# Business Analysis on Shipment Issue Diagnosis

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DATA 230: Data Visualization

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**Abstract**

Flexport logistics corporation have been trying to build the most optimal freight process by utilizing their structure data. Throughout the past couple years, they devoted much time and efforts to make the entire freight process better step by step. Following the idea of "data in; insights out", Flexport has been aimed to provide their clients with fast, reliable, on-time deliveries at low costs.

With the 5 tables the provide, in this project, we implemented the "Funnel Pyramid" method to drill down the problem. Just like peeling an onion, we want to carefully examinate the whole business workflow and discern any valuable insight that can be hidden beneath the data. Every action in every stage can lead to a significant consequence for each part. By examinate how influential each decision is, we can provide suggestions on where to start to upgrade the whole process more efficiently.

Since Flexport's main idea is to create the largest profit in the most effective time, we targeted on the revenue side of the data for this project. We noticed that the total among of unexpected lost offset around 14% of net revenue during 2017 to 2019. Approximately, 38% of the total lost were related to the three specific consignees. The counts of these questionable shipment were only about 2% of the whole shipment records. We can see how small among of unhealthy business harming the whole ecosystem. Eventually, we offered four suggestions for Flexport to strengthen their procedure.

## Introduction

As a freight process optimization pioneer, Flexport is a logistics corporation that aims to provide the best freight service around the world. Their main business is to manage complex shipping processes and provides a seamless transportation experience between suppliers and consignees. The data generated from the global supply chains is innumerably multifarious and varied. They have been trying to successfully upgrade the process by using the data they collected. In order to seek for more expert advice to their business, they have contributed the data to the public and held an online data analysis assessment. This is a business analytics Story on the Flexport Shipment Diagnosis. The data is originated from the online assessment provided by Flexport Logistics Corporation. A brief diagram of how products are shipped from suppliers to consignees.


**Figure 1. Shipment Workflow**

As we can see, after the products were shipped from the supplier, there are two primary modes of freight to ship the goods, air and ocean. For ocean shipments, the products are transported within Containers. However, no containers will be used for the Air shipments. In this project, we are trying to identify any insight contains in the workflow.

Using the CSV file they provide, this project want to dig out the gold hidden inside the data. The data is ranged between 2017 to 2019. There are 5 tables in total. 7580 rows can be seen in the Shipment file since we are targeting on the shipment.csv file the most in this project. In the image below, we are trying to show the relational database schema for all 5 tables:

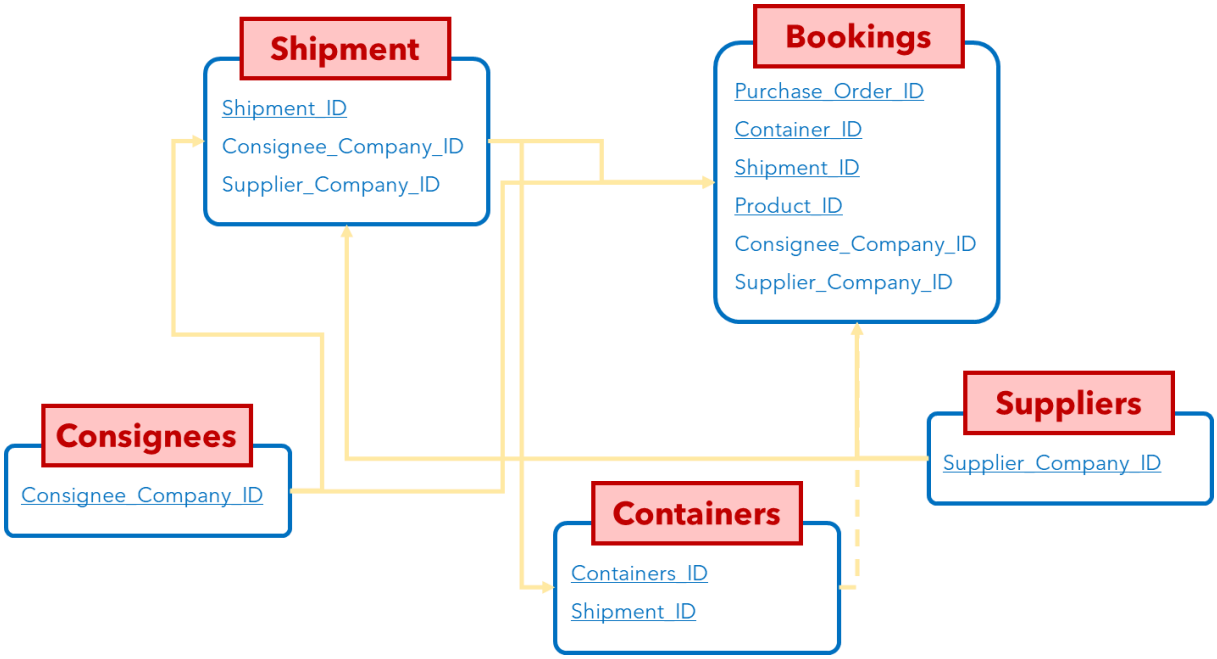


Figure 2. Relational Database Schema

By identifying different primary key for each table, we will be able to draw the relational diagram between one and another. Most of the primary key contains unique value in the table. The only difference can be found in the Containers table. Since most of the columns can be joined across shipment and bookings table, they have been set as the fact table according to the star schema methods. As for the other three, they have been set as the dimension table for this schema. In this project, we will focus more on the shipment table and use the other four table as additional information to strengthen our explanations.

## Ask the Question

After collecting the raw data, the next thing to do for this project is that what issue are we trying to solve. Normally, the main questions that a logistics business are trying to solve will set around money and time. How is the profit or cost? Is there a delay happening on shipments or other delivery? In this project, we will target on the money and try to find the cause of money losing. Therefore, the question we are asking will be:

*What are the possible reasons that freight profits are not as good as expected?*

## Funnel Pyramid

We decided to implement the funnel pyramid method to identify the problem by peeling the issue layers one by one like an onion. This funnel pyramid has the ability to demonstrate the steps of the whole shipment process. It starts from the lead generation and ends with completed outcome. In order to shrink the large-scale question a concise solution, we look forward to understanding the consequences each action will lead to. Moreover, we can further determine which part of the pyramid do we want to optimize the most in the future. In the image below, we display the funnel pyramid and the structure of it we used to analyze this dataset.

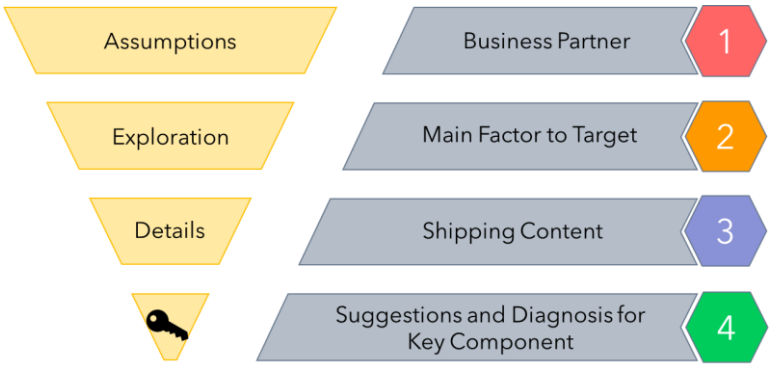


**Figure 3. Funnel Pyramid**

As you can see, we separate the whole process into four steps. Beginning from making assumptions, step by step, we want to come up with meaning suggestions for each part of the pyramid.

## Stage One

First, let us try to visualize all shipment revenue and see how they look:

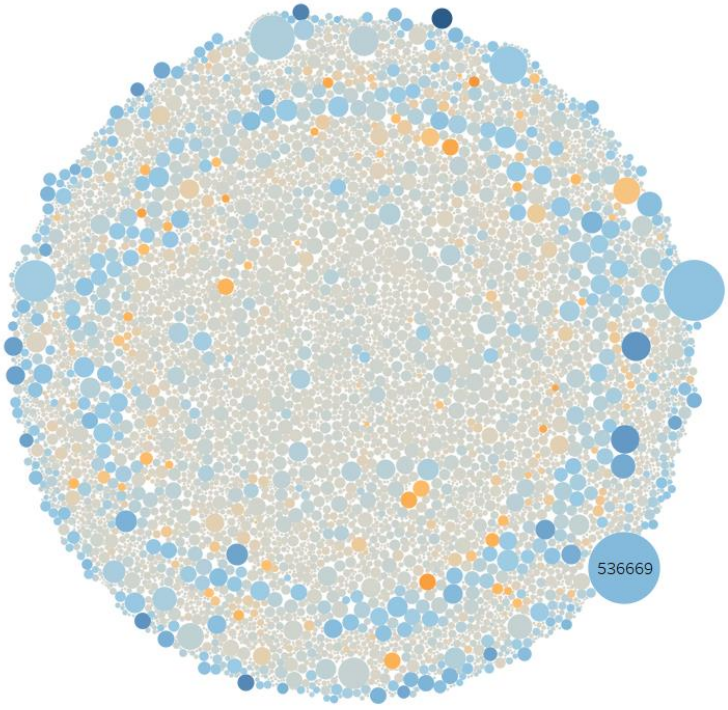


**Figure 4. All Freight Bubble Graphics**

The blue circle represents good revenue of the shipments. Gray means that the cargo operation income is acceptable. Although it is not profitable, at least it has not lost money. Therefore, the circle of warm colors is something we need to discuss. After all, this is the root cause that overall income is not as good as expected.

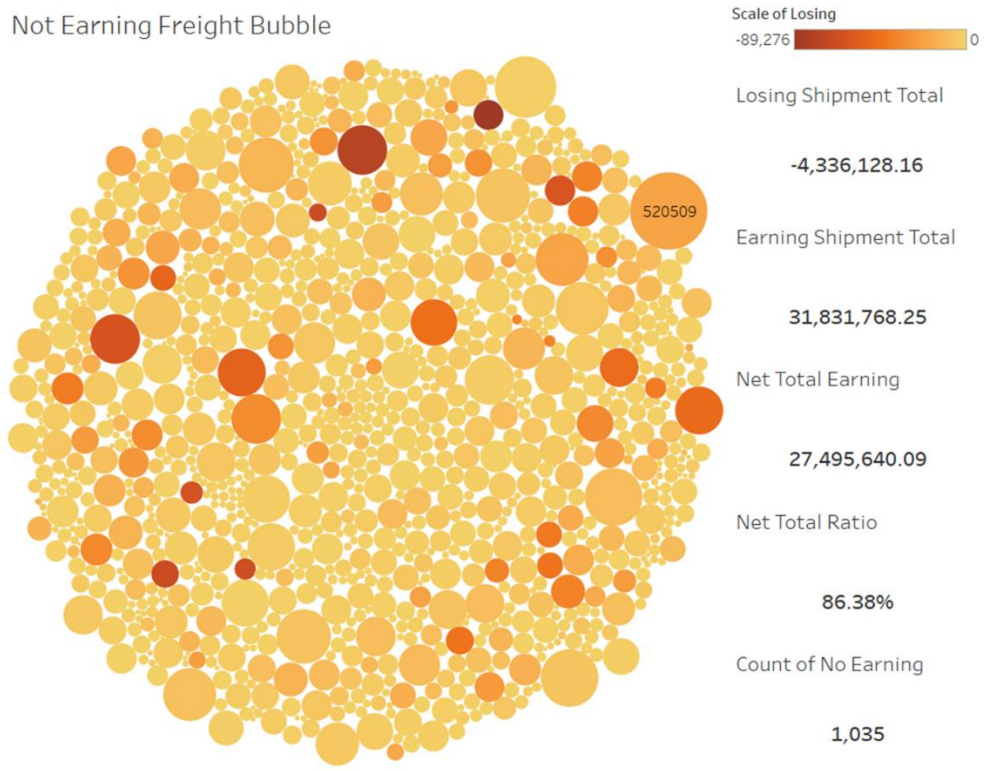


**Figure 5. Not Earning Freight Demonstration**

As we extract all the negative revenue shipments, we obtained the bubble graph like this. The size of the circle represents the expected revenue of each shipment. The bigger it is the higher value we expect. Alternatively, the color scale represents the actual loss of each shipment. Those big circles with dark color indicate that the company's expectations are far from the actual results, and this kind of freight cooperation has done a lot of damage to the

company. As a result, in the revenue situation from 2017 to 2019, these less-than-expected cooperation caused at least about 14% of the company's losses.

