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Port operations and cargo handling operations. Process based approach

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Abstract. In line with the quality management principles applied within a functional settlement of an organization, unconcerned of the size or principal object of activity, port operators should be treated as operational entities carrying out specific activities, aiming to achieve specific objectives, that are prior determined but in dependence with their location and role determined alongside the port logistic chain. The process-based approach involves establishing the processes and sub-processes applied to achieve the port operator's entire set of objectives, functions and tasks. As with any business, the company aims at lowering costs, delivering better, consistent and predictable results, focusing on priority. These can be more easily achieved through a process approach that allows the systematic definition of the activities necessary to achieve the desired outcome, setting clear and quantifiable responsibilities for key management activities, analysing and measuring the capability of core activities, identifying links between key activities and the organization's functions, focusing on the elements that can improve the organization's activities (resources, methods and materials) and assessing the risks, consequences and impact of activities on all stakeholders. Carrying out the process map, identifying the data stream, establishing input and output data are the first steps applied in orderto achieve a process model that will further allow the identification of indicators to improve the quality of the services provided and consequently to ensure the satisfaction of customers and other stakeholders.

Keywords: process, stevedoring, port services, port operations

1. Conceptual induction. Literature review on process definitions

What is a process? There are several definitions of the process. One of them, with which many specialists agree, is that of Roger Burlton who says that "a true process encompasses all the things we do to give someone something they expect to receive" (Burlton R., 2001).This definition covers a real process from the beginning to the end, meaning from the initial triggering of the process, to the final satisfaction of the stakeholders. Burlton adds that "the final test of completing a process is whether the process actually delivers a product or service to an external stakeholder or another internal process."

Businesstoday is one of the dominant institutions in society, all around the world. The term *business* refers here to any organization that is engaged in making a product or in providing a service in order to gain a respective profit.[7]

In the business property theory (sometimes referred to as the property or financial theory), the company is defined as the property of its owners. Thus, the major goal of the company is to maximize shareholders' return, meaning to generate as much money as possible, for those who own the shares and equities in the company. In this perspective, the interests of the shareholders are essential and will have priority over the other stakeholders’interests.

A contrasting vision, called the stakeholder theory of the business, claims that the company serve a wider public purpose, namely to create value for society. All companies must earn a profit for their owners and, if not, they will no longersurvive. However, on a larger scale, corporations also create other types of value, such as employee professional development and innovative new products for their customers. In this perspective, corporations have multiple obligations and the interests of all stakeholders must be taken into account.

Companies are integrated into networks involving many participants, each of whom develops a relationship with the company, based on interactions during the course of the activities, and each participant shares, to a certain extent, both the risks and the benefits of the business activities, requesting a kind claiming firm resources and attention, based on law, moral right, or both.The number of these stakeholders and the variety of their interests may be great, and so the decisions of a company are quite complex.Strong relationships between a company and its stakeholders are an convenience that adds value.[7]

Establishing and managing processes is an essential activity for the business success, but also is quite difficult to be achieved, mostly due to the fact that the processes are not independent but mostly interacting with each other.

Companies create and offer value in the shape of a product or serviceoutput, they would offer to the final consumers or other clients or end users. Regardless of the type of business, the product or service is created through a sequence of tasks or activities that transform a series of inputs into the desired outputs.We conceive here the business process as a seamless sequence of activities conducting toward a defined result. Figure 1.1 illustrates a process in its basic and generic chart of flow.A process consists of several sequential steps or activities that produce results or outputs.[9]

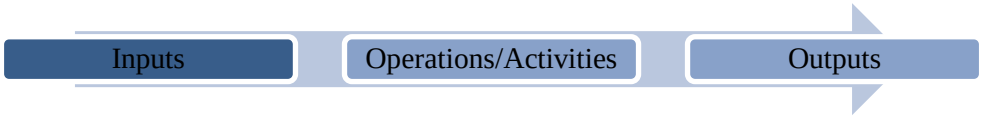

Figure no. 1 *The generic chart flow of a process*

The brief approach of a process chart flow

Today's businesses use a complex of processes. The simplest functionality involves chaining three fundamental processes: procurement, production and shipping. In the acquisition process, the company purchases the basic materials it uses to produce goods or services. The production process, as its name implies, involves the manufacture or generation of the desired goods and services. Finally, during the shipment process, the company delivers the goods or services to customers or resellers.

