

# **Improving ROIs in Ports through Operational Streamlining**

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## **ABSTRACT:**

Ports provide a critical link in the global supply chain by connecting sea transport, air transport and land transport. Ports provide facilities and services for the transfer, storage, inspection, and control of the goods moving both in and out of a country. The inefficient management of a port can considerably increase costs and hamper the timeliness of delivery. This paper looks at the potential impact of integrated data management on port operations.

**Keywords:** Port Management; Operations Management; Transportation;

## **INTRODUCTION:**

Ports provide a critical link in the supply chain by connecting sea or air transport with land transport. This linkage with international trade is invaluable to a country's economic sustainability and growth; as, all imports and exports must pass through a port of some type. Ports provide facilities and services for the transfer, storage, inspection, and control of the goods moving both in and out of a country. These services if provided inefficiently will increase costs are reflected in the higher costs of the goods; thus, making them less competitive. These inefficiencies also make the usage of the offending port less desirable; which in turn makes it harder for the port authority to secure financing for the improvement of port services.

To attract trade and achieve financial viability, ports authorities must develop sound commercial management practices and efficient operational processes. Mechanisms are needed to enable users to participate in decision making to raise port efficiency through streamlining operations and procedures. In the changing technological and economic environment, the management and operational practices of the past are no longer appropriate. As a result, ports are adopting more commercial attitudes towards vessel and cargo handling, as well as, developing new commercial activities within the port areas and immediate vicinity. These changes come at a cost.

All enterprises must perform short and long-term prioritization of financial resources. Even if regulatory requirements cause funds to be diverted from long-term infrastructure needs, to short-run compliance dictates. Ports must devote capital to long-term infrastructure maintenance and improvements or find themselves at a severe competitive disadvantage. The multi-modal nature of port infrastructure further exacerbates these decisions. To meet the demands of increased competition, ports have to invest in their infrastructure to increase efficiency and productivity [13]. Though infrastructure improvements are long range projects; in the interim, efficiencies in production must be achieved through organizational, cultural and operational improvements

The key to achieving the aforementioned goals and objectives is not how much money a port makes, but how much it is able to keep. There are common low-cost investments that can be made which produce high-yield profits while increasing efficiencies. Established ports on average operate at an estimated 15 – 20% deficiency (i.e., failure to use existing information for maximum optimization), while ports in developing countries are estimated to operate with a

deficiency as high as 30 – 50%. There are two core elements that define deficiency; (1) the collection of data, and (2) the appropriate use of that data.

This paper proposes that ports can substantially improve their ROI through the streamlining of their operational processes; in most cases achieving results that exceed 30% enhancement to existing ROI. For example, in 2013, the Port of Lagos, Nigeria analyzed their operations specific data and implemented targeted improvements that produced a 34% increase in ROI within the first 3 months. Those improvements were responsible for a US\$ 340 million increase in annual revenue. The positive gains of improvements are often scalable, so are losses when ports fail to make necessary changes. Most U.S. Ports are much larger than the Port of Lagos, which means they are losing hundreds of millions of dollars each year simply by failing to identify and implement operational improvements.

## ISSUES AFFECTING PORT OPERATIONS

[22] examined the determinants of maritime transport terminal costs, emphasizing port efficiency. Their research found nine factors that affect operational efficiency in maritime ports; hourly container loading rate, general turnaround time, bureaucratic turnaround time, ship waiting time, general ship waiting time, container handling capacity at port, yearly congestion time, and average stay per vessel. These variables grouped into three factors; time inefficiency, productivity, and length of vessel stay. The variables associated with time inefficiency are those affected by the suggestion proposed in this paper. Furthermore, the [8] has identified four issues affecting the development of Ports; public sector dominance, outdated and cumbersome procedures, rapidly changing technology. A fourth issue that underlies all three of the previous stated issues is human factors.

### Public Sector Dominance:

There are several government departments and parastatals involved with the management of ports; all grappling to control the complexity of operations carried out by government agencies and private operators in a relatively confined area. This conflict had led to inefficiencies in port operations, which in turn has led to increased costs.

