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This final research report has been approved by the Graduate School.

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Adam, Munira *The Relationship Between Supply Chain Management and Risk Management in Port Operations*

**Abstract**

A great nation develops even further with growing trade and business with other great economies. Splendid port operations play a huge role in realizing a well-developed industrialized economy. This paper will discuss the current organization structure, supply chain and operation logistics of port XYZ to further understand the potential areas of improvement and advancement. Port operations depend on a variety of factors like globalization, supply-chain capabilities, technology infrastructure, as well as people & leadership. This study used lean tools like 5S, kaizen workshops, surveys, questionnaires, technology infrastructure assessment and pilot prototype to develop a long-term sustainable solution. We sampled 25 participants from the 400 employees working at the port. Of these 25 employees, two were top management, 10 middle level, and 13 entry-level employees. Study findings revealed, that customers are using manual outdated systems of making payments and clearing cargos in the port. The management team of the port under study was found to be inefficient, which has resulted in delays in cargo delivery and clearance the port has witnessed losses, the reason being that the port lacks proper risk assessment, mitigation and management methods and no capacity building of employees, poor remuneration and their effort not recognized.
Acknowledgments

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Chapter I: Introduction

Port operations in a country play a significant role in the management of its economy. Countries that have progressed and gained a steep rise in their economic activities have significant better port operations and services. Effective port management depends on a variety of factors like leadership, supply-chain capabilities, infrastructure, technology prowess etc. Risks from lack of infrastructure, effective management and government regulations are the key deterrents to an effective port operations system. For this research, the focus will be on examining the important elements of supply chain and risk management in the port of XYZ. The port XYZ is ranked 117 out of 835 sea and inland ports in the world and faces risks and opportunities in its overall port operations system.

In the past few years, there has been significant amount of changes, both in management structure and in capacity in terms of handling goods and services at ports. Port performance and transparency in the overall logistic business has seen improvement but still, there is a lot to be done. There has been an increasing demand to look into some of the key elements that enhance port performance and risk mitigation in supply chain operations. In case of Port XYZ, demand for effective end-to-end services from both private and public sector have increased due to the lack of transparent logistics operations and continuous improvement in supply-chain technology. The immediate need for a better service infrastructure has put immense pressure on the marine transportation sector.

The increased exchange of goods and expansion of trade around the world has resulted in the rapid globalization of the world’s economy. As a result, there is a sudden need for advanced and improved implementation of information technology to facilitate the performance and transparency of exchange of goods and services. As global trade accelerated, the increased
demand in transporting goods from one place to another directly led to significant challenges and vulnerabilities in the shipping lines, some of which are present in port XYZ. Global entry ports must play a central role in improving the cost of transportation by minimizing all the risks associated with supply chain management. Management of such global ports must open their borders to ensure fair trade. By incorporating cutting-edge technologies and risk mitigation techniques, ports can ensure proper surveillance, reduce their losses and increase overall revenues. Better infrastructure, effective management and newer technologies will reduce the risks associated with the supply chain management and port performance.

Founded in 1890, Port XYZ has been the main entry point for all trade activities and supported all imports and exports carried out by two landlocked countries in the region. Port XYZ has 19 berths, including one bulk terminal for grains, two jetties, four container berths, and 12 cargo berths. With an outdated and inefficient port operating technology, port XYZ has significant capacity limitation for a port serving three countries. The processing system for cargo handling and communications also needs significant uplift, thus reducing the accessibility problem for bigger cargo ships. A single port serving three major economies is unique, and therefore, proper discussion and introduction of new cargo handling machines would play a significant role in improving the services at the port.

Port XYZ also faces the problem of both lack of structure and outdated technology. They do not support staff to effectively co-ordinate cargo handling, thus leading to a delay in clearance of customer goods at the port. Over the past years, XYZ port has also been trying to solve logistical challenges such as late delivery of goods and delay in clearance of new goods. Due to an increased demand for goods delivery in the three countries it currently serves, these challenges pose numerous risks to its supply chain management. The use of manual systems to
make payments by the customers has led to unnecessary delays in the port. Besides, the port has ineffective risk management methods that lead to unwanted expenses and losses in essential assets. Looking into some of the elements that enhance risk mitigation in the supply chain, port XYZ requires immediate improvement in communication, vendor relationship, payment, and delivery of services.

Bichou (2014) states that risk management in ports plays a fundamental role in improving logistics. In relation to port XYZ, risk management proved to be a significant element in enhancing its supply chain management and improving port operations. While, port of XYZ did very little about risk management, it led to an improvement in services including, clearance, and inefficient payment processing and late delivery for end-users. Introduction of modern-day logistics management technology, improvement of port leadership as well as creating a global teamwork system are among the risk mitigation strategies that the port must implement in order to enhance its supply chain management. Therefore, leadership plays a central role in carrying out these changes, introduction of supplier management strategies and risk management tools with its various stakeholders, thus providing the gateway to improved port services (Bichou, 2014)

In a competitive environment where port XYZ operates, it is imperative that managers employ the understanding of agent theory to establish the relationship between risk management and supply chain management. Ineffective risk management strategies, as in the case of port XYZ, will lead to poor service delivery and low profitability. This study will examine the relationship between risk management and supply chain management for effective performance for port of XYZ. The port operations of XYZ have faced many challenges where customer demands are on the rise and become more specific, calling for better risk management strategies.
Problem Statement

Port XYZ has been facing severe challenges in both operations as well as effective management of its resources. Outdated payment system, poor vendor relationship management, no risk assessment and less use of technology are significant contributors of these problems. As a result, port management is considering various risk management strategies to improve operations at the port including information technology, process management, and resources management.

Purpose of the Study

The purpose of this study was to conduct a survey to identify challenges faced by the port and provide sustainable solutions and mitigation strategies. The study focused on different areas including technology, general management of the port, risk management in terms of financial and occupational areas, transportation of the goods from the port to the relevant clients, clearing and forwarding in the port and the storage of containers in the port (Baruch & Holtom, 2008). Implementation of the proposed solutions will ensure that the port’s service delivery system is improved.

