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Analysis of the supply chain in commercial ports by SCOR model

Laura Trueba-Castañeda[1,2,*], D. S. Sanz[3,4], A. Trueba[3,5]

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ABSTRACT

Ports as a place where different areas of circulation of merchandise and services converge have become spaces of convergence between transport systems, service providers and are integrated into a merchandise distribution system that requires logistical developments. In the current situation, where the environment is increasingly complex, organizations must improve their internal and external performance, achieving integration with both suppliers and customers. To carry out this process, it is necessary to identify and analyse the supply chain of each organization because it integrates supply and demand both inside and outside the company. This integration ties together the functions and processes of the business to make it a coherent, operationally excellent, and high-performance business model. In this sense, the SCOR model (Supply Chain Operations Reference) represents a standard tool for diagnosing supply chain management, providing a unique framework that integrates business concepts, management indicators, benchmarking, and the identification of best practices, in a structure to support communication between all actors in the supply chain and improve management efficiency. The work analysed the processes and activities of the supply chain of commercial ports to detect opportunities for improvement. The description of supply chains following the structure of the SCOR model, allowed to analyse very simple or complex supply chains using a common set of definitions. As a result, different activities could be linked to describe the depth and breadth of almost any supply chain. Continuous process improvement is a strategy that allows organizations to continuously generate value, adapting to changes in the market and permanently satisfying the increasingly demanding needs and expectations of their customers and users.

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1. Introduction.

Maritime transport is the most used mode in international trade and one of the supports of the global economy. Globalization has expanded markets, extended the distribution of goods, and increased the participation of different economic actors, making maritime transport the most used mode of transport in international trade and one of the supports of the global economy.

International trade goes through integral logistics based on the evolution of exchange networks and logistics structures, both locally and internationally. Understanding that an integral logistics allows the coordination and joint management of the logistics of supply, production, storage and distribution, from the business point of view, it offers a broad vision of the entire process in order to manage resources efficiently (Romero Serrano & León Arias, 2003).

Although maritime transport is predominant in the world of logistics, ports cannot survive without the support of the rest of the logistics subsectors such as land and air, which transport the product from the factory to the ship, and intermodal transport systems must be strengthened. In addition, the potential of the ports depends on the growth of merchant ship traffic, the concentration of shipping companies, the increase in the size

[1]Coastal and Ocean Planning and Management I+D Group. University of Cantabria. .

[2]PhD Student in Engineering Nautical, Marine and Naval Radio Electronics. University of Cantabria.

[3]Sciences & Techniques of Navigation and Shipbuilding Department. University of Cantabria.

[4]E-mail Address: david.sanz@unican.es.

[5]E-mail Address: alfredo.trueba@unican.es.

*Corresponding author:Laura. Trueba-Castañeda. E-mail Address: laura.trueba@alumnos.unican.es.

of the ships and the development of inland terminals and corridors, in a framework of growing competition between ports and / or between ports. port regions that require greater competitiveness (UPC, 2004: Romero Serrano, 2002). This process includes the integrated study of basic functions of the organization, such as supply management, production management, distribution management and supply chain management (Dorta González, 2014).

Ports as a place where different areas of circulation of merchandise and services converge have become spaces of convergence between transport systems, service providers and are integrated into a merchandise distribution system that requires logistical developments.

In the current situation, where the environment is increasingly complex, organizations must improve their internal and external performance, achieving integration with both suppliers and customers. To carry out this process, it is necessary to identify and analyse the supply chain of each organization because it integrates supply and demand both inside and outside the company. This integration ties together the functions and processes of the business to make it a coherent, operationally excellent and high-performance business model. In this sense, the SCOR model (Supply Chain Operations Reference) represents a standard tool for diagnosing supply chain management, providing a unique framework that integrates business concepts, management indicators, benchmarking and the identification of best practices, in a structure to support communication between all actors in the supply chain and improve management efficiency. The independent organization Supply Chain Council defines it as the standard model for analysing, evaluating and optimizing the processes that are developed along the value chain. A supply chain requires maintaining an overview, adapting and making constant improvements to facilitate the flow of goods from manufacturer to customer and optimize structures.

