

Volume XXIII 2020 ISSUE no.2 MBNA Publishing House Constanta 2020



SBNA PAPER • OPEN ACCESS

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To cite this article: M Bucur, C Popa and A A Purcarea, Scientific Bulletin of Naval Academy, Vol. XXIII 2020, pg.221-230.

Available online at www.anmb.ro

ISSN: 2392-8956; ISSN-L: 1454-864X

LOGISTICS PROCESSES AND QUALITY FRAMEWORK IN PORT OPERATION

M. Bucur¹, C. Popa² and A. A. Purcarea³

¹ Polytechnical University, 313th Independentei Splai, Bucharest, Romania, marius. bucur@anmb.ro

² "MirceacelBatran" Naval Academy, 1st Fulgerului Street, Constanta, Romania, <u>catalin.popa@anmb.ro</u>

³ Polytechnical University, 313th Independentei Splai, Bucharest, Romania, <u>apurcarea@gmail.com</u>

Abstract: The port operation services have developed a specific framework of business processes of which model is commonly defined by the peculiar logistic activities provided for goods handling in stevedoring operations or for storage, stowage, unitization, or processing operations with added value alongside the flow of the supply chain. In the last decades the port services have been enlarged and diversified not only on extensive basis but intensively also, having on its ground new methods of business processes modelling in completion to the updated equipment and technologies. In this context, the port development is calling for a higher level of social and environmental responsibility, the quality management standards becoming very important for a successful business on sustainable development perspective. Due to its excessive diversification, the quality management framework has been considerable diversified, making difficult the recognition of all the required procedures and standards, to be acquired and implemented on different areas of port logistic functions and processes. The authors' main purpose for this paperwork was to identify and to depict the most relevant processes, actively pursued in the stevedoring operations, as to further draw a synoptic panel of applied quality management standards, in order to serve the sustainable efforts in harmonizing the business practices in compliance with the social, environmental and public responsibility imperatives.

1. Stevedoring logistic processes description based on literature review on port business processes

The port represents the delimited part of the national territory, located on the coast or on-shore the water, protected naturally or artificially against waves, winds, currents, ice, for the purpose of berthing and sheltering ships, providing services for ships, passengers and goods, as well as facilitating commercial and industrial activities (i.e. Government Order no.22 from 29th of January 1999 regardingtheadministration of portsandservices in ports). Therefore, the port is the place where the facilities for ships mooring or anchoring are located, together with the equipment and facilities for

handling goods for the complex purpose of managing the transfer of goods from ship to shore, from shore to ship or from ship to ship (Lun et al, 2009). The modern port is a ship-shore interface or an intermodal interface (Alderton, 2008a).

The port is also considered the place where the goods and passengers are transferred from the navigable waterways to the shore and vice-versa. Transfers are made to and from ships. In this perspective, the port can be a *freight port* (which handles only the transfer of goods), a *passenger port* (which only deals with the transfer of passengers) or a *combined freight/passenger* port (Wayne, 2009).

Fromother author point of view the ports can be seen as(see Robinson, 2002):

- the destined place or respective endowed area, which dealing with ships and cargo;

- including an operational system, which handles ships and cargo within an efficient operational framework;

- constitutes into a complex of businessentities, that deals with ships and cargo within an effective and efficient economic framework;

- macro-managed by an administrative entity, that handles ships and cargo within an effective and efficient administrative and political framework.

Ports are an essential component of the transportation infrastructure and its most important functions are designed as following:

• connection link and distribution hub to other means of transportation, such as motorways, railways and inland navigation systems;

• gateway for trade, polarization for business entities attached as auxiliaries to the maritime business and trade, such as banks and insurance agencies, as well as other industrial correlated activities.

Throughout the time, the ports have been evolved from simple points of loading/ discharging of goods to distribution centres with complex technologically updated infrastructure and equipment, that serves as transportation hub alongside the logistics supply and distribution chains. The ports act as an interface between the production and consumption areas, being a business source for the economic operators in the port area. Thus, the ports couldn't be considered just simple gates for goods shipping and transfer, but also important matrixesfor business opportunities bringing together different manufacturing components, banking institutions, agencies, warehousing or other logistic services, that have a great social and economic impact, in addition to the workforce high significance as major employer in seafaring, on sea-side regions and not only (Alderton, 2008b).