## Stage Two

According the Flexport, business workflow might be slightly various when it comes to different working partners. In this stage, we are trying to identify which partners might have the potential of leading to a bad business cooperation.

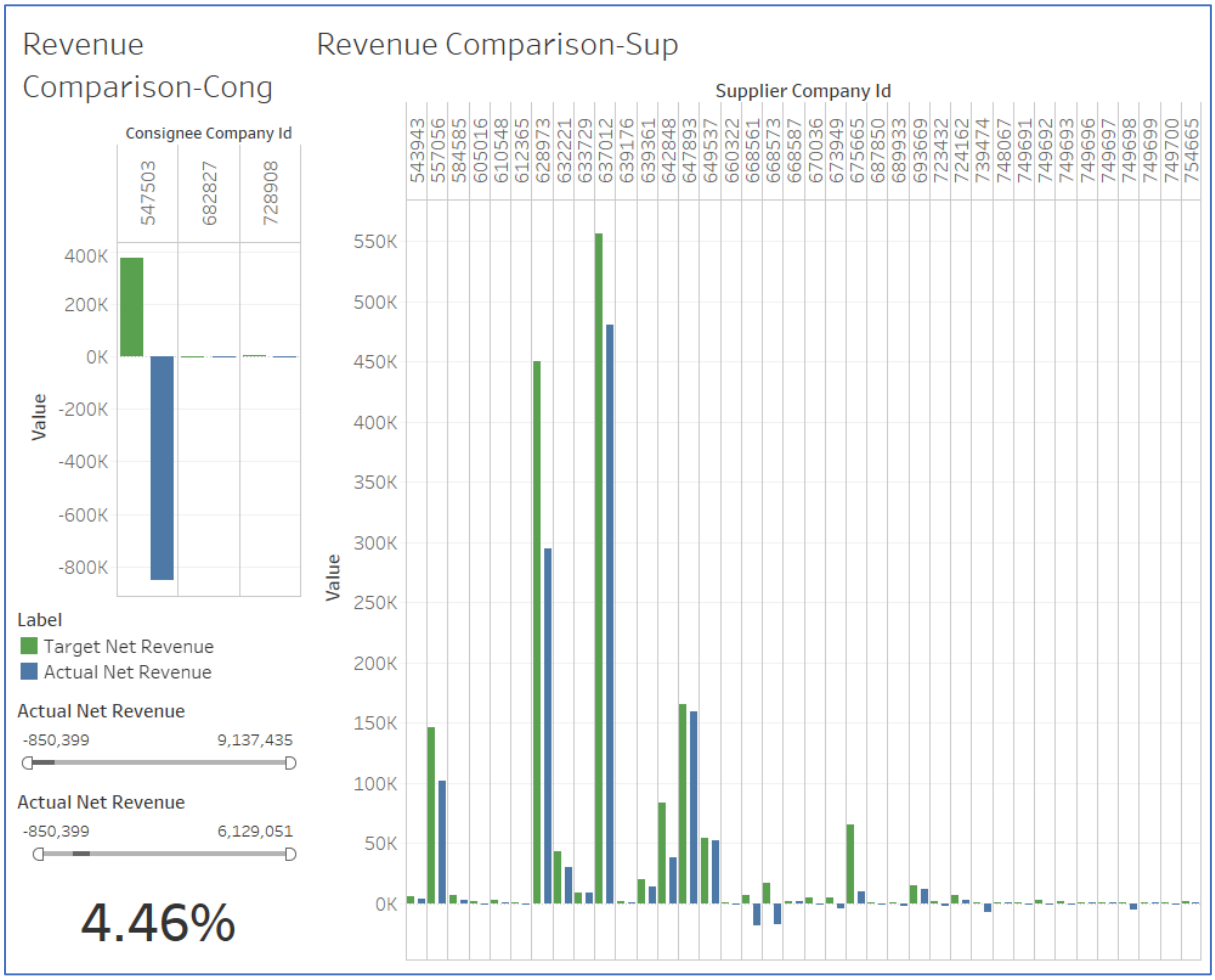


**Figure 6. Revenue Comparison**

After we lock on the targets we want to explore, we want to further understand which partners account for the heavier losses. In this section, we list the estimated and actual revenue of each partner. Even more, the partners whose actual situation is not as good as expected are specially screened out.