The study analysed the processes and activities of the commercial ports supply chain in order to detect opportunities for improvement, excluding specific tasks and practices as they were not standardised.

2. Methodology.

SCOR model (12.0) was the framework for supply chain operations. The independent organization Supply Chain Council defines it as the standard model to analyse, evaluate and optimize the processes that are developed along the value chain. A supply chain requires maintaining an overview, adapting and making constant improvements to facilitate the flow of goods from manufacturer to customer and optimize structures.
The model links business processes, metrics, practices, and technology into a unified structure to support communication between supply chain partners and improve their effectiveness. In this sense, the SCOR model provided a single framework to connect business processes, management indicators, best practices, and technologies in a unified structure (APICS, 2017).
The SCOR model was developed to describe the business activities associated with all phases of customer demand satisfaction. It is organized around six main management processes (ASCM, 2021):

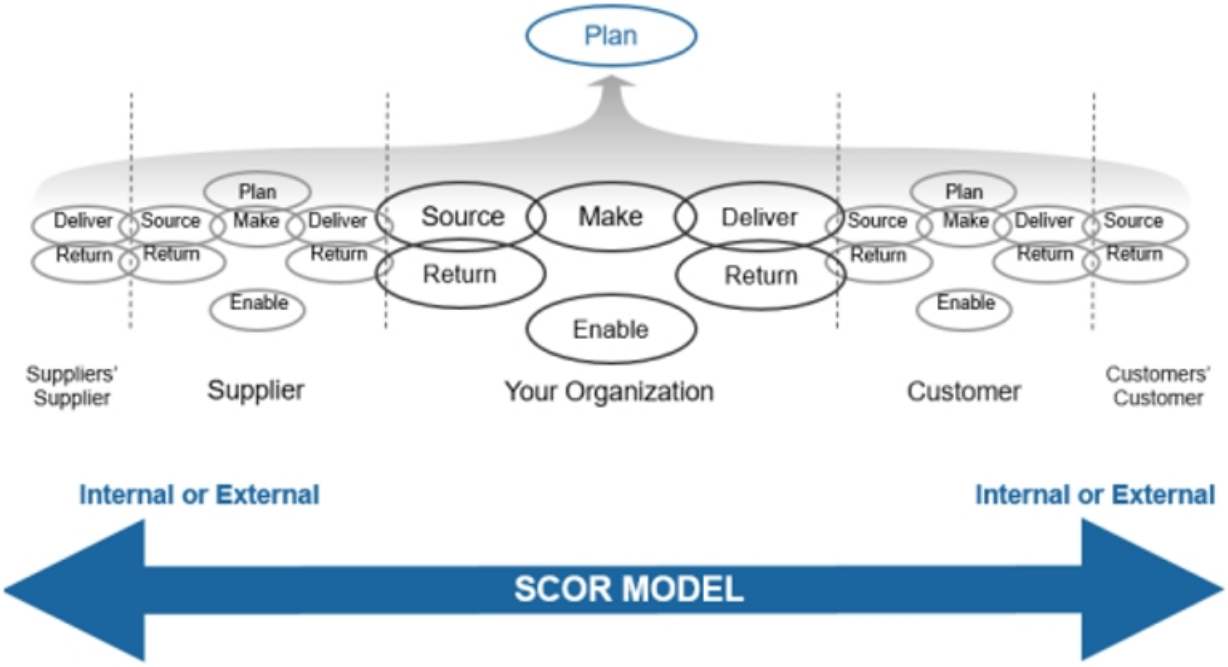
1. *Planning (P):* resources are determined, communication and distribution chains are established, business objectives are coordinated according to demand and available capacities, and best practices are established considering inventory, transportation, resources and legal requirements to increase effectiveness.
2. *Procurement (Pr):* describes the procurement and sourcing infrastructure, how to manage inventory, the supplier network, supplier agreements, and supplier performance. Discuss how to handle vendor payments and when to receive, verify, and transfer the product.
3. *Manufacturing (M):* includes production activities, quality control, packaging, management of the production network and equipment and facilities.
4. *Distribution (D):* orders, transport, storage and sales are managed, as well as all processes related to the delivery and provision of finished products or services.
5. *Return (R):* Companies must be prepared to handle the return of defective containers, packaging or products. Return involves managing business rules, return inventory, assets, transportation, and regulatory requirements.
6. *Support (S):* Covers processes such as business regulations, databases, risk management, legal requirements and contractual provisions.

