly exploring these factors, our objective is to illuminate the critical aspects that significantly impact the effective implementation of E-Port in this prominent seaport cluster.

2. Literature Review

Transportation, transportation infrastructure, finance, telecommunications, information technology, and human resources are essential factors that significantly influence port operations and logistics efficiency. In this literature review, we discuss relevant studies that highlight the importance of these factors in the context of E-Port utilization.

2.1. Transportation

Transportation is critical in ensuring efficient port operations, encompassing road, rail, and waterway networks. Yos Sunitiyoso et al. [15] conducted a study to analyze the impact of different transportation modes on port performance. The findings revealed that an integrated and well-connected transportation network positively affects port efficiency and productivity. Additionally, the quality of transport connections significantly influences port selection, even in developed countries like France [9]. These findings highlight the necessity of establishing seamless intermodal transportation systems to optimize port operations and implement digital port solutions.

2.2. Transportation Infrastructure

The significance of transportation infrastructure for E-Port utilization has been widely recognized in the literature. Ziaul Haque Munim and Schramm [16] investigated the relationship between infrastructure development and port competitiveness. Their findings suggest that investments in port infrastructure, such as berths, handling equipment, and intermodal connectivity, are crucial for improving port efficiency and attracting more shipping activities. This aligns with the importance of transportation infrastructure in supporting E-Port utilization.

2.3. Finance

The role of finance in E-Port utilization is evident in studies that examine port financing models and financial strategies. Burns [2] analyzed recent trends and critical issues in financing container terminal development. The study emphasized the importance of sufficient financial resources and favorable financing mechanisms for port development, technological advancements, and infrastructure improvements. These factors ultimately contribute to optimizing E-Port utilization. Wu and Fu [14] also acknowledge the significance of finance in this context, highlighting its role in supporting the efficient utilization of E-Ports.

2.4. Telecommunications and Information Technology

Integrating advanced telecommunications and information technology systems is imperative for efficient E-Port operations. M. Attia [12] explored the impact of information and communication technology (ICT) on port efficiency and competitiveness. The study revealed that adopting ICT tools, such as real-time data exchange systems and digital platforms, improves communication and information flow, enhancing E-Port utilization. Adabere et al. [4] also examined the relationship between digitalization and port efficiency. They found that ports that embrace digital technologies exhibit higher levels of productivity and efficiency, underscoring the role of information technology in optimizing port operations.

2.5. Human Resources

The role of human resources in port operations and E-Port utilization has been studied extensively. Buchari and Hasan Basri [6] investigated the significance of human capital in port development. Their research highlights the importance of a skilled and knowledgeable workforce in optimizing E-Port utilization. Effective training programs, workforce development initiatives, and human resource management practices are crucial for enhancing operational efficiency and ensuring smooth cargo handling processes.

Building upon the insights from the literature review, this study aims to develop a comprehensive research model that integrates the critical factors of transportation, transport infrastructure, finance, telecommunications, information technology, and human resources in the context of port operations. The model will be empirically tested using a dataset collected from multiple stakeholders in the Cai Mep - Thi Vai port cluster, including port operators, shipping companies, and relevant government agencies. By analyzing the data, this study seeks to uncover the relationships and impacts of these factors on E-port utilization and identify potential areas for improvement and strategic interventions.

3. Overview of the situation of using E-Port at Cai Mep - Thi Vai areas

The Cai Mep - Thi Vai seaport cluster in Ba Ria-Vung Tau province has experienced significant formation and development, establishing itself as a prominent port hub in Vietnam renowned for its capability to handle super-large mother ships. According to The Container Port Performance Index (CPPI) 2022, the cluster ranks 12th globally regarding ship and cargo throughput [18]. The adoption of the E-Port system within this cluster has witnessed remarkable growth, revolutionizing the transaction process between customers and the various entities involved in the port ecosystem, including seaports, shipping lines, and logistics service providers.

