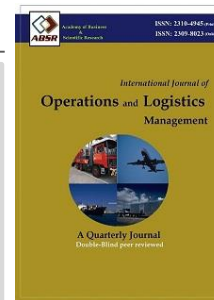




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Root Cause Analysis for the Overstock of Goods in Arab Marine Ports

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In global supply chain, Marine ports are critical nodes where value adding and logistics-related activities take place. The integration of ports on supply chain management creates high level of uncertainty for downstream activities due to the increasing of processes complexities and range. One of the common problems in Marine Ports in Middle East is the accumulation of goods which lead to delay in the downstream activities of the supply chain. Therefore, the main objectives of this study is first to demonstrate the causes of overstock or accumulation of goods problem at Marine ports in practically in Alexandria and Jeddah seaports using cause and effect diagram (fishbone diagram). Second, is to identify root causes of this problem especially for hazardous material and automotive products using Pareto analysis. Finally, recommend a solution for this problem based on the root cause analysis in order to minimize the probability of problem occurrence and improve the performance of the supply chain. Case study research strategy was used to identify and examine the causes of this problem in real-life context and determine their frequency. In particular, two case studies were conducted Alexandria and Jeddah ports. Structured interviews conducted with the executives of ports. The study findings shows that the main two root causes of overstock or the accumulation of goods in the Arab marine ports are the complicated customs and documentary procedures and delay in conducting inspection procedure in particular for the hazardous goods and automotive goods.

Keywords: Supply chain vulnerability, Marine ports, overstock of goods

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INTRODUCTION

The role of supply chain became very critical in recent years in creating and maintaining a strategic competitive advantage for the organization through close customer relationship, increased satisfaction and improved business profitability (Mentzer, 2001). Chan and Lee (2005) defined supply chain management as the efficient management of the end-to-end process of designing, development, anticipating and sourcing through complex supplier networks, manufacturing, and distributing products from raw material to the final customer, and the final disposal of the product by the customer. In global supply chain, marine ports are critical nodes where value adding and logistics-related activities take place. Szwankowski (2000) defined ports as "the interface between land and sea economic objects properly prepared with regard technical-technological and organizational handling of foreign trade, carried out by sea, as well as to service of maritime transport and land engaged in their carriage".

Marine Ports facilitate multi-modal transport, operating as a logistics centre, adding value, connecting flows, and creating supply chain path and processes (Bichou and Gray, 2005). As transport is an essential part of the entire supply chain, the ports play a major position in the management and coordination of resources and information flows. The competitive position of a port is determined not only by its inside advantage such as efficient cargo handling connections but is also affected by its links in a given supply chain (Carbone and DeMartino, 2003). According to Bichou and Gray (2005), ports in the concept of logistics and supply chain management can be classified from three perceptions. Firstly from the logistic channel, the port serves as a path in the multimodal transport intersection and operates as a logistics centre for the flow of goods and passengers. Secondly for the trade, the ports is a key location where by channel control can traded. The third, is the supply channel, the ports not only links outside flows and process but also creates its own process. In this background of ports can act as network working sites bring together the whole member in the supply chain (Panayides, 2002).

Despite of the previous importance, the integration of ports on supply chain management can create high level of uncertainty for downstream activities due to the increasing of processes complexities, range and problems in managing these processes (Loh and Thai, 2011). One of these problems is "overstock of goods" in ports that lead to the increasing of lead time, increasing of financial costs, damage of goods and finally customer dissatisfaction. In the ports and shipping literature, few authors have addressed the role of ports in supply chain management and the associated problems in particular the overstock of goods problem in developing countries. The majority of marine ports in the Arab countries suffers from a major problem which is the overstock in goods, especially the port of Alexandria and Jeddah Islamic Port (Arab news, 2013). Therefore, the main objectives of this study is first to demonstrate the causes of overstock in goods problem in Alexandria and Jeddah Islamic ports using cause and effect diagram (fishbone diagram). Second, identify root causes of this problem especially for hazardous goods and automotive products using Pareto analysis. Finally, recommend a solution for this problem based on the root cause analysis in order to minimize the probability of problem occurrence and its severity that lead to decline the performance of the supply chain.

LITERATURE REVIEW

The researchers reviewed the published literature that focused on the problems that face the Maritime ports in particular the overstock of goods problem. The published literature included books, conference proceedings, and literature obtained from electronic sources. Search engines were used such as Google Scholar, Science Direct, Emerald Insight, IEEE, Springer Link and Inderscience databases for literature. Keywords such as 'ports', 'Maritime ports', 'overstock of goods', 'ports and supply chain', 'Supply chain vulnerability' were used to find related literature. The publications were found in the areas of logistics management, operations management, ports management and business logistics. The references cited in each

relevant literature were examined to find additional sources of information. The following literature focus only on the previous studies that discussed and investigated the causes of overstock of goods in maritime ports.

