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THE ROLE OF DEVELOPING LOGISTICS ACTIVITIES IN IMPROVING THE PERFORMANCE OF IRAQI COMMERCIAL PORTS (AN APPLIED STUDY ON UMM QASR PORT)

O PAPEL DO DESENVOLVIMENTO DAS ATIVIDADES LOGÍSTICAS NA MELHORIA DO DESEMPENHO DOS PORTOS COMERCIAIS IRAQUIANOS (UM ESTUDO APLICADO SOBRE O PORTO DE UMM QASR)

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Abstract
This study aims to examine and analyze the role of developing logistics activities in improving the performance of Iraq's commercial ports, to design a framework that clarifies the impact of physical distribution elements—such as transportation and storage—on enhancing the performance of Iraq's (maritime) commercial ports. The application focuses on Umm Qasr Port. The study arrives at several key findings, most notably the existence of a statistically significant relationship between transportation and logistics distribution and the improvement of port performance in terms of the number of vessels, waiting time, cargo throughput, and number of containers. It also highlights the presence of a modern logistics zone at Umm Qasr Port and proposes a set of recommendations, including the establishment of an independent administrative unit specialized in logistics management to oversee transportation and storage activities, as well as greater attention to the port's maritime access channel to enhance the performance of Iraq's commercial ports. Furthermore, the study recommends applying the proposed model, which contributes to improving the efficiency of Iraq's commercial ports.

Keywords: Logistics Management. Port Performance. Physical Distribution. Maritime Transport. Umm Qasr Port.

Resumo
Este estudo tem como objetivo examinar e analisar o papel do desenvolvimento das atividades logísticas na melhoria do desempenho dos portos comerciais do Iraque, a fim de elaborar um quadro que esclareça o impacto dos elementos da distribuição física — tais como transporte e armazenamento — na melhoria do desempenho dos portos comerciais (marítimos) do Iraque. A aplicação concentra-se no Porto de Umm Qasr. O estudo chega a várias conclusões importantes, sendo a mais notável a existência de uma relação estatisticamente significativa entre o transporte e a distribuição logística e a melhoria do desempenho portuário em termos de número de embarcações, tempo de espera, movimentação de carga e número de contêineres. Ele também destaca a presença de uma zona logística moderna no Porto de Umm Qasr e propõe um conjunto de recomendações, incluindo a criação de uma unidade administrativa independente especializada em gestão logística para supervisionar as atividades de transporte e armazenamento, bem como maior atenção ao canal de acesso marítimo do porto para melhorar o desempenho dos portos comerciais do Iraque. Além disso, o estudo recomenda a aplicação do modelo proposto, o que contribui para melhorar a eficiência dos portos comerciais do Iraque.

Palavras-chave: *Gestão Logística. Desempenho Portuário. Distribuição Física. Transporte Marítimo. Porto de Umm Qasr.*

1 INTRODUCTION

Iraq's commercial ports play a vital role in the Iraqi economy, as they constitute a primary gateway for foreign trade and contribute significantly to national economic development. However, Iraqi ports face several challenges that negatively affect their performance, necessitating the search for solutions to improve efficiency and effectiveness. One such solution is the activation of logistics activities, which can play an important role in enhancing port performance.

As logistics systems improve, consumption and production begin to separate geographically, leading certain regions to specialize in goods that can be produced efficiently, while surplus production may be exported to neighbouring countries. Imports, in turn, become limited to goods that cannot be produced locally. This exchange process reflects the principle of comparative advantage.

When applied to international markets, this principle helps explain the rise in international trade since 2019. An efficient logistics system enables international trade to benefit from the unequal distribution of land and population in terms of productive capacity. Logistics systems are therefore highly important, as they help raise overall economic living standards. Despite the abundance of foreign studies addressing logistics activities, Arabic studies have not previously examined the role of developing logistics activity systems in improving the performance of Iraq's commercial ports. This research addresses that gap through an application to Umm Qasr Commercial Port, which has become a fundamental pillar of other governmental economic sectors due to the substantial revenues it generates for the state treasury. Without Iraqi maritime transport and logistics systems, Iraqi society would suffer from severe shortages of various goods and commodities.

The study aims to examine the role of developing logistics activities in improving port performance in order to design a framework that clarifies the role of the efficiency of logistics activities (transportation and storage) in enhancing performance, with application to Umm Qasr Port.

2 RESEARCH HYPOTHESIS

There is no statistically significant effect of logistics activities, from the perspective of transportation and storage dimensions, on improving the efficiency of maritime port performance.