The stevedoring operations are the majorrank of servicesprovided within a port, this internal business determining the goods, information and financial flows within the port. The stevedoring operations provide the handling services of the goods that arrive in port by land (rail or road), by seawater or by inland waterways (barges), following to be loaded/dischargedon/from the ships. There are also related services for passengers arriving in the port individually or by car, demanding to leave the port by cruise ship/ferryboat.

The stevedoring and the port services entities can legally operate as a port public entitystate owed or a private company (for example, a shipping line or terminal operator) that acts under the port authority, pursuing their operational mission under different property and commercial regimes depending on the port functional model (i.e. public port, private port, landlord port, tool port). If the port has a private legal regime, abusiness entity may operate the port or may enclose contracts with specialized operators that are able toto carry out the daily operations of the port.

Following other author's theory (Wayne, 2009), the port operator is a business entity that provides a complex transfer service for goods and passengers. The overall framework of the transfer services within a port forth determines the related goods-information-financial flows, in relation with thegoods' volume of passengers'number in transit through port location. Port operators use labour force, the business capital (i.e. operating facilities) and the port infrastructure to transfer cargo and passengers to and from ships. Within the ports' competition framework, port operators are those who, under business competitiveness pressure, must undertake efforts into effective and efficient financial, material, human and technical resources allocation, pursuing to obtain an optimum cost-effectiveness balance.

Technical efficiency will occur when the port service output and operational flow is as close as possible to the break-even quantity point determined by the optimum level of allocated resources. Cost-effectiveness willoccur when the port transfer is made at the lowest cost considering the price of the resources allocated and further paid by the port operators (Wayne, 2009).

2. Logistics chain – functional perspectives in literature review

Considering the recent development of the logistics chains and its effects against the business processes, various researchers sought to define it in the literature, uprising a vivid debate around the right definition of the mainstreamed processes that support the logistic chain alongside its seamless and integrative functional matrix.

Ganeshan and Harrison (1995) defined the logistics chain as a network of distribution facilities and options that perform the functions of procuring materials, transforming these materials into intermediate and finished products and distributing finished products to customers. On the other hand, Lee & Corey (1995) stated that the logistics chain consists of the integrated activities that take place among a network of companies that purchase raw materials, transforming them into intermediate goods and further into final products, seeking to deliver it, as final rationale, toward the customers and end users, through a distribution network.

The logistics chain represents the network of organizations involved, through upstream and downstream links, in different processes and activities, that produce added value shaped as final output (products and services), according to the requirements of the final consumers. (Christopher, 1998)

A logistics chain includes all activities associated with the goods flow and ongoing transformation, occurred from the raw material stage to the final product or service, used by the end or intermediate customer, as well as the associated information flows. (Handfield, Nicholas, 1999)

A logistics chain includes all the stages involved, directly or indirectly, in fulfilling the client's demand and requirements. (Chopra, Meindl, 2001)

The management of the logistics chain represents the systematic and strategic coordination of the traditional business functions and the tactical and strategic decision making processes associated to the business operations in a certain company and among the companies within the supply chain, in order to improve the long-term performance of the business entities involved in the supply chain and the supply chain as a whole for the sake of the end consumer needs fulfilment. (Mentzer et al, 2001)

From other perspective, the logistics chain is a flow of products and services occurred among the producers of raw materials, of intermediate products, or of final outputs, wholesalers, distributors and traders connected through integrated transport and storage activities through information, planning and integration activities. Therefore, the logistics chain management is a set of approaches used to effectively integrate suppliers, producers, warehouses and retailing entities, so that the goods are produced and distributed in the right quantities, at the right locations and at the right time, with minimum costs and meeting the costumer's requirements. (David Simchi-Levi, 2002)