Due to the complexity, expense, and/or low returns on investment associated with the development and management of many types of transportation infrastructure, such as ports, coupled with the high potential for economic development, government often initiates ownership. [21] states that “transport infrastructure, such as port terminals, airports, inland ports or logistics zones, many forms of governance are in place which shape modes of financing, operations, functioning and external relationships. This is particularly important as large terminal infrastructure involved in global flows of passengers and freight are complex, capital-intensive and of strategic importance to the economic welfare of whole regions” (p. 149). To govern this ownership, a Port Authority is established. Port Authorities are entities of a state or local government that owns, operates, or otherwise provides infrastructure and services at ports.

It is reasoned that port authorities are able to more efficiently manage port facilities as a whole rather than privately owned and operated terminals. Port authorities are involved with activities related to operations, construction and maintenance of infrastructure, marketing, and management of services. By the very nature of their formation, their power is limited within their jurisdiction, placing them increasingly at odds with the changing business environment due to globalization. Because of this inherent conflict, governance structures are devolving into other forms ranging from partial to full privatization [4].

The principle drive of the many governance structures is the recent trend towards alternative services. The first trend is the rapid improvement in information technologies. These

improvements have increased the transparency of operations in government; thus, increasing citizens' ability to monitor and participate in government activities [9] [19]. The second trend is increasing deficit and accumulated debt burdens [9], coupled with low levels of public confidence in government [15], both of which are forcing governments to find ways to do more with less. [4] discusses the various form of governance structure for ports.

The operation and management of a port involves numerous stakeholders. The term 'port community system' (PCS) is intended to reference the stakeholders associated with a particular port, along with their associated processes and infrastructures. There are two types of stakeholders: residents and non-residents. Resident stakeholders are physically located within the boundary of the port; such as the Port Authority, the terminal operator, concession operations, etc. Non-resident stakeholders are physically located outside the port's boundary, but influence the port on a regular basis; such as customs and custom agents, transport companies, freight forwarders, etc. There are other stakeholders beyond the resident and non-resident status, the key discriminator being the frequency of impact.

It is generally accepted that competition in the global marketplace does not happen between companies, but between supply chains. The degree of flexibility in a given supply chain is often a result produced by the coordinated/integrated contributions of the various companies and stakeholders that constitute the supply chain [18]. One of the main issues preventing port management structures from achieving greater integration and coordination across their respective PCS's is the lack of cohesion and trust among the various public and private stakeholders [23].

### **Outdated and Cumbbersome Procedures:**

[7] noted that management was responsible for the development, maintenance and control of the systems and processes used to service the company's chosen markets. One of the great oversights that management is continuously guilty of is that they rarely if ever scrub/review existing policies and procedures to insure that they are still valid and support of the company's strategies, goals, and objectives. Over the decades, governmental agencies have added regulations and procedures; making the same mistakes that private industry has made. These regulations and procedures have produced excessive controls, inspections, documentation requirements, duplication of documentary procedures, and many unnecessary security controls. The result of these regulations and procedures has been to lengthen the time vessels stay in ports and cargo clearance through ports, resulting in higher costs and increased cargo damage and loss due to pilferage.

One example of the impact of excessive regulations and procedures can be seen in Customs practices and security checks. These practices and checks are often a major impediment to efficient cargo and container handling. As previously mentioned, these procedures are not always reviewed or upgraded with the introduction of new commercial oriented practices. Consequently, attempts at rationalizing, simplifying, and/or reducing documentation have frequently led to increased documentation and checks.

Another example can be seen in safety and aids to navigation. Due to changes in vessel design, reduced crew sizes, and increased automated navigational systems, the need for reliable aids to navigation is becoming even more important. As existing aids to navigation age, technology changes, and vessel traffic increases, the risk of accidents in coastal waters and port approaches is increasing. Though the International Association of Lighthouse Authorities (IALA) has brought together lighthouse authorities to improve aids to navigation and maritime traffic management practices; Ports authorities need to live up to these international obligations.

Fulfilling these obligations take money, once again highlighting the need for Ports to improve their ROIs.

### **Rapidly Changing Technology:**

The [8] notes that fundamental to port operations is the whole range of changes from vessel design to containerization. These changes usually mean upgrading infrastructure, requiring major investment in new and more equipment. Keeping pace with changing technology is a particular problem for smaller island ports and feeder ports.”