Ports and maritime transport thus play an important role today in global trade. Over 90% of global trade takes place via Marine transport for at least some part of the supply chain and as a result there has been a drive to better secure maritime transportation (Dutra et al., 2015). Each year 6 billion tonnes of freight moves by maritime transport and is estimated to comprise 45 per cent liquid bulks, 23 per cent dry bulks and 32 per cent general cargo. Total freight movements vary according to region, commodity and freight origin/destination (Mangan and Lalwani, 2008). For instance, in the European Union (EU), the ports sector handles more than 90 per cent of the union's trade with third countries and approximately 30 per cent of intra-EU trade, as well as over 200 million passengers every year. According to the World Bank (2001), there are more than 2,000 ports around the world, from single berth locations handling a few hundred tonnes a year to some of the world's largest ports such as Shanghai, Singapore and Rotterdam, which individually handle multiples of this (Mangan and Lalwani, 2008). Robinson (2002) clarified that ports are the elements fixed in value-driven chain systems and that it is important for the port and the service providers to offer sustainable value to its customers other competing value-driven chain systems. Woo et al. (2011) argue that the integration of ports into supply chains will have a positive impact on overall supply chain. In line with Robinson and Woo, Olesen et al. (2014) clarified the value adding activities such as inventory, packing, order picking and customizing that can be performed in ports to satisfy the customer needs or, improves what the customer wants as shown in figure 1. The authors clarified the lack of effectiveness and efficiency in those value adding activities will lead to poor performance in the port and customer dissatisfaction.

FIGURE 1 HERE

Mi and Hanbin (2010) demonstrated the port as a core, effectively integrates the various service

suppliers (including handling, processing, transportation, warehousing, customs clearance, distribution, or even financial, business services companies, etc) and customers (including shippers and shipping companies, etc) into a whole, then delivers the correct number of goods to the right place at the right time in their model. Its goal is to achieve the lowest cost throughout the supply chain. The authors declared that the development of port SC-Model in China is still in the early stage compared with the foreign port due to the lack of the systemic concept of supply chain and effective coordination mechanism, efficiency of information transfers and the extent of share between node enterprises are low, high inventory costs and lack of logistics management calibre. Therefore, the port transportation costs, warehousing costs and management costs in China are higher.

Dwarakish and Salim (2015) pursued to study the role played by ports in the development of a nation. The authors concluded in their report that the ports will become obsolete and eventually too inefficient to run, If port systems are not continuously updated. Therefore, port owners need to constantly reserve funds for upgrades and maintenance costs.

Jeevan et al (2015) examined the functions and challenges of dry ports development in Malaysia. The authors found that Malaysian dry ports are developed to accelerate national and international business, to activate intermodalism in the nation, to promote regional economic development and to enhance seaport competitiveness. Malaysian dry ports perform the function of transport and logistics, information processing, seaports and value-added services. Also, the authors identified the challenges which include insufficient railway tracks, unorganized container planning on the rail deck, highly dependent on single mode of transportation, poor recognition from the seaport community, and competition from localized seaports.

Tamimi (2007) highlighted the phenomenon of congestion and overcrowding of goods inside the port as is one of problems that led to disruption of production capacity of the ports. The author stated that the reasons for the phenomenon are: lack of qualified workers, low capacity of docks, lack of cranes, poor equipment, and lack of storing

yards, documentation procedures and weather conditions. El Nahrawy (2008) studied the competitive component of container ports in the Arabian Gulf. The author focused on the obstacles faced by Arab Marine ports in terms of documentary procedures and necessary to rid the clearance of goods. The author recommended using electronic logistics to reduce the waiting time of ships and overstock of goods problems such as in Jebel Ali port in the UAE and Rotterdam port in the Netherlands. El Boghdady highlighted the decline in the capacity of Alexandria ports in Egypt. Also, the author stated that the waiting time of ships and overstock of goods are the major problems in the port. Mohamed (2011) identified the obstacles that face the development of Egyptian ports which are the complicated documentary procedures and lack of technology. Also, El shierf (2012) studied the possibility of developing Yanboia port through increasing the capacity of docks, advanced equipment and establishing logistics center inside the port.

It clear from the previous studies that the majority of Arab marine ports suffers from a major problem which is overstocked of goods and the problem has negative impact on supply chain lead time, costs and customer satisfaction. The main finding from those previous studies is the initial list for the causes of the overstock of goods as shown in table 1.