Assumptions of the Study

The main assumption for this study is that the data collected in the process would be significant enough and applicable to different sections of analysis and help in achieving the project objectives. Additionally, the study assumed that the contracted suppliers at the port and at the private companies would help to drive the desired results and improve the service delivery process at the port (Marshall, 2014). The study assumed that the organization would give a larger storage for specific goods as part of improvement process. The improvement team and other topic specialists will take interest in the survey process. Marshall (2014) established that there would be complex arrangements required to incorporate the extensive changes in the
system to improve service delivery. While it would take as less than a year to execute the proposed solutions in the service delivery charter and achieve the objectives early by increasing the efficiency of the machines and the delivery of services.

**Definition of Terms**

This section will describe the key terms used in the overall research paper.

**Cause and effect diagram.** The cause and effect diagram helped in analyzing the relationship between all the potential or real causes (or input) that results in a single effect (or output). Various tasks were arranged based on importance and helped in understanding the relationship between the changes proposed or made and the impact of the same (SkyMark, 2018).

**Flowchart.** A flowchart depicts the various stages needed to achieve the goal. These steps are placed in a sequential manner so that there is a proper depiction as well as planning for better implementation. The flowchart consists of seven quality tools that are used for process analysis (Quality, 2019).

**Kaizen principles.** Kaizen principles are a common method used in multiple industries to understand the various ways to improve the performance and efficiency of the port. This technique involves minimum costs and focuses on process improvement. The Kaizen Principles concentrate on cooperation and commitment to achieve results and transformation (Rouse, 2018).

**Risk management.** Risk is part of every business. However, it is extremely important to understand the risks involved in each decision/ event and accept the same as per one's risk appetite. Risk management techniques allow individual risk events and overall risk to be well
understood, analyzed and managed proactively, in order to optimize success and minimize risks (APM, 2018).

**Root cause analysis.** Aims at finding out the actual issue, which causes a non-conformance, which should be eliminated through changes in the process. Having a proper understanding of the root cause helps in knowing the actual challenge to help design the processes accordingly (American Society for Quality, 2019).

**Supply chain management.** Supply chain management (SCM) is a technique which helps in attaining competitive advantage and maximize the customer’s value. It helps in creating a better value for the customers (SME, 2017).

**Total Productive Maintenance (TPM).** A maintenance process designed to build value into products through continuous improvement and employee ownership of preventative maintenance (Ahuja & Khamba, 2008).

**Limitations of the Study**

The study specifically focusses on the data collected through surveys of permanent employees of the port, excluding private owned clearing and forwarding companies, contracted suppliers and project managers. However, the port is likely to experience cultural and personal issues between the managers of the port and their subordinates. Due to this, the obtained data will be biased and used adequately to provide the required solutions for the aforementioned challenges (Baruch & Holtom, 2008). In addition, the time stipulated to collect effective responses is likely to be limited due to the work schedules of the organization and limited access to respondents.
Methodology

The goal for this study was to identify the challenges in the port XYZ and address them with appropriate solutions and mitigation strategies. In order to achieve the objectives, the survey was conducted using questionnaire and interviews with the relevant departments in the port. The responses collected from the questionnaire and interviews were analyzed to provide potential solutions. There was documentation of for effective management and analysis. One set of data was collected to identify why the port does not utilize technology in the delivery of its services. After analysis, the result was used to determine the steps XYZ port should take in service delivery in order to improve the overall efficiency of operations.

Finally, data was collected on risk management to identify the strategies the port uses to control both financial and occupational risks with the port. This data helped in determining the strategies in risk management, which have not been utilized effectively; in the service delivery at port and in handling of goods with the premises that lead to higher operation cost. Transport data was also collected to determine the means of transport of the various goods from the different parts of the country and outside to improve the efficiency in those modes of transportation.
Chapter II: Literature Review

Port XYZ has been facing severe challenges in both operations as well as effective management of its resources. Outdated payment system, poor vendor relationship management, no risk assessment and less use of technology are significant contributors of these problems. As a result, port management is considering various risk management strategies to improve operations at the port including information technology, process management, and resources management. To ensure proper workflow, there must be a solid supply chain management and risk assessment process for port operations. This requires proper planning and inculcation of management systems for the overall development of the port. As the boundaries are shrinking, the business is becoming extremely global. This creates an immediate need to enhance the technologies by creating a sound supply-chain management system to ensure that quality service is cost effectively provided.

Flowchart

To make any business flourish, it is extremely important to understand the various steps required to attain success. A flowchart is a step-by-step planning at different levels to ensure that the plans are well executed.

To attain the overall goal of getting more customers by means of better management, a flowchart is prepared to depict the flow of work. The flowchart would help in understanding the port dynamics and create predictable and prioritized scheduling for better workflow by considering the various players in the system and ensuring that each of these are well placed in the flowchart (Towill, 1996).

Cause and Effect Diagram

Supply chain and risk management need to be based on the cause and effect relationship.
Every decision or action taken involves resources and leads to an impact, which might be positive or negative. The cause and effect relationship diagram identifies and gives a quick glimpse of the impact of each action.

The actions in a port are generally quantitative and involve rigorous statistical analyses to improve the planning. The Cause and effect diagram help in understanding the group based modeling and understand the short and long-term impact of the tasks done (Rahman, 2002).

**Kaizen Principles**

Kaizen principles are the set of techniques, which are applied to manufacturing, engineering and business industries to create a holistic development without really increasing the monetary expenses. This system helps in understanding the actual problems and critically evaluates the same. According to the research with a proper application of this technique, there can be high levels of savings in human resources, the increased output as well as improve the effectiveness. Proper implementation of Kanban system with just-in-time production helped to avoid wastage and when investing in new facilities were done, it helped in meeting the increased demand in the market (Abdulumou, 2015).