The current trend in maritime operations is towards strategic alliances using larger vessels to provide scheduled liner services between major ports, with smaller vessels providing intra-regional services. The top 25 shipping lines control almost 60% of the global container transport capacity [10]. These shipping lines often control and manage their own terminals, creating a hub and transshipment ports system. Within this system, these ports require specialized handling equipment, especially for containers, to service these mainline services. A port’s degree of efficiency and cost-effectiveness operations is dependent upon the nature of its infrastructure.

The internet and advanced telecommunication systems are motivating changes in virtually every industry. The increase in transport capacity is also driving requirements for immediate data on the exact location and status of cargo, as well as, on all logistical and institutional aspects of port operations [10].

### **Human Factors:**

Maritime and land-based multi-modal ports are the embodiment of highly complex, tightly-coupled systems. The number of simultaneous operations involving highly skilled labor, high-value cargo, powerful machinery, and competing priorities is mind-numbing. The output of highly complex and tightly coupled systems that are interrelated and interdependent, involving specific processes, technology or machines and human beings are relatively intolerant of variations in input quality, quantity or timeliness [6] Thus, the potential for a seemingly minor human error, to set a chain reaction in motion and create a widespread catastrophe, cannot be discounted or ignored.

A settled principle of human factors engineering is that the greatest degree of variability in any system can be attributed to the human being. Researchers in human memory, learning, and error have developed several taxonomies for describing human behavior. These behaviors can be placed into three categories:

1. Skill-based behaviors; those actions that are manipulative in nature and performed at the subconscious level.
2. Rule-based behaviors; an “if, then” decision-making process; the desired action is dictated by circumstances and convention.
3. Knowledge-based behavior; occurs when the human is unable to reduce the situation to rule-based or skill-based behavior.

Many tasks have a degree of repetition and mundaneness to them. As a consequence of these job characteristics, the task performer sometimes makes a mistake through either shortcircuiting the process or inattention. This results in lost productivity, accidents, or even more serious problems. The two most common traits involved in this process are: complacency and deflection. Complacency refers to an individual’s natural tendency to accept information at face value. During the performance of their assigned tasks, it can frequently be observed where individuals will accept proffered statements from others as being true, without any consideration

for verifying the information. While, deflection seeks to reduce an individual's perceived linkage to the act.

## **PROPOSED METHODS FOR IMPROVING RETURN ON INVESTMENT AT PORTS**

There are numerous stakeholders involved in the management and operations of ports. These stakeholders include importers, exporters, the Port Authority, the terminal operators, customs, customs agents, transport companies, freight forwarders, and others. Each of these stakeholders controls processes specific to their interests and each inducing variability into the port management process. These variances and the lack of visibility can significantly affect the effectiveness of the port to plan and execute freight and/or passenger flows through the port into the appropriate distribution networks.

[1] proposed a collaborative supply chain management system for maritime port logistics. Their proposal features three main components: management of port governance, a port logistics operations model, and a logistics management platform system.

### **Linking and Streamlining Operational Process**

[6] discusses several troubling issues with port management. These issues range from the increasing size of ships and the number of inbound ships to the limited capabilities of port to unload those ships.

Due to the fragmentation of production systems, modern operational paradigms such as JIT, have tended to reduce warehousing and increase the integration between elements within a production system. Consequently, transport terminals are having to shift paradigms, becoming more demand focused and more closely integrated to the production and distribution systems they support; thus minimizing delays and warehousing.

There is significant time wasted – resulting in financial losses due to a lack of integration between various port functions. For example, the VTMS focuses on the movement of ships, the TOS focuses on the management of cargo, the CMS focuses on the clearance of cargo, and FMS focus on the movement of trucks. While there is movement of cargo across the supply chain, it is extremely rare to see all of these functions aligned. As a result, there is a considerable loss in time management, duplication in paperwork and processing, and an overall loss of port efficiency. All of this leads to significant revenue loss, which negatively impacts a port's dynamic space.

As noted previously, there are several sources of variability in port operations; such arrival times of incoming vessels, arrival times of transport resources for the transfer shipment of incoming freight, clearance times for inbound and outbound freight through customs, etc. The goal of port management is the reduction of variability throughout the operation: thus the need for better coordination within and among the physical and document flows.