The description of supply chains following the structure of the SCOR model (Figure 1), allowed to analyse very simple or complex supply chains using a common set of definitions. As a result, different activities could be linked to describe the depth and breadth of almost any supply chain. The model describes and provides a basis for supply chain improvement for global or specific projects. SCOR encompasses all interactions with the customer (order entry through paid invoice), physical material, transactions (supplier, customer, supplier / customer, including equipment, supplies, spare parts, bulk products or software) and all interactions of the market (based on the understanding of aggregate demand for the fulfilment of each order). It does not attempt to describe each business process or activity individually, but the entire organization. Therefore, the model focuses on the activity involved, not on the person or organizational element that performs the activity. The model is designed to support supply chain analysis of the levels defined in Figure 2 (APICS, 2017).

The SCOR Model structure consists of four levels, three based on standardised information and one based on specific information (Torres-Rabello, 2012):

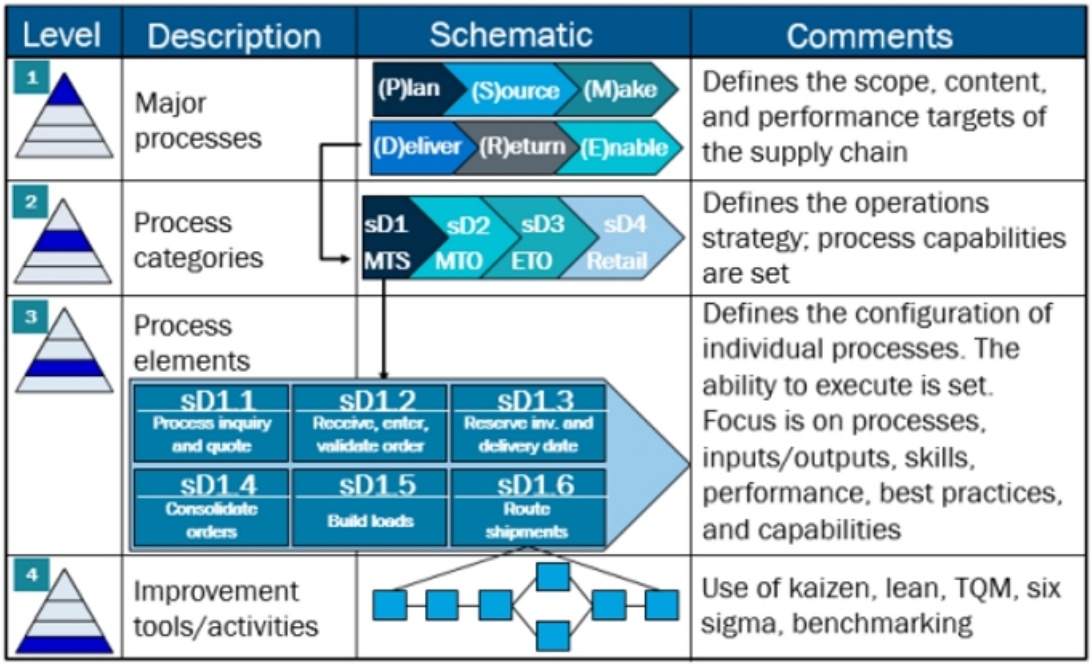
- *Level 1: Macro-processes.* The organization develops its strategy to plan, supply, produce, distribute products or perform a service. At this level, specific objectives for response times are established. They are grouped in (Hammer & Champy in 1993):
  - *Operational:* the resulting products are received by a person or organization external to the organization. They constitute the sequence of added value

Figure 1: Structure of the SCOR model.



Source: APICS (2017).

Figure 2: The SCOR model and hierarchical levels of organizations.