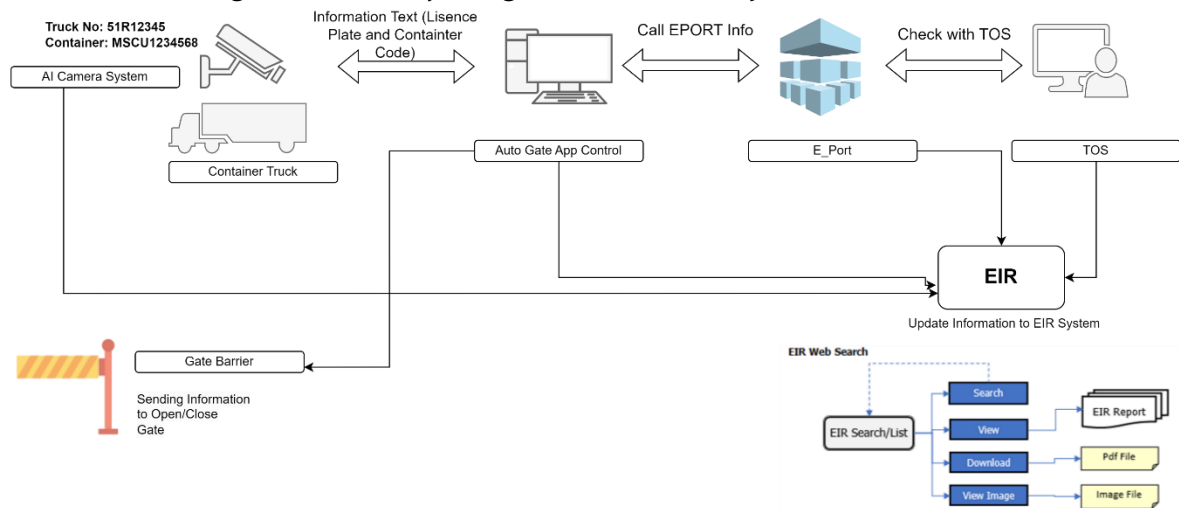
Implementing the E-Port system has delivered substantial convenience and benefits to users and management agencies. By digitizing operations and enabling online interactions, the E-Port system facilitates time and resource savings, streamlines document management, and enhances overall operational efficiency. Particularly noteworthy is the introduction of electronic delivery orders (EDO) by shipping lines in October 2019, further augmenting the capacity of the E-Port system and contributing to improved service quality and enhanced customer convenience. While Saigon Newport Corporation pioneered implementing the E-Port system in 2011, offering online platform services to customers, other ports within the Saigon Port system and Vinalines have also transitioned towards E-Port adoption [24]. However, their current offerings are limited in functionality and lack broader customer applicability.

Table 1.1 Statistics of E-port Usage at Cai Mep – Thi Vai

| Enterprise | E-Port Implementation | Terminal Operations System |
|---|--|---|
| Saigon Newport Corporation | Tan Cang Saigon implemented the first E-Port in Vietnam at the beginning of 2016 and was internally developed by the Information Technology Department of Tan Cang Saigon Corporation. This is the earliest and most comprehensive E-Port system deployed to date in Vietnam. | TOPX (RBS) for planning and managing operations and TOPO for managing container data. TOPOVN is developed by RBS and TCIS (Tan Cang Information Technology Solutions Joint Stock Company) |
| Cai Mep International Terminal Co., Ltd. (CMIT) | Limited offers of services: cargo tracking, electronic invoices, online refunds, vessel departure reports | Navis (N4, SPARCS) |
| SP-SSA International Terminal (SSIT) | SSIT utilizes an application called Forecast, provided by Tideworks, to facilitate seamless communication between shipping lines, transportation companies, and other parties. The web-based platform allows customers to access a portal for cargo information and register for services before arrival at the port. This leads to reduced customer | Tideworks (Spinnaker, Traffic Control) |

| | | |
|-----------------------------|--|---|
| | service costs, improved transaction time at the port, and the elimination of unnecessary paperwork storage. | |
| Gemalink International Port | Gemalink uses the SmartPort technology provided by CEH IT Company for its port system, which includes a range of essential features for an electronic port, such as online order registration, online payment, electronic documents, E-DO, E-Gate, and integrated online data retrieval across multiple ports. This technology is also utilized in the port systems of Gemadept. | The company uses multiple suppliers for their port systems, including CATOS, SmartPort, and River Gate. |

Figure 1. Model of using E-Port at Cai Mep - Thi Vai areas.