The logistics chain represents the networks of producers and service providers, working together to transfer goods from the stage of raw materials to the end user, being connected through physical, informational and financial flows. (Bozarth and Handfield, 2008)

The management of the logistics chain represents a way of interconnecting the organizations that relate through the links between the value-producing processes that take place within them and whose purpose is products or services intended for consumers. (Nigel Slack et al, 2010)

3. Quality concepts and quality standards

Following up the increasing global competitionhiking, the companies are under a certain and permanent pressure to produce high quality products and services and to continuously improve their processes in order to remain competitive. Briefly synthetizing the specialized literature: "Quality is aptitude in use" (J. M. Juran, Quality Control Handbook, McGraw Hill, New York 1980); "Quality is conformity to specifications" (Crosby, Ph., Quality is free, McGrav Hill. New York 1984);"Quality is compliance with needs" (C. Hersan);"Quality is the satisfaction of the needs appreciated by the

customer or user" (P. Lyonnet); Quality is a set of characteristics of a product or service that gives it the ability to meet expressed or implied needs. (SR ISO 8402:1995) But in any of these perspectives, quality is now considered, along with price, one of the main factors of competitiveness in a market oriented global economy. (J. M. Juran).

The quality management system (QMS) is a type of training from which can benefit all types of manufacturing or service business. Companies that implement QMS are focused mainly on their clients and further on efficiency of the processes' enhancement. QMS is labelled as a business management system that can be applied to all organizations, regardless of their type or size. Customer satisfaction, market competitiveness and profitability are largely determined by the delivery of quality products / services. The quality management system is widely accepted throughout the world to achieve quality within organizations. (Kolka, 2002)

The most commonly used standard for implementing a QMS is ISO 9001, a standard that helps the company to focus mainly on the quality of its products or services provided to the customers. The requirements of ISO 9001 don't stand aspure performance standards, that asses the quality of a company's products or services or the business environmental results, but could be rather considered as standards that satisfy the need to conclude and to describe the processes in relation with the human resources in a shape of a set of operational procedures, useful to satisfy into a sustainable manner the customers' requirements and implicitly to achieve the market competitiveness.

Quality management has become over time, and especially in the last decades, an important factor of the business growth and consolidation on global markets environment, creating a solid competitive advantage, due to the ongoing process improvement, with significant effect against the organizational performance and costs reduction. Most ports in developed and developing countries have implemented quality and environmental standards from the ISO range, because the certification of the organizational quality management system represents an immediate facility regarding the access to international trade on long-term sustainability basis.

The basic principle for the standards implementation to set up the process approach by procedural description of the carried activities of the port operators. ISO promotes the adoption of a process-based approach in developing, implementing and improving the efficiency of the QMS, in order to increase customer satisfaction by meeting its requirements. For a port operator to work effectively, it must identify and conduct numerous intercorrelated processes. An advantage of the process-based approach is the permanent control that it provides, the connection between the individual processes and their complex interaction within the business system, supporting both particular and holistic perspectives. When such an approach is used within the management system settings, then certain advantages will result: understanding and satisfying customer requirements, considering processes in terms of value added, increasing processes' performance and efficiency and continuouslyprocesses improving, based on objective measurements and assessments.

Another principle in the quality standards application is involving the risk-based manner of thinking. Port operators that apply the ISO 9001, ISO 14001, ISO 27001, ISO 27005, ISO 31000, ISO 5001 standards will benefit from the following advantages: focusing efforts to achieve the planned results, increasing flexibility in documenting information, better risk control, proactive initiatives for environmental protection, improving social environment, better control of processes and implicitly their improvement, increasing customer satisfaction and loyalty, improving company image and increasing reputation and market credibility.

The ports evolution can be seen in interdependence and related compliance with the quality standards evolution, under a bivalent ongoing determination and functional relation. Thus, alongside the recent technical and technological evolution, modern ports have come to the next functional stage of the 5th generation, similar to the quality framework where we can seethe evolution from Quality Control to Total Quality Management and to the newer models of excellence such as Six Sigma, passing through the stages of Quality Control and Quality Assurance basic concepts. (Bisgaard, 2017)The fifth generation of ports as reflected in the literature, refers to the seaports business within the integrative context of international logistics chains.

