DESIGN OF AN OPERATIONAL MODEL TO IMPROVE THE EFFICIENCY OF CONTAINER CARRIERS IN PANAMA PACIFIC PORTS

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Keywords

Port, Efficiency, Control, Time.

Abstract

Panama container ports in pacific coast are placed in the entrance of the Panama Canal in its Pacific side. This situation supposes that all traffic inbounds the canal or going to port terminals, are sharing the same space. This situation can provoke congestion and delays in the ship's calling at terminal. From the freight point of view, the time when ship is waiting for a calling slot, is redundant in all the transport chain required time. If additionally, there are also obstacles and not fluent traffic in the shore side (terminal); the multimodal transport chain will be affected in terms of demurrages and disconnections.

This paper is going to present the first stages in the design of the performance model to improve freight transit efficiency. Through field work carried out through questionnaires sent to land transporters, along with a series of interviews with responsible transport and maritime area personnel. They show us results that indicate that the current maximum average time that a carrier takes in each process to be able to deliver and/or pick up a freight is 30 minutes. This suggests that it is necessary to strengthen the processes, to achieve a reduction in times.

1 INTRODUCTION

Fig. 1 Aerial view of the Port of Balboa and the PSA terminal study area.
Source: Supplied by Hutchison Ports PPC, All Rights Reserved.

Trade has played a very important role in the history of Panama, because since its discovery in 1501, the country has been dedicated to the movement of freight from one coast to the other one. And it was not until 1534, when the first studies were ordered to create a route to the Pacific following the Chagres River, which was on the Isthmus of Panama (MONTERO CASTILLO, 2006).

In 1902, an agreement was reached with the French company to transfer the rights to build the canal to the Americans for the price of 40 million (GIRALDEZ ROACH, 2018). The United States achieved the completion of this interoceanic route on August 15, 1914.

As the years went by, this canal needed improvements and adaptations in size and draft to make way for new vessels that could carry out transit and provide a better service to global trade, which demands improvements in the delivery times of goods. And for this reason, the canal expansion is carried out.

The container ship called Cosco Shipping Panama was in charge of carrying out the official inauguration of the Cocolí and Agua Clara locks, in June 26, 2016, the third lane for the passage of Neopanamax ships (GIRALDEZ ROACH, 2018).

With this new expansion and the opportunity to receive new vessels, with a larger size, the needs that Panamanian ports must cover also increase, since they are vital nodes in the supply chains not only at the national level, but also at the global level.

The development of high-quality, efficiently operated port infrastructure has often been a prerequisite for the success of growth strategies, particularly those driven by exports.

For the Panamanian Pacific, the opportunity has been presented to carry out a detailed study of all the processes inside and outside the facilities, which establishes the strengths of its operations and the weaknesses in the service being provided. The port sector in Panama has been characterized by playing a very important role in the economy, representing a pillar in the country's heritage, with a contribution of approximately 30% to the national GDP.

With the Study of delivery and/or withdrawal times of containerized cargo from the ports of the Panamanian Pacific, we will be able to establish the variables that give rise to possible weaknesses as a starting point, and develop an improvement plan.

The surveys will be administered at Panama International Terminal. (PSA) and Hutchison Ports PPC, that operates the Ports of Balboa (Pacific), port facilities in the Panamanian Pacific. Where the interaction of cargo traffic to the port is correlated with congestion in the areas near them, it is sought that there is an impact with the city, since it generates an impact on traffic. The different points of the ports where trucks have to carry out a procedure were analyzed, the times in which the truck takes to enter the port facilities will be taken.

Panama International Terminal. (PSA), is a port terminal located on the West side of the entrance to the Pacific Canal, precisely in the former Rodman naval base. This port operator began operations in December 2010 with the reception of iron products and other supplies for the expansion of the Canal.

Hutchison Ports PPC has operated the Ports of Balboa (Pacific) and Cristóbal (Atlantic) since 1997, located at both ends of the Panama Canal. Serving as a distribution center for the Atlantic and Pacific trade routes, the ports are equipped with extensive facilities for handling containers, general cargo, bulk cargo and passenger vessels.

This document will address the topic of the surveys carried out on the carriers that transit through the port of Balboa and PSA, with the purpose of knowing the delay time when entering the cargo terminal and in which areas, problems occur that cause these delays. This in order to identify the causes that produce delays in entering the terminal and thus be able to implement measures that help improve the operation and optimize entry to it.

The methodology that was used was the survey, through an interview to the driver when the vehicle is stopped waiting for its turn to enter the port, or by filling out the form with the vehicle's data when it was moving, which covered a significant number of carriers for a set period of time.