Gemalink International Port is the newest port in the Cai Mep - Thi Vai area to have implemented an intelligent port system on May 12, 2021 [21]. The port will refine its procedures and systems toward a completely innovative port model shortly.

Transport and port operating companies strive to provide services through digitalization in most regional ports. The reason is that a company with a modern information system allows for access to new and more successful business models. Additionally, adopting the E-Port system has been recognized as a crucial driver for enhancing the port's competitiveness, especially in developing countries like Vietnam. In the prevailing digital era, the deployment of the E-Port system has become indispensable for port operators to remain at the forefront of technological advancements and effectively meet the evolving needs of the industry.

4. Research Model and Data

To attract investors to the E-Port in the Cai Mep - Thi Vai port cluster, the research methodology of this project used a simple random sampling method [3,17,19]. The formula for determining the sample size n is calculated as follows: ϵ is the acceptable sampling error range of \leq

2%; the confidence level is 95%. The study selected a 5% proportion; therefore, the calculated sample size n is:

The calculated sample size for the survey is obtained.

$$\varepsilon = 2\%; p = 5\%; q = 98\%; \alpha = 5\%; Z_{\alpha/2} = Z_{0,025} = 1,96$$

$$n = \frac{Z^2(p.q)}{\varepsilon^2} = \frac{1,96^2 \cdot 0,05 \cdot 0,98}{0,02^2} = 47$$

An official research survey table consists of 6 representative rating scales for the influencing factors (with 36 observed variables) and one representative rating scale for the satisfaction level of foreign direct investors in the enterprise (with three observed variables). Therefore, the minimum sample size for the study is $n = 47$ research subjects. The study collected data from 50 operating enterprises in the province of BR-VT (accounting for 10% of the total number of seaport, logistics, and transportation service enterprises). The survey was conducted from January 2023 to March 2023. The data was entered and processed using IBM SPSS software (Statistical Package for Social Science) version 20 and statistical algorithms [11].

The main content of the study is to collect, analyze, and propose solutions to increase the utilization of E-Port in the Cai Mep - Thi Vai port cluster in Ba Ria - Vung Tau province. The study mainly reflects the status of the factors: transportation infrastructure, telecommunications, finance, transportation vehicles, information technology, and human resources.

4.1. Research Methodology

To suit the conditions of the Cai Mep - Thi Vai port cluster in Ba Ria - Vung Tau province, the research team conducted a workshop with experts from port operators, logistics service providers, officials from the Customs Department, the Department of Industry and Trade, and the Department of Transport, to identify the key factors influencing the use of E-Port in the Cai Mep - Thi Vai port cluster.

Based on the results of the research workshop, the study proposed the main factors affecting the use of E-Port in the Cai Mep - Thi Vai port cluster, including:

- (1) Transportation infrastructure (TI): Land area, road, port bridges
- (2) Telecommunications (TC): Broadcasting stations, 5G network, smartphones
- (3) Finance (FI): Payment methods, banks, capital sources, fixed and working capital
- (4) Transportation (TR): Vehicles, road, rail, connecting traffic and waterways
- (5) Information technology (IT): Computers, software, artificial intelligence (AI)
- (6) Human resources (HR): Abundant labor force, trained labor, disciplined labor, language proficiency, and IT application skills.