Source: APICS (2017).

with which the organization satisfies the needs of the clients.

- *Support:* essential to manage operational processes.
- *Strategic:* activities carried out by managers to maintain operational and support processes.

- *Level 2: Processes.* Organizations configure their operations strategy through the sequence of processes and activities they choose for their chain. Like macro-processes, they are grouped into operational, support and strategies.

- *Level 3: Activities.* Describes the process elements or standardized activities. The previously identified processes are in turn divided into the activities they encompass. Each activity has a definition, metrics that facilitate diagnosis, observed good practices and necessary software tools. Each activity group specific tasks that represent the work of each organization, so they cannot be standardised.

3. Results and discussion.

Maritime transport is influenced by ports and Logistics Activity Zones (LAZs) as operational nodes. Both were connected in order to streamline logistics and general cargo operations optimally. Coinciding with González Laxe (2018), ports proved to be the main maritime transport network, offering fast, flexible and safe services to international trade. At present, they are the main link in the international supply chain. As in any organization, being part of an international supply chain does not exempt you from having your own supply chain.

3.1. Level 1: Macro-processes.

According to Torres-Rabello (2012), macro-processes group the processes that share a common objective, so it is essential to correctly define the objectives, ensuring their coherence with the mission and institutional objectives. To highlight the following:

- *Operational:* processes with which the port meets the needs of users and customers.
  - Processes on infrastructures and the public domain.
  - Promotion and commercial development.
  - Processes related to ship traffic.
  - Processes on the ship.
  - Processes related to goods.
  - Processes for environmental management.
  - Processes related to clients and users.

- *Support:* they allow the development of the main activities of the port.
  - Processes related to document management.
  - Processes related to economic-financial management.
  - Processes related to people management.
  - Processes related to general management.

- *Strategic:* they propose the policies to be followed by the port.
  - Processes related to strategic planning and management.
  - Processes related to the evaluation of the management and innovation system.

Table 1: Relationship of the macro-processes of the analysis model with the port macro-processes.

Port macro-processes	Macro-processes of the analysis model
About infrastructure and the public domain	Provisioning
Promotion and commercial development	Provisioning
About the ship	Manufacturing
Related to the goods	Manufacturing
For environmental management	Planning
Related to customers and users	Distribution
Related to ship traffic	Manufacturing
Related to document management	Support
Related to people management	Planning
Related to economic-financial management	Support
Related to general management	Support
Related to strategic planning and management	Planning
Related to the evaluation of the management and innovation system	Planning

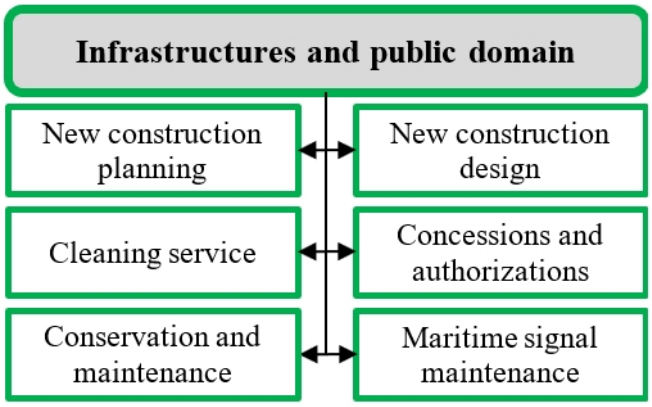
Source: Authors.

3.2. Level 2: Processes.

Each port unit carries out different activities defined in duly identified and managed processes so that the organization is efficient and seeks continuous improvement. To identify the processes, the objective of each macro-process must be studied, and the expected products / services established. Coinciding with Aguilar (2013), its identification can be useful to isolate the problems that may arise and enable different treatments within the same process.

Regarding the *operational processes*, the derivatives of the macro-process on the infrastructures and the public domain in a port are indicated in Figure 3.

