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MODERN MODELS OF MARITIME PORT MANAGEMENT

СУЧАСНІ МОДЕЛІ МЕНЕДЖМЕНТУ МОРСЬКИХ ПОРТІВ

The article aims to define and analyze modern management models of seaports. As a result of the conducted research, it was determined that the management model of a seaport is a concept that defines the features of managing port operations, infrastructure, and services. The analysis of contemporary scientific developments allows for the identification of several key management models, each of which has its own characteristics and specific application in the context of ensuring the stability and efficiency of port operations, especially in large and complex port complexes. The study concludes that the classical model is focused on a clear hierarchy and division of responsibilities among participants in port operations. The systems model views the port as a complex system in which elements are interconnected and interact with each other. The process model focuses on the interaction of various processes within the port, which allows for more efficient management of operations. However, its implementation requires clear organization and continuous monitoring of processes to prevent potential delays or disruptions. The situational model allows for the adaptation of management practices and decision-making based on specific conditions.

Keywords: port infrastructure competitiveness, management practices, port complexes, logistics flow optimization.

Метою статті є визначення та аналіз сучасних моделей менеджменту морських портів. У результаті проведеного дослідження встановлено, що модель менеджменту морського порту являє собою концепцію, яка визначає особливості управління портовими операціями, інфраструктурою та послугами. Аналіз сучасних наукових досліджень дозволяє виокремити кілька основних моделей менеджменту, кожна з яких має свої характеристики та специфіку застосування в контексті забезпечення стабільності й ефективності портових операцій, особливо у великих і складних портових комплексах. У межах дослідження встановлено, що класична модель менеджменту орієнтована на чітку ієрархію та розподіл обов'язків між учасниками портових операцій. Вона забезпечує стабільність і контроль, проте її недоліком є обмежена гнучкість і недостатня здатність до швидкої адаптації в умовах змін. Водночас системна модель розглядає порт як складну систему, елементи якої взаємопов'язані та взаємодіють між собою, що сприяє комплексному підходу до управління. Ця модель дозволяє ефективно керувати складними процесами, проте може вимагати значних ресурсів для координації та підтримки взаємодії між підсистемами. Зазначено, що процесна модель зосереджена на взаємодії різних процесів у порту, що сприяє більш ефективному управлінню операціями. Однак її впровадження потребує чіткої організації та постійного моніторингу процесів (для запобігання можливим затримкам або порушенням). Встановлено, що ситуаційна модель дає змогу адаптувати управлінські практики та ухвалювати рішення залежно від конкретних умов. Вона є найбільш гнучкою та здатною швидко реагувати на зміни у зовнішньому середовищі, проте її ефективність залежить від спроможності керівництва оперативно оцінювати ситуацію та приймати обґрунтовані рішення. Таким чином, кожна з моделей має свої переваги й недоліки, а для забезпечення стабільності та ефективності операцій у великих і складних портах може бути доцільним поєднання кількох підходів. Це дозволить максимально адаптувати управління портом до змінних умов і забезпечити безперебійну роботу. Перспективи подальших досліджень полягають у визначенні базових принципів поєднання окреслених моделей менеджменту морських портів.

Ключові слова: конкурентоспроможності портової інфраструктури, управлінські практики, портові комплекси, оптимізація логістичних потоків.

Statement of the problem. Effective management of seaports is a task of strategic importance for the economy of any country. This is because seaports serve as key logistical hubs, handling the main flow of goods and services, thereby ensuring international trade, transportation links, and market integration. Therefore, the development and implementation of modern management models are essential to ensuring the viability and competitiveness of port infrastructure. In this context, seaport management should be based on a management model capable of ensuring the efficiency of decision-making regarding port operations, optimizing logistical flows, ensuring security and environmental sustainability, and enhancing its investment attractiveness.

Analysis of research and publications. A wide range of issues related to seaport management has been explored in the works of Rusanova S., Perepichka M. [1], Panchuk A.O. [2], Nikolyuk O.V., and Vityuk A.V. [3]. However, modern seaport management models remain insufficiently studied in the scientific literature.

Despite the existence of individual studies addressing general aspects of port management, a comprehensive analysis of modern management approaches, particularly considering global trends and best practices, has yet to receive adequate coverage.

Formulation of the research task. The aim of this article is to identify and analyze modern seaport management models.