Based on the study of the specialized literature, I concluded that regardless of the field of activity, the functions underlying the functionality of a company induce the following processes:

Process	Main activities	Aproach
Procurement	Identify and select suppliers Sending orders to vendors Evaluating vendor performance Planning	[1], [3], [4], [7], [9], [10], [12], [13]
Production	Work flow design Production programming Production Execution Inspection of the quality of the goods produced	[1], [3], [4], [7], [9], [10], [12], [13]
Storage	Receipt of goods from suppliers Inspection of the quality of goods received Own production Preparing and dispatching goods Receiving returned goods	[1], [3], [4], [7], [10], [12]
Sale and marketing	Identify customers Customer Relationship Management Promotion of products / services Receiving and processing orders After-sales service	[1], [3], [4], [7], [9], [10], [12], [13]
Research and	Research in the field	[1], [3], [4], [7], [9],

Development	Product development / process development	[10], [13]
Financial Accountant	Processing payments received / processed Cash flow management Capital needs management Financial situations	[1], [3], [4], [7], [9], [10], [13]
Human Resources	Identifying workforce needs Recruitment and recruitment Personal training Employee evaluation Employee rights and benefits	[1], [3], [4], [7], [9], [10], [12], [13]
Information technology	Facilitates transaction processing Provides information for process monitoring Provide troubleshooting tools	[1], [6], [7], [9], [10], [12], [13]
Quality Assurance	Establishing process map, Performance appraisal, Monitoring, measurement, analysis and evaluation	[1], [2], [6], [7], [9], [10], [13]

The processual approach is a philosophy that emerged in the early 1990s as a result of the increased complexity and distributed operations that globalization has gradually enforced. Large companies have acquired other foreign companies and expanded operations globally, one of the results being the emergence of operational problems.The process vision has provided businesses with the opportunity to standardize how they operate regardless of home country or operational location, thus achieving significant cost savings.

2. Process-Based Approach

In the maritime industry, the particularities of industrial processes are also analysed according to the scope of trade applicability, being in fact the factual framework of three interacting elements: cargo flow, ships and ports of operation, settled within a specific frame of rules and specific business laws.The links and interdependences rooted among these three elements induce interdependence of processes in the area of responsibility that results in a set of services that provide a logistic chain according to market requirements. *The **ship's operating process** is the major port operations framework and consist in the designed chart flow of the most efficient, effective, safe, reliable and cost savingactivities planned, coordinated or carried out, in respect of cargo handling process, overtaken for transferringtheloads/consignments, from oronboard the ships,using the port operation on-shore and off-shore infrastructure and facilities.*

The business processeswithin the involved companies consists mainly in the study of the main categories of work, the processes necessary for the achievement of all the company's objectives. The result of the organization is essentially identifyingthe particular chart of functions, activities, duties and tasks.This type of approach is efficient in terms of further possibilities for development and improvement of subsystem and system performance in ensemble.Also, the process organization determines the structural organization because the processes within the processes must be carried out from elementary to final product or service level.

Process-based approach could be considering the ground of the structural organization depiction because is also feasible for describing the functions, processes and sub-processes together with the need for correlating with the identified functions, posts and organizational relations – figure 2.

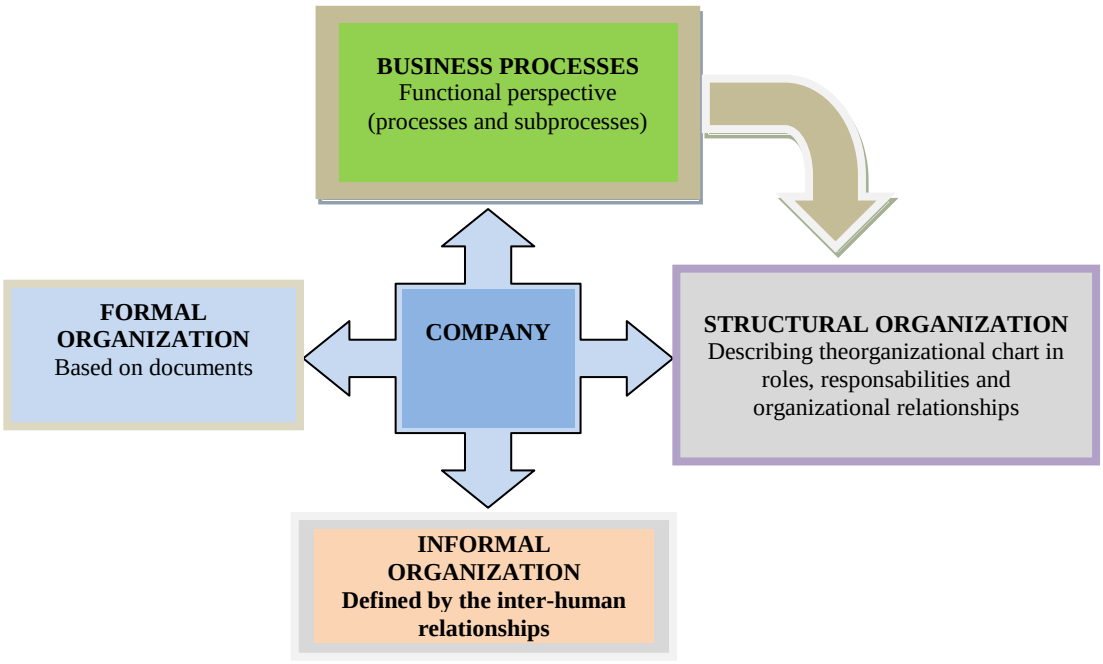

Figure no. 2 *Business modelling perspectives*

The port operators and stevedoring companies must also comply with the functional requirements generally enforced for any other type of business. The main functions of the company determine the important processes that lead to the achievement of the strategic and operational objectives. What differentiates port operators from other types of companies is the thorughput process that has predominantly **technic**, **technologic** and **logistic** features – figure 2.