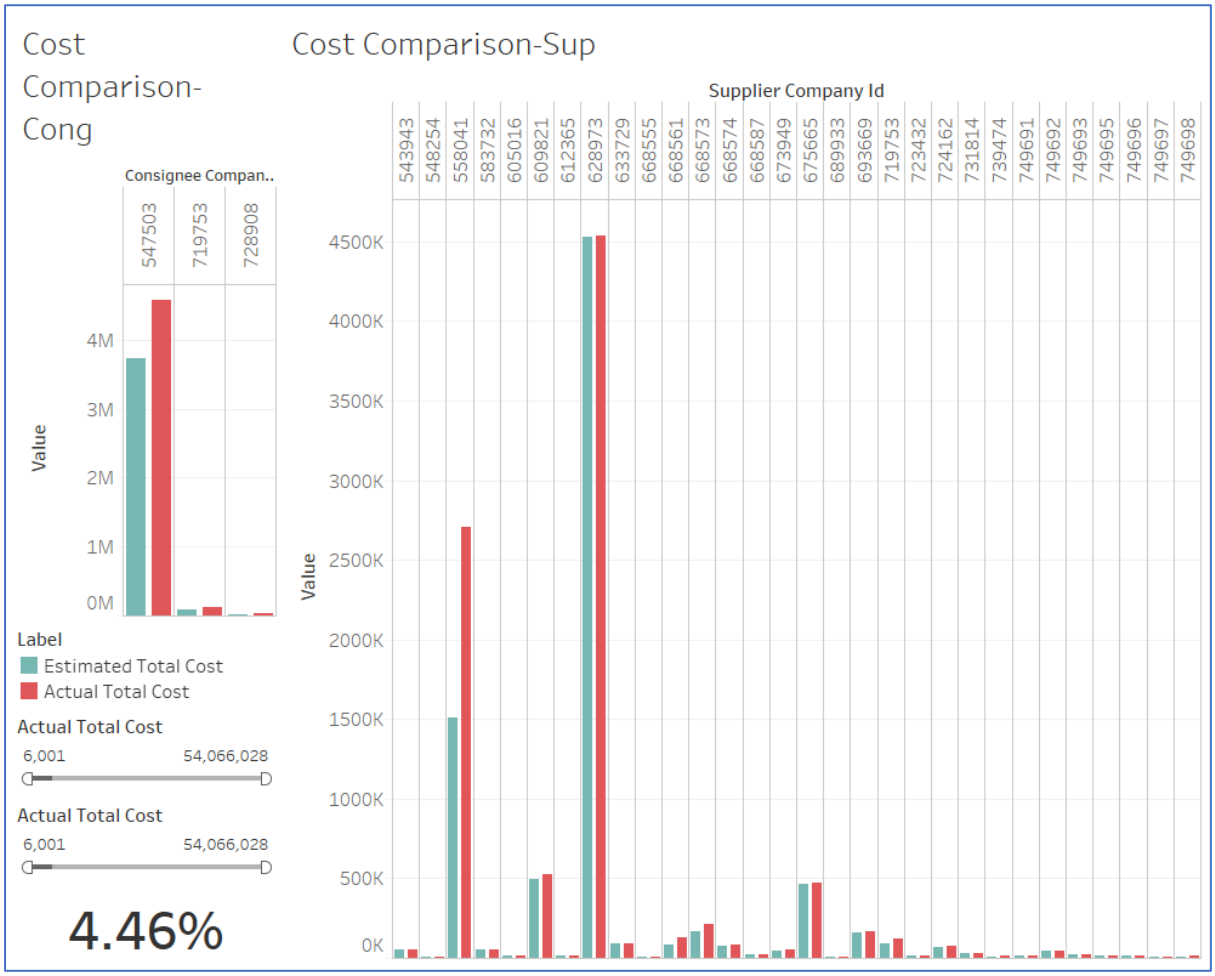


**Figure 7. Cost Comparison**

When we look at the costs, it is not difficult to find that the consignees whose actual cost is higher than the estimated cost are the same as those selected in the previous page. In order to further narrow the target that we want to focus on, in this project we decided to disassemble

the three consignees (547503, 719753, 728908) in details. Their data accounts for around 4% of the entire dataset.