The results allowed us to identify problems that are affecting the delay time when entering the port, quantifying that the maximum time that an import takes in Balboa is 2 hours and in PSA it is 1:50 hours (COEL, 2023), and with these values, measures can be taken, it is necessary to minimize times in the offices and places that their values are greater than those established in the terminals.

2 OBJECTIVES

To document and analyze the times required for a land carrier of containerized cargo to deliver or remove a full or empty container in the Pacific ports of Panama. The purpose is to search for improvements in operational procedures that would allow the movement of a greater volume of cargo and to improve the competitiveness of the area and improve transport mobility to the ports.

2.1 Specific objectives

1. Establish the average delay time for trucks entering the port.

2. Identify the area of the port in which the greatest problems that cause delays, happens.

3. Analyze external factors that may have an effect on the delay time.

4. Establish recommendations to optimize the experience of carriers when entering the port.

3 METHODOLOGY

The methodology used for the project development is detailed below. Once the congestion problem is identified on shore, a statistical survey was carried by means of surveys organized in two phases. A first phase outside the port facilities and a second inside the facilities. The aim was to identify all the parameters, steps and times in which the journey is made to deliver the cargo or collect the cargo that arrives at the port.

The survey design began through a meeting with the students and the interested agents in the results of the survey. In the case of the second phase, the collaboration of the interested agents was of great importance in order to establish the scope of the measurement, and finally, the data collection section where the day, place and time of the surveys are detailed.

3.1 Survey design

In order to obtain a real time picture of all the steps that the freight passes, the process was in usen a survey.

Phase 1: surveys were carried out for a period of two weeks from 6:00 am to 8:00 PM outside the PSA and Port of Balboa facilities, to find out through interviews to the carriers, their experience in waiting times. With the collaboration of Professor and students from the Technological University of Panama. The development of the survey presents the following conditions: if the transporter arrived and did not have to wait, only the license plate and time were taken on the survey form. Otherwise, the different questions are asked.

If you had to wait in line, and if the carrier allowed it, he is asked 12 questions, that are related to the moment, places within the port where the wait was longer.

Phase 2: with the collaboration of PSA and Port of Balboa (PPC), the Maritime Authority of Panama (AMP), George Tech (GT) and the Technological University of Panama (UTP).

A group of V-year students of the Port Maritime Engineering program were located at different strategic points of the PSA Panama terminal and Port of Balboa, which allowed them to take the arrival and departure time at each of the carriers' locations, which move containerized cargo.

Data collection was carried out from 8:00 AM to 5:00 PM. Which generated a report prepared by George Tech called "Performance of the Port Cluster of the Interoceanic Zone of Panama in Serving Carriers, Study carried out at the request of the Logistics Business Council (COEL, 2023). Presentation of the August 2023 report. For this project, only data from the Pacific coast are presented.

3.1.1 Survey organization

a. Meeting with students

Phase 1: a meeting was held with the students who were going to carry out the surveys, where each of the questions and how the surveys had to be carried out were explained. In order for the student to have an idea of how to handle each situation.

Phase 2: In the second part, the coordination was carried out by George Tech, because they were designated for data collection, analysis of the results and presentation of recommendations to the ports and authorities involved.

b. Involvement of interested agents

Phase 1: Contact was only made with the carriers and additional information could be received based on the reasons the carrier explained the delay in the processes.

Phase 2: There was visual contact at each location with both parties, the carrier and with the port personnel who provided the service, as shown in Figure 2 in the different locations. Where a record of observations was made of the anomalies that occurred when a carrier arrived and some inconvenience occurred that did not allow a normal process to develop.

The different points where the times were taken were those indicated in Figure 2:

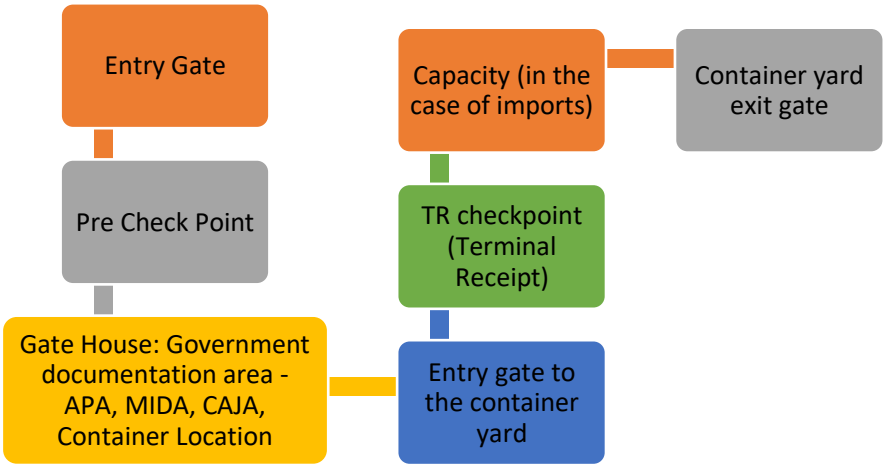

Fig. 2: Process flow of phase 2, inside the terminal where the times were taken.

c. Data Collection

Phase 1

From February 6 to 17, 2023, data collection was carried out at the entrance of PSA and the Port of Balboa from 8:00 AM to 7:00 PM, in groups of 3 students.