Summary of the main research material. Within the study, the authors emphasize that the seaport management model concept refers to a framework that defines the specifics of managing port operations, infrastructure, and services. Analyzing contemporary scientific research allows for the identification of the following models [2–3]:

1. The classical seaport management model focuses on a rigid hierarchy and a clear distribution of roles and responsibilities among all participants in port operations.

2. The systemic seaport management model views the organization as a system composed of interrelated elements.

3. The process-oriented seaport management model where port management is considered as a set of interconnected processes that continuously interact with one another.

4. The situational seaport management model involves adapting port management practices and decisions based on specific conditions that arise in different situations.

Let us examine each of the outlined seaport management models, which has its characteristics and specific applications in ensuring the stability and efficiency of port operations, particularly in large and complex port facilities.

The classical (traditional) seaport management model is based on traditional management principles, namely:

– centralized decision-making;

– process control;

– resource optimization.

The key characteristics of this model in the context of seaports (Table 1) are centralized management decisions, a clear hierarchy and division of responsibilities, process formalization, control and monitoring, and management through command.

Based on the outlined principles, it is evident that the characteristics of this model ensure the stability and consistency of operations (due to clearly defined roles and processes [1]), especially in large and complex port facilities, where precise regulation of every detail is essential for safe and efficient functioning. It should be emphasized that the classical management model allows for the standardization of all operational processes, such as cargo handling, port security, customs clearance, and the provision of port services.

However, regarding the model's effectiveness important to note that its main limitation is its lack of flexibility [5].

Table 1

Characteristics of the classical (traditional) seaport management model

Characteristic	Features of the characteristic	Advantages of the manifestation of characteristics
Centralization of management decisions	Most decisions are made at higher levels of the hierarchy (e.g., by the port director or senior management)	Ensures control and helps maintain stability in port operations, but may be less flexible in the case of changes or unforeseen circumstances
Clear hierarchy and division of responsibilities	Each employee has a defined role and function. Each department operates according to established standards	Ensures effective execution of operations such as cargo loading and unloading, vessel handling, infrastructure management, and service provision
Process formalization	Processes within the port are strictly regulated*	Ensures safety, efficiency, and risk reduction
Control and monitoring	Continuous control over all port processes	Allows for prompt response to deviations in port performance from the plan
Management through command	Managers are responsible for decision-making and overseeing their implementation	Subordinates must carry out the tasks assigned to them, minimizing the number of errors

Note

*This includes documentation, operational standards, procedures for cargo handling, and the execution of other port functions.

Source: compiled based on [1; 5–6]

Since the model is focused on strict adherence to procedures and instructions, it may be less adaptable to rapidly changing conditions or new challenges. Additionally, due to the rigid hierarchy and complex administrative procedures, the classical model can lead to bureaucracy.

The systemic seaport management model places particular emphasis on the coordination and integration of various functional subsystems to ensure efficiency, stability, and continuity of operations. Therefore, the key characteristics of the systemic seaport management model (Table 2) are integration of all elements, interconnection and dependency of elements, adaptation to external factors, optimization of interaction between departments, and continuous improvement of processes.

Based on the outlined principles, it is evident that the characteristics of the described model allow for effective management of all components (including cargo handling, vessel movement control, interaction with cargo suppliers

Table 2

Characteristics of the systemic seaport management model

Characteristic	Features of the characteristic	Advantages of the manifestation of characteristics
Integration of all elements	The port is viewed as a system consisting of several interconnected elements: operations (loading and unloading of cargo, container handling, vessel servicing), infrastructure (terminals, warehouses, docks), personnel, technologies, finances, and logistics chains. All these elements must interact organically	Allows achieving high efficiency and speed in cargo handling, as well as reducing delays and increasing port capacity
Interconnection and dependency of elements	Changes in one part of the system (for example, an increase in vessel traffic) may lead to the need for adjustments in other parts (such as the allocation of resources for cargo handling or in managing loading operations)	Emphasis on the interconnections between different functions and subsystems within the port
Adaptation to external factors	Taking into account the influence of external factors such as weather conditions, economic conditions, changes in international trade routes, legislative requirements, and so on. All these elements must be integrated into the port management system to ensure its adaptation and effective functioning in changing conditions	Enables the assessment of potential risks and ways to minimize them (e.g., creating backup plans for cargo handling in case of changing circumstances)
Optimization of interaction between departments	Special attention is given to establishing cooperation between different port departments (management, operational staff, security services, customs authorities, transportation companies, etc.)	Ensuring synergy among all participants in operations enhances the overall effectiveness and productivity of the port
Continuous improvement of processes	Continuous improvement of operational processes, which is ensured through the analysis of results, feedback, and the implementation of innovations	Allows for the creation of mechanisms to evaluate the performance of each element and identify weak points that need improvement