**Payment Systems in Port Supply Chain Management**

While some ports use computerized and modern payment methods, other ports still use the traditional manual system. Technology is one of the key drivers to the current global ports supply chain challenges, given that some ports are not able to adopt new methods of payments (Panayides, 2017). The payment systems used in the current port is one of the supply-chain management challenges noted in this research study. In the very port, customers are using manual outdated systems of making payments and clearing cargos in the port. According to Clott & Hartman (2016), payment systems at the port determine whether its supply chain management
is cost-efficient or not. In this regard, it clearly implies that the adoption of the latest technology in the design of payment systems is of particular importance (Thekdi & Santos, 2016). For instance, use of computerized payment systems ensures that less cash is handled, thereby reducing errors that could result from cash handling procedures, along with saving the cargo procurers more time and making the cargo clearing process much easier.

Use of computerized and electronic payment systems serves to ensure that payment is made effectively, efficiently, and in real-time. This makes the payment system easily understandable by customers when it comes to clearing. A number of challenges in the port have been associated with the manual payment systems (Silvestre, 2015). To begin with, the clearing process has been taking too long, inconveniencing customers given that the payment process does not take place in real-time. Another particular challenge is that a lot of money is lost due to errors or omissions with manual payment system and theft. In this light, if ports were to improve operational efficiency, one way of doing so is by avoiding manual systems of payment as much as possible (Wang & Cullinane, 2015). A computerized payment system is critical as it allows customers to make payments easily and the supply chain flows swiftly.

Advancement of technology is the industrial revolution of the 21st century. Firms that adopt technology enjoy greater benefits such as fast, secure and efficient operations, to mention a few. This means that for business to prosper in the current times, they must adopt technology, and ports are not an exception (Thekdi & Santos, 2016). Large ports handle much cargo per day, that have to be cleared, and payments remitted. This implies that the supply chain of the port must be very extensive to allow handling such functions in an effective way, hence boosting competitive advantage. Therefore, there is a necessity for ports to adopt a computerized payment
system which will play a key role in satisfying their customers and eliminating possible money losses through errors and theft.

Ideally, if a port losses money because of the manual payments systems, the clients/cargo procurers will definitely lose confidence in the very port, which has a negative impact on the supply chain management (Wang & Cullinane, 2015). The competitive advantage is also affected. It is well known that ports and any other organization that uses computerized payment systems attract many customers as they have an assurance that their money will not get lost (Seo, Dinwoodie, & Roe, 2016). A manual payment system in a port may also mean that friendship and close association may ‘take hold of the port operations’, and in this way, the port incurs losses. In lighter words, some people may evade paying the clearance fee at the port.

Similarly, the manual payments system will stimulate some of the port personnel to ship goods packaged in containers, and not willing to pay for the actual fee and charges since payment systems are manual and nobody can track the transactions. Further, malicious behavior is likely to result where some port personnel may use clearance fees paid by clients for their benefit. It is in this light that the premise of computerized payment systems is justified. A computerized system is capable of tracking all cargo received, their quantities and respective amounts, thereby ensuring accountability (Ho, Zheng, Yiddish, & Talluri, 2015). This means that using a computerized payment system in the port helps to ensures payment for all goods passing through the port for clearance. To this end, it is evident that the current payment systems at the port of XYZ plays a part in the existing supply chain and logistics challenges.

**Port Management Activities**

One of the key drivers of profitability and competitive advantage in any business is management. The better the management, the more the port performs and vice versa. The
management team of the port under study were found to be inefficient, which has resulted to delays in cargo delivery and clearance (Bichou, 2015). Management of the supply chain cannot be overlooked when discussing about port management. In the words of (Grant, Trautrim, & Wong 2017), the ports that do have a competitive advantage are the ones that have effective supply chain management.

It has been noted, in this literature review that ports receive and send cargo and, in this line, inefficient port management results into delays when receiving cargo. This has a negative impact on supply chain management of the port. As such, the current port suffers significant because management is not effective. In this respect, there is a need for the port to change its management to ensure that the supply chain is effective; otherwise, it will continue to experience the same problems (Coyle, Langley, Novack & Gibson, 2016). The only measure to overcome such challenges is to train the entire port management team. Effective leadership in the port will ensure that all port activities are cost-effective and operating effectively.

Manager’s role is to lead the organization in the right direction; they are persons who do liaise on behalf of any organization. In this light, any problem that affects the management, the supply chain management of the port is also affected. If there is a problem/challenge from the management side, several problems will result such as delayed clearance, decreased profits, and weakened supply management system. In the realm of these challenges; therefore, many customers will shun away from doing business with the port (Lam & Su, 2015). The management plays primary organizational functions such as planning, organization, coordination, control, and staffing, and when there is a problem, these operations are not undertaken effectively. These real problems, however, can be resolved. One possible way of addressing the challenges is making changes in the team, or rather doing away with the team so
that the port can have effective management (Ivanov, Dolgui, & Sokolov, 2019). It is hypothetical that overhauling the management team in the port under study could help to eliminate delays in cargo clearing and processing and, in this way, the port will attain its short-term and long-term goals, along with its competitive advantages.

**Risk Analysis**

Understanding the risks associated with improper management and the financial impact of the same is extremely important. According to Bichou, Bell and Evans (2013), the risk associated with the proper management and transportation of cargos needs much more attention. There needs to be better territorial management and strategic planning to ensure better management and development of reporting and transportation. Ports are responsible for checking for the authenticity, hazardous capability as well as their proper and on time delivery. As the products might be for the consumption of other goods, delays in delivery can affect the entire procedure. In addition, there are products with limited shelf life making each hour in delay in the delivery matter. Thus, there is need for detailed study of the various risks associated with the port and the reason for delays analyzed and solved (Bichou et al. 2013).

A proper analysis and assessment of the probabilistic and economic techniques to identify risks involved in port operation. In addition, a thorough cost-benefit analysis will help the decision makers to make a better decision on the number of risks, to take after considering the risk appetite as well as the costs associated to prevent the same. Proper project planning would help in overcoming such risks (Alises, Molina, Gómez, Pery & Castillo, 2014).