2.1 Research importance

The importance of the maritime transport sector at the present time lies in its suitability for applying the fundamental concepts of modern logistics systems, given the scale of services it provides to a wide range of sectors. This significance served as the motivation for selecting this topic. The more sound and appropriate the basic requirements of this sector are, the greater its positive impact on other economic, industrial, commercial, and social sectors.

2.2 Research problem

The research problem is formulated through the following question:

1. To what extent can the development of logistics activities influence port performance improvement?

In light of the research problem, objectives, and recommendations, Figure (1) illustrates the proposed framework for the role of logistics activities in improving the performance of Iraq's commercial ports.

Figure 1

Proposed Framework Illustrating the Role of Logistics Activities in Improving Umm Qasr Port Performance

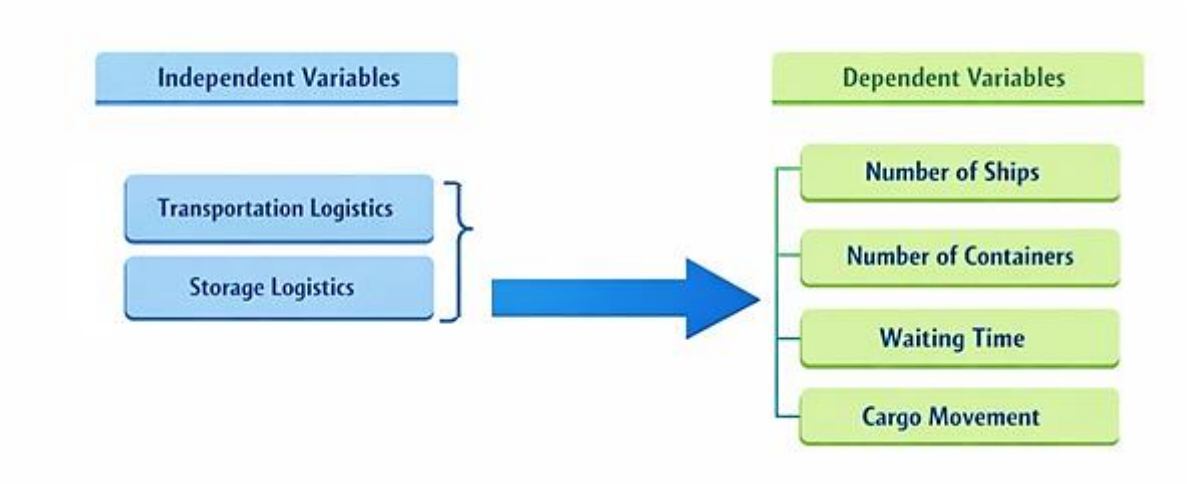

Table 1

Variables

Purpose	**Description**	**Variable**
There is no statistically significant effect of logistics activities, from the transportation dimension, on improving port performance (number of ships, cargo movement, number of containers, waiting time).	Port's attention to the quality of transportation services and the establishment of an integrated transport network within logistics services, relying on high-quality transport vessels, efficient management, and the use of technology to accomplish transportation processes.	Transportation Dimension (Independent Variable)
There is no statistically significant effect of logistics activities from the perspective of the storage dimension on improving port performance (number of ships, cargo movement, number of containers, waiting time).	The use of necessary logistics information for storage operations is effective in improving the quality of storage activities and raising the level of service.	Storage Dimension (Independent Variable)
—	The extent to which safety and security standards are provided for all ships calling at ports, and the provision of all necessary facilities and services required for transporting cargo from the berths.	Number of Ships (Dependent Variable)
—	Providing the basic infrastructure required to accommodate the number of containers in ports and the availability of reserve space for future capacity expansion.	Number of Containers (Dependent Variable)
—	Providing the necessary navigational aids while ships are waiting at anchorage areas, such as marine beacons, wireless communication stations, and navigational guidance for directing ships to and from the berths.	Waiting Time (Dependent Variable)
—	The efficiency and effectiveness of ports in cargo handling operations, and the availability of administrative and technical staff to organise cargo handling processes.	**Cargo Movement (Dependent Variable)**

Source: Prepared by the researcher based on Figure (1).

2.3 Research methodology

The study adopted a deductive approach based on a descriptive–analytical method to analyse the collected data and conduct a field study aimed at identifying the factors and variables that achieve the study's objectives. This was carried out by testing the validity of the research hypotheses to determine the role of logistics activities in improving port performance. The data were collected from published and unpublished statistics obtained from several sources, most notably Umm Qasr Port and its Planning and Follow-up Department, in addition to personal interviews with selected heads of industrial and commercial sectors and port employees.

2.4 Research Population

The research population consists of all of Iraq's commercial ports, as shown in Table (2).