4. Quality standards implementation in port operation businesses - theoretical approach

Organizational quality involves the harmonization of its mission, policies and procedures, in compliance with the implemented principles of quality as specified in the standing standards, employees' involvement and customer satisfaction. Quality assurance, in addition to the operational function, leads to at least three other significant implications to be pursued: company reputation, product/service reliance and global integration.

The certification of the port operators according to ISO 9001:2015 implies an additional effort for the company management, reflected by additional costs and organizational bureaucracy increasing, but it alternatively leads to a large range of advantages that will ultimately support the management efficiency and economic growth.

A port operator certified with a quality management system implemented according to ISO 9001:2015,could just consolidate its market position or can pursue to achieve new market segments by improving the company's image and placing it on the competitive market in an advantageous position. Respecting the principles of quality management would determine an effective management and an improvement of tasks coordination in a consistent and systematic manner, creating the necessary framework for the continuous improvement of its efficiency and transparency of internal processes and improving the performance of the services delivered to the clients. The quality compliance certificate confirms to the interested stakeholders that the organization operates on the basis of an internationally recognized quality system principles, determining the increasing of the business partners confidence (i.e. customers, suppliers, stakeholders) in the services offered, as well as in compliance with the contractual conditions assumed. Also, the economic benefits generated by the decreasing of the non-conformities, of the lost customers and of the customers' dissatisfaction, together with the active and systematic adaptation to the ongoing market changes could lead to a consistentbusiness global costs' diminishing.

Given the specificity of the port operators' activity, especially regarding the involved processes, the implementation of a corelative environmental management system, according to ISO 14001:2015 is imperative, in conjunction with the compulsory IMO requirements regarding environmental protection, especially since it became operationally integrated with ISO 9001: 2015. The advantages of implementing the related environmental standard are visible in several functional areas of the port operators. Thus, in terms of the environmental issues, conducting activities in accordance with the international standard could lead to: minimizing the impact on the environment due to waste disposal, cost savings by conserving natural energy resources (e.g. electricity, gas, water), preventing pollution and reducing the amount of waste, facilitating the authorizations achievement, reducing the costs associated with the polluting products' emissions. Regarding the marketing process, the alignment with the environmental standard implies: improving the image and competitiveness in the field of activity, meeting the expectations of the clients related to the environmental protection, meeting the national and international purchasing requirements. Overall, from financial standpoint, the ISO 14001: 2015 certification could lead to improvements incapital access by eliminating those costs associated with the legal compliance with the national standards. Also, production costs savings will be recorded due to quantitative reduction of raw materials and energy, as also savings due to safer working conditions, reduction of losses and associated risks, forthimproving the business relations with insurance companies.

Regarding the human resources employed in port stevedoring processes, the Occupational Safety and Health Management System standard - OHSAS 18001 standard is in the focus to be applied, being developed to be compatible both with the Quality Management Systems (ISO 9001) standards and with the Environmental standards (ISO 14001), with the finalrationale of easing a harmonized implementation within the same organization. Like the ISO standards for Quality and the Environment, the standard for Occupational Safety and Health, is based in its functioning, on the processes' integration in the Plan-Do-Check-Act loop, with a special focus on continuous improvement. The implementation of the nominated standard brings a number of advantages such as: reducing the number of accidents by systematizing all the activities relevant for occupational health and safety, reducing costs by reducing health risks, increasing the degree of legal certainty by strictly applying thelegal framework, reducing the material losses by diminishing the number of accidents, with lower insurance costs.

In other perspective, in modern port business, the information flow and data security policies play an important role in the process management. The implementation of a standardized Information Security Management system according to ISO 27001 leads to a large range of benefits, as following: enhance the awareness of the internal computer network vulnerabilities for adapting the risk behaviour, increasing the productivity by reducing the response time and the data transmission failures; efficient resources allocation in the organization, reducing the risks occurred due to the IT vulnerabilities; increasing the level of customer confidence in the services offered, reducing the costs of assistance; reducing the risk of losing information;provides a major competitive advantage by securing the information; andassure the continuous improvement of the data storageand information management policies.