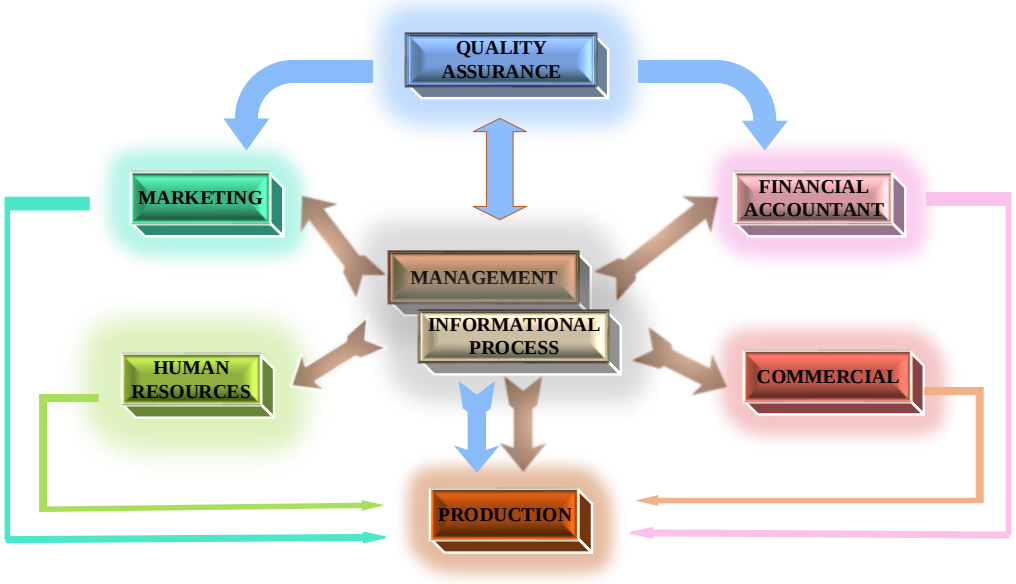

Figure no. 3 *Processes and process relations in a company*

Further on, based on the structure presented in Figure 4, will be presented in a logical-functional perspective, the general processes identified within a stevedoring company, reflecting the throughputparticularprocess for a port operator.

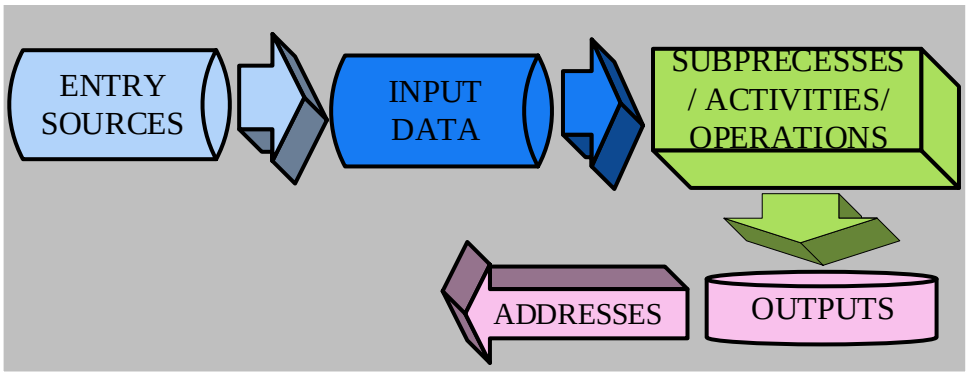

Figure no. *4 Processes' chart flow diagram*

2.1 General processes

2.1.1 The management process

Management is the process of planning, organizing, coordinating, leading, motivating and controlling thehuman resources and other resources (material, financial, technological and informational) to achieve the goals of an organization. Starting from the core roles of **management on a process-based approach**: defining the purpose / mission and strategic objectives, setting tasks for the fulfilment of the operational objectives and their fulfilment, taking into account the fact that all those involved in the management process perform a certain succession of operations, they reach the sub-processes management that derives from the functions it has to fulfil: the forecast / planning, organization, coordination, motivation and evaluation-control. [10]