**Stage Three**

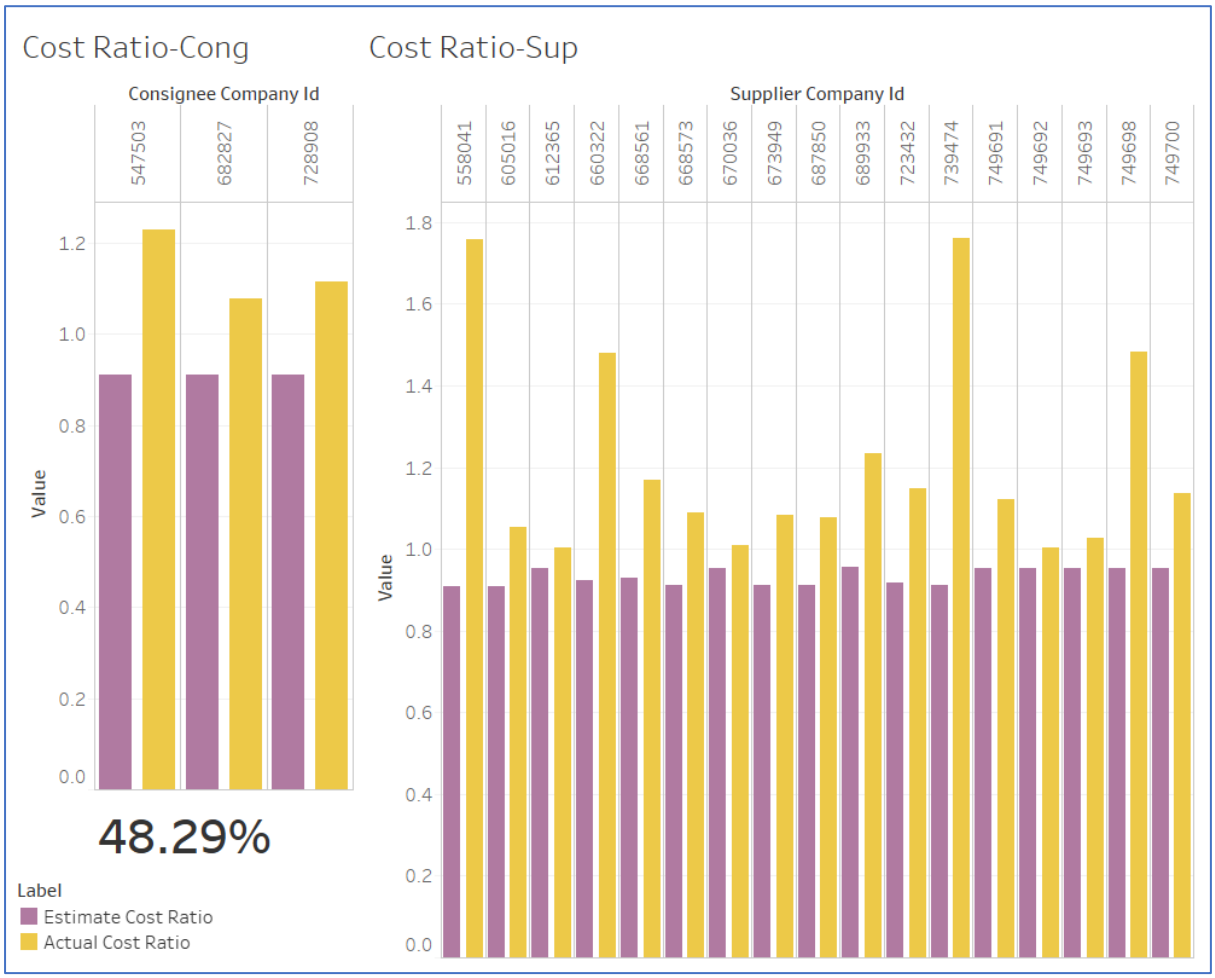


**Figure 8. Cost Ratio Comparison**

In this stage, we want to further dig into the losing shipments originated from the three consignees. Additionally, people may wonder that under the different business scales of each partner, how to compare which cooperation has the greatest damage to the company? In order to solve this matter, this page here listed the ratio between expect cost/ revenue and the actual

cost/ revenue. We are targeting on those who not only has a significant increase on the actual cost ratio, but also those partners whose costs are higher than the revenue. In this project, we will further investigate on the three consignee partners. As we limited the data on the losing records only, they took around 48% of all three consignees shipment records.