Risks occurred in the maritime industry are represented by those foreseen or unpredictable events, that may occur during the port operation or during the service of goods transportation, that could lead to dangerous situations. Due to its complexity and characteristics, the business of port operation services presents many challenges in order to overcome and manage the risky situations. To have a proper managed safety management, the decision-making process is needed to be supported by a coherent information management. Most of the time the information cannot be directly observed or quantified and the rules decisions usually appear after an unwanted event isoccurring. This is also why any port operator should implement ISO 31000:2009, regarding the Risk Management. The certification of the company in the risk management field would bring the following advantages: increasing the probability of achieving the objectives, enhance the awareness of the need for risk identification and management in the organization, developing methods of identifying opportunities and threats, establishing a reliable basis for decision making process, with an efficient resources allocation and use in order to eliminate risk factors andto minimize the losses.

Port operators are important energy-consuming industrial enterprises. There is an increasing emphasis on the efficient and responsible use of energy resources and in this context, it would be suitable for the port operator to apply ISO 50001:2011, regarding the Energy Management Systems. This framework consists in an international standard based on common elements of energy standards ISO management systems, that ensure a high level of compatibility with ISO 9001 and ISO 14001. Standardization also implies in this case a series of benefits: implementing a management strategy for increasing energy efficiency, reducing costs by increasing energy performance, reducing gas emissionswith greenhouse effect, other impacting effect on the environment and energy costs, through systematic energy management.

5. Integrated PAS 99 quality framework in port services - common requirements for an integrated management system

The management systems help companies to become more competitive, integrating each particular management standard under a holistic perspective, allowing the businesses to grow on long run, without additional investments. PAS 99 is the world's first specification for such and integrated management systems, developed using the ISO 72 - *Guidelines for justifying and developing the standards of management systems* - thus offering a world-class framework for more efficient operations management under an integrative standards' approach.

PAS 99 package has been built based on the six common requirements of ISO 72 guidance, considering the policy, planning, implementation and operation, performance evaluation and improvement and management analysis. The management system can be designed with the clear purpose of eliminating the complexity of an independent implementation of each standard seeking to achieve functional solutions for implementing an integrated management system, which may include ISO 9001 quality management, ISO 14001 environmental management, OHSAS 18001 occupational

safety and security management, ISO 27001 information security management, IT / IEC 20000 service management and BSI ISO 22301 business continuity management, but not limited only to these standards. (*https://www.bsigroup.com/en-AE/PAS-99-Integrated-Management-Systems/*)



Figure no. 1*The business process model in port operation services, valuing the support of the integrative management system*

According to PAS 99 integrative perspective, as depicted in figure no. 1brief design, the business process model can be conceived as valuing on its fundamentals the sustainable support of an integrative quality system management, implemented under an integrative perspective, in terms of functional effectiveness and efficiency, that could harmonize the multiple inter-dependent positive effects of all standards suitable to be applied in port operation services. In this manner only, the potential of using the logistics support as a competitive advantage on the market position, is doable and recommended to be implemented.

As underlined in the figure no. 1, all business processes from research and development, to the throughput development, are supported by the logistic functions, in terms of supply, operations management and clients order fulfilment, havening on its basis the analysis and improvement loop provided by the quality system. The process mainstream is centred on the marketing function, as a functional merging vector of the primary components of the business model, namely the research and development, the resources management and the operation services functions. The supportive ground of all logistic functions as identified in port operations services is functionally connected under an integrated manner by the integrated management system, in reference to the following port operation logistic activities: *forecasting; purchasing-procurement-strategic supply; order management; inventory management; transportation; warehousing management; cargo handling/transfer; operation planning; distribution; cargo forwarding operations; cargo unitization; cargo services; information flow; distribution and cargo transportation; routing and monitoring systems; customer service.*

The role and main responsibility of an integrated management system would be to value the importance of vertical (internal) and horizontal (external) integration of all these functions as further to be able to implement harmonized quality standards, into a holistic functional perspective, that will contribute for designing and providing better services, on sustainable basis, with optimum effectiveness and efficiency. In this order, the most innovative perspective of quality standards integration is how to harmonize but in a valuable consistent manner, all the standards for the same processes, but following up different strategic objective.