TABLE 1 HERE

RESEARCH METHODOLOGY

This research explores and describes the causes of overstock or accumulation of goods problem in the real-life context in Arab marine ports. Also, it extends to analyze and conduct the root causes analysis to identify the root causes of overstock or accumulation of goods. Therefore, this research is a combination between descriptive, exploratory and analytical research according to the research objectives. First the researchers conducted extensive review of the previous studies to identify the causes of research problem. Then, case study research strategy was used to identify and examine the causes of this problem in real-life context and determine their frequency. In particular, two case studies were conducted: Alexandria and Jeddah

Islamic ports. The researchers focused on Hazardous goods and automotive products because the overstock of goods problem is associated with those products comparatively with other products. . It has been chosen the port of Alexandria, Egypt and the port of Jeddah, Saudi Arabia for the following reasons:

- The largest and oldest ports in the Arab world.
- Extended experience in cargo handling and cargo handling volume.
- The importance of the geographical location of the port
- Subsidized problem of congestion for a long time.
- The possibility of researchers to access to the information.

Semi-structured interviews were conducted with the executives of marine ports face to face and each interview lasted between 30 and 45 minutes. The semi-structured interviews were divided into two main sections. The first section examines the causes of the overstock goods that collected from literature review. The second section includes open questions about further causes for this problem. Also, the researchers used observations during the visits to the ports to notice the internal processes conduction and the causes of the research problem. Then, the researcher used fishbone diagram to demonstrate the causes of the overstock of goods using 4 categories: machine, material, manpower, method and environment which are the sources of any problem or deviation that identified by Ishikawa (Tague, 2005). Finally, Pareto analysis was used to detect the root causes based on their frequency that identified by the executives during the last 6 months.

RESULTS

The researchers identified the causes of overstock of goods in ports from literature review as mentioned section 3. Then, these causes are examined using semi-structured interviews and observation that conducted by the researchers to compare between the literature review and case studies finding as shown in table 1. As shown in

the table, there are common causes that led to the accumulation of goods problem as follows:

1. Long period for inspection process of goods and lack of inspection centers
2. Slow documentary procedures.
3. Lack of qualified personnel and expertise.
4. The limited numbers of docks within ports.
5. Poor handling, loading and unloading equipment.
6. There are no adequate storage yards.

Cause and Effect Diagram for the Causes of the Overstocking Goods in Ports

A Cause-and-Effect Diagram is a tool that helps graphically identify, sort, and display possible causes of a specific problem or quality characteristic in manufacturing and service sectors.

It helps to determine root causes, indicates possible causes of variation and increases knowledge of the process. It accepted that there are 6 main categories that need investigation that known as the "4M's". Then, the diagram is developed to include the environment category (Foster, 2010; Sohal and Oakland 2002).

Manpower: Everyone involved with the process across the value stream.

Methods: This defines how the process is performed and the all requirements needed for doing it, including quality procedures, work instructions.

Machines: All machines and equipment, needed to accomplish the job.

Materials: Raw materials, purchased parts and sub-assemblies that feed into the end product.

Environment: The conditions that influence the process including time, temperature, humidity or cleanliness.

The researcher are used the fishbone diagram to display and sort the causes for overstock of goods graphically to determine root causes and increases knowledge of the process as a first step to identify the root causes of the problem as shown in figure 2.

FIGURE 2 HERE

Pareto Analysis to Conduct Root Cause Analysis

It is used to identify and prioritize problems or the causes of the problem to be solved. It is actually frequency charts that is aided by the 80/20% rule adapted by Joseph Juran from Vilfredo Pareto, the Italian economist. 80/20% rule means 80% of the problems are created by 20% of the causes (Foster, 2010; Sohal and Oakland 2002). In this research, Pareto analysis was used to detect the root causes based on their frequency that identified by the executives of Alexandria and Jeddah ports during the last 6 months. The researchers focused on Hazardous goods and automotive products because the overstock of goods problem is occurred frequently for those products comparatively with other products. Then, a comparison between the two cases to find out the common root causes for the accumulation of goods among both cases for the possibility of dissemination of the results for each of the hazardous materials and cars.

Pareto Analysis of Root Cause Analysis for Hazardous Goods

Figure 3 shows the Pareto analysis that used by the researchers to identify the root causes for overstock of goods problem for hazardous material in port of Alexandria. It shows that 80% of the problem caused by 20% of the causes as follows:

1. Slow documentary procedures.
2. Long period for inspection process of goods.
3. There are no adequate storage yards.
4. Lack of qualified personnel and expertise.
5. Poor handling, loading and unloading equipment.
6. Lack of logistic centers.