**Risk Management**

Risk management is another crucial aspect in relation to supply chain management. Risk management is not only important in the port setting but also to all businesses. Risk is an
unforeseen event that is likely to affect operations of an entity negatively. At the same time, risk management refers to the activities related to mitigating, controlling, and assessing risks. Risk management is a fundamental concept and if not well taken care of, will negatively affect the organization. The port in the current study is not well off, as far as risk management is concerned (Touboulic & Walker, 2015). There is a challenge of risk management in the current port. In the past few years, for example, the port has witnessed losses, the reason being that the port lacks proper risk assessment, mitigation and management methods.

The important role of the supply chain management in mitigating such risks is hereby stated (Justice, Bhaskar, Pateman, Cain & Cahoon, 2016). The management has a significant role to play in ensuring that the port has effective risk management strategies. Currently, several risks associated with the port including cargo loss, delayed cargo, people failing to pay, to mention but a few.

There are many possible ways of mitigating risks in the current port. For instance, some vital risk management strategies involve avoiding the risk, reducing the impact, as well as risk retention. Failure of a port in risk management is one of the key factors that lead to losses (Silvestre, 2015). At times, losses could be too significant such that customers would avoid doing the business with the port, fearing that losses incurred could be transferred to their cargo. This implies that ports should always prioritize risk management methods if they are to achieve a competitive advantage. Competitive advantage is very critical as it enables the port to compete with other ports from all over the world.

Genovese, Acquaye, Figueroa, & Koh (2017) echoes that risk identification is the first step in risk management. However, importance is attached to risk assessment, which measures prospective risks. In this process, the potential impact of the risks are evaluated, along with the
identification of a strategy to determine whether the risk is acceptable or unacceptable. This was found to be one of the problems that the port under study failed to address (Choi, Wallace, & Wang, 2016). Hypothetically, the port management is aware that risks exist, but lack a concise way of addressing and assessing their impact.

An effective risk management practices are those that involve all stakeholders. The stakeholders, in this case, could be employees, and other port authorities whose participation will lead to development of risk management strategy. Aspects to include in risk management plans is the risk tolerance levels, communication and documentation of risks in the organization as well as strategies for risk management. Therefore, it is important that the port of XYZ adopt risk management strategies if it were to achieve a competitive edge. Further, the current state of the port is a disadvantage as customers are likely to shift to other ports.

**Supply Chain Management**

Supply chain management (SCM) is a technique, which helps in attaining competitive advantage and maximize the customer’s value. It helps in promoting a better value creation strategy for the customers (SME, 2017). As the level of competition is increasing, there is a greater need for better planning and effective supply chain management in order to grow and survive in the industry. Unless there is proper management of the supply and demand, there would be an inefficient use of resources, leading to difficulty in growth and survival. Bichou & Gray (2004) found out that there has been recognition of the need for improved logistics, but what is most important right now is better application of the same. There is need for increased use of technology to ensure better integration and streamlining of the various activities. Statistics show that unless there is proper application of technology, it would not be effective and efficient. Unless an effective supply chain management along with the lean a system is installed in a
medium/ large sized port, the costs would be too high to manage with the increasing competition. Conceptualizing ports from a logistics and supply chain management approach would help propose a relevant agenda of port functioning (Bichou & Gray 2004).

In the port industry, there is a greater need for better integration in the supply chain. Resources cannot be used in a cost-effective manner, and the business cannot flourish on a long-term perspective, unless streamlining is effectively done, (Song & Panayides 2008).

**Summary**

The literature review section has explored past academic literature on supply chain management in ports. It was noted in this literature review that, the port of XYZ experiences several logistic challenges. More specifically, the section has looked into the supply-chain management challenges through the following dimensions: the size of the port, the management activities in the port, methods/ payment systems, and risk management. This paper contends that analysis of supply-chain management issues is the starting point in devising solutions.

The supply chain includes a wide range of activities such as planning, control, execution, as well as dispatching cargo to the end user. These activities start right from receipt of goods/cargo into the port and include acquisition of raw materials, production, and distribution of goods to the final user. This paper has also emphasized that the process needs to be cost-effective and streamlined as much as possible. The port will be able to attain a competitive advantage, from the perspective of this study, through ensuring cost efficiency, having a competent team of management, and use of computerized payment systems for making payments. To this end, the port of XYZ needs to implement recommendations given to solve its challenges and attain competitive advantage.
Chapter III: Methodology

This research study sought to shed more light on the supply-chain management challenges faced at the port of XYZ. This chapter presents the researcher’s approach to data collection; the research methods used by researcher to collect data.

Target Population

This study targeted 400 employees of port XYZ performing various functions such as shipping, dockside operations, handling bulk cargo, transporting, as well as clearing and forwarding. The respective numbers of employees performed different functions from labor, lead, supervisors, managers and executives are 300, 5, 50, 26 and 19 respectively, totaling to 400. Given the limitation of resources and time, this study selected 6% of the total population mentioned above. The key factor to consider here was making the sample size manageable. This research study used random sampling techniques to select the sample where each member had an equal chance of selection.

The stratified random sampling technique was applied to select the participants. The strata were top management, middle-level employees, and entry-level employees. From the sample of 25 employees, two were top management, 10 were middle-level employees, and 13 were entry-level employees. The entry-level employees were from the majority in the port of XYZ; majority selection here was justified.
Table 1

*Target Population Table*

<table>
<thead>
<tr>
<th>Function</th>
<th>No/Employee</th>
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<tbody>
<tr>
<td>Labor</td>
<td>300</td>
</tr>
<tr>
<td>Lead</td>
<td>50</td>
</tr>
<tr>
<td>Supervisors</td>
<td>26</td>
</tr>
<tr>
<td>Managers</td>
<td>19</td>
</tr>
<tr>
<td>Executives</td>
<td>5</td>
</tr>
</tbody>
</table>

**Instrumentation**

The primary tool used for data collection in this research study was a questionnaire. In addition, root and effect, 5s, and risk assessment sheet were used to provide further study to document the current state of the XYZ port operation. The survey was intended for the port of XYZ employees. No other outside party could participate in the study as it could lead to false and invalid data. The survey questionnaire included both open-ended and structured questions. An open-ended question allows the respondent to give his or her views regarding the issue under investigation. Structured questions do not give an opportunity for respondents to giver personal views, but rather guides the respondents to select from the given choices (Lo & Thai, 2016). Structured questions were formulated on the basis that it is easy to administer and analyze them while open-ended questions were used because they allow the respondents to give more in-depth responses and express their views.

