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Impact of Dry Port on Seaport Competitiveness

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المستخلص

تلعب الموانئ دورًا مهمًا في ربط الأفراد المحتاجين للخدمات اللوجستية بالمنظمات التي تقدم الخدمات اللوجستية. بدلاً من أن تكون مجرد محاور لإعادة الشحن. تطورت الموانئ مؤخرًا إلى مراكز لوجستية متكاملة مع سلسلة نقل مستمرة، حيث تعتمد هذه التطورات بشكل أساسي على أنظمة سلسلة التوريد لمشغلي الموانئ الرئيسيين. على الرغم من أن التغييرات تؤثر على حركة التعامل مع المحطة الطرفية، إلا أن الكميات المتزايدة أدت إلى زيادة ضغط العمل، فضلاً عن مستويات الازدحام وفترات الانتظار في المناطق الطرفية. يعتمد نموذج الميناء الجاف على ميناء بحري متصل مباشرة بالمحطات الداخلية متعددة الوسائط، حيث يمكن تدوير الشحن على الفور إلى الميناء البحري في وحدات تحميل متعددة الوسائط. يبحث هذا البحث في تأثير نمو السفن على تنافسية الموانئ، ويبحث في التكامل بين الموانئ البحرية والموانئ الجافة لمواجهة الزيادة الهائلة في حجم السفن في الموانئ البحرية. ولتحقيق هذا الهدف تم إجراء مسح لقياس العلاقة بين الموانئ الجافة والموانئ البحرية. توضح هذه الورقة أيضًا كيف يرتبط توسع السفينة بانخفاض الكفاءة التشغيلية، والازدحام، والقدرة المحدودة ودعم البنية التحتية، والمبادئ التوجيهية القديمة لتطوير الموانئ الحالية، والحاجة الملحة إلى استثمارات إضافية في التنمية المكانية، وتنمية الموارد البشرية.

Abstract

Ports play an important role in connecting individuals in need of logistics services with organizations that provide logistics services. Rather of being merely transshipment hubs. Ports have recently evolved into integrated logistics centers with a continuous transport chain, with these developments primarily relying on the supply chain systems of major port operators. Though changes impact terminal handling traffic, rising quantities have increased job pressure, as well as congestion levels and dwell periods in terminal areas. The dry port model relies on a seaport which is directly connected to inland intermodal stations, where freight may be rotated immediately to the seaport in intermodal loading units.

This research investigates the influence of vessel growth on port competitiveness and investigates integration between seaports and dry ports to counteract the huge increase in ship size at seaports. To achieve this goal, a survey was conducted to measure the relationship between dry ports and seaports. This paper also illustrates how the vessel expansion is associated with reduced operational efficiency, congestion, limited capacity and infrastructure support, outdated guidelines for existing port development, and the urgent need for additional investment in spatial development, and human resource development.

Keywords: Dry Ports – Competitiveness – Seaports – Vessel size

1. Introduction

The maritime industry plays an indispensable role in global trade and economic development, all commercial and maritime sectors depend on the services and capabilities provided by the shipping sector to facilitate the supply chain cycle from door to door. Therefore, the efficiency of maritime sector services is a major focus in the competitiveness of any economy and its ability to achieve economic growth, and attract foreign investment to the country. As the number of seaports and port efficiency, as well as the quantity of foreign trade exports and imports, have become crucial indices for measuring the country's success, sea ports play a vital role in economic growth and enhance national income.

Technological progress, changes in institutional functions, substantial participation of major ports in regional and international competition, dramatic spatial development, improvements in seaport services, and broader implications of changes in the business environment each had an impact on seaport profitability, often changes. Furthermore, the changing competitiveness of seaports is intimately tied to the character of the marine business, which is significantly influenced by changing investor activity.

A major obstacle for seaports trying to accommodate these megaships is their draft, i.e. not having deep or wide channels. For example, safe passage through a canal requires a separation safe zone between the ships, in addition to the coupling beams of the two ships. This can be a major issue for two huge ships. One-way channels must be developed to accommodate most large ships, causing delays in waits for smaller ships (Yan, 2021).

Dry ports play an important role in reducing transport time and cost. As well as, the function of dry ports in enabling the national economy's international trade and cargo handling. In order to facilitate the establishment of a free trade area between States, dry ports are one of Egypt's interfaces with international trade activities, the flow of imports and exports of commodities and the facilitation of trucking with many countries. Planning and management of these ports, operationalizing container activities at the regional and international levels, and coordinating action among the parties involved in them to ensure smooth functioning and good service delivery in order to relieve pressure on seaports.