Table 2

Iraq's Commercial Ports

Port	Port Authority	No.
Umm Qasr North Port, Umm Qasr South Port, Umm Qasr Central Port	Umm Qasr Port Authority	1
Khor Al-Zubair Oil Port	Khor Al-Zubair Port Authority	2
Abu Flous Commercial Port	Abu Flous Port Authority	3
Al-Maql Port (out of operation)	Al-Maql Port Authority	4
Al-Faw Production Port	Grand Faw Port Authority	5

Source: Al-Hajjaj, "Evaluation of the Efficiency of Iraqi Maritime Transport and Its Role in Economic Development," PhD Dissertation, University of Basra, College of Education for Pure Sciences, 2014, p. 51.

2.5 Research sample

The research sample consists of Umm Qasr Port (North and South) for the following reasons:

1. It is a container port.
2. It handles bulk, liquid, and bagged cargo.
3. Vessels remain berthed within the port for cargo handling operations.

4. Vessels wait at the anchorage area for preparation prior to entry.
5. The port is located at a unique strategic position, linking Khor Abdullah to the north and Khor Al-Zubair to the south. It comprises ten berths with a total length of approximately 10.3 km and a quay frontage of 4,532 m, allowing vessels with a draft of 9–10 m to berth. The total port area is approximately 678,829,165 m². The port includes general cargo berths, container berths, vegetable oil berths, and grain (silo) berths. In addition, a railway line operates within the port to transport various goods, containers, fuel, and vegetable oils.
6. Ease of access for employees and administrative staff to obtain the information required for the study.

2.6 Questionnaire design

All study data were collected using a questionnaire developed based on previous academic theses and dissertations and designed to test the research hypothesis.

2.7 Unit of analysis

The unit of analysis consists of selected respondents from different administrative levels.

2.8 Statistical methods used

The researcher employed a set of statistical methods to process and analyze the data to verify or reject the research hypothesis, in accordance with the nature of the available data, as follows:

1. **SPSS (Version 22):** One of the most widely used statistical software packages for data analysis across various scientific fields; it is also commonly used for questionnaire analysis.
2. **Arithmetic Mean:** Used to examine the relationship between independent and dependent variables through the value of the coefficient of determination, which indicates the proportion of variance in the dependent variable explained by the

independent variables, as well as to test the overall significance of the model using the F-test.

3. **Standard Deviation:** Used to conduct descriptive analysis of variables to determine the degree of dispersion or consistency in responses and to rank statements based on the weighted mean. When statements have equal weighted means, the statement with the lower standard deviation is assigned the higher rank.
4. **Simple Correlation Coefficient:** Used to identify the strength and statistical significance of the relationship between study variables in their bivariate form.
5. **Arithmetic Means:** Used to perform descriptive analysis of variables based on the simple arithmetic mean, as illustrated in Table (3).

Table 3

Interpretation of Arithmetic Mean Values

Interpretation	Mean Value Range
Very Low Level	1.0 – 1.8
Low Level	1.9 – 2.6
Moderate Level	2.7 – 3.4
High Level	3.5 – 4.2
Very High Level	4.3 – 5.0

3 ARITHMETIC MEAN AND STANDARD DEVIATION OF LOGISTICS MANAGEMENT

Table 4

Arithmetic Mean and Standard Deviation of Logistics Activities at Iraq's Commercial Ports (2020–2023)

Standard Deviation	Mean	Statement	Dimension
2.11	4.11	The port has the ability to compete in the transportation sector, particularly by relying on the quality of transportation services used.	Transportation Dimension
1.12	4.12	The port pays attention to patterns of commercial relationships with customers through the establishment of an integrated transportation system of logistics services.	
1.11	3.14	The port relies on an integrated, high-quality transport fleet that meets transportation needs efficiently.	
1.11	4.11	The port depends on efficient management of transportation means to provide services within the required time.	

1.13	3.12	The port uses modern technological tools to accomplish transportation operations.	
1.21	2.11	The port uses administrative logistics information and data for storage operations in effective ways.	Storage Dimension
1.41	3.11	The port exploits available opportunities to improve the quality of storage activities.	
1.31	3.12	The port relies on insurance documentation (insurance policies) for stored goods in line with customer requirements, contributing to improved storage service levels.	
2.34	3.32	The port depends on an updated records system to provide information and data and to deliver storage services more rapidly.	