There are many advantages of questionnaires such as, (1) less costly as the researcher email the respondents, (2) questions are simple for the convenience of the respondents, (3) are easy to administer, and (4) can be left with respondents who will respond in their convenient
time. The questions were structured to obtain views of the respondents. All the four sections sought to solicit employees to give data in particular and respective study variables (risks and supply chain management).

**Cause and Effect Diagram**

A cause and effect diagram was developed to visual analysis of the XYZ port activities. It determines which step(s) of the process requires redesign and improves its activities. Employees were asked to document, identify, and understand the cause and effect of the designated area of responsibilities. Cause and effect diagram (Figure 1) aim at finding out the actual issue, which causes a non-conformance. The cause and effect diagram focused on area such as receiving goods, procedure, storage, team, payment system, and inspection. Having a proper understanding of the cause and effect helps in knowing the actual challenge and design the processes accordingly.

<table>
<thead>
<tr>
<th>CAUSE</th>
<th>EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive</td>
<td>Problem</td>
</tr>
<tr>
<td>Procedure</td>
<td>• Delay</td>
</tr>
<tr>
<td>Inspection</td>
<td>• Lost Goods</td>
</tr>
<tr>
<td>Team</td>
<td>• Defect</td>
</tr>
<tr>
<td>Payment</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 1. Cause and effect diagram.*
Risk Assessment

Participants also documented activities using risk assessment sheet (Table 2) to examine the impact of treats and vulnerabilities to the port operation. Participant from several areas of responsibilities were given a set of questions in form of a table (Figure 2) for recording risks in terms of customer satisfaction, economic issues, time scheduling, environmental risk to determine which areas needs more attention. The tool will assist with minimizing problems identified by the employees and develop an action plan for workers to communicate risk within the XYZ port operations effectively.

Table 2

*Example of Risk Assessment Sheet*

<table>
<thead>
<tr>
<th>Risk Event</th>
<th>Likelihood</th>
<th>Impact</th>
<th>Risk Rating (likelihood x impact)</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Scheduling</td>
<td></td>
<td></td>
<td></td>
<td>- Throughout all operation</td>
</tr>
<tr>
<td>Economic Issues</td>
<td></td>
<td></td>
<td></td>
<td>- Most critical: shipping and clearing</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td></td>
<td></td>
<td></td>
<td>Throughout port activates</td>
</tr>
<tr>
<td>Environmental Risk</td>
<td></td>
<td></td>
<td></td>
<td>Throughout operation activity receiving, shipping, and transporting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Throughout the port designated areas</td>
</tr>
</tbody>
</table>

Rating Scale: 5=High, 3=Medium 1=Low

5S Process

The 5S process (Figure 2) was presented to participants so that work can be performed effectively and safely. The goal was to reduce waste and time it takes to complete activities. Participants were given opportunity to implement a process by using the 5S sheet to help
standardize activities within the port operation to increase productivity and efficiency. The 5S consist of five principles: sort, set in order, shine, standardize and sustain.

![5S Process Map](image)

*Figure 2. 5S process map.*

**Data Collection Procedures**

Primary data was collected using questionnaires. The researcher sent a formal email to the participants explaining the nature and purpose of the study and sought their consent. After obtaining participant’s consent, the researcher sent questionnaires to the participant for completion. The participants were free to complete the questionnaire at any time and place according to their convenience. To ensure protection of their privacy, the questionnaire did not require them to fill personal data like name. It was clarified that, upon completion of the study, the information was to be destroyed after analysis thus adhering to the ethical requirements of the research study.

The cause and effect sought to identify the origin of a problem using a number of steps in order to determine what happened, why and what to do to reduce the likelihood of that problem. The key assumption in this step is that events are often interrelated, such that one event causes the other.
Using the cause and effect diagram, the first step was: (1) problem statement which was stated that the port of XYZ is experiencing supply chain management challenges, (2) Data collection; results showed that the port experienced delays in payments, along with the capacity of handling goods (Peerally, Carr, Waring, & Dixon-Woods, 2017), (3) identification of causal factors. This study appreciated that use of manual systems of payment is a key driver to the current problem. In step four, it was appreciated that the fact that the port serves a small area has been the reason for using manual systems. In step five, the study recommended that the port adopt strategies such as leveraging technology.

This paper appreciates the fact that there are risks that may affect the research, based on their impacts. As such, effective risk analysis is important in a research study. It was agreed that there are a number of risks such as lateness in data collection, and inaccurate data collection. The impact of risk can be classified as, either high or low, and probabilities as either high or low (Modarres, 2016).

Another important technique was the 5S process. It helps to perform the work faster, and safely. The 5S refers to; sort means eliminating any unnecessary work clutter. In this way, the process of data collected focused on removing any unnecessary work. setting means putting things in order. It aims to ensure that data collection processes and procedures are well organized. In this perspective, during data collection it was ensured that all necessary tools were readily available, and strategically located in case any need arises. shining, means it is important to organize work daily. In this perspective, the data collection procedures need to be neat and clean meaning that data collection procedures are done in a very professional way. For instance, the questionnaire provided to client was to be free of flaws (Agrahari, Dangle, & Chandratre, 2015). Then comes standardization, in this step, a key concern is on adherence to the research
norms and ethics. It must be in a way that leaves the clients in no doubt as far as the research is concerned. It simply means remaining disciplined and smart to make changes in prior steps sustainable. This will encompass effective communication.