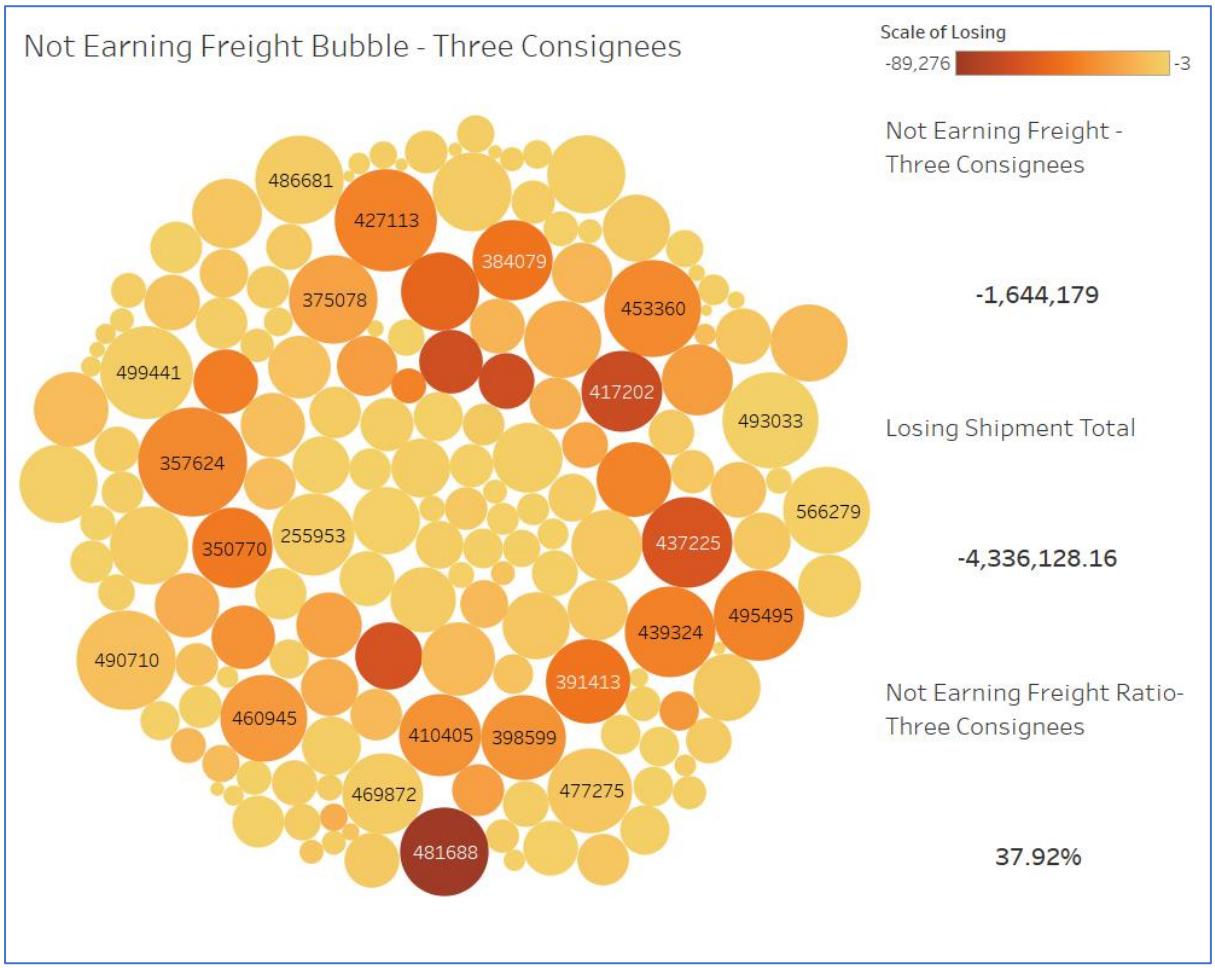


**Figure 9. Losing Shipments – Three Consignees**

Examining the three consignees deeper, we listed out all money-losing shipments using the bubble graph. As we see a lot of big circle with dark colors, they represent a high expectation of revenue but unfortunately losing a lot of money at the end. We believe that some questionable behaviors can be found during the company's cooperation with these three