FIGURE 3 IS HERE

Figure 4 shows the Pareto analysis that used by the researchers to identify the root causes for overstock of goods problem for hazardous material in port of Jeddah. It shows that 80% of the problem caused by 20% of the causes as follows:

1. Slow documentary procedures.
2. Long period for inspection process of goods.

3. Lack of qualified personnel and expertise.
4. Poor handling, loading and unloading equipment.
5. Lack of docks.

Based on the results derived from the analysis of Pareto for hazardous goods for both Alexandria and Jeddah ports, it is showed the common root causes for accumulation of hazardous goods in ports are as follows:

1. Slow documentary procedures.
2. Long period for inspection process of goods.
3. Lack of qualified personnel and expertise.
4. Poor handling and unloading equipment.

Pareto Analysis to conduct Root Cause Analysis for Automotive Goods

Figure 5 shows the Pareto analysis that used by the researchers to identify the root causes for overstock of goods problem for the automotive goods in port of Alexandria. It shows that 80% of the problem caused by 20% of the causes as follows:

1. Slow documentary procedures.
2. Long period for inspection process of goods.
3. Lack of docks.
4. Lack of logistics center.
5. Slow handling, loading and unloading procedures.
6. Weakness of safety procedures in containers yards.

FIGURE 5 HERE

Figure 6 shows the Pareto analysis that used by the researchers to identify the root causes for overstocking goods problem for the automotive goods in port of Jeddah. It shows that 80% of the problem caused by 20% of the causes as follows:

1. Slow documentary procedures.
2. Lack of logistics center.
3. Narrow Roads.
4. Weakness of safety procedures in containers yards.

5. Lack of docks.
6. Slow handling, loading and unloading procedures.
7. Long period for inspection process of goods.

FIGURE 6 HERE

Based on the results derived from the analysis of Pareto for automotive goods for both Alexandria and Jeddah ports, it is showed the common root causes for accumulation of automotive goods in ports are as follows:

1. Slow documentary procedures.
2. Long period for inspection process of goods.
3. Lack of qualified personnel and expertise.
4. Poor handling, loading equipment.
5. Lack of docks
6. Weakness of safety procedures

CONCLUSION AND RECOMMENDATIONS

The main objective of this study was to identify root causes of overstock/the accumulation of goods particularly for hazardous goods and automotive products in port of Alexandria and Jeddah Islamic using Pareto analysis. Finally, recommend a solution for this problem based on the root cause analysis in order to minimize the probability of problem occurrence and improve the performance of the supply chain.

The researchers concluded the following root causes for the accumulation of goods across the two ports for automotive goods and hazardous goods:

- Slow documentary procedures and long period for inspection process of goods. Part of these findings are consistent with a previous studies done by Tamimi (2007) and El Nahrawy (2008).
- Nature of products has an impact on the causes of the problem similar to the case of hazardous material, the overstock/the accumulation of goods is happened due to the inspection procedures for hazardous products.

The researchers recommend the top management in Arab marine ports to:

- □ facilitate the documentary procedures.
- □ increase the number of inspection centers within the ports.
- □ extend the use of information technology networks.
- □ developing calibers to use advanced technology and equipment.
- □ Expand the capacity of the ports through expanding the docks, roads and the means of transport within the port.

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BIOGRAPHY

Sahar El Barky is an Assistant Professor in logistics and supply chain management department and head of quality assurance unit at College of International Transport and Logistics at Arab Academy for Science, Technology and Maritime Transport AASTMT, Alexandria, Egypt. She earned B.S. in industrial Engineering from AASTMT, Master in Quality Management from Productivity and Quality Institute at AASTMT and PhD in Engineering Management from University of Strathclyde, Glasgow, United Kingdom. She has published journal and conference papers. She has extended experience in implementation and auditing of quality, environmental and safety management system according to ISO 9001, ISO 14001 and OHSAS 18001 standards in industrial and service sectors. Her research interests include lean manufacturing, operation management, environmental management, and Green practices, quality management, reverse logistics, and risk management. She is a certified tutor and auditor from IRCA.