**Data Analysis**

Having collected data, the researcher edited it for accuracy and checked for reliability, validity and completeness in preparation for analysis. Analysis was according to the three main themes: the current state of the port, the logistic challenges faced at the port, and strategies to minimize/counter the challenges. It is from these themes that inferences, and conclusion drawn regarding the research problem. The whole process of data collection took two months, from early September to early October 2019.

**Study Limitations**

Firstly, the results obtained cannot be generalized across all other ports in the country because it was conducted in the only country’s seaport while inland ports were excluded. The country has more inland ports than seaports; therefore, a study that includes all the country’s port should be conducted and see whether the same results will be obtained.

Secondly, the sample size for this study was very small due to resource and time constraints. For a research study, the sample size should be infinitely large to represent the whole population; however, the sample size used was very small.

Thirdly, the data collection instrument used was the questionnaire. In this method, the researcher sent an email to the participants to fill the questionnaires and submit. Because the researcher was not present to help participants complete the survey questions to clarify any difficulties with the survey could have weakened the results, this implies that a study where the researcher is present could help eliminate these inconsistencies.
Fourthly, this study suffered another major problem, where getting top employees was very difficult, given their tight work schedules. Contrary to other employees selected to participate, the researcher had to send email to remind them continually. Given the pressure to fill the survey and tight work schedule, the top management representatives could not have taken time to respond to the questionnaire. Hence, there could be flaws in the collected data from this group.

Finally, data was collected from permanent employees, excluding other contractual and private employees. In this way, the views of these employees could add to the information on how to address the current logistic challenges at the port of XYZ but were excluded. Their contribution could have given insightful information about the problem at hand.

**Summary**

The research methodology chapter describes the research methods used to collect and analyze data to address the research questions of this research. This methodology aligned to the research question formulated: what strategies should be implemented to address logistic challenges faced in the port of XYZ. The chapter begins a description of the research design, where a case study design is proposed. The subject selection and description follow the case study. The subject, in this case, as employees of the port of XYZ, comprising of the top management, the middle-level employees, and entry-level employees. A sample of 25 was selected from the 400 employees working at the port. Of these 25 employees, two were top management, 10 middle level, and 13 entry-level employees. Based on the nature of this study, qualitative data was collected, using themes such as leadership and general management, risk management, clearing and forwarding, and storage and transportation of goods in the port.
The chapter then continues with data collection procedures, where a description of the data collection approach is given. The methods for data collection were that the researcher first sends an email to participants explaining the purpose before obtaining their consent. After receiving the consent form, then the questionnaire was sent to participants for them to fill.

In addition to the primary data collection of questionnaires, participant were given tools to identify cause and effect, risk assessment sheet and 5s process map to help determine which procedures in a process may need to be eliminated, and which procedures may need to be improved.

Finally, the data analysis approach was that the researcher checks the data for accuracy, edits it where necessary, monitor for validity and reliability and then arranges it for analysis. Data analysis was conducted with respect to the themes mentioned earlier in this paper. Further, the chapter continues to address limitations, including the methodological limitations such as small sample size, limited time for data collection and inconsistencies in data collection.
Chapter IV: Results

Port XYZ has identified several obstacles during its risk assessment and supply chain assessment stage. Good port management relies on a range of factors such as governance, supply chain skills, infrastructure, expertise in engineering, etc. Risk arising from lack of infrastructure, effective management and government regulations are key disincentives to an active port operation system.

This chapter reviews the results of the study, including a detailed analysis of the 25 workers who received the survey questionnaire. Out of those 25 workers, only 18 responded for an overall response rate of 85.71%. Seven workers did not participate.

Item Analysis

After comparing the total positive responses to the negative responses, we can safely conclude that the majority of XYZ port employees believes that the overall work they do is important. The first area of the survey results covers technology and looking at the data, we can safely say that 77.78% of XYZ employees reported that the organization provided strong support with technology training. The flow of information also received high mark with 83.33% of respondents believing that due to increased use of technology they were now able to have many data points in making their decisions. The port operation currently supports future processes and operation activities with a positive response of 61% compared to 11% negative responses.

The second part of the questionnaire centered on the leadership and general management concepts. XYZ employees are generally satisfied with leadership team as 72.22% of the respondents said yes compared to only 11.11% expressing any form of concern. Data points related to the “Sharing new ideas and suggestion” parameter also shows that 78.95% favored when employees shared information with leadership, and 61.11% felt that the organization
established guideline and responsibilities to the employers whereas, 22.22% gave a negative response.

The third section summarizes the risk management at the port operation. 77.78% of the XYZ port employees considered that management communicating or developing effective contingency plan helped them boost their performance. In addition, 72.22% of participants appreciated communication of risk and business interruption and supported the end-to-end resource capacity planning by the management.

The fourth area reviewed parameters related to the ease of clearing and forwarding cargo shipments. 88.88% of the employees believed that when the organization provided its customer with proper guidelines, the overall work impact is high and satisfactory. Another parameter called the safe storage at the port also marked high positive response rate with 83.33% of the employees supporting this move. Another parameter called the “strict policy on corruption procedures” was supported by less than half of the employees as they gave only 44.44% positive responses.