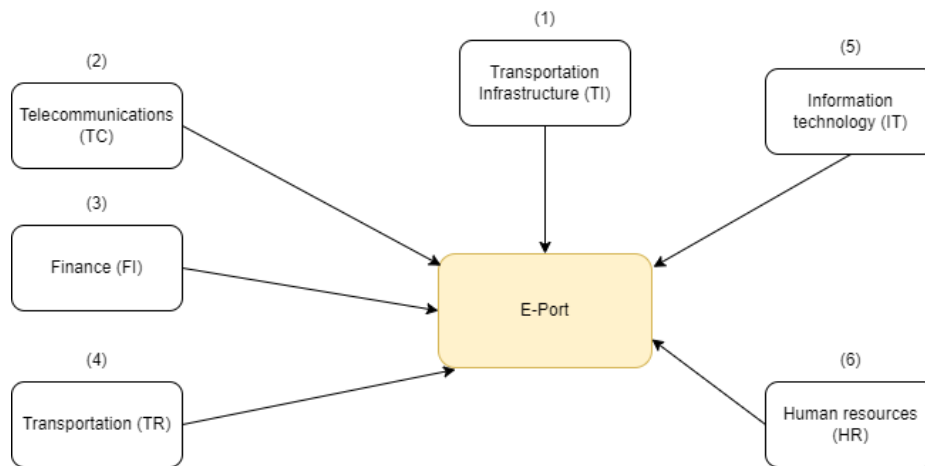


Figure 1. Research Model

5. Research Results

5.1. Research results

- *Step 1 Factor Analysis*

A study was conducted using six representative measurement scales for influencing factors (36 observed variables) and one measurement scale representing the level of E-Port usage (with three observed variables). After conducting Cronbach Alpha tests, the following results were obtained:

These factors are grouped into seven categories: transportation infrastructure (TI), telecommunications (TC), finance (FI), transportation (TR), information technology (IT), human resources (HR), and abundant labor force (AL).

Table 4.1. Characteristics And Measurement Scale of Good Quality

| Measurement Scale | Factors | Cronbach Alpha |
|-------------------|-------------------------------|----------------|
| TI | Transportation infrastructure | 0,915 |
| TC | Telecommunications | 0,926 |
| FI | Finance | 0,927 |
| TR | Transportation | 0,944 |
| IT | Information technology | 0,926 |
| HR | Human resources | 0,950 |
| EP | E – Port | 0,852 |

All measurement scales met the reliability requirement with a value greater than 0.7, where the lowest was the E-Port usage level with $\alpha=0.852$ and the highest was the human resources measurement scale with $\alpha=0.950$.

Testing the appropriateness of EFA:

Table 4.2. KMO and Bartlett's Test

| | | |
|--|--------------------|-----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0,878 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3,581.643 |
| | Df | 50 |
| | Sig. | 0,000 |

According to the Kaiser-Meyer-Olkin (KMO) test with a value of 0.878, which satisfies the condition of $0.5 < \text{KMO} < 1.0$, exploratory factor analysis (EFA) is appropriate for real-world data. Bartlett's test of sphericity with a Sig. < 0.05 indicates that the observed variables have a linear correlation with the representative factor.

The EFA model reveals that all characteristic variables have factor loading coefficients greater than 0.55. Two representative factors affect the use of E-Port in the Cai Mep – Thi Vai port cluster, which is organized differently from the initial theoretical model. These factors are grouped into seven categories: transportation infrastructure (TI), telecommunications (TC), finance (FI), transportation (TR), information technology (IT), human resources (HR), and abundant labor force (AL). Based on the quality test of the scale and the EFA model test, there are seven representative scales for factors that affect E-Port and one representative scale for the degree of E-Port with 36 characteristic variables.

- *Step 2: Multivariate regression analysis*

In order to identify the factors that affect the use of E-Port in the Cai Mep – Thi Vai port cluster, a multiple linear regression model with the form $\text{E-Port} = \beta_0 + \beta_1F_1 + \beta_2F_2 + \beta_3F_3 + \beta_4F_4 + \beta_5F_5 + \beta_6F_6 + e_i$ is utilized. Here, $\beta_1, \beta_2, \dots, \beta_k$ are coefficients that need to be determined using the correlation between the degree of E-Port and the influencing factors. The variables for regression analysis are determined by calculating the scores of each factor.