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APPENDIX

Tables 1: The causes of overstock of goods based on literature Review and Case Studies

	Causes of overstock of goods based on literature review	Causes of overstock of goods based on case studies findings
1.	Long period for inspection process of goods	limited number of inspection centers that lead for delay in inspection process
2.		Long distance between the inspection centers and storage yards
3.	Poor handling, loading and unloading equipment.	Poor handling, loading and unloading equipment.
4.	Lack of qualified personnel and expertise	Lack of qualified personnel and expertise
5.	Lack of storing yards in the ports	lack of diversity in warehousing and high temperatures in the Gulf regions that lead to damage to goods
6.	Lack of an effective logistics center in the port enabled	There are no adequate yards for storing hazardous materials and automotive products
7.	The limited numbers of docks within ports	The limited numbers of docks within ports
8.	Narrow roads inside the port	There is no optimal use in port areas.
9.	lack of administrative control within the port	Weakness of safety procedures in containers yards
10.	Slow documentary procedures.	Slow documentary procedures.
11.	lack of a strategy for port development plan	Slow handling, loading and uploading procedures

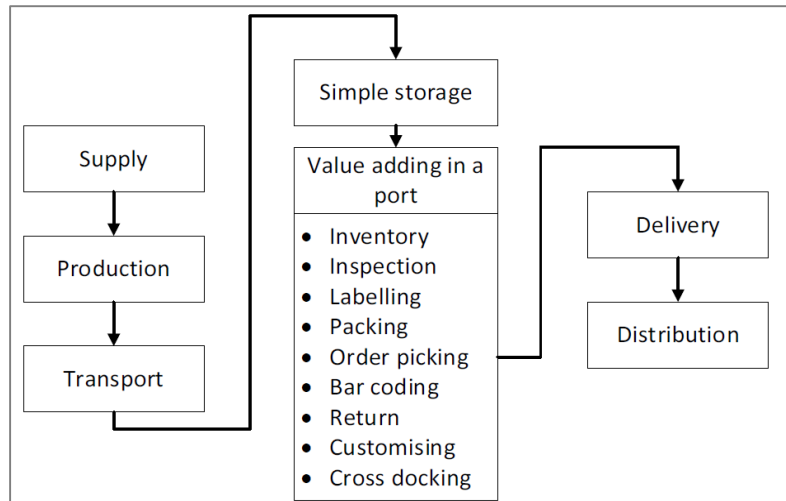


Figure 1: value adding activities in ports based on Untied Nation and Social commission for Asia and Pacific (2002) and Olesen (2014)