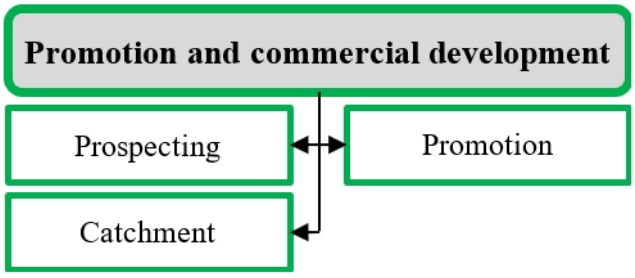
Figure 3: Operational processes derived from the macro-process on infrastructures and the public domain.



Source: Authors.

Ports organize national and international trade missions in key destinations to boost traffic and strategic lines. Likewise, they promote research and studies to improve competitiveness. In this sense, the operational processes derived from the macro-process on promotion and commercial development are indicated in Figure 4.

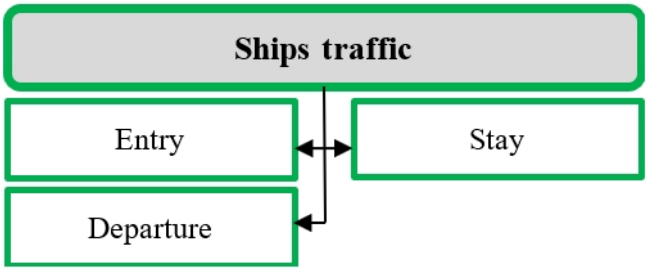
Figure 4: Operational processes derived from the macro-process on promotion and commercial development.



Source: Authors.

Ships traffic within the scope of the Port Authority requires the operational processes derived from the vessel traffic macro-process indicated in Figure 5.

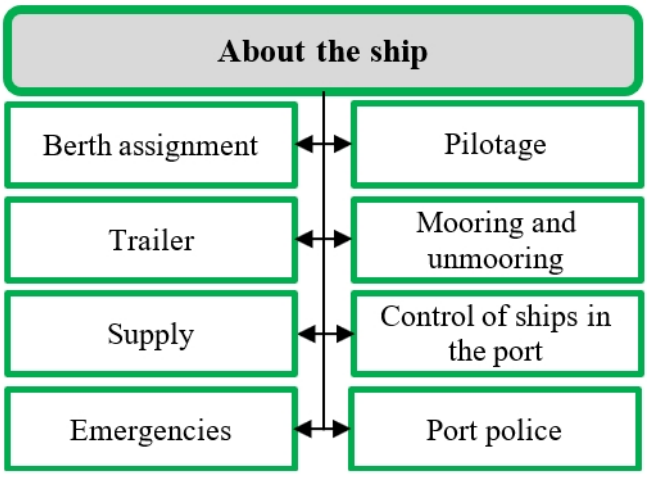
Figure 5: Operational processes derived from the macro-process on ship traffic.



Source: Authors.

According to Fernández & Iglesias (2015), ports have to provide all the services required by the ship from when it enters until it leaves the port facilities. Thus, the operational processes derived from the macro-process on the ship are indicated in Figure 6.

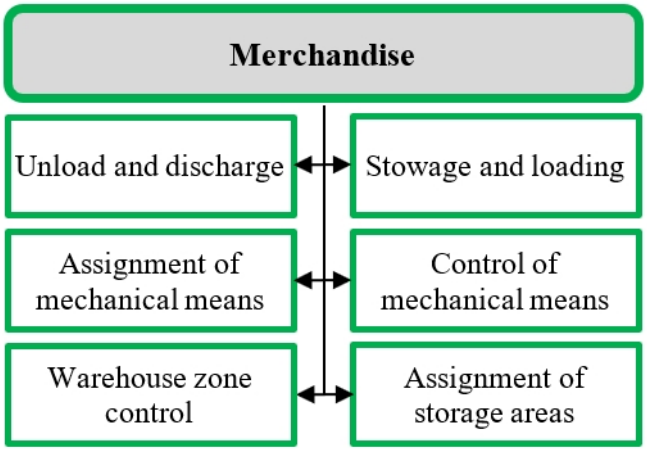
Figure 6: Operational processes derived from the macro-process on processes about the ship.



Source: Authors.