The regression coefficients for the factors that affect the use of E-Port in the Cai Mep – Thi Vai port cluster are essential for identifying appropriate solutions, making adjustments, and creating high and sustainable profits for businesses operating in the cluster. The significance test results (see Table 4.3) indicate that the transportation infrastructure, telecommunications, and human resources variables have a Sig. < 0.01 , thus the transportation infrastructure, telecommunications, finance, transportation, information technology, and human resources variables are significantly correlated with the degree of E-Port use with a 99% confidence level.

Table 4.3 Regression coefficients (Coefficients)

| Model | Unstandardized Coefficients B | Sig. |
|------------|----------------------------------|-------|
| (Constant) | 0,000 | 1,000 |
| F1- TI | 0,375 | 0,003 |
| F2-TC | 0,192 | 0,004 |
| F3-FI | 0,285 | 0,002 |
| F4-TR | 0,183 | 0,008 |
| F5-IT | 0,424 | 0,001 |
| F6- HR | 0,162 | 0,000 |
| F7- AL | 0,052 | 0,783 |

It is transforming the level of correlation concentration insignificance with logistics capability to below 95% reliability (rejected). Based on the test results, the regression function of the E-Port level for the Cai Mep - Thi Vai port cluster in Ba Ria-Vung Tau province is E-Port level = 0.000 + 0.375 F1 + 0.192 F2 + 0.285 F3 + 0.424 F4 + 0.183 F5 + 0.162 F6. The regression function shows that out of the six tested factors, there is a positive correlation with the E-Port level. Among these factors, the information technology factor with a regression coefficient of $\beta_3 = 0.424$ (Sig=0.003) is significant, strongly affecting the use of E-Port in the Cai Mep - Thi Vai port cluster in Ba Ria-Vung Tau province.

- *Testing the appropriateness level of the model and the level of explanation of the model:*

The level of using E-Port in the Cai Mep - Thi Vai port cluster in Ba Ria-Vung Tau province is explained by the factors (Transport infrastructure, Telecommunications, Finance, Transportation, Information Technology, Human resources). The test results on IBM SPSS 20 software are as follows:

| R | R Square | Adjusted R Square | Change Statistics Sig. F Change | Durbin-Watson |
|-------|----------|-------------------|---------------------------------|---------------|
| 0,672 | 0,452 | 0,389 | 0,000 | 0,751 |

Table 4.4 Model Summary

In the table above, the overall correlation coefficient is $R = 0.672$, indicating a relatively strong relationship between the degree of E-Port utilization and other tested factors. The six tested factors explain 38.9% ($R^2=0.389$) of the variation in the degree of E-Port utilization. Thus, the variation in E-Port utilization at the Cai Mep-Thi Vai port cluster in the province of BR-VT is explained by independent variables such as transportation infrastructure, telecommunications, finance, transportation, information technology, and human resources.

The suitability of the variance analysis with Sig.<0.01 shows that the model fits the real data. In other words, the independent variables are linearly correlated with the dependent variable with 99% confidence.

5.2. Regression discussion:

The unstandardized regression coefficients determine the influence of independent variables: transportation infrastructure 23.13%, telecommunications 11.84%, finance 17.58%, transportation 26.16%, information technology 11.19%, and human resources 9.99%. Therefore, the order of influence of factors on the degree of E-Port is as follows: transportation, transportation infrastructure, finance, telecommunications, information technology, and human resources.

6. Solutions to promote digital transformation at the Cai Mep-Thi Vai areas

The research outcomes hold significant practical implications for fostering digital transformation at the Cai Mep-Thi Vai Seaport Cluster. By examining transportation, transportation infrastructure, information technology, telecommunications, finance, and human resources, the study offers valuable insights into the challenges and opportunities for implementing the E-Port model effectively in the region. Furthermore, a comparative analysis with previous studies enhances our understanding of the research's contributions and alignment with existing knowledge.