Table 5

Arithmetic Mean and Standard Deviation of the Performance Variable of Iraq's Commercial Ports (2020–2023)

Standard Deviation	Mean	Statement	Dimension
1.58	2.458	The port relies on providing safety and security standards for all types of maritime units calling at the ports.	Number of Vessels
3.42	3.51	The port provides the necessary facilities and services for cargo handling from berths and equipment.	
1.33	3.34	The number of vessels calling at the ports is consistent with the capabilities and services provided by the ports.	
4.16	3.15	The number of vessels calling at the ports is appropriate relative to the volume of trade exchange.	
2.17	4.14	The port handles vessels calling at the ports with high quality and efficiency, particularly during cargo handling operations.	Cargo Handling (Stevedoring)
2.13	4.20	Ports provide all necessary maintenance means for capital assets and facilities, including berths and navigational aids, contributing to improved efficiency of commercial cargo handling.	
2.12	4.23	Ports provide technical and administrative staff with a high level of training and performance efficiency to manage and direct container handling operations within the port.	
2.11	4.12	Adequate monitoring and control are available for vessel and cargo movements within the ports.	Number of Containers
2.10	4.21	Ports develop basic infrastructure facilities in line with the level of demand for port services, particularly with respect to the number of handled containers.	
1.20	3.31	Ports apply a balance between costs and service fees.	
2.21	4.21	Sufficient land areas are provided for port activities, while preserving hinterland areas for future expansion.	
2.11	4.32	Navigational aids are provided to ensure safe navigation upon vessel arrival or while waiting at the pilotage/anchorage station.	Waiting Time
2.20	4.21	All tugboats, cranes, coastal signaling aids, and radio communication stations required for guidance are available.	
—	—	Maritime pilots and guides are available to assist vessels from the anchorage area to berths and vice versa.	

Source: SPSS statistical software.

It is evident from **Table (5)** that the arithmetic mean values are relatively high (greater than 3). This can be attributed to the availability of maritime pilots and guides assisting vessels from the anchorage area to berthing locations, which recorded a mean value of **4.41**. The mean value for the provision of all navigational aids to ensure safety upon vessel arrival or while waiting at the pilotage station reached **4.32**. In addition, the availability of internal guidance services, tugboats, cranes, coastal signaling aids, and radio communication stations for navigation recorded a mean value of **4.21**. Ports also rely on providing all necessary maintenance means for capital assets and facilities, including berths and maritime aids, as well as services that contribute to improving the efficiency of cargo handling (stevedoring) operations from berths and equipment, which achieved a mean value of **4.20**.

3.1 Hypothesis testing

Interpretation	Statistical Significance	Value	Test
Not statistically significant	p = 0.115 (> 0.05)	0.41	Correlation Coefficient (r)
—	—	0.168	Coefficient of Determination (R^2)
Not statistically significant	p = 0.115 (> 0.05)	7,153	Regression Coefficient (B)
—	—	3,324.68	Constant (a)

3.2 Testing the validity of the first hypothesis

The main hypothesis states that there is no statistically significant effect of logistics activities, from the transportation dimension, on improving port performance, as measured by the number of vessels, cargo movement and handling, number of containers, and waiting time. The results are presented in Table (6).

Table 6

Results of the First Hypothesis between the Independent and Dependent Variables

Standardised Regression Coefficient	Correlation Coefficient (R)	Sig. (p)	F-test	Sig.	t-test (C.R)	Regression Coefficient	Dependent Variable	Independent Variable
0.051	0.210	0.007	7.501	0.050	2.710	0.171	Port Performance	Logistics Activities (Transportation Dimension)

Source: AMOS software output.

As shown in Table (6), the correlation coefficient between the independent variable (logistics activities) and the dependent variable (transportation dimension of port performance) for Iraq's commercial ports (Khor Al-Zubair and Umm Qasr North and South) reached **0.051**, indicating the presence of a relationship between the two variables. The F-test result (**F = 7.501; Sig. = 0.007 < 0.05**) confirms the statistical significance of the regression model. The coefficient of determination (**R^2 = 0.168**) indicates that logistics activities explain approximately **4.6%** of the variation in port performance from the transportation perspective.

Furthermore, the t-test results (**t = 2.710; Sig. = 0.050**) indicate that the effect of the independent variable on the dependent variable is statistically significant at the **0.05** level. Accordingly, the null hypothesis is **rejected**, and it is concluded that logistics activities—specifically the transportation dimension—have a statistically significant effect on improving port performance in terms of the number of vessels, cargo handling, number of containers, and waiting time.

3.3 Testing the validity of the second hypothesis

The second hypothesis states that there is no statistically significant effect of logistics activities, from the storage dimension, on improving the performance of Iraq's commercial ports, as measured by the number of vessels, cargo movement and handling, number of containers, and waiting time. The results are presented in Table (7).