Phase 2

From March 27 to March 31, 2023, data collection was carried out at the port entrance, Precheck, Gate House (APA Office: CUSTOMS Authority, MIDA: Ministry of Agricultural Development, Pay, Location of yard), Entrance to the patio, Patio, TR Gate (Terminal Receipt), Departure Gate, those indicated in Figure 2. From 8:00 a.m. to 5:00 p.m., one student at each location.

4 RESULTS

4.1.1 Phase 1

Once collecting the data, in the surveys from the carriers, it has been possible to measure the information, which allows us to establish a complete picture of the waiting time diagram for trucks outside the port facilities. 617 surveys were carried out, of which 300 and PSA 317 were carried out in the Port of Balboa. In the observations of "Operations and availability of port equipment" and "Personnel" for the Port of Balboa, as can be seen in figure 3 part A, they are the ones that present the greatest concern for carriers.

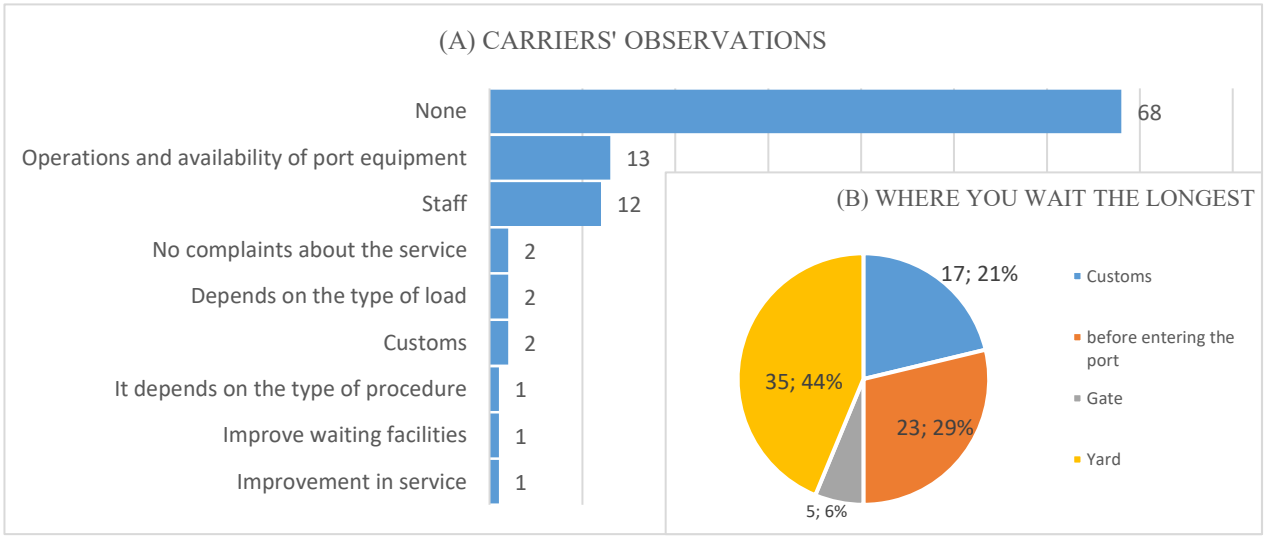

Fig. 3: (A) Opinions of the carriers of the experience they have each time they make a delivery or pickup cargo at the Port of Balboa is shown in a bar graph. (B) The places in the port facilities where they must wait.

In the PSA Port case, according to Chart 2, figure 4 part A, the "Personal" option is the one with the greatest concern for carriers. Part B, the highest waiting times are generated in the queue before entering the port and in the container yard.