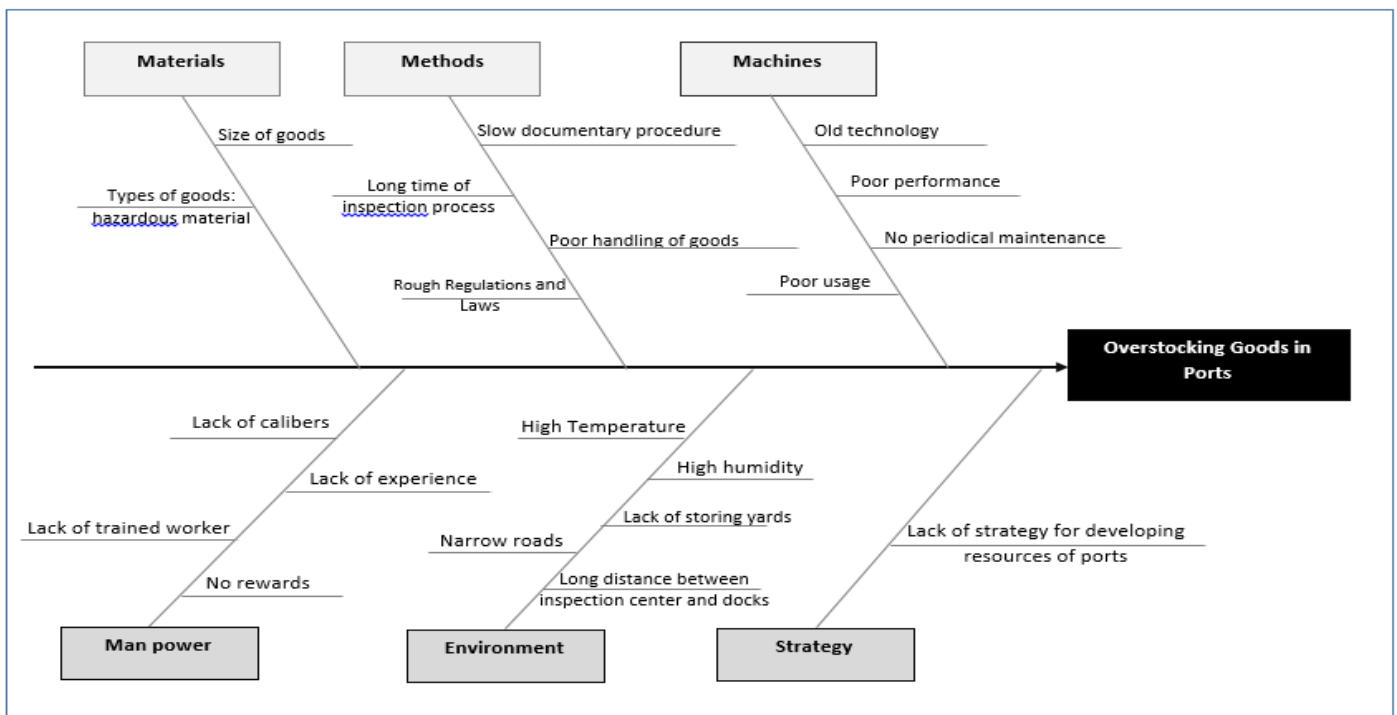


Figure 2: Cause and Effect Diagram (Fishbone) for Overstock of Goods in Arab

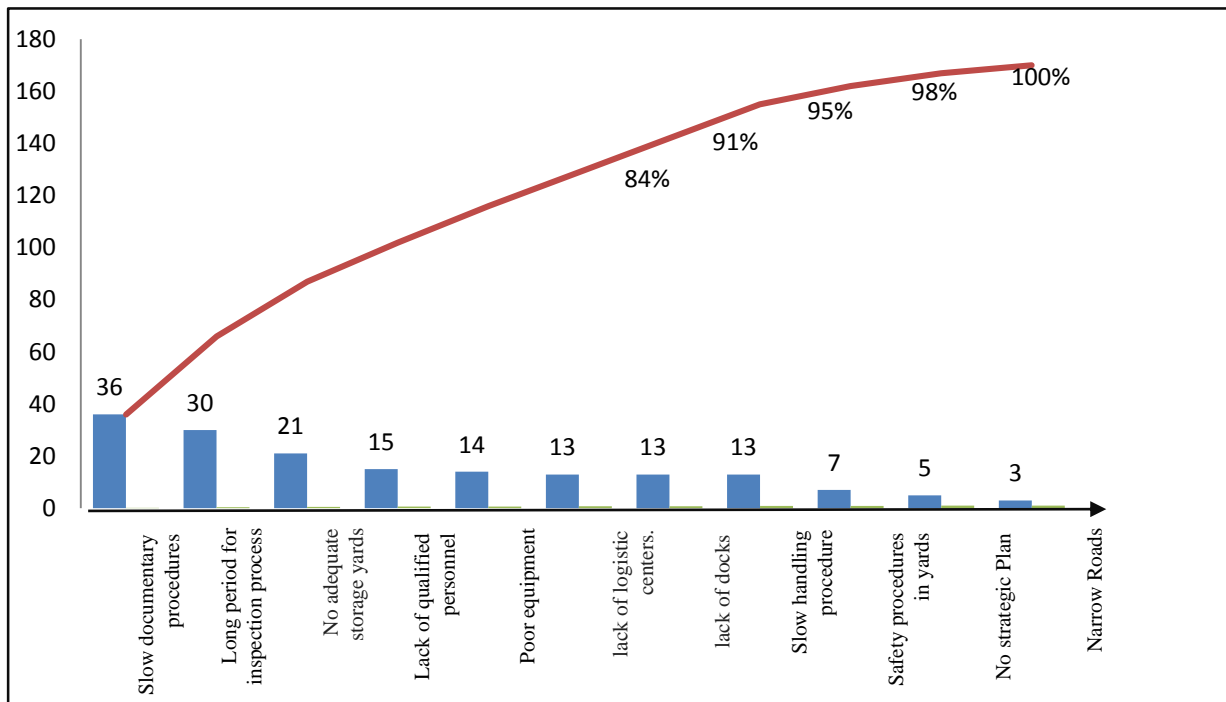