Table 7

Results of the Second Hypothesis between the Independent and Dependent Variables

Correlation Coefficient (R)	Sig. (p)	F-test	Sig.	t-test (C.R)	Regression Coefficient	Dependent Variable	Independent Variable
0.400	0.00	22.300	0.00	5.200	1.220	Storage Dimension	Logistics Activities

Source: Prepared by the researcher based on AMOS output.

As shown in **Table (7)**, the correlation coefficient between the two variables reached **0.116**, indicating a weak relationship. However, the F-test result (**F = 22.300; Sig. = 0.00**) confirms the statistical significance of the regression model. The coefficient

of determination (**R^2 = 0.111**) indicates that logistics activities explain approximately **1.2%** of the variation in port performance from the storage perspective.

The t-test result (**t = 5.400; Sig. = 0.00**) indicates that the effect of logistics activities on the storage dimension is statistically significant. Accordingly, the null hypothesis is **rejected**, and the alternative hypothesis is **accepted**, indicating that logistics management from the storage dimension has a statistically significant effect on improving port performance in terms of waiting time, number of vessels calling at ports, cargo movement, and number of containers.

4 IMPACT OF LOGISTICS ACTIVITIES ON PORT PERFORMANCE

Logistics activities play a fundamental role in enhancing port efficiency and increasing competitiveness. Effective management of cargo handling, storage, transportation, and vessel scheduling directly contributes to reducing waiting times, accelerating cargo flows, and increasing port operational capacity. Moreover, modern logistics practices—such as the use of information systems, container and cargo management, and green logistics—contribute to improving service quality and reducing costs. As logistics activities become more organized and developed, port performance improves in terms of productivity, revenues, and turnaround time, thereby strengthening ports' commercial position and their ability to attract maritime shipping lines, vessels, and cargo.

Table 8

Effect of Logistics Activities on Port Management

Component Matrix (Loading)	Variable
0.613	Number of vessels calling at the port
1.234	Cargo handling operations
0.900	Number of containers
0.710	Overall logistics activities at the port
2.421	Waiting time

The saturation values for other dimensions are as follows: cargo handling operations (**1.234**), container handling (**0.900**), and the number of vessels calling at the port (**0.613**). These high saturation values indicate that the logistics activities have a **substantial effect on port performance**.

From these results, the following conclusions can be drawn:

1. The null hypothesis regarding the main first hypothesis and related sub-hypotheses is **rejected**, indicating that logistics activities significantly impact port performance.
2. The alternative hypothesis is **accepted**, as survey analysis of port administrative staff revealed several indicators reflecting the actual organisation and administrative logistics performance. The results showed variability in staff perception across administrative levels: some indicators received high agreement scores, reflecting clear authorities and task alignment, while others scored medium or low, indicating weaknesses in administrative coordination, communication, or decision-making mechanisms.

The analysis also highlights the need for **integration among administrative levels** and the development of management methods to enhance performance efficiency, which positively affects the port's logistics operations. A statistically significant and positive relationship was observed between logistics activities and improved performance at Umm Qasr Port.

Specifically, in the **transportation dimension**, logistics activities impact the number of vessels, cargo movement, container handling, and waiting time. The field study indicated that high-quality, integrated shipping services, efficient transport management, and timely service delivery—combined with well-structured commercial relationships and an integrated logistics network in the port's hinterland—enhance port performance. Some administrative divisions, however, still follow traditional logistics management practices.

4.1 Recommendations for improving Umm Qasr Port (North, South, and Central)

To enhance the performance of this strategic commercial port, the study recommends:

1. Establish an **independent logistics management department** to oversee and implement logistics activities within the port.
2. Implement the **proposed framework** to improve maritime port performance.
3. Improve port access points to enhance operational efficiency.
4. Develop **human resources** by enhancing skills across all administrative levels to preserve intellectual capital.
5. Promote an **organisational climate** that encourages innovation and creativity among all administrative levels.
6. Operate port divisions as **independent economic units**, focusing on cost reduction and high-quality service delivery within the commercial port.
7. Connect the port to a **modern land transport network**, including railways, highways, and conveyor systems.
8. Integrate the port with advanced **communication networks** to facilitate transfer and coordination, making administrative and financial collaboration an integral part of operations.
9. Work toward including the port in **international treaties** that protect commercial and legal rights against potential exploitation by neighbouring countries.
10. Upgrade warehouses, supply storage equipment, and organise container stacking to prevent congestion and delays.
11. Develop **dry ports** for ship repair in Iraq instead of relying on external facilities.
12. Implement **planned future projects** to increase the efficiency of Umm Qasr Commercial Port and enhance its competitiveness against neighbouring ports.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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