Finally, the fifth segment focused on storage and transportation. Approximately 33.88% of the employees reported that the organization use of effective system to monitor storage helps them in their day-to-day functionality. Tools like inventory tracking system also got a major support, with a positive response rate of 44.44%. Machines and equipment used by employees at the port of XYZ got support with only 38.89% of the participants giving negative feedback.
Table 3

Results of the Employee Feedback Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Neutral</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Organization provides strong support with technology training</td>
<td>2</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>The current information technology at our organization support current and future process of all operation activities</td>
<td>5</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>How has the flow of information changed due to increased use of technology at your workplace?</td>
<td>2</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Does your organization encourage its staff to learn about new technology?</td>
<td>1</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Overall, how satisfied are you with your department/group leader/manager.</td>
<td>4</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Do you feel comfortable sharing new ideas and suggestions with leadership at work</td>
<td>3</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>The organization defines organizational structure to their employee’s by establishing guidelines of the key</td>
<td>3</td>
<td>11</td>
<td>4</td>
</tr>
</tbody>
</table>
responsibility and accountability of each employee

Management fully considers risk in determining the best course action and providing effective contingency plan

Management communicates any risk and business interruption stemming from technology failure, equipment failure or other events, which will impact operation activity

The organization practice efficient resource capacity planning to ensure that customer needs and demands are met in a timely fashion

The Employees of the organization use the financial, future earnings, and assets for authorized or ethical purpose

The organization provides the customer with proper guidelines for clearing and forwarding cargo

Does your organization strive to consistently meet or exceed customer expectation
The customers agree that clearance fee as reasonable charges for quality of services provided by your organization.

The organization has a strict policy on corruption and has procedures how to identify and eliminate.

Does your organization provide a safe storage for the goods that arrive at the port?

The organization uses effective application to monitor storage availability, registration of goods, and inventory tracking system.

The machines and equipment used by the employees at the port are considered to be up-to-date, safe, and effective allowing the employees to carry out all operation activities in a timely manner.

<table>
<thead>
<tr>
<th></th>
<th>7</th>
<th>9</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>195</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4

Risk Assessment Sheet Results

<table>
<thead>
<tr>
<th>Risk Event</th>
<th>Likelihood</th>
<th>Impact</th>
<th>Risk Rating [likelihood x impact]</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Scheduling</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>- Throughout all operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Most critical: shipping and clearing</td>
</tr>
<tr>
<td>Economic Issues</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Throughout port activates</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>Throughout operation activity receiving, shipping, and transporting</td>
</tr>
<tr>
<td>Environmental Risk</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>Throughout the port designated areas</td>
</tr>
</tbody>
</table>

Rating Scale: 5=High, 3=Medium, 1=Low

The initial risk assessment performed by the research team on the port operations revealed that the current process itself was not flawed, meaning the process was working as it was intended to work but there were still areas that needed improvement through the use of lean methods, technology and process realignment. The risk assessment therefore focused on parameters that can be improved in both short-term and long-term. Economic viability parameter had the highest impact and likelihood and all major efforts had to be developed keeping the goal of economic improvement in mind. Customer satisfaction and Time Scheduling had equal final risk rating. Both these parameters can be improved by using technology, simplifying port operation chains and ensuring timely flow of information from senior management. Environmental issue was a concern but at a much later phase. Right now, the prime focus for the port should be to simplify and streamline process chains, cut irrelevant costs and ensure use of technology to achieve higher efficiency.
Cause and Effect Diagram

Port XYZ has faced many operational issues in the recent years and therefore our team decided to do a root cause analysis to have a better understanding of the current state and process flow of major port operations. During our analysis we found that, Port XYZ has significant inefficiencies with tools and technology. Outdated, legacy-based and non-flexible port operating technology has created significant capacity limitation for XYZ port. In addition, the current processing system for cargo handling and communications has severe accessibility problem for bigger cargo ships. Both these tools play a major part in daily operational activities and need immediate revamping and restructuring.

Another area of concern identified during the current state analysis is the training for the employees. Organizational leadership at Port XYZ needs to step-up and be decisive. They need to listen to the feedback from their employees and build credible partnership. They need to usher a new era of revolution in terms of redesigning the port operational team and the overall process of performance evaluation. Employees need training, recognition and support for professional and personal growth, the leadership must embrace such model of employee motivation.

In the case of receiving goods and procedure at port XYZ, the information appears to be incomplete in many cases, and the inspector won’t know what information to verify or how to label the container. As a result, this can cause major delay, and serious problem when compelled to meet the required regulation checklist for clearing goods at the port.
**Figure 3.** Cause and effect diagram result.

**5S Process Map**

The main purpose of 5S process map was to summarize and develop a method to reduce waste and time by standardizing the port operation activities. First, participants were given a sheet to identify and record problems they encounter when they use the current inventory tracking system to monitor storage, availability, and registration of goods. Participants were asked to list the major factors that could create a delay in transportation and lack of storage during critical situations. Outdated applications, inability to add new features, application running slow or crashing often, and falling behind competitors were the major issues identified. The outdated application used throughout the organization is prone to security breaches and are vulnerable to hackers targeting the system and gaining unauthorized access. New features that are incompatible with the current system were constantly added, thus creating several downstream issues for IT operations team. The IT division was mainly responsible for helping the team override system issues and allow registration of goods and payment process. Their
working methodology and tools to identify root cause issues were inefficient, thus causing delay and backlog. The system often ran slow or crashed too often, mainly due to the use of outdated technology. These has led to Port XYZ falling behind the competition. There are significant capacity and huge system deficiencies that need immediate attention.

The future state design creates a pathway to effectively rationalize each problem and develop targeted solution. We created a small demonstration of new tool used to track the capacity of storage center and it immediately showed the potential advantages achieved down the line. The new tool improved the daily processed capacity of port operations and contributed to a better utilization number.

Figure 4. 5s process map results.

Summary

This study identified several key areas of concerns and improvement for Port XYZ in terms of supply chain and operations. The researcher conducted a current state analysis to mark down and group activities that need immediate improvement. Reducing waste, monitoring of storage facility, use of advanced technical tools to increase efficiency are the major initiatives that the firm can take immediately. For longer term, senior leadership team needs to streamline itself and constantly lookout for employee concerns and areas of growth for them. There is a
huge amount of either untapped or underutilized value day-to-day operations. There is need for a company-wide support for all major organizational changes including Port Operations, development of a transformation plan with top management and employees as equal stakeholders. We also saw the need for major improvement in port capacity utilization due to the use of new technology.
Chapter V: Conclusion and Recommendation

This chapter will present the conclusion and recommendations for our study research. Port XYZ experience serious challenges as well as effective resource management. Delayed payment system, poor vendor relationship management, no risk assessment, and less technology use contributes significantly to these problems at the port.