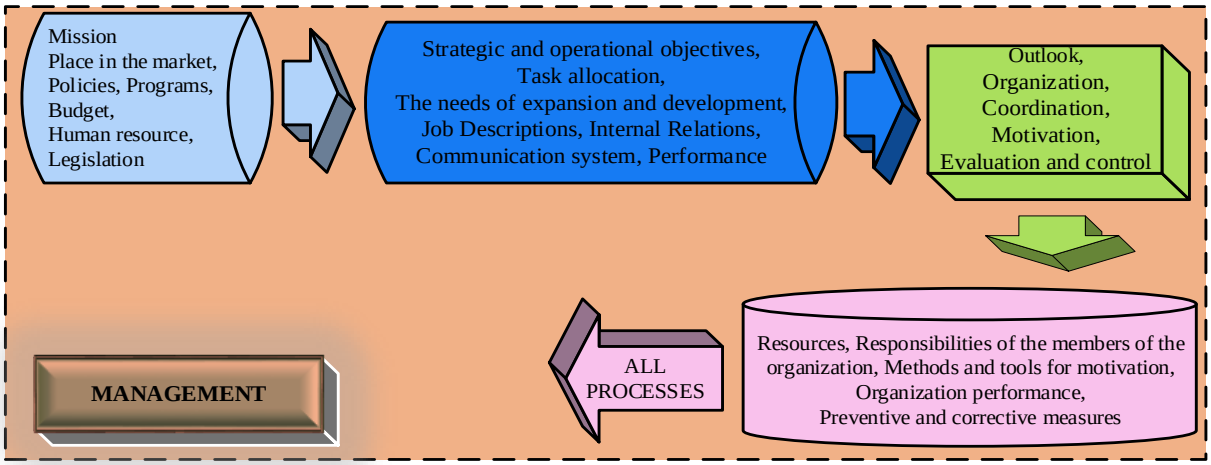

Figure no. 5 *The elements of the management process*

2.1.2 Human resources management process

Achieving the company's objectives is conditional on the smooth deployment of the technical subsystems served by the human resources subsystem without which the system could not function in any of its components. The technical subsystems put the objectives to the human resources subsystem, tasks and activities required for the products and services proposed by the company's managers to the human resources subsystem. Human resources must be selected and organized in such a way as to be in line with company objectives and performance indicators can also be achieved through adequate qualitative and quantitative structure of staff.

Human resources planning is the development of strategies to meet a firm's future human resources needs. The starting point is the organization's overall strategic plan. From this, human resources planners can forecast future demand for human resources. Next, the planners must determine whether the needed human resources will be available. Finally, they have to take steps to match supply with demand.Job analysis is a systematic procedure for studying jobs to determine their various elements and requirements. A job description is a list of the elements that make up a particular job. It includes the duties to be performed, the working conditions, the responsibilities, and the tools and equipment that must be used on the job.[10]

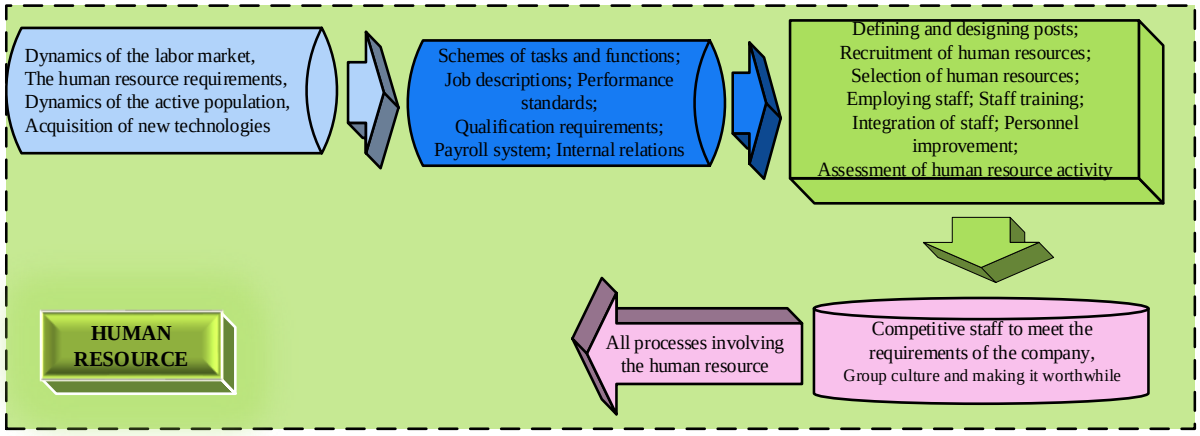

Figure no. 6 *The elements of the human resource management process*

2.1.3 Financial-accounting process

As component of managerial process, the financial-accounting processes involve knowing the legal norms governing the accounting activity, its optimal organization, the use, management and permanent pursuit of the use of financial means on the basis of the maximum profit principle, as well as the analysis and provision of capital needs for the next period , which is determined by choosing the optimal variant.