Basically, a large number of standards can be implemented into an integrative manner, using an integrated management system and a harmonized vision against all processes occurred in port services, for both primary and support activities. Syntactically, the major standards that can be considered in this framework are listed as following, but not limited to these lines:

- ISO/PAS 28000:2007, Logistics chain security management systems;

- SR EN 16992:2017, Competences of the customs representatives;

- SR EN 16747:2016, Maritime and port security services;

- SR EN ISO 19011:2011, Guide for auditing management systems;

- ISO / IEC 31010:2009, Risk management - techniques for risk assessment;

- SR EN ISO 50001:2011, Energy management systems;

- SR EN 13852-1:2014, Lifting installations. Marine lifting equipment. Part 1: General purpose marine lifting equipment. The standard establishes the specific requirements for general purpose marine lifting installations, including their base and supporting structure;

- SR EN 61025:2007, Fault Tree Analysis (FTA);

- SR EN 61078:2006, Analysis techniques for operational safety. Reliability diagram and Boolean methods;

- SR EN 61078:2017, Reliability charts;

- SR EN 60300-3-12:2011, Safety management in operation. Part 3-12: Application Guide. Integrated logistics support;

- SR EN 60812:2006, Systems reliability analysis techniques. Procedure for analysing the failure patterns and their effects (AMDE);

- SR EN 61703:2017, Mathematical expressions for terms of reliability, availability, maintainability and maintenance logistics;

- SR ISO 10001:2008, Quality management. Customer satisfaction. Guidelines for codes of conduct in organizations;

- SR ISO 10002:2015, Quality management. Customer satisfaction. Guidelines for dealing with complaints within organizations;

- SR ISO 10004:2013, Quality management. Customer satisfaction. Guidelines for monitoring and measurement;

- SR ISO 10018:2012, Quality management. Guidelines for staff involvement and competence;

- SR ISO/TS 9002:2017, Quality management systems. Guidelines for the application of ISO 9001: 2015.

All these standards and its related recommendations, would merge practically toward the same objectives and strategic aims, pursuing to achieve a higher effectiveness and efficiency in all processes, under an integrative management system. Due to its complex features, the port operation business would further get a higher value for all social, economic and political dimensions, promoting a sustainable manner of approaching the business processes, continuously improved and embedded with a higher social and environmental responsibility and accountability.

6. Conclusion and remarks

As a first step for a larger upcoming study regarding the detailed quality system framework in port businesses management, the major purpose of this paperwork has been initially focused in describing the literature synthetical concept regarding first the logistic support function in business modelling processes, and second regarding the integrative view against the quality management systems that can be used and effectively implemented in port operators management system.

The conclusion of this paper, synthetizing the depicted concepts, but also the potential quality standards identified as suitable to be implemented in port business management, could underline the next ideas and recommendations:

- the quality standards could bring a vivid and coherent approach for an integrative settlement of respective procedures in a port operation company, considering together all business impacting determinants: the process management, the logistic functions, the environmental issues, the work efficiency, the energy consumption, the clients' satisfaction, the stakeholders accountability, the information system reliability and so on;

- due to its complexity, the port services encompass in its range of activities a very large scale of responsibilities related to the society, environment, employees and clients, for which purpose the integrate management system can offer a coherent solution for integrating on vertical (internally) and horizontal (externally) manner all tasks and activities, pursuing to increase the value chain of the occurred processes;

- the logistic processes will continue to be a relevant support for competitiveness for which, the quality management and its related standards and recommendations can contribute in a significant manner;

- the integrated management system will also harmonize the information system policies, among all processing dimensions within the port businesses.

A forthcoming deeper study shall reflect all thesestandards in a common frame, in relation with the port services business model components, to reflect the potential actions applicable to the specificity of cargo and ship services.

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