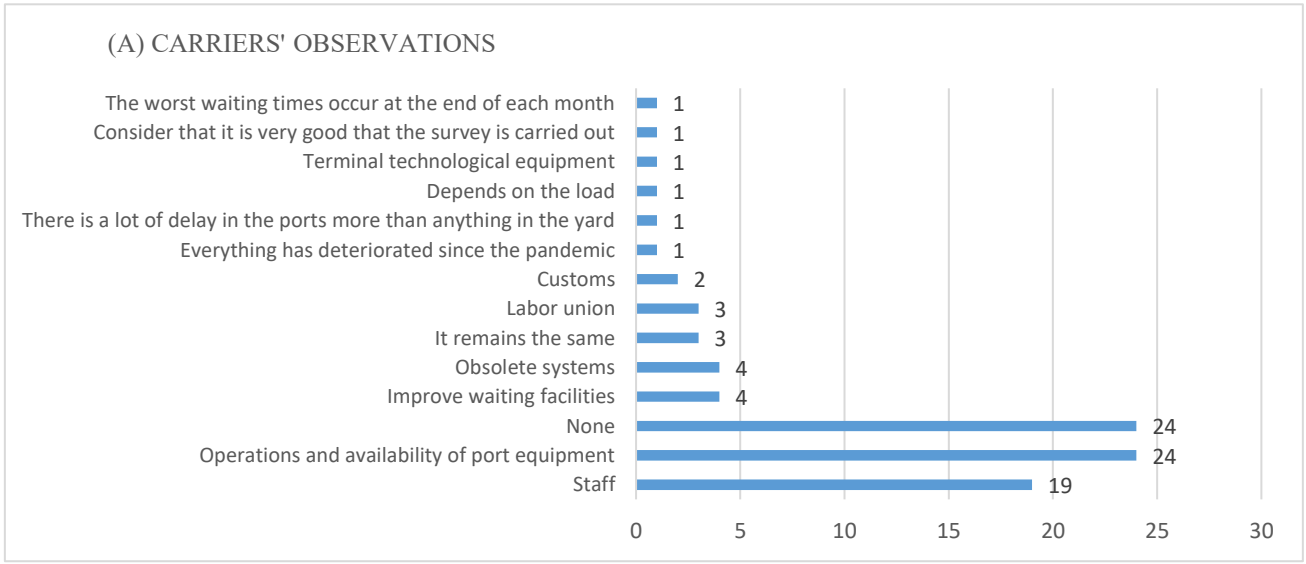

Fig. 4: (A) Opinions of the carriers are presented in a bar graph; the experience they have each time they make a delivery or collection of cargo in the PSA. (B) The places in the port facilities where they must wait.

Analysis of the surveys of Phase 1 for the two ports PSA and Balboa, carried out on the transporters, before entering the Ports in both cases. Figure 5 presents the results of a group of questions related to times, in years, months, hours, showing the dates when the surveys were carried out, we find times of the year where the wait increases, these are the months from October to December, the waiting range is generally greater than 30 minutes, and this increase has been growing according to the perception of those surveyed since 2017.

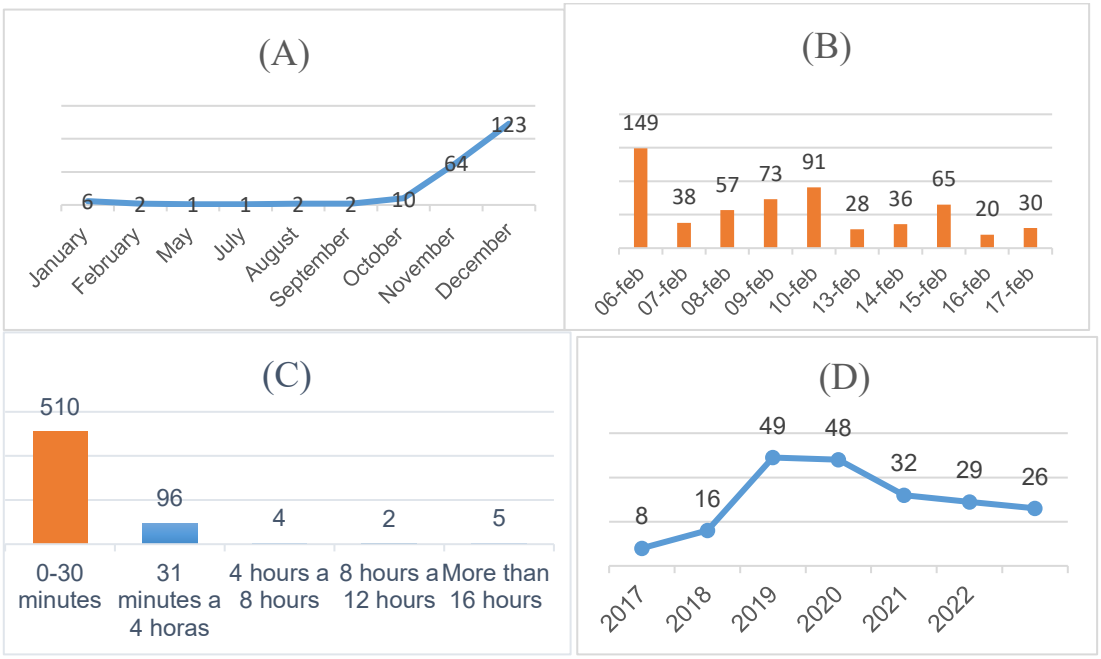

Fig. 5: (A) presents the different months of the year and where the waiting time is greatest. (B) The days where the surveys were carried out. (C) Waiting times in minutes. (D) What has been the evolution per year of the waiting in the two facilities. The graphs shown are the summary for the two terminals.