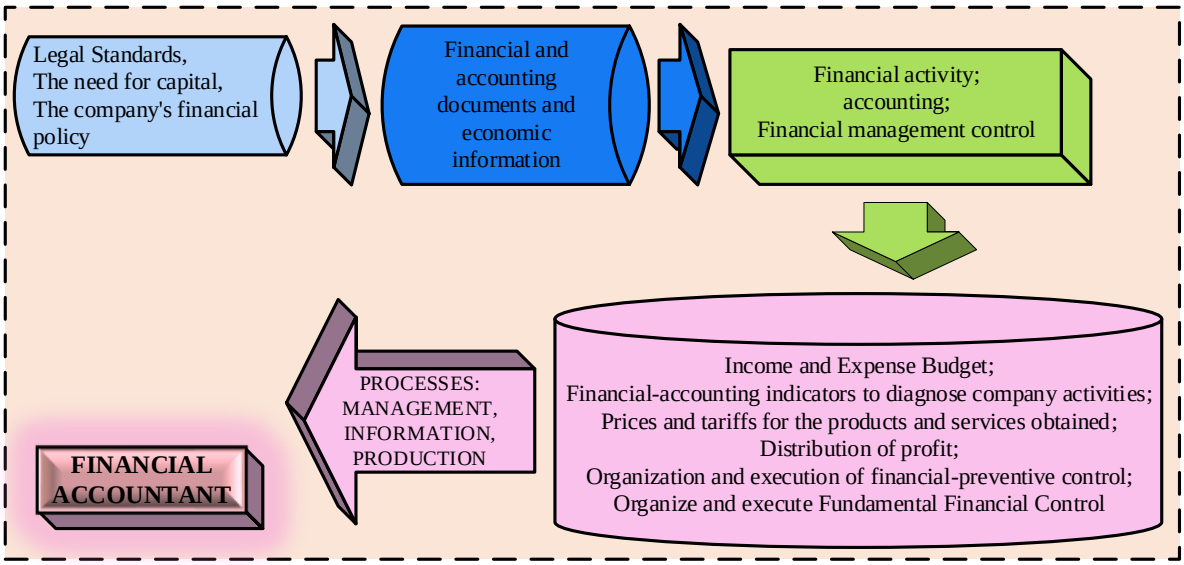

Figure no. 7 *The elements of the financial-accounting process*

2.1.4 Commercial process

It includes all the activities related to strategic and operational sourcing, supply and procurement processes, on domestic or foreign trade, including the international economic cooperation, to acquiring the necessary means and providing services which are the basic subject of the port thorughput services.

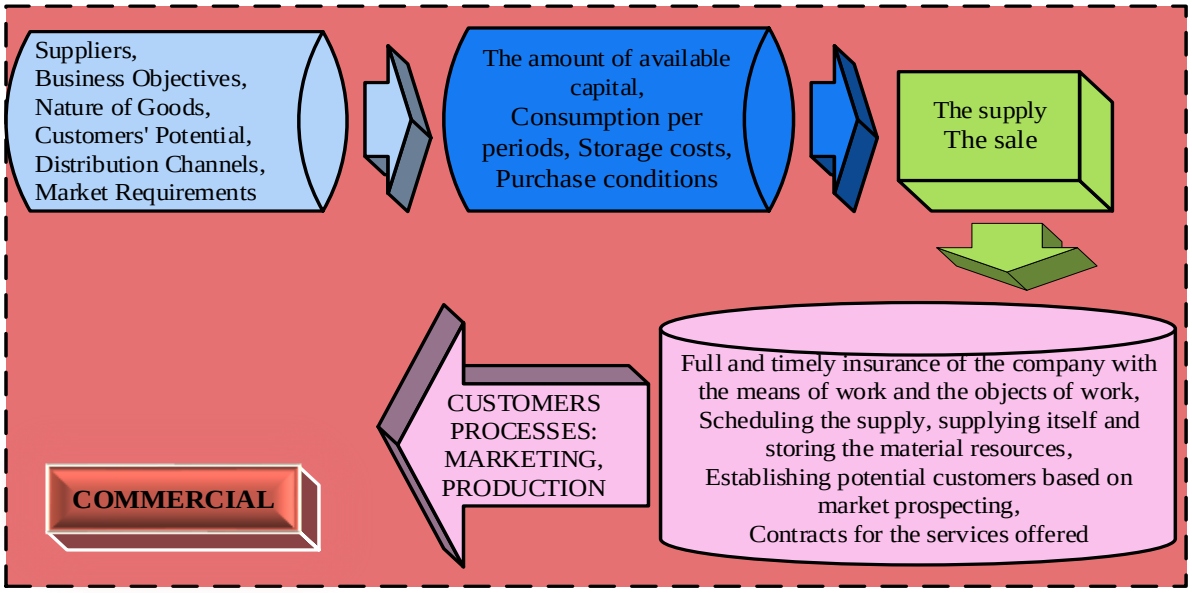

Figure no. 8 *The elements of the commercial process*

2.1.5 Marketing process

The marketing conceptis a business philosophy that a firm should provide goods and services that satisfy customers' needs through a coordinated set of activities that allow the firm to achieve its objectives. [10]

Philip Kotler, the father of marketing, defined marketing as "a social and managerial process by which individuals or groups of individuals obtain what they need and want by creating, offering and exchanging products and services of a certain value."