Source: compiled based on [1–2; 5]

and consumers, as well as cooperation with customs and transportation authorities [1–2]), ensuring high throughput and minimizing delays.

The systems approach allows for maintaining flexibility even in large ports, which is crucial in conditions of high unpredictability, such as during adverse weather conditions or changes in international trade flows.

The systemic model enables ports to integrate their operations with international logistics and trade chains [5]. It ensures compliance with quality standards and enhances the port's competitiveness in the global market.

Thus, the systemic seaport management model allows for the creation of an efficient, interconnected structure that ensures stable and high-performance operations, particularly in large and complex port facilities. It is due to the model's focus on the integration of all functional elements that enable enhanced operational efficiency, resource optimization, and a quick response to changes in the external environment.

The process-oriented seaport management model focuses on managing specific processes and their interaction within the system. The key characteristics of the model (Table 3) are process orientation rather than structural focus, interaction of processes, continuous improvement of processes, flexibility and adaptability, automation, and technological support.

Based on the outlined principles, it is evident that the characteristics of the described model allow for the optimization of cargo handling, specifically by reducing the time required for processing [2–3]. Each stage of cargo handling – from its arrival at the port to distribution and dispatch – is part of an integrated process that must be optimized to ensure the seamless flow of goods.

The process-oriented model allows for reducing vessel processing time through precise planning and coordination of all necessary procedures: customs clearance, terminal work scheduling, and ensuring the availability of required resources for loading/unloading.

The interaction between processes allows for effective management of port infrastructure, including docks, warehouses, technical equipment, and more. Continuous process monitoring enables timely identification of technical malfunctions or maintenance needs for infrastructure.

The process-oriented model enables the port to fully comply with international standards in safety, ecology, service quality, and other requirements [2; 5]. Processes must be properly structured to maintain all necessary standards and regulations.

Thus, the process-oriented model of seaport management offers immense opportunities for optimizing operations, reducing cargo and vessel processing times, and improving coordination between different port subsystems. At the same time, within this model, all processes are efficiently organized, quickly adapted to changes, and maximally optimized.

The situational model of seaport management emphasizes the ability to quickly adapt to changing environmental conditions, including economic, technological, political, or even weather-related factors. The main characteristics of this model are (Table 4) adaptability to changing conditions, flexibility in applying management practices, decision-making based on specific situations, focus on particular processes and approaches, and resource allocation as needed.

Based on the provided points the characteristics of the outlined model allow for an appropriate response to changes in cargo and vessel volumes. Specifically, the number of vessels arriving at the port can fluctuate sharply depending on global trade flows or seasonal factors [3]. The situational

Table 3

Characteristics of the process-oriented seaport management model

Characteristic	Features of the characteristic	Advantages of the manifestation of characteristics
Orientation towards processes	Focuses on specific processes such as cargo handling, vessel reception and dispatch, logistics, customs clearance, terminal management, and so on	The process becomes a crucial element for ensuring the uninterrupted operation of the port
Interaction of processes	Processes are set up so that one part of the work smoothly transitions into the next without delays or errors*	Synchronization of operations, information exchange between different units of the port, as well as identifying and eliminating bottlenecks in the processes
Continuous improvement of processes	Processes are not only executed but also continuously analyzed to identify opportunities for improving efficiency (reducing time, resources, or costs)	It emphasizes continuous process improvement through monitoring, analysis, and optimization
Flexibility and adaptability	All processes are closely interconnected, and changes in one process may require adjustments in others. This creates the conditions for flexibility in organization and the ability to quickly respond to changes in conditions	It allows ports to be flexible and quickly adapt to changes such as shifts in service demand, new technologies, or changes in legislation
Automation and technological support	The active use of automation and modern technologies to optimize processes	It helps minimize the human factor, reduce errors and delays, and increase the efficiency of cargo handling

Note

*For example, the cargo handling process is closely linked with the vessel scheduling process, terminal operations, customs procedures, and other activities.