4.1.2 Phase 2

The second phase of getting data happened through observations and annotation of times and observations. Once carrier arrived at each point, from the entrance to the exit of the port are; the time of arrival and the time of departure from that place was recorded. Which resulted in figure 6, which indicates the average waiting time and the standard deviation.

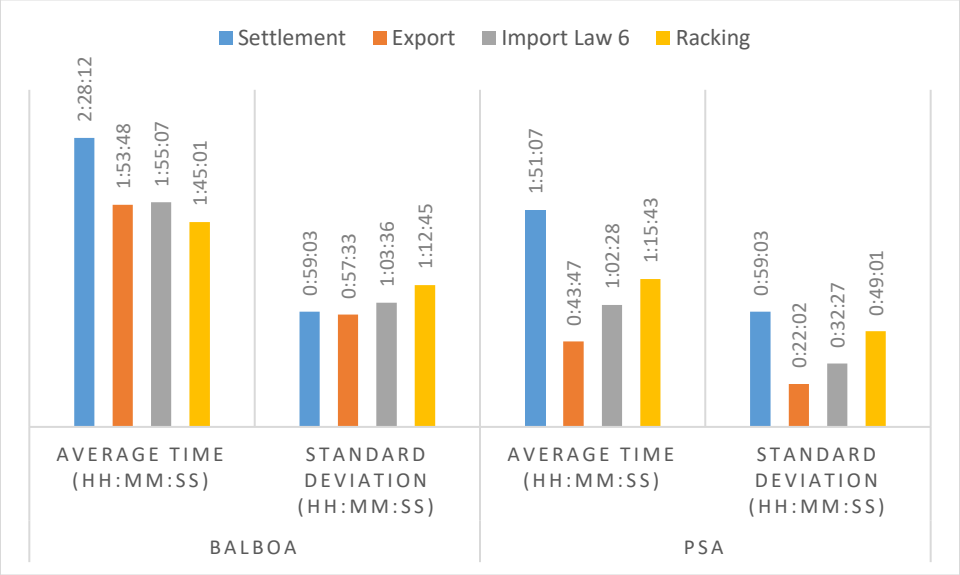

Fig. 6: Result of measurements within the PSA and the Port of Balboa
Source: Performance of the Port Cluster of the Interoceanic Zone of Panama in Serving Carriers, Study carried out at the request of the Logistics Business Council (COEL, 2023).

The measurements shown in figure 6 correspond to the total stay time of the carrier from its arrival until it leaves the port facility. Includes processing times and leisure times. Each port has specific geographical conditions that identify it with particular characteristics (COEL, 2023)

In figures 7 and 8 we can see how the times in each part of the ports for the port of Balboa and PSA respectively, which gives us the result that for the Port of Balboa the customs office is the one with the highest and in the case of PSA the import procedures at the MIDA office.

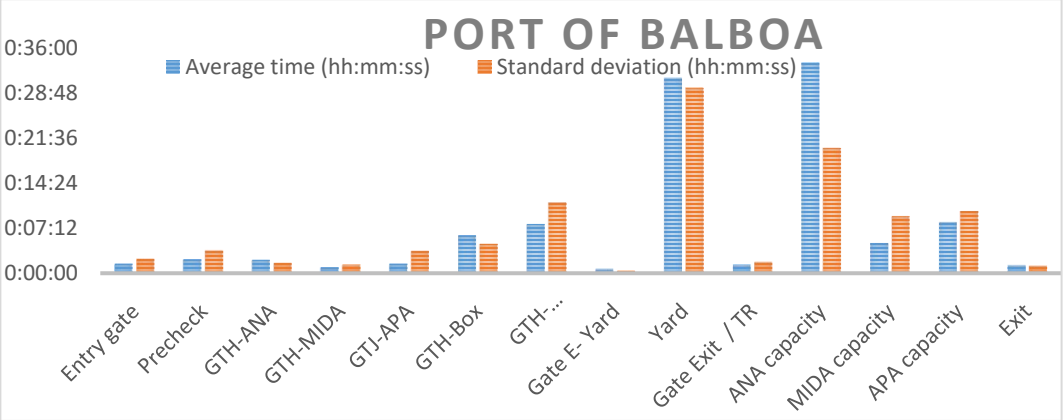

Fig. 7: Result of the measurements within the Port of Balboa at each of the carrier's stops.
Source: Performance of the Port Cluster of the Interoceanic Zone of Panama in Serving Carriers, Study carried out at the request of the Logistics Business Council (COEL, 2023).