In addition, terminal operators and seaport authorities are under pressure to invest heavily in equipment and voyage access to reduce or eliminate the potential economies of scale of such large entities at ports. Additionally, ports should work with inland terminals to enhance flexibility by restoring inland navigate. It should be noted that incorporating dry ports into maritime transportation networks can have a substantial influence on seaport profitability. Based on these talks, this paper addresses the challenges that ports face as a result of vessel expansion and the role that dry ports play in assisting ports in resolving these problems. What role may dry ports play in ensuring ports stay competitive?

2. Seaport Competitiveness

Technological progress, changes in institutional functions, substantial participation of seaports in regional and global competition, dramatic spatial development, improvements in seaport services, and significant effects of changes in the business environment have all had an impact on seaport competitiveness. Furthermore, the changing competitiveness of seaports is intimately

tied to the character of the marine business, which is significantly influenced by producer and investor activity. Frequent and productive effort and change have a strong influence upon it (Munim, 2019).

Competitiveness was first used to examine the strategic behavior of enterprises, but it was later expanded to apply to rivalry between nations and economic ecosystems. A seaport as defined a network in which the success of each firm is intrinsically linked to the competitiveness of the system as a whole. Port (terminal) operating efficiency, port cargo handling prices, dependability, shipper and carrier and port selection preferences, the depth of the navigation channel, adaptation to changing market situations, landside accessibility, and product distinctiveness are all major determinants. These components differ from those that emphasize efficiency, accessibility to main liners and shippers, network extension, and hinterland growth (Saeed, 2019).

3. The Effect of Ship Size on Seaport Competitiveness.

A major obstacle for seaports in accommodating megaships is their draft, i.e. not having deep and wide channels. For example, safe passage through a canal requires a separation safe zone between the ships, in addition to the coupling beams of the two ships. This may be a critical challenge for huge ships. One-way channels must be developed to accommodate most large ships, causing delays in waits for smaller ships (Nguyen, 2021).

Ports handling feeder vessels are therefore more attractive to shipping companies. In addition, selected mega hub ports will require quayside cranes, enabling faster handling with shorter turnaround times. Significant investments are required to prove the mega ship's capacity and equipment suitability to ensure smooth cargo flow to and from the vessel. Terminal operators and seaport authorities are under pressure to invest heavily in equipment and nautical access to reduce or eliminate the potential economies of scale of such large units in ports (Tran, 2021).

This is important for improving vessel efficiency (shorter turnaround times) and port efficiency (faster transshipment processes). Ports and terminals are urged to undertake significant and quick infrastructure expenditures in order to handle larger vessel sizes and compete with other ports. In terms of port competitiveness, this has a significant impact on ship-port relationships. This is because operational bottlenecks and port inefficiencies lead to inadequate port infrastructure and superstructures.

Terminals, port stevedores, shippers, and logistics and transportation corporations can improve efficiency by making full use of information technology (IT) solutions. To ensure the essential capabilities to manage a VLCS, a single IT platform for all parties participating in the port procedure for logistics may be required. Significant increases in ship size have forced gateway ports to be highly synchronized with their hinterland through dedicated rapid transit corridors served by barges or rail, often including dry ports (Jiang, 2014).

Move a large amount of containers quickly from vessel to hinterlands and conversely to reduce freight, that has a negative influence on port attractiveness. To shorten container stay time, the inland transportation infrastructure must be adequately connected to and from ports. Ports are becoming overcrowded as a result of growing external and domestic traffic, and these

congestions can have an indirect impact. Delays caused by congestion, for example, might cause lay time to expire, causing arrival at the next port of call to be delayed (Li, 2014).

The advent of megaships increases the need to expand Storage capacity to allow for the addition of extra containers. Container intermediate parking, reroute yard areas, and freight container plug-ins, and storage areas are therefore essential for smooth handling .Improving port productivity will require the incorporation of large amounts of skilled personnel, equipment and self-driving vehicles. Accordingly, seaports must have new Expansions suitable to accommodate mega-fleet (Nur, 2019).

4. The role of Dry Ports

By using multimodal transport, dry ports play an important role in reducing transport time and cost. In addition, the function of dry ports in enabling the national economy's international trade and cargo handling. In order to facilitate the establishment of a free trade area between States, dry ports are one of Egypt's interfaces with international trade activities, the flow of imports and exports of commodities and the facilitation of trucking with many countries. Planning and management of these ports, operationalizing container activities at the regional and international levels, and coordinating action among the parties involved in them to ensure smooth functioning and good service delivery in order to relieve pressure on seaports.