** For example, the implementation of automated terminal management systems, cargo monitoring, electronic document flow, and the use of intelligent systems for forecasting and planning.

Source: compiled based on [1; 3; 5]

Table 4

Characteristics of the situational management model for sea ports

Characteristic	Features of the characteristic	Advantages of the manifestation of characteristics
Adaptability to changing conditions	It requires port managers to have the ability to adapt their strategies and tactics depending on the specific circumstances*	Managers take into account changes in the surrounding environment
Flexibility in applying management practices	It takes into account that a port may face different situations that require various management approaches	For each situation, appropriate strategies are chosen, ranging from simple adjustments in operations to radical changes in work processes**
Decision-making based on specific situations	Decision-making based on the specific conditions that arise in port operations***	Forecasting possible situations and being prepared to respond quickly to their consequences.
Focus on particular processes and approaches	It focuses not only on general strategies for managing the port but also on specific processes: cargo handling, ship arrivals and departures, logistics chain organization, customs clearance, and more	In the event of unforeseen situations in one of the processes, only those aspects directly related to the situation are changed
Resource allocation as needed	The ability to mobilize additional resources when necessary, for example, in the case of unexpected changes in the flow of ships or cargo	It ensures the continuity of operations and a quick response to market demands

Note

* For example, if weather conditions change, appropriate measures may be taken to adjust the loading on ships or transfer part of the cargo handling to other terminals.

** For example, during peak season overload or significant changes in trade, it may be decided to temporarily alter the terminal operation structure, involve additional resources, or even adapt customs processes to speed up cargo handling.

*** For example, if the port faces significant delays due to weather conditions or technical issues, a decision must be made to address these problems, even if it involves temporarily changing standard operational procedures.

Source: compiled based on [2–4; 6]

model allows the port to quickly adapt to these changes by adjusting the priorities of terminal operations, shifting cargo, or rescheduling loading/unloading activities.

The characteristics of the outlined model allow for effective management of weather-related risks [2–4]. Ports may face unpredictable situations, such as storms, fog, or strong winds, which can cause delays or pose risks to cargo handling. The situational model enables the adjustment of operations by shifting focus to more sheltered or less weather-sensitive port areas.

Moreover, the port can effectively adapt to changes in customs or legislative requirements. In the event of changes in legislation or customs procedures, the situational model allows for the rapid adjustment of management decisions and port practices to the new conditions. It is crucial for ensuring port operations (with national and international standards [6]).

The situational model of seaport management is useful for quick adaptation to various conditions and challenges. It allows for flexible responses to changes in the external environment, including economic fluctuations, changes in transportation flows, natural disasters, or political circumstances.

Conclusions. As a result of the conducted research, it has been determined that the seaport management model is a concept that defines the features of managing port operations, infrastructure, and services. An analysis of contemporary scientific developments allows several key management model identification with characteristics and application specifics in the context of ensuring the stability and efficiency of port operations, particularly in large and complex port complexes. In the framework of the research, it has been established that:

1. The classical (traditional) model is oriented towards a clear hierarchy and the distribution of responsibilities among participants in port operations. It ensures stability and control; however, its limitation is the lack of flexibility and quick adaptation to changing conditions.

2. The systemic model views the port as a complex system where elements are interconnected and interact with each other. It allows for effective management of complex processes but may require significant resources for coordination and maintaining interaction between subsystems.

3. The process model focuses on the interaction of various processes within the port, which allows for more effective operations management. However, its implementation requires clear organization and constant monitoring of processes to prevent potential delays or disruptions.

4. The situational model allows management practices to be adapted and decisions to be made depending on specific conditions. This model is the most flexible and capable of quickly responding to changes in the external environment. However, its effectiveness depends on management's ability to assess the situation promptly and make informed decisions.

Thus, each model has advantages and disadvantages, and combining several approaches may be advisable to ensure the stability and efficiency of operations in large and complex ports. It will allow port management to be optimally adapted to changing conditions and ensure uninterrupted operation. The prospects for further research lie in identifying the fundamental principles of combining the outlined models of seaport management.

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