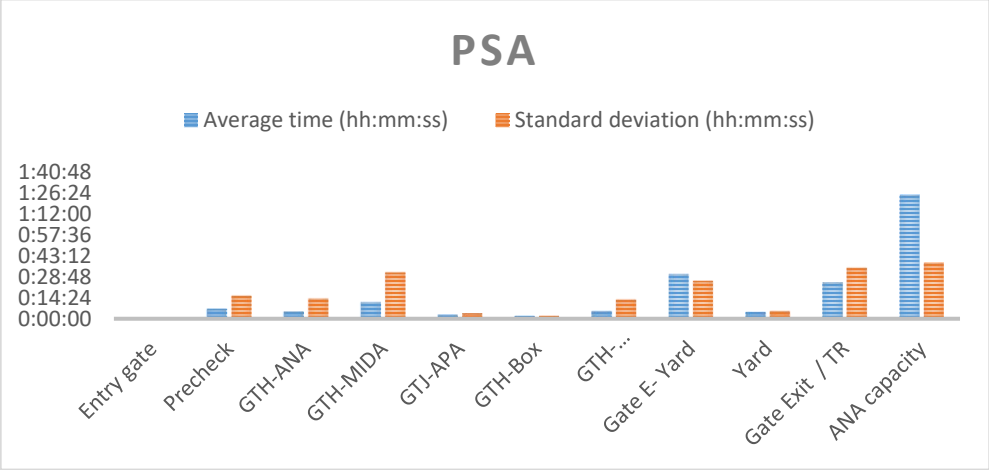

Fig. 8: Result of measurements within PSA, at each of the carrier's stops.
Source: Performance of the Port Cluster of the Interoceanic Zone of Panama in Serving Carriers, Study carried out at the request of the Logistics Business Council (COEL, 2023).

4.1 DISCUSSION

The only port that has a comparative base of previous studies is Balboa (CALDERÓN BENAVIDES, y otros, 2017), as shown in Figure 9 since this is the first time that the port community is comprehensively measured. It should be noted that in 2016, the liquidation and importation process, Law 6, was classified as "importation". With the aim of establishing a comparison, on this occasion both processes were unified to standardize them with the results of 2016. The total movement of containers at this port has decreased approximately 23% compared to 2016 (COEL, 2023), (Portal Logístico de Panamá).

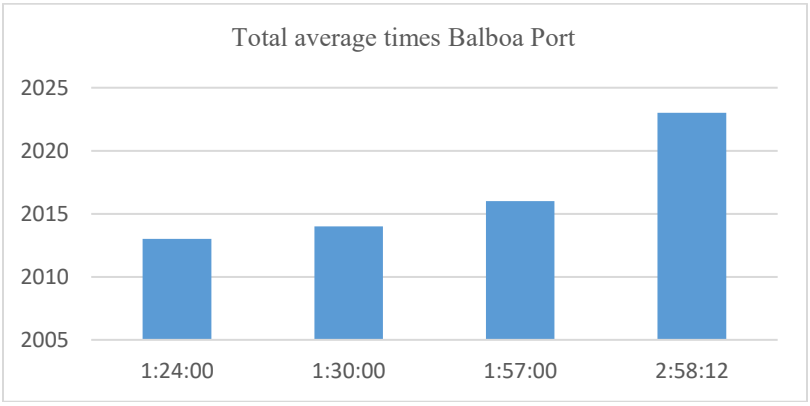

Fig. 9 Results of Total Average Times for truck trips.
Source: International Maritime University of Panama Study (2012-2013), UTP study (2014), GT study (2016) and GT study (2023), (COEL, 2023).

After carrying out the two phases of the surveys, we found that both PSA and the Port of Balboa have implications in the development of operations that give us similar results. The observations that can be recovered from the surveys are:

Most observations from carriers when surveyed, were related to, the improvements focused on Personnel and the request for Operations and availability of port equipment.

The off-site delay can be related to the capacity of the land roads connected to the port and that can go hand in hand with the second, that we can deduce that the waiting time in the yard and/or the operation in the yard must be very slow which can cause the flow in and out of the terminal to slow down.

That said, it can be seen that in figure 6 the standard deviation in the port of Balboa is approximately 1 hour, in all cargo classifications, both in export and import, while in PSA we find import has maximums 00: 59:00 and minimums 00:22:00. Each terminal presents different needs for improvement, and it allows us to know when presenting the improvement proposal that we find similar weaknesses, but also different needs. Analyse external factors that may have an effect on the delay time.