Follow-up on technological changes in this area, identify a traffic plan for car traffic and heavy transportation within the port, to provide indicative signals, lighting, various means of communication, and identify the required for storage and transportation. The importance of a dry port is to eliminate the problem of cargo accumulated at seaports and to maximize the port's complementary role in reviving international trade and transit traffic and linking seaports to neighboring cities. The customs procedures on the cargo are carried out entirely within the dry port, relieving the pressure on the seaport and the speed of circulation (Abdul Rasoul, 2022).

5. The Role of Dry Ports in Seaport Competitiveness

Dry ports are a critical part of port production as containers move in and out of ports with high-performance means for effective supply chain solutions across the transport chain as well as in the hinterland. Advances in the supply chain have increased pressure on port operations and inland cargo flows, making inland access a key factor in determining port competitiveness (Sangkyun, 2015).

Increased container flows into and out of ports have caused terminal overcrowding and increased container wait times, reducing ports' overall competitiveness. The emergence of dry ports connecting various actors. As container volumes have increased, access to port hinterlands has become critical to competitive advantage. The establishment of dry ports has had an influence on port competition, specifically through enhancing port performance and expanding the range of services available to port customers. (Hyuksoo, 2015).

Improve port and hinterland connections, as well as port volume of trade and capacities. This demonstrates the importance of installing modern intermodal terminals. Dry ports' capacity to regulate and optimize substantial segments of the container transportation chain will aid in the development of inland seaport capabilities.

The addition of sea ports to the dry ports system will boost capacity, improve access to the port, increase container handling efficiency and reliability, operate as a decongestion sector in the port, and improve productivity. This will boost the port's competitiveness.

Increasing the port's competitiveness by providing storage spaces to increase the number and volume of cargo and containers handled. Keeping pace with global trends to facilitate cross-border trade through border ports, such as the Salloum port on the western borders of the Arab Republic of Egypt, Qustol and Arkin on the southern borders of the Arab Republic of Egypt and achieving competitive advantages for investors, by reducing the rates of time taken to complete customs release and export procedures.

Hence the need to discuss the work and description of dry ports, so that they can examine their operational relationship with seaports, because the dry port depends on a directly connected seaport. Close to consumption places, raw materials places and industrial areas to serve trade in transit traffic to increase competitive advantage.

Ensuring the ability to operate the 2017 VLCS requires a unified IT platform for everyone involved in the port logistics process. Inevitably poor "information structure" (e.g. Port Community Systems). Freight forwarders, shippers, terminal operators and shipping companies believe dry ports can reduce supply chain disruptions and save money and time in container handling (Thai, 2021).

6. Development of Questionnaire

Surveys are one of the best known and most commonly used analytical methods. It offers a convenient method to collect information from specific population groups. A questionnaire is defined as "a tool for gathering information to describe, compare, or explain knowledge, attitudes, behavior, and/or socio demographic characteristics". This approach is extremely adaptable for measuring many sorts of data (subjective, objective, qualitative and quantitative). Generally speaking, there are several sorts of surveys that may be used in study. Mail survey, cluster monitoring survey, household admission and interviews.

However, respondents who take surveys often want to limit their responses, which can render the survey pointless. However, researchers can overcome this problem to some extent by providing sufficient space for comments. From another side, response rates for hand written questionnaires are low, especially postal surveys, are the most common problem and can significantly reduce the reliability of survey results. Naturally, postal surveys may not yield responses from data subjects, further negatively impacting survey results. The following equation was used to calculate the sample size.

$$n = \frac{X^2 \times N \times P \times (1 - P)}{(ME^2 \times (N - 1) \div (X^2 \times P \times (1 - P)))}$$

Where:

n = sample size.

X² = Chi-square for the specified confidence level at 1 degree of freedom.

N = Population Size.

P = population proportion (.50)

ME = desired Margin of Error (expressed as a proportion)

An opinion poll was conducted for workers in maritime sector, by taking a sample of workers at the middle and senior management level. 350 copies of the questionnaire were distributed through Google Forms. 320 were answered, 20 were excluded, and 300 were statistically analyzed by SPSS.

6.1 Descriptive analysis for the statement of the questionnaire

1- Dry port have a positive effect on productivity of seaport.