- Transportation:

Pham's study [13] reveals the direct impact of transportation on logistics performance. Nevertheless, the Cai Mep-Thi Vai port area experiences a disparity, where only 15% of containers undergo customs procedures at BR-VT and utilize roads. In comparison, the remaining 85% heavily depend on barges for transportation to HCMC and other locations for customs clearance. This lack of synchronous traffic connection with regional highways poses a significant challenge, hindering the smooth transfer of goods through the port system [13]. Consequently, meticulous planning and systematic implementation of transport infrastructure become imperative to address this issue effectively. Transportation contributes (26.16%) to E-Port deployment in the Cai Mep area, highlighting the importance of intermodal connectivity and integration of roads, rail, water, and air traffic networks.

- Infrastructure:

High-quality port infrastructure, including berths, handling equipment, and intermodal connectivity, is critical in enhancing logistics performance [16]. The modern handling equipment in the Cai Mep-Thi Vai port cluster facilitates efficient operations of large vessels on a global scale. Transportation infrastructure significantly (23.13%) influences E-Port utilization, driven by rising customer demands for operational efficiency amidst increasing logistics costs. To meet these demands, port operators prioritize rationalizing post-handling activities, optimizing supply chain management, and reducing turnaround time, enhancing operational efficiency and competitiveness.

- Telecommunications and Information Technology:

The successful implementation of the E-Port model in Cai Mep-Thi Vai heavily depends on robust telecommunications and information technology, contributing 11.84% and 11.19%, respectively. The complex nature of container shipping processes, involving multiple parties and intricate information security procedures, demands efficient IT and communication support. A notable example is Maersk Line's container shipment from Kenya to the Netherlands, which involved an intricate process with the participation of 30 parties and the handling of over 200 documents illustrating the intricacies of container operations [7]. Emphasizing the pivotal role of

telecommunications and information technology aligns with previous studies [12,4], but the unique context of the Cai Mep-Thi Vai Seaport Cluster necessitates tailored solutions for successful E-Port model implementation.

- Finance:

Financial stability (17.58% contribution) is another critical factor for the success of digital transformation. The practical situation at the Cai Mep - Thi Vai Seaport Cluster demonstrates that despite substantial development efforts, several port projects have faced delays in becoming operational due to financial constraints [22], consistent with previous studies observations on funding challenges for container terminal development worldwide [2,14]. Securing sufficient financial resources is crucial for successfully implementing digital transformation in this port cluster, highlighting its role as a critical enabler in logistics domain initiatives.

- Human Resources:

Human resources significantly contribute (9.99%) to digital transformation's essential support and influence. Song's study emphasized the effectiveness of human involvement in handling exceptional cases during automation processes [7]. Consequently, the study highlights the importance of a skilled and well-trained labor force capable of meeting rapid development and digital transformation needs. The need for more highly skilled resources in Vietnam's maritime and logistics sectors necessitates collaboration with the government and universities to build a skilled workforce. Investing in training and development programs becomes imperative to enable human resources within the port cluster to utilize technological advancements and effectively drive overall growth and innovation.

The research results partially explain the challenges and opportunities for promoting digital transformation at the Cai Mep-Thi Vai Seaport Cluster. By integrating pertinent research findings, decision-makers can understand the determinants influencing digital transformation in the Cai Mep-Thi Vai regions. With this understanding, leaders can develop resilient strategies that capitalize on the potential of transportation, transportation infrastructure, and finance, prioritizing them accordingly. While information technology and human resources remain essential, they assume a secondary priority compared to the factors mentioned earlier. These strategies should possess flexibility, adaptability, and alignment with individual businesses' unique requirements and circumstances within the port system.

Leadership's proactive stance is vital for promoting digital transformation in the Cai Mep-Thi Vai areas. Leaders can foster successful digital transformation initiatives by developing short-term and long-term strategies, striking a balance between efficiency and cost, and considering the influence of key independent variables. This approach will empower businesses to embrace digital solutions, optimize their operations, and capitalize on the advantages offered by the E-Port model.