The set of processes that regulate merchandise transfer operations between ship and shore or vice versa, derived from the macro-process on merchandise, are indicated in Figure 7.

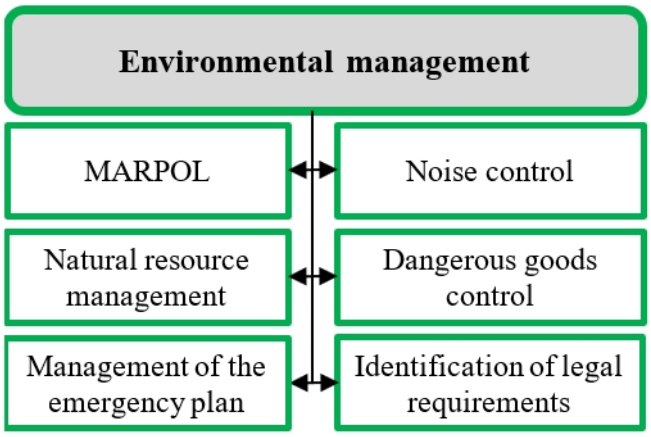
Figure 7: Operational processes derived from the macro-process on merchandise.



Source: Authors.

The Port Authority must articulate environmental management initiatives that reach port operators and all economic activity that takes place in the port. To do this, an identification of the applicable legal requirements is carried out periodically and their compliance is regularly verified. The operational processes derived from the macro-process on environmental management are indicated in Figure 8.

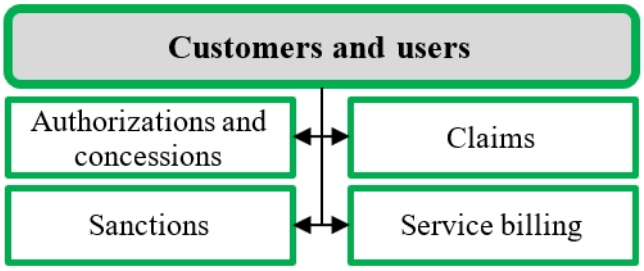
Figure 8: Operational processes derived from the macro-process for environmental management.



Source: Authors.

The activities developed by private companies providing port services or concessionaires are subject to a series of general and specific conditions established in their licenses or contracts. The Port Authority oversees supervising, monitoring and controlling that all the aspects agreed and signed in the respective contracts or licenses are fulfilled, putting into practice the operational processes derived from the macro-process on clients and users indicated in Figure 9.

Figure 9: Operational processes derived from the macro-process related to customers and users.

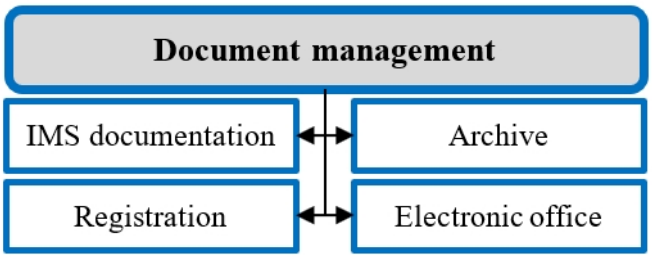


Source: Authors.

The support processes describe how the necessary resources are provided so that the port activity is as efficient as possible and to be able to offer a service to the customer's satisfaction. An Integrated Management System (IMS) allows unifying the organization's document management system in search of continuous improvement and customer satisfaction. The support processes derived from the macro-process related to document management in a port are indicated in Figure 10.

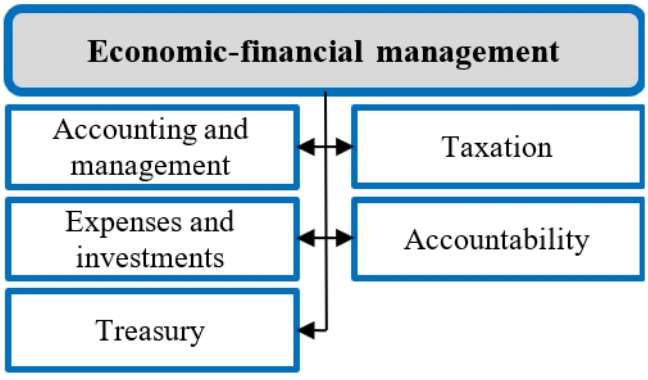
Regarding economic-financial management, according to Lambert et al. (1998), accounting, collection and payment management, investment calculations, cash flows, annual accounts and good supplier and customer management are essential for a port to be viable in the long term. In this sense, the support processes derived from the macro-process on economic-financial management are indicated in Figure 11.