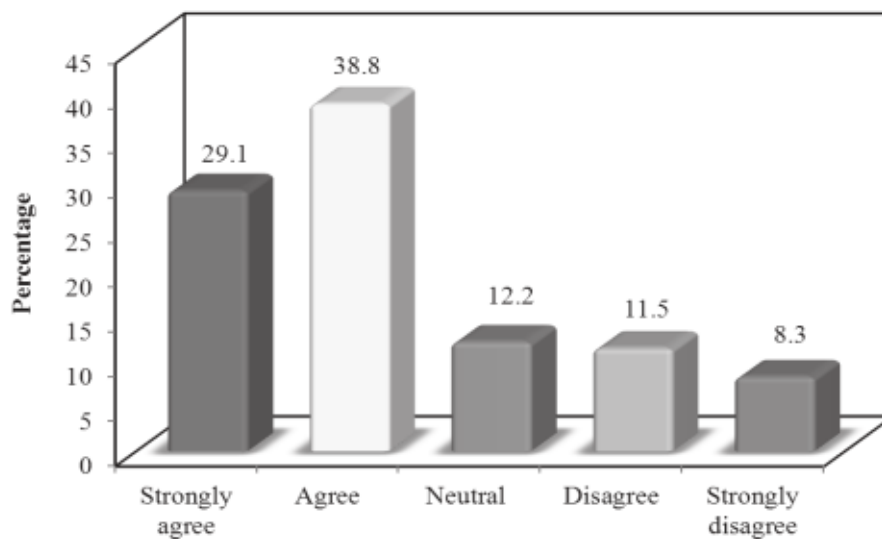


Figure (1): Dry port have a positive effect on productivity of seaport.

67.9% agree that dry port have a positive effect on productivity of seaport, 19.8% do not agree and 12.2% are neutral, and therefore this will positively affect the performance of seaport.

2- Dry port has a positive effect on vessels size.

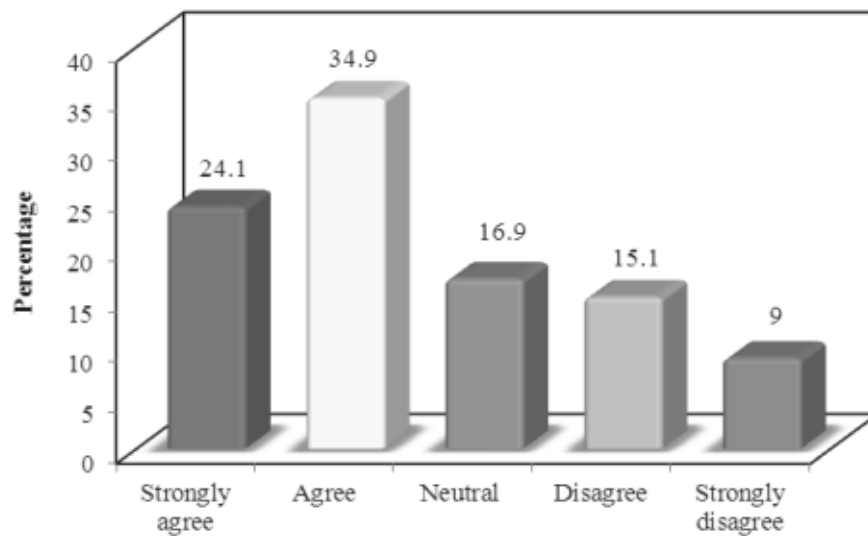


Figure (2) Dry port have a positive effect on vessels size.

59% agree that dry port have a positive impact on productivity of seaport, 24.1% do not agree and 16.9% are neutral, and therefore this will positively affect the solution to the problem of seaport overcrowding and the vessels size and speed handling in seaport.

3- Dry port has a positive impact on competitiveness of seaport.