consignees. By only picking these three partners, in the cooperation cases with them, the total loss of various freight has accounted for 38% of the company's all freight losses. If we can find a solution for this stage, the company can reduce a great amount of their lost.

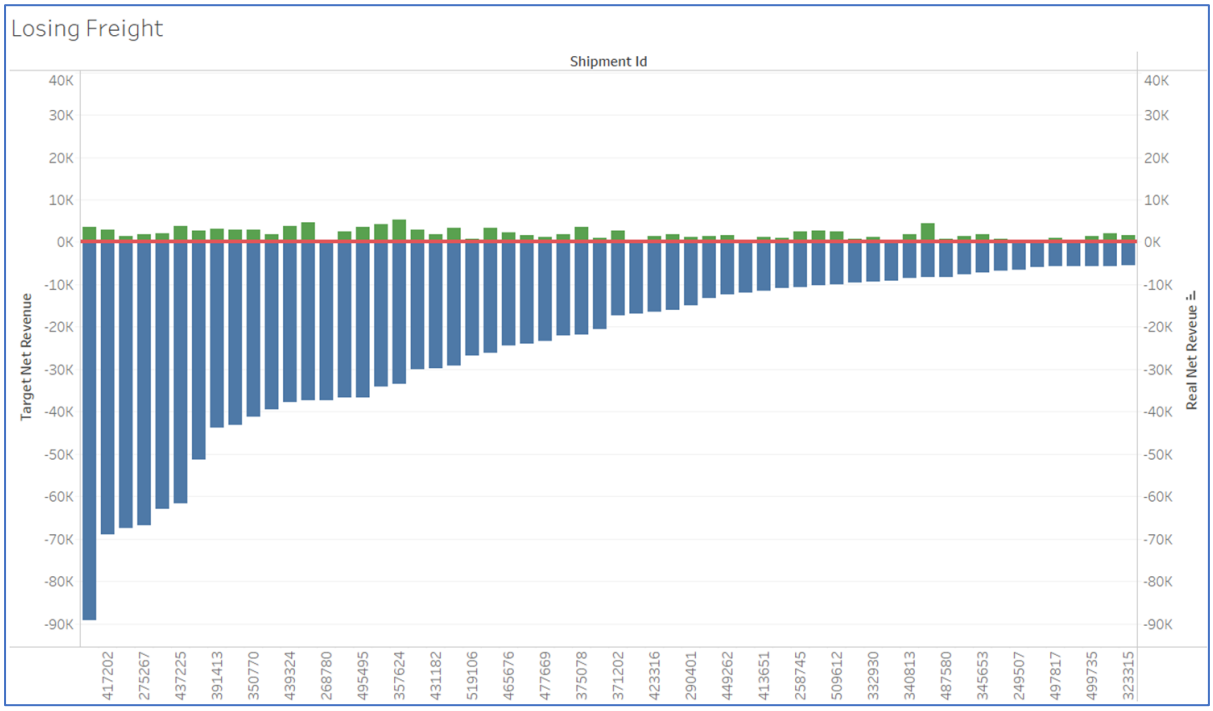


**Figure 10. Losing Freight**

From another point of view