Figure 10: Support processes derived from the macro-process related to document management.



Source: Authors.

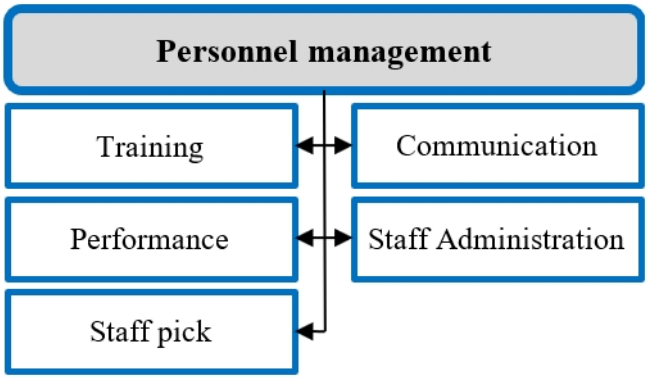
Figure 11: Support processes derived from the macro-process on economic-financial management.



Source: Authors.

Ports offer continuous training to their workers, measure the performance of their work, the management maintains a fluid communication with the staff and each worker is assigned the ideal function according to their qualities. In this sense, the support processes derived from the macro-process on personnel management are indicated in Figure 12.

Figure 12: Support processes derived from the macro-process for people management.

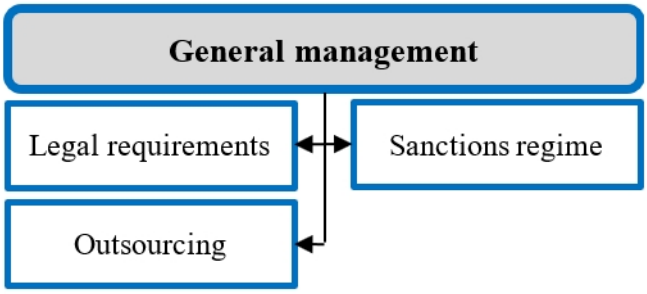


Source: Authors.

The issues related to the legal requirements of the port, the sanctioning regime and the management of subcontracting are

defined in the support processes derived from the macro-process for the general management of Figure 13. The sanctioning regime aims to sanction infractions in a regulated manner in port matters and with the legal guarantees established in the Law. Subcontracting in ports is a key aspect since many of the services offered are carried out by third parties.

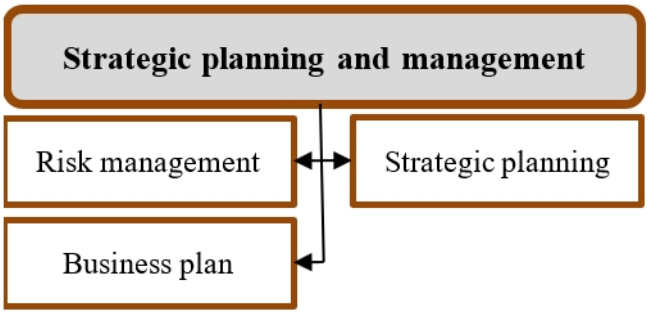
Figure 13: Support processes derived from the macro- process for general management.



Source: Authors.

Regarding strategic processes, they define and control the objectives of the port, its policies and strategies. The strategic lines of commercial ports revolve around five main strategic axes: growth and competitiveness, economic impact, social benefit, excellence in management and economic-financial sustainability. Achieving the objectives defined by the Port Authority will depend, to a large extent, on the strategic processes derived from the macro-process on strategic planning and management indicated in Figure 14.

Figure 14: Strategic processes derived from the macro- process for strategic planning and management.