### ***Operational Processes:***

Although there are a multitude of operational processes that may be identified across the global supply chain, they can typically be summarized into the following process categories.

1. **Market Demand:** Any cargo movement is reliant upon demand. It is at this point in time the global supply chain actually starts.
2. ***Sourcing and Manufacturing:*** Upon determining a specific product is required, the acquisition must be sourced through a provider or series of providers in the case of white label products or those with parts from multiple origins. There are a number of different operational processes like manufacturing / production, labeling, packaging, shipping, storage,

- and inventory management. To reduce manufacturing cost for maximum profitability the auto industry leverages JIT principles.
3. *Global Trade and Logistics Hub*: The finished product ultimately must be transported to the end user. This effort can assume a number of processes like freight forwarding, intermodal transport, cargo inspection, and tariff collection. Port processes are generally associated with this group, and include the information management systems previously addressed.

These processes are controlled by multiple parties; each with their own agenda. While the transition between processes is orchestrated in a manner to optimize the supply chain, it is more often than not this linkage that provides the greatest opportunity for improvement, enhancing port efficiency. Although ports do not directly control remote processes in the global supply chain, knowledge of relevant activities permits enhancement of port activities. Over simplifying to address the point, a ship waiting at a terminal for the arrival of a specific shipment of vehicles both delays the departure of that ship, as well as blocks the terminal's use for other activity.

The ability to look (data collection) deeply into the global supply chain with a 360° view and in real-time (data management systems) offers port operators and their stakeholders the opportunity to maximize productivity (streamline processes). Achieving this requires minimal to minor CAPEX, yet maximizes efficiency output, presenting a significantly high ROI.

### ***Enterprise Asset Management***

Operations process improvements must be integrated with the technology, machinery and equipment used to handle, move and store the commodities for which the port serves as a conduit. The migration from labor-intensive assets to advanced capital-intensive ones has created a demand for maintenance and asset management. Due to stringent customer demands, many ports are having difficulty in scheduling the required maintenance because of the required downtime.

A holistic approach to improving ROI in ports should include a robust reliability based maintenance (RBM) strategy. RBM is a data-driven scheme that helps the organization proactively plan and schedule maintenance and replacement instead of operating to failure, and suffering the up and down-stream consequences. RBM can also create financial efficiencies by targeting maintenance when and where needed, instead of the traditional phase-type schedules which required maintenance even on equipment that was operating efficiently and effectively.

## **IMPLICATIONS**

Understanding how these principles apply to the PCS and the impact of each is crucial to improving ROI. The ability to recognize how complacency and deflection affect the true understanding of port operations is critical. As simplistic as it may seem, increasing a port's ROI is directly linked to the removal of pride of ownership. Individuals must prepare themselves mentally and emotionally to view the port in a critical manner, with significant detail and absence of blame.

The first step in this process is to perform a comprehensive port assessment. When conducted properly, port assessments can be performed biennial, although table-top reviews should occur annually. Any properly conducted assessment requires participation from all port stakeholders. Under effective tutelage and guidance by a 3<sup>rd</sup>-party consultant, port stakeholders can learn to better understand the broad activities and effects of operations across the PCS and global supply chain, thereby starting to recognize and comprehend the significance of effective integration beyond the port boundary. The major importance of performing an assessment is it identifies and prioritizes improvements. A cost-benefit analysis can correlate corrective actions

with the highest ROIs. This ensures that port operators quickly address issues that affect higher profitability easing typical management concerns, whether internal, from outside review committees or even public scrutiny.

The second step is to use system integration techniques to develop a port master plan that ensures a maximum data capture across the entire global supply chain. Maximizing data collection requires the integration of the various stakeholders regardless of whether they are resident, non-resident, public or private. To achieve synchronization of a multi-layered organizational structure, a host organization will need to be identified to lead the overall process. New infrastructure will also be needed to support these changes, the most common being a centralized information management facility.

The third step is for the port authority to lead participating stakeholders in crafting policies and procedures for the capture, use and management of port data. When conducted properly a port information sharing process is implemented fostering higher profitability across the entire PCS.

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