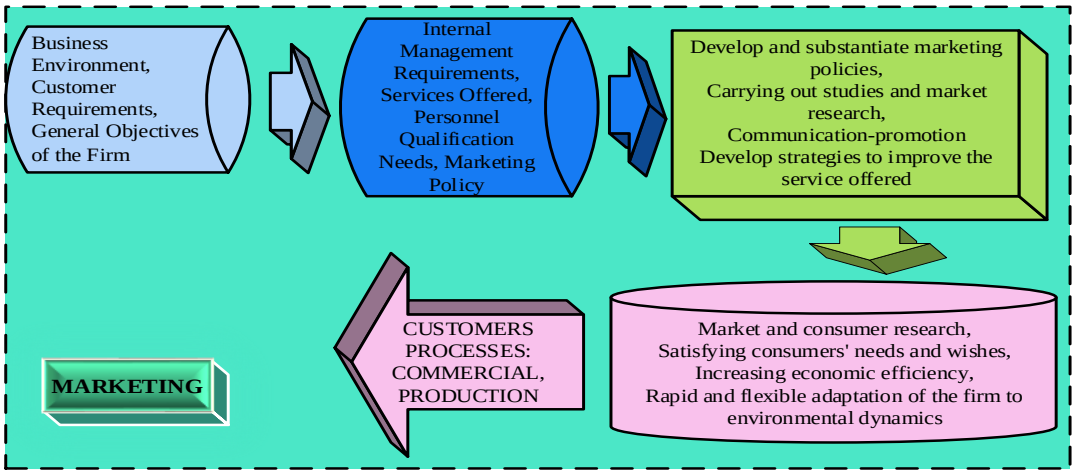

Figure no. 9 *The elements of the marketing process*

Marketing is a means of assurance before services are offered to match the needs and wishes of potential customers.As a basic process of the firm, marketing has a relatively equal position with

the other processes, with multiple relationships and interference elements, forming an integrated system that behaves homogeneously to any influence of the external environment.

The role and position of the marketing activity within the firm depends on the extent to which it is appropriated to the satisfaction of stakeholders.

2.1.6 Informational process

It is the collection of information gathering, transmission and processing activities, and the information has its central role in the process. Within a company, the role of the information system is to provide management with the information needed to make decisions.

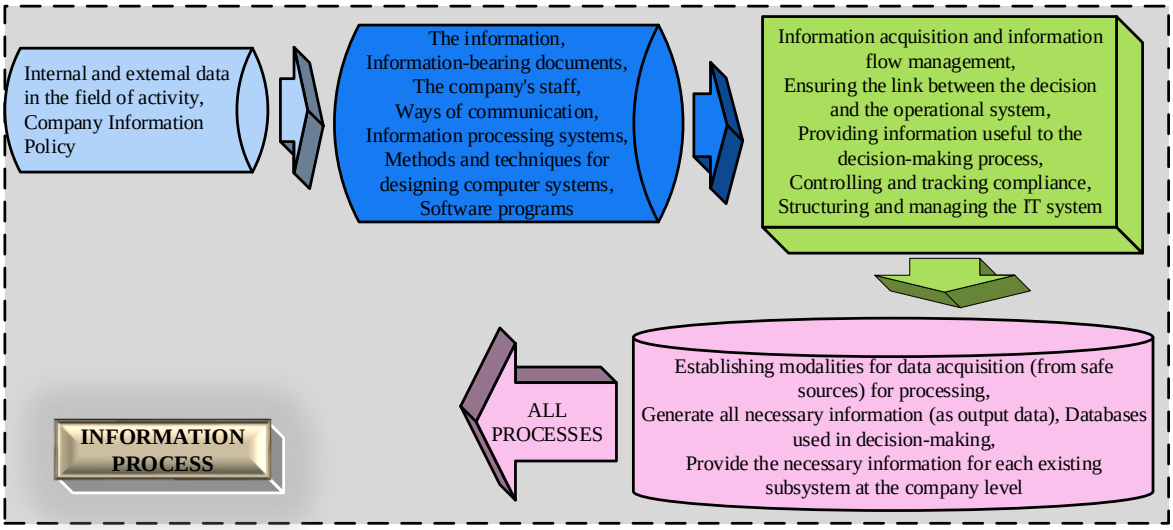

Figure no. 10 *The elements of the informational process*

2.1.7 Quality assurance process

To ensure the requirements of stakeholders at a company level, a quality management system must be developed to meet the requirements of ISO 9001: 2015. Through the existence of a permanent feed-back from both the external environment and the internal processes linked to the quality management system, corroborated with the performance indicators and established procedures, the management is able to permanently improve the whole activity of the company, to meet the requirements of the clients and to promptly and efficiently rectify any change in the external environment.