Figure 3: Pareto Analysis for Hazardous Goods in Alexandria Port

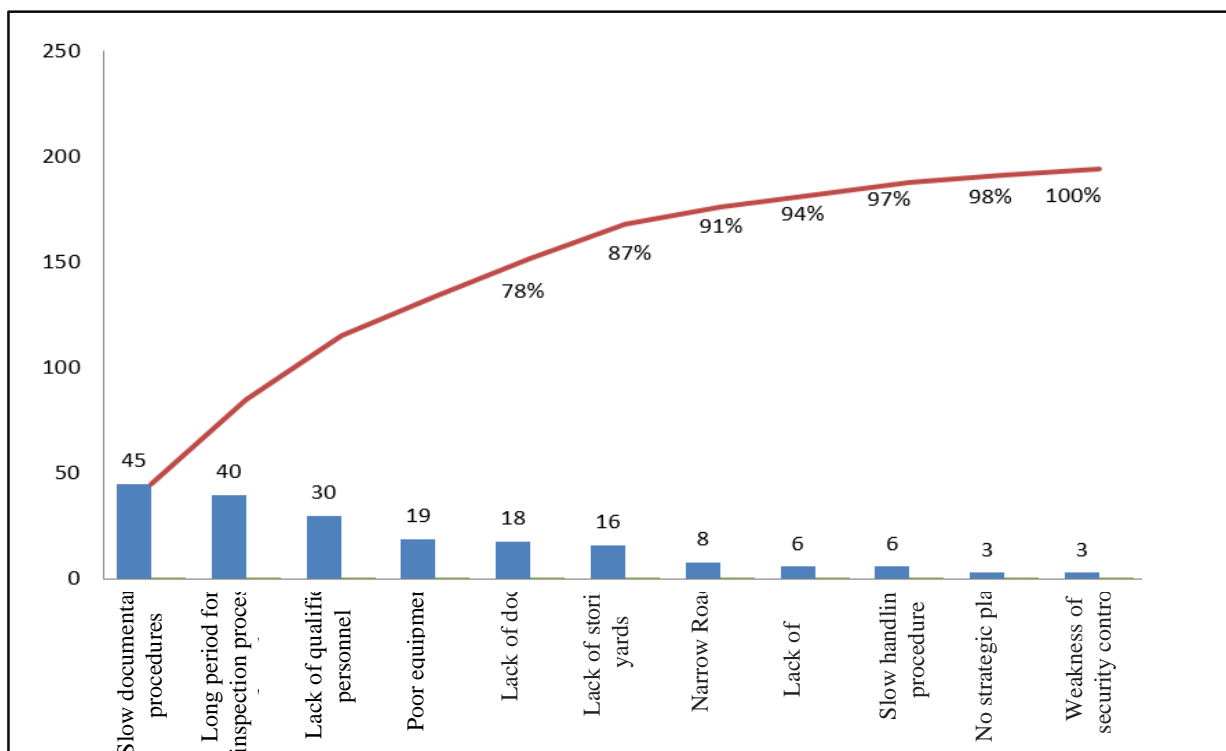


Figure 4: Pareto Analysis for Hazardous Goods in Jeddah Port

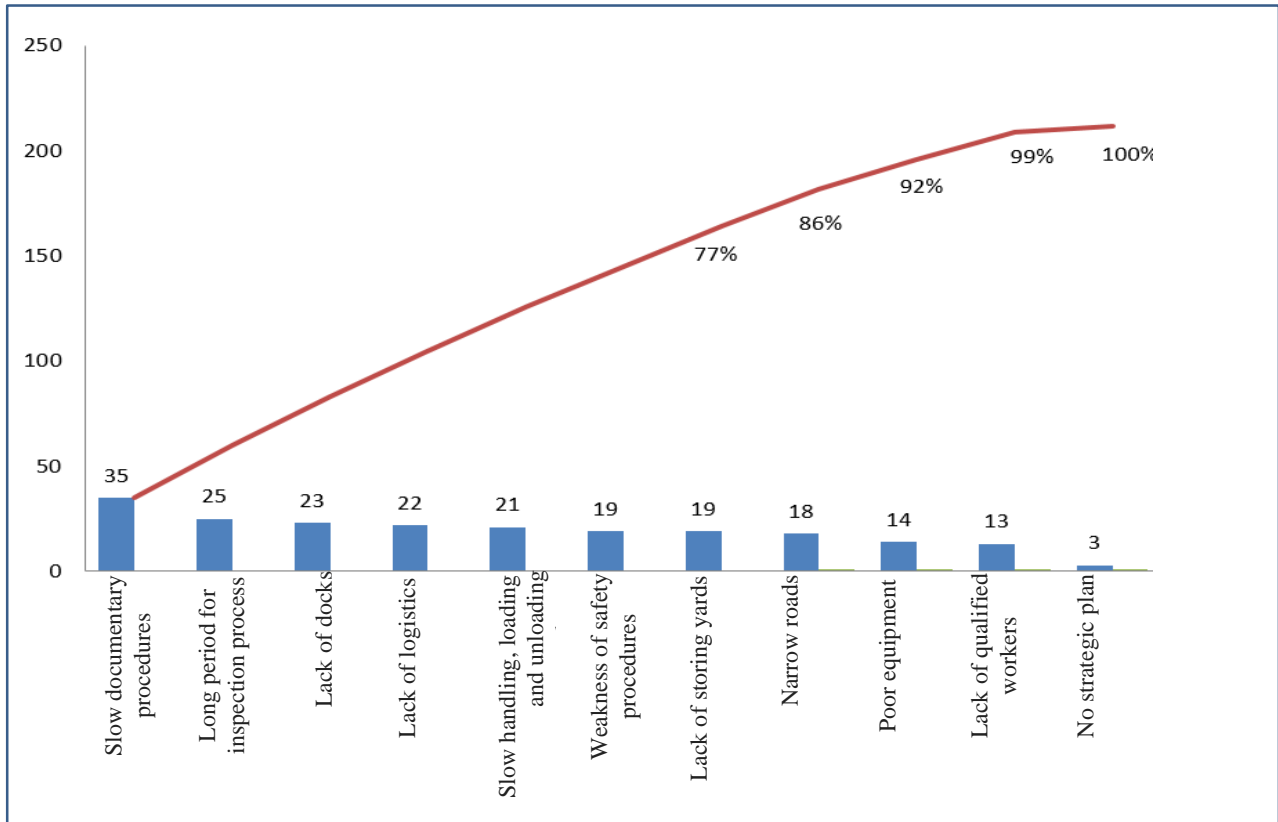