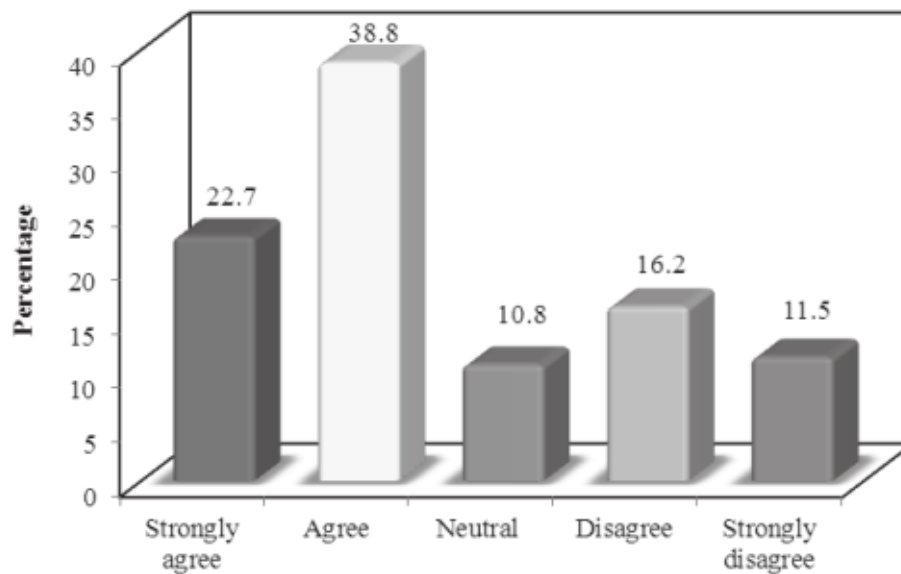


Figure (3) Dry port has a positive effect on competitiveness of seaport.

61.5% agree that dry port have a positive effect on productivity of seaport, 27.7% do not agree and 10.8% are neutral, and therefore this will positively affect the competitiveness of Egyptian seaport.

Through the descriptive analysis of the survey questions, dry ports have a positive impact on the productivity of sea ports, the size of ships, and on increasing the competitiveness of sea ports. From the above, found that dry ports will affect the increase in the competitiveness of sea ports.

6.2 Hypothesis Test

This paper tests the research hypotheses between one dependent variable and three independent variables, and after conducting multivariate linear regression, it was found that the dry port will positively affect the competitiveness of seaports.

Table (1): Multivariate Linear regression for Dry port

	B	SE	Beta	t	p
(Constant)	0.137	0.112		1.225	0.222
Competitiveness	0.660	0.105	0.557	6.296*	<0.001*
Vessel size	0.372	0.073	0.342	5.074*	<0.001*
Productivity	-0.058	0.084	-0.052	-0.684	0.494
R²=0.675, adjusted R²=0.671, SE=0.75, F=189.524*, p<0.001*					

F, p: f and p values for the model

R²: Coefficient of determination

B: Unstandardized Coefficients

SE: Estimates Standard error

Beta: Standardized Coefficients

t: t-test of significance

*: Statistically significant at $p \leq 0.05$

Table (1) shows the multiple regression analysis for the impact of the three variables under study together on Dry ports. It was found out that competitiveness has the most significant positive impact on Dry ports followed by vessel size in the presence of other variables (P-value< 0.05) While productivity has insignificant positive impact on Dry port. Thus, it will have an effect on the competition of seaports.

7. Discussion

The influence of dry ports on seaports as ship sizes vary remains unknown. As a result, this study has proven dry port may benefit these seaport in a variety of ways, and as a consequence, seaport accessibility, infrastructure, service quality, efficiency, and capacity are likely to improve. Furthermore, the availability of dry port reduces total stay time, limits waiting time for large boats, enhances seaport operations efficiency, reduces internal traffic, allows for proper information interchange, allows for faster turnaround time, and boosts container yard profitability.

The increasing involvement of large ships in seaports could lead to a number of issues, including decreased operational efficiency, congestion, and restricted capacity. Although larger vessels are not now frequent in seaports, their presence in the future may have substantial financial effects. To preserve a competitive edge, seaports must adapt to this transformation. To guarantee that these seaports are ready to accommodate larger vessels, a seaport infrastructure comprised of

seaports, inland terminals, transportation networks, and freight routes must be established, in addition to concentrating on collaboration between seaports and dry ports. This is essential for enhancing idle port capacity and competitiveness.

8. Conclusion

Essentially, the presence of huge ships in a harbor raises certain concerns about seaport efficiency. Congestion, capacity, and infrastructural support limits, out-of-date standards for the development of existing ports, extra funding needs for urban expansion, as well as the requirement for personnel training are all factors to consider. As a result, the paper advocated the creation of a dry port to mitigate the harmful impact of large boats on the network of seaports. Because of general changes in marine logistics services, such as enhanced port performance and increasing variance in port services, dry ports have an impact on container port systems, and reduced proximity to ports. Remote areas, increasing trade volume and port storage capacity, productivity, and up to global performance indicators.

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