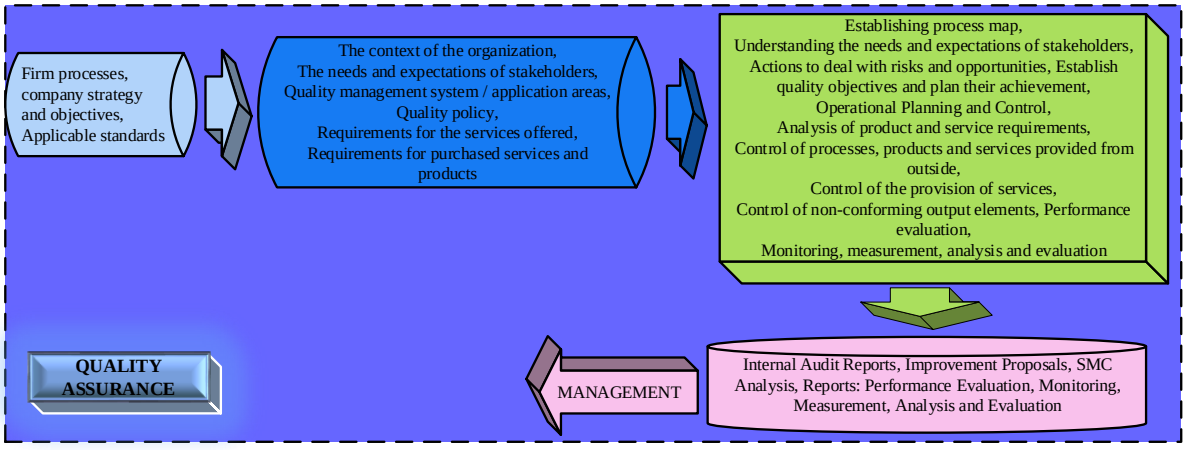

Figure no. 11 *The elements of the quality assurance process*

2.2 Production process

Will be presented in more detail as it distinguishes through sub-processes, operations and activities specific to the port environment of operation.

Goods are subject to ship-to-shore handling operations from where they can be distributed across multiple routes, which determines the importance of the cargo handling subsystem as a part of the commodity transfer system and consequently its capacity determines **the capacity transfer of the entire system**.

Any port operator carries out production activities that can be grouped into three major sub-processes:

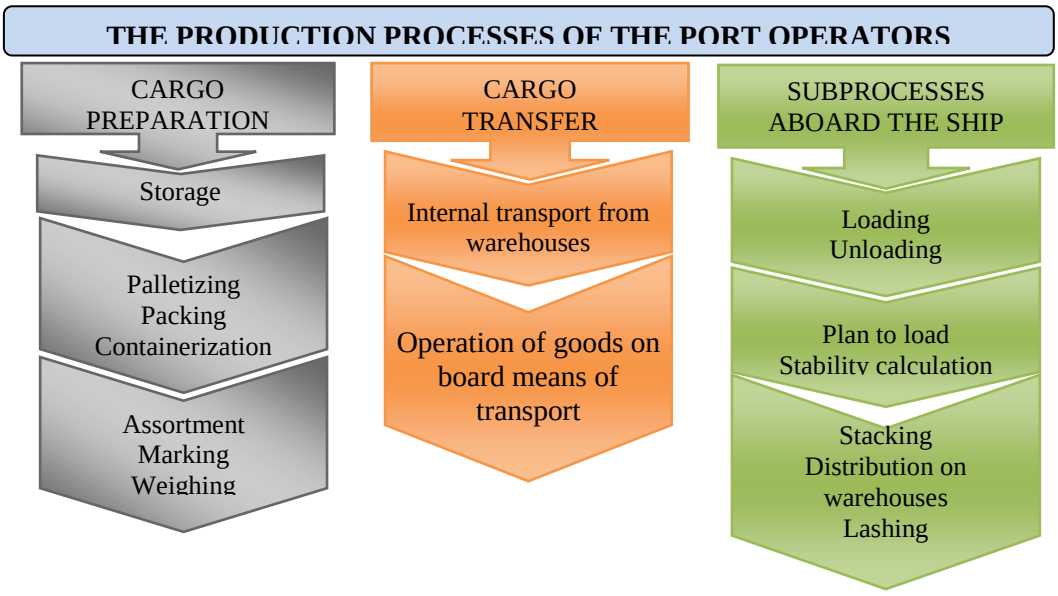

Figure no. 12 *The production sub-processes*

The description and analysis of each sub-process can determine the determinants of the quality and productivity of the work that the port operators transpose during the total ship operating time.

This may be the subject of subsequent articles that thoroughly analyze each process reaching the task level to highlight elements that can influence the efficiency and effectiveness of the act of production.

Next I propose only an enumeration with a brief description of the production sub-processes resulting in a material that can be further developed depending on the port operator and the type of goods that is the subject of the work.

2.2.1 The process of preparing the goods

The space for storage is a key factor in the efficiency and productivity of any port since it is almost inevitable that there is no disturbance between the rate of loading / unloading of vessels and speed with which goods arrive at the port or leave the port for distribution by destination.

Storage space is a buffering solution whose role is to amortize cargo flows and whose capacity depends on the volume for which it is intended. It must provide space for handling goods and access to machinery - forklifts, cranes, conveyors etc. - and additional storage space in extreme weather conditions.