7. Conclusion

The present study's findings highlight the order of influence of factors on the degree of E-Port utilization in the Cai Mep - Thi Vai port cluster. The results indicate that transportation, transportation infrastructure, finance, telecommunications, information technology, and human resources play significant roles in determining E-Port utilization. The study reveals that transportation holds the highest influence, followed by transportation infrastructure, finance,

telecommunications, information technology, and human resources. These results emphasize the importance of efficient transportation services, well-developed infrastructure, sufficient financial resources, advanced telecommunication systems, and a skilled workforce in optimizing E-Port utilization.

It is essential to acknowledge the limitations of the current study. Firstly, the research focused specifically on the Cai Mep - Thi Vai port cluster, and it may be necessary to enhance the generalizability of the findings to other port clusters or regions. Additionally, the study relied on data collected through surveys and interviews, which could be subject to respondent bias or limited representation of the entire population. Moreover, the analysis primarily considered the order of influence of factors on E-Port utilization without delving into the specific magnitudes of their effects.

Several recommendations and future directions have been proposed based on the findings and limitations. Firstly, conducting similar research in other port clusters or regions would provide a more comprehensive understanding of the factors influencing E-Port utilization across different contexts. This would help validate and expand upon the current findings. Furthermore, future studies could explore the quantitative measurement of the impact and magnitude of each factor on E-Port utilization. This would provide a more precise assessment of the relative importance of each factor and enable more informed decision-making. Investigating the interplay and synergistic effects between different factors could offer more profound insights. For example, we examine how integrating information technology and human resources within an optimized transportation and infrastructure framework can enhance E-Port utilization. Lastly, as technology evolves rapidly, future research could explore emerging trends and innovations such as blockchain, the Internet of Things (IoT), and artificial intelligence (AI) concerning E-Port utilization [10]. Investigating these technologies' potential benefits and challenges would help shape future strategies and investments. Moreover, it is essential to consider the growing trend of reducing CO₂ emissions and implementing carbon credits in port operations. Exploring how these technologies can contribute to achieving environmental sustainability and supporting carbon reduction efforts in the port industry would be valuable for future research and decision-making.

This includes improving transportation systems, enhancing infrastructure capabilities, ensuring access to financial resources, integrating advanced telecommunication technologies, and nurturing a skilled workforce. By focusing on these factors and optimizing E-Port utilization, the logistics and seaport sectors in the Ba Ria - Vung Tau province can achieve increased efficiency, productivity, and competitiveness. The findings of this study contribute valuable insights for informed decision-making and resource allocation, facilitating sustainable development and economic growth in the region. Addressing the order of influence of transportation, transportation infrastructure, finance, telecommunications, information technology, and human resources on E-Port utilization underscores the importance of these factors in unlocking the full potential of the E-Port in the Cai Mep - Thi Vai port cluster and propelling the logistics industry forward.

REFERENCES

Book:

- [1] Ba Ria-Vung Tau Provincial Statistics Office (2023). Statistical Yearbook 2022. Ba Ria-Vung Tau Provincial Statistics Office.
- [2] Burns, M. G. (2018). Port management and operations (p. 406). CRC Press. <https://doi.org/10.4324/9781315275215>
- [3] Ha, V. S. (2010). Textbook of principles of economic statistics. Statistical publisher.

Journals:

- [4] Adabere, S., Owusu Kwateng, K., Dzidzah, E. and Kamewor, F.T. (2021), "Information technologies and seaport operational efficiency", *Marine Economics and Management*, Vol. 4 No. 2, pp. 77-96. <https://doi.org/10.1108/MAEM-03-2021-0001>
- [5] Arda Toygar, & Yildirim, U. (2023). Examining the effects of the russia-ukraine conflict on global supply chains. <https://doi.org/10.4018/978-1-6684-6741-1.CH010>
- [6] Buchari, E., & Hasan Basri. (2015). The importance of human resources development and its impact in increasing of national port productivity. *Procedia Engineering*, 125, 519–525. <https://doi.org/10.1016/J.PROENG.2015.11.049>
- [7] D. Song, "A Literature Review, Container Shipping Supply Chain: Planning Problems and Research Opportunities," *Logistics*, vol. 5, no. 2, p. 41, Jun. 2021, doi: <https://doi.org/10.3390/logistics5020041>.
- [8] Gavalas, D., Syriopoulos, T., Efthymios Roumpis, Gavalas, D., Syriopoulos, T., & Efthymios Roumpis. (2022). Digital adoption and efficiency in the maritime industry. <https://doi.org/10.1186/S41072-022-00111-Y>
- [9] Guerrero, D. (2018). Impacts of transport connections on port hinterlands. *Regional Studies*, 53, 540–549. <https://doi.org/10.1080/00343404.2018.1474192>
- [10] Hoang Phuong Nguyen, Quy, P., Dang, Viet Duc Bui, & Dinh Tuyen Nguyen. (2023). Application of IoT technologies in seaport management. <https://doi.org/10.30630/JOIV.7.1.1697>
- [11] Hoang, T., & Chu, N. M. N. (2008). Analyze research data with SPSS. Hong Duc Publishing House.
- [12] M. Attia, T. (2016, March 15). Importance of communication and information technology and its applications in the development and integration of performance in seaports. The International Maritime Transport & Logistics Conference.
- [13] V. T. Pham, "A study on transport planning solutions to meet the development of logistics services, a case in cai mep-thi vai port" *Humanities & Social Sciences Reviews*, vol. 8, no. 1, pp. 789–801, Feb. 2020, doi: <https://doi.org/10.18510/hssr.2020.8195>.
- [14] Wu, H., & Fu, C. (2020). The influence of marine port finance on port economic development. *Journal of Coastal Research*, 103, 163. <https://doi.org/10.2112/si103-035.1>
- [15] Yos Sunitiyoso, Shimaditya Nuraeni, Noorhan Firdaus Pambudi, Tutik Inayati, Ilham Fadhil Nurdayat, Fikri Hadiansyah, & Adhya Rare Tiara. (2022). Port performance factors and their interactions: A systems thinking approach. *The Asian Journal of Shipping and Logistics*, 38(2), 51–124. <https://doi.org/10.1016/J.AJSL.2022.04.001>

- [16] Ziaul Haque Munim, & Schramm, H.-J. (2018). The impacts of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade. *Journal of Shipping and Trade*. <https://doi.org/10.1186/S41072-018-0027-0>

Report:

- [17] Department of Industry and Trade of BR-VT province (2023). Report on implementation of the industrial and commercial plan in 2023.
- [18] Humphreys, M., Mooney, T., Lane, A., Guillot, D., & Ashley, G. (2023). Container port performance index 2022 v2.
- [19] Provincial People's Committee of BR-VT (2023). Report on the implementation of the socio-economic development plan, 2023.
- [20] United Nations. (2022). Review of maritime transport 2022. The United Nations Conference on Trade and Development

Website:

- [21] Gemadept. (2021). *Website Tập Đoàn*. Gemadept.com.vn. <https://www.gemadept.com.vn/gemadept-officially-launches-smartport-platform-from-may-12-2021-4324/index.html>
- [22] Kieu Linh, "Withdrawal of a seaport project with a capital of more than 10,000 billion VND in Ba Ria - Vung Tau," *Vietnam Economic Association*, Mar. 27, 2018. <https://vneconomy.vn/thu-hoi-du-an-cang-bien-von-hon-10000-ty-tai-ba-ria-vung-tau.htm> (accessed Jul. 18, 2023).
- [23] Saigon Newport Corporation, "Human resource for sustainable port development," *saigonnewport.com.vn*, 2023. <https://saigonnewport.com.vn/en/article/operation-news/human-resource-for-sustainable-port-development-seminar-organized-by-the-asean-port-association-held-in-vietnam.html> (accessed Jul. 18, 2023).
- [24] Saigon Newport Corporation. (2019, June 25). *Introducing vehicle management software through E-port conference*. Saigonnewport.com.vn. <https://saigonnewport.com.vn/tin-tuc/hoat-dong-kinh-doanh/hoi-thao-gioi-thieu-chuong-trinh-nhap-thong-tin-quan-ly-phuong-tien-tren-e-port.html>