Figure 5: Pareto Analysis for Automotive Goods in Alexandria Port

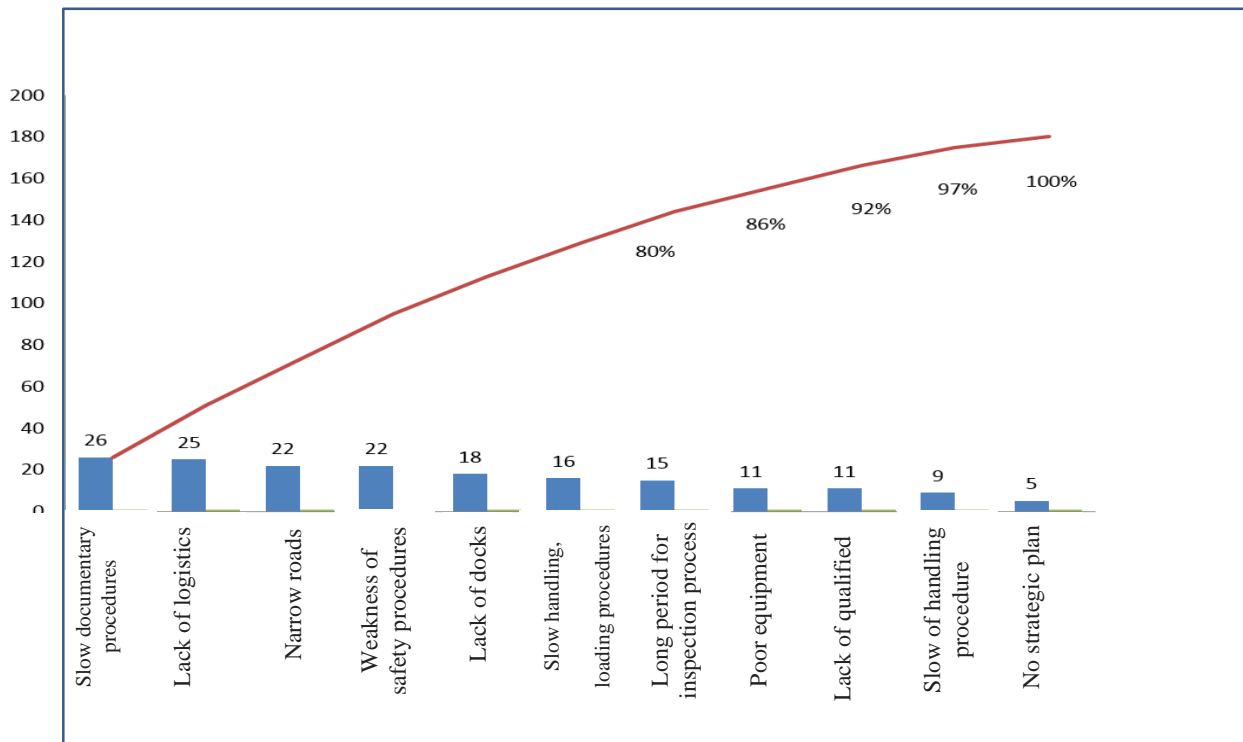


Figure 6: Pareto Analysis for Automotive Goods in Jeddah Port