Storage is of great economic importance and makes the modern maritime port a huge reservoir of commodities - raw materials or manufactured goods linked to the major interests of the economy of the country or the hinterland area.

Storage capacity or lack thereof is often considered one of the main causes of **port congestion** and a major contributor to reducing the **capacity of port and dock**.

Following studies by various authors, it was concluded that the main operations performed during storage are the reception, handling and preparation of cargo lots:

Figure no. 13 *Main operations performed in the warehouse*

The receipt of goods is the set of quantitative and qualitative goods identification and verification operations. The main objective is to verify how the supplier fulfills his contractual obligations (in terms of product range, quality, quantity, packaging, marking) and whether the transport authorities comply with their obligations regarding the integrity of the goods during transport.

The warehouse is the place where most handling operations are carried out. The ability to handle goods depends on the existing **means and machinery, their technical characteristics and the suitability of their use**.

In the framework of the cargo operations, port operators sort the goods concerned, prepare the lots and arrange goods in stacks to facilitate loading on board ships. Batch preparation includes the main logistic service characteristic of general goods - their unification - in terms of transport efficiency and much more complex handling operations.

2.2.2Processes of internal transportation of goods to the berth

Within the indirect freight transport route, there must be a link between vessel processes and the storage process, this being achieved through the inland transport process.

Depending on the nature of the goods, shipment takes place in different ways and using different interior transport capacities. In the case of general goods, the transfer is carried out by means of the internal transport equipment and consists of carrying out several steps which ensure the movement of the goods from the berth to the storage places and vice versa, each stage representing a transport cycle.

The development of these logistics services for the transfer of goods to the berth implies a series of operations that make up the components of the transport cycle: picking up the goods from the warehouse, loading the goods in the inner transport means, transporting the goods to the berth.

The delays in this process have an effect on the entire logistics chain of shipments to the ship, recommending that it be established and anticipated in this cycle by analyzing the main factors affecting the transfer time.

According to studies conducted in port practice, these factors are mainly represented by:

• The transport distance from the storage structure to the operating berth
• The speed of loading and displacement of the means of transport used
• The time of immobilization in the activities of loading and unloading the goods in their picking and delivery centers

In order to ensure an optimal transfer cycle, those responsible should make certain calculations and standardizations to allow easy and well-coordinated transfer. These calculations and decisions involve the analysis of the weight of the freight group and the choice of the optimal transfer means, the determination of the necessary number of transfer and transport equipment, the determination of the labor force and the number of teams of workers, the calculation of the time required for the takeover and delivery operations.

2.2.3. Production processes on board ships

2.2.3.1 The process of operating the goods

The increasing volume of goods carried by sea has led to a worldwide increase in the number of vessels and their tonnage, has led to a specialization and universalization of these vessels in order to reduce transport costs. In order to accelerate the handling of these goods, high-capacity automated loading / unloading facilities were built into terminals.

The general (conventional) terminal is distinguished from other terminals by the fact that the goods are sometimes also operated with the loading / unloading means on board the ship, their storage before and / or after operation being done in covered spaces (warehouses).

The goods have very different shapes, sizes and weights, can be solid, liquid or gaseous, the loads can be "unified", the goods being placed on pallets or in big bags, or they can be containerized. The objective of each port operator, whatever of cargo handling, is the reduction in the number of movements that implicitly leads to increased productivity of handling and the reduction of the idling time.

Modern terminals must provide operating docks appropriate to the type of cargo operated, of sufficient length, width, depth, to provide road, rail, or inland waterways sufficient to ensure **decongesting traffic** as well as specific equipment to enable goods to operate efficiently in to reduce vessel time in port.

2.2.3.2The process of lashing

Goods loading is the process which, by specific operations, ensures the stability of the goods by temporarily binding to the body of the ship using means and methods appropriate to the type of cargo that eliminate the danger of shipment of consignments during the voyage and, implicitly, damage, contamination or even loss.

Goods loading sometimes involves the provision of arrangements that allow for the catching of the bitter materials with sufficient resistance against the forces that may occur during the voyage due to the ship's oscillations.

2.2.3.3 The process of stacking cargo on board

Stacking is the ship loading process that involves specific operations depending on the nature of the cargo and the type of packaging, the specific weight of the cargo, the way it is handled and disposed in the ship's stores so as to ensure stability of the ship to avoid any accidents that arise from the in which the merchandise was ordered. By stacking it is necessary to understand not only all the operations concerning the methodical and judicious placement of goods in the ship, but also ensuring their perfect preservation throughout the voyage.

3. Conclusions

The logical - functional presentation of a port operator's activity allows for the structuring of the processes presented in two broad categories: general processes that are found in the functionality of any company - management, information, human resources, financial accounting, marketing, marketing - and specific processes grouped in the process production whose subprocesses have been presented.

This article may be the basis for further developments in the production process in terms of the successive establishment of activities and their complexity to the level of tasks.

By modeling the production process, performance indicators can be established for the main activities and then simulation can be achieved solutions for the efficiency of the tasks and the productivity of the work.

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