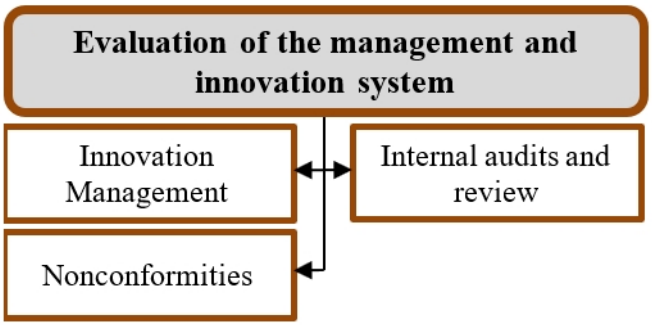
Source: Authors.

Having tools for evaluating the port management system is essential to assess its operation, as well as to implement new ideas, introduce proposals for improvement and develop port activity. Thus, the strategic processes derived from the macro-process on the evaluation of the management and innovation system are indicated in Figure 15.

3.3. Level 3: Activities

The processes considered define the procedures that indicate the specific way of carrying out an activity as a sum of

Figure 15: Strategic processes derived from the macro-process on the evaluation of the management and innovation system.



Source: Authors.

tasks. It indicates what should be done and who should do it, when where and how it should be done and how it should be controlled. The activities are aimed at achieving an objective, with a clearly defined beginning and end, and its evolution can be measured by means of indicators or data sets.

Coinciding with Mallar (2010), the activities will guide the effort, improve the distribution of tasks, gain flexibility and control, detect inefficiencies and errors quickly, optimize resources or reduce operating costs in commercial ports, shortening the execution times of port work and increasing the satisfaction of customers and users for the service provided.

Conclusions.

Commercial ports have become spaces for convergence between transport systems, service providers and are integrated into a merchandise distribution system that requires a management and operation system that increases its strategic lines and its competitiveness in a globalized environment.

The SCOR model represents a tool that provides a basis for improving the supply chain of commercial ports from the point of view of interactions with the customer, services, transactions and all market interactions from the perspective of the whole of the organization. on multiple levels.

Port activity must evolve in sync with the supply chain. The parts of this chain increasingly demand tailored, dynamic, efficient and competitive port management.

Port activity must improve its internal and external performance, in order to integrate with customers and users in a complex environment. This involves identifying and analysing the port supply chain to integrate supply and demand within and outside the organization. This integration brings together strategic and operational functions and processes to make it a consistent, operationally excellent, and high-performing business model.

The continuous improvement of processes is a strategy that allows organizations to continuously generate value, adapting to changes in the market and permanently satisfying the increasingly demanding needs and expectations of their customers and users.

References.

APICS. 2017. Supply Chain Operations Reference Model SCOR version 12.0 (http://www.apics.org).

ASCM. 2021. Association for Supply Chain Management (https://www.ascm.org/).

Dorta-González, P. 2014. Transporte y logística internacional. Universidad de Las Palmas de Gran canaria.

González Laxe, F. 2018. La competitividad portuaria: un análisis de los principales criterios. Universidad de A Coruña.

Hammer, M; Champy, J. 1993. Business process reengineering. London: Nicholas Brealey, 444 (10), pp. 730-755.

Lambert, D.M.; Cooper, M.C; Pagh J.D. 1998. Supply Chain Management: Implementation issues and research opportunities. Int. J. Logistic Management. 9 (2), p.p. 1-19.

Mallar, M.Á. 2010. La gestión por procesos: un enfoque de gestión eficiente. Visión de Futuro, 13 (1), pp. 1-23.

Romero Serrano, R. 2002. El transporte marítimo. Introducción a la gestión del transporte marítimo. Ed. Marge Books.

Romero Serrano, R; León Arias, A. 2003. Logística del transporte marítimo. Ed. Marge Books.

Torres-Rabello, R; Chavez, J.H. 2012. Supply Chain Management. RIL editors.

UPC. 2004. El futuro tecnológico de las terminales marítimas de vehículos: la integración de sus sistemas de información. Departament de Ciència i Enginyeria Nàutiques. Barcelona.