Port XYZ is facing a huge problem in streamlining operations, reducing costs and increasing the overall efficiency of their employees and management. With an outdated and inefficient port operating technology, port XYZ has significant capacity limitation for a port serving three countries.

The processing system for cargo handling and communications also needed significant uplift, thus reducing the accessibility problem for bigger cargo ships. It was against this backdrop that there was the need to examine the current state of operations, management structure, and employee productivity. All these three areas will help identify the root cause of problems and design a future state with effective model of operations.

The mode of maritime transport plays a very important role for the XYZ port economy as it serves three countries. The world of import and export has risen rapidly to ensure that the port stays competitive, it is necessary that the efficiency of the port operations and services is effective since the cost of port ships and goods determines the major part of the shipping chain. As discussed in the literature review, as competition increases, better planning and efficient supply chain management is essential to grow and succeed in the port industry. Without understanding the importance of supply and demand management, resource use would be inefficient, leading to development and survival challenges.
By implementing 5s process map, the transformation results were a success determining problematic areas after updating current tracing inventory management, and transformed the work activities into an organized, and efficiency environment. This reduced the cycle from receiving to storage by 40% after proper flow of information and timely movement of the physical goods from the suppliers, which permitted the workers to manage the goods and keep it moving the next step without major delay.

**Recommendations**

The following recommendations based on the new port operation and further development. The alternative solution for improving port performance and productivity include enhancing operation methods along with good management. One of the port main challenges is human resource and therefore improving human resource development plan by focusing on effective hiring, promotion, fair pay, and corruption reduction or minimization is critical. Training of employees is one the most effective way to help them learn and retain information and therefore, the port must establish a facility for adequate training. A huge number of issues at port XYZ are related to effective sharing information with the senior management team. To resolve this, the training of employee should emphasize on how to improve exchange of information cross-functionally so that employees across all level and team can feel engaged. Bottom-up management method will be beneficial for optimizing port communication structure and increase flow of information as it involves employee input project plan, activities, and goals. It is essential to improve employee confidence by recognizing their performance and developing incentives such as pay raise or promotion. Rewards reinforces the confidence in employees, which will in turn boost employee confidence and make them believe that they performed beyond their normal roles.
Another important recommendation is to formulate a strict policy on corrupt practices. The company needs a strong policy to tramp corruption and ensure that people understand the importance of doing fair business. Regular compliance check, whistle-blower protection, security and fair practices training can help regulate and formulate good business practices.

Effective use of technology to initiate efficient payments/port operations as well as monitoring functions to replace the current manual outdated systems for making payments and clearing cargos in the port is critical. Analyzing the best-computerized port payments system is the first step to identify a change management initiative at the firm.

In addition, setting up the clearing process and customer/employee training is essential to make the technology transformation a long-term success. Large ports handle huge payloads of cargo per day, and payments remitted. This implies that the supply chain of the port must be very extensive to allow handling such functions in an effective way, hence boosting competitive advantage. Therefore, it is necessary for ports to adopt computerized payment remitting and cargo tracking systems. A computerized system will be capable of tracking all cargo received, their quantities, and respective amounts, thus ensuring accountability.
References


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https://doi.org/10.1080/03088830701848953


https://doi.org/10.1016/j.jclepro.2015.05.080


## Appendix A: Questioners Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Neutral Responds</th>
<th>Positive Responds</th>
<th>Negative Responds</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Organization provides strong support with technology training</td>
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<td>The current information technology at our organization support current and future process of all operation activities</td>
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<td>How has the flow of information changed due to increased use of technology at your workplace?</td>
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<tr>
<td>Do you feel comfortable sharing new ideas and suggestions with leadership at work?</td>
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<td></td>
</tr>
<tr>
<td>The organization defines organizational structure to their employee’s by establishing guidelines of the key responsibility and accountability of each employee</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Management fully considers risk in determining the best course action and providing effective contingency plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management communicates any risk and business interruption stemming from technology failure, equipment failure or other events, which will impact operation activity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The organization practice efficient resource capacity planning to ensure that customer needs and demands are met in a timely fashion</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The Employees of the organization use the financial, future earnings, and assets for authorized or ethical purpose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The organization provides the customer with proper guidelines for clearing and forwarding cargo</td>
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<td></td>
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<tr>
<td>Does your organization strive to consistently meet or exceed customer expectation</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
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Does your organization provide a safe storage for the goods that arrive at the port?

The organization uses effective application to monitor storage availability, registration of goods, and inventory tracking system.

The machines and equipment used by the employees at the port are considered to be up-to-date, safe, and effective, allowing the employees to carry out all operation activities in a timely manner.

Total
### Appendix B: Risk Assessment Sheet

<table>
<thead>
<tr>
<th>Risk Event</th>
<th>Likelihood</th>
<th>Impact</th>
<th>Risk Rating [likelihood x impact]</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Scheduling</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>☐ Throughout all operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>☐ Most critical: shipping and clearing</td>
</tr>
<tr>
<td>Economic Issues</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>☐ Throughout port activates</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>☐ Throughout operation activity receiving, shipping, and transporting</td>
</tr>
<tr>
<td>Environmental Risk</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>☐ Throughout the port designated areas</td>
</tr>
</tbody>
</table>

**Rating Scale:** 5=High, 3=Medium 1=Low
Appendix C: Cause and Effect Diagram

Problem
- Delay
- Lost Goods
- Defect

CAUSE

Receive Goods

Insufficient procedure

Insufficient procedure

Outdated system

Lack of training

Team

Procedure

Inspection

Lost Goods

Defect

Payment

Storage

Lack of space
Appendix D: 5s Process Map

- Sort
- Receive Good
- Collect
- Place it in chronology of order

- Set in order
- Setup, arrange in order of the
  Picking process
- Shortest distance between each set

- Shine
- Clean each area
- Safety
- Free up space to be more productive

- Standardize
- Correct labels
- Set up training

- Post visual audit
- Share the report with leadership
- Document improvement