In the case of trucks that enter Pacific ports, the external effects that affect them are the weaknesses in the processes of prior procedures, which must be carried out before arrival at the facilities, which causes them to be within the port facilities, you have to return to the consignee offices to complete the documentation and begin the procedures for cargo withdrawal or delivery for the second time. In Figure 10 we can see how the movement of trucks developed within the port. Where the thickness of the line indicates which are the busiest checkpoints and the arrowhead indicates the direction of travel.

Resulting in the fact that there is currently no single route within the facilities, they are subject to efficiency when completing documentation before arriving at the port.

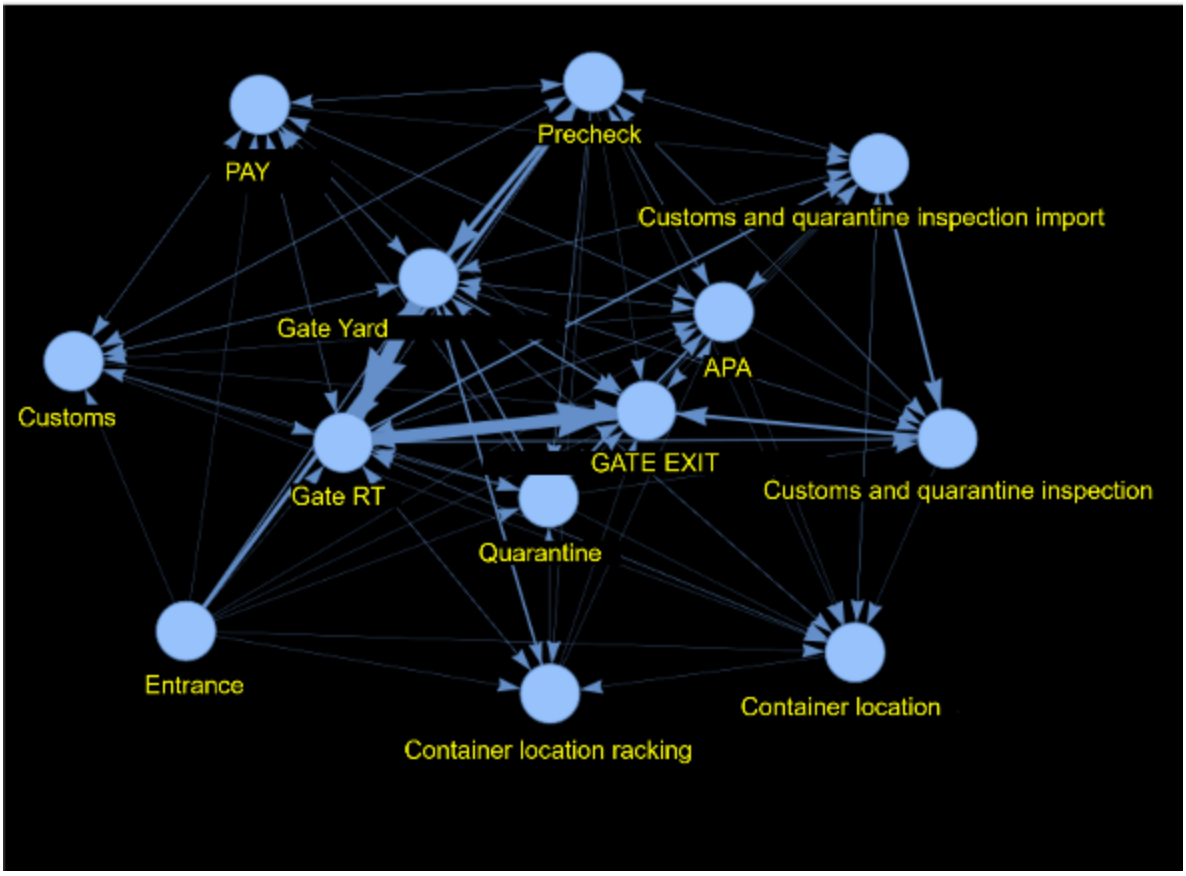

Fig. 10: The current route mesh of the Balboa port, a graph purposely made in Python with the survey data, to have a baseline to propose an improvement in the port's operating model.

Currently, it can be observed with the two phases of the surveys that there is no order in the processes, that the carriers, upon arriving at the port, usually carry out the procedures without order. As could be seen in figure 10.

With the image in figure 11 we find that 25% of the carriers that enter the port, carry out the procedures in the correct order. But even so we found a greater concentration at the TR checkpoint and at the exit of the yard.

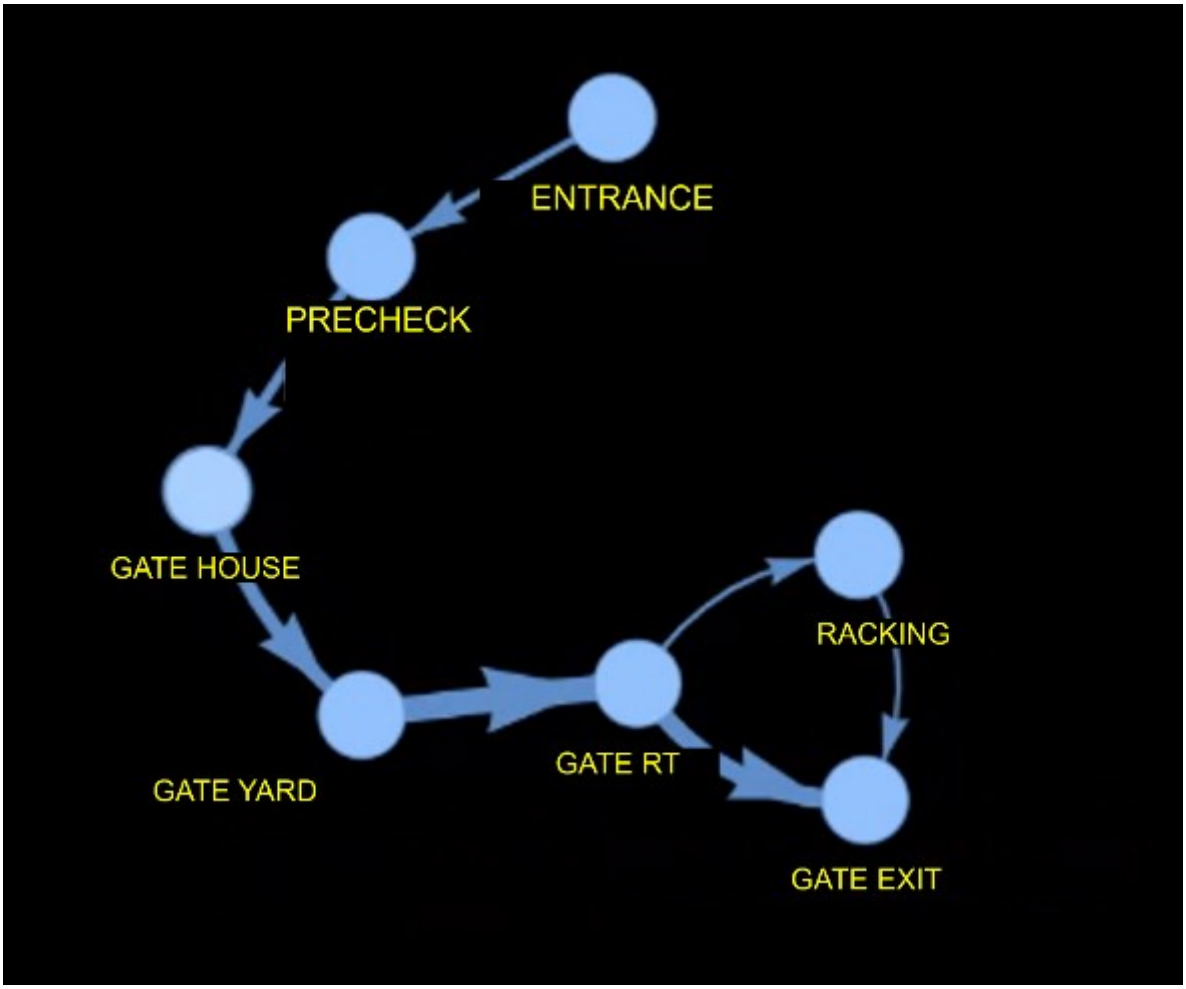

Fig. 11, The mesh is presented with 25% of the transporters who make a tour of order within the facilities.

5 CONCLUSIONS

- With these surveys it has been possible to document the waiting times in each of the processes from waiting outside the ports to the internal journey through each of the checkpoints and the controls that must be met for the delivery or collection of the cargo
- With an average time to enter ports of 30 minutes, taken outside the facilities.
- The place where they wait the most is the container yard, as indicated by the transporters surveyed in the two ports.
- When analysing the times and the causes that cause the delay times, it can be highlighted that by not having complete documentation in the case of carriers, the port will not be prepared with the equipment to load or unload the trucks in the yard area inside the terminal. It causes that an optimal flow was not developed in the operation
- It can be highlighted that in the two phases of the research, the strengthening of personnel at a higher technological level plays a very important role in being able to implement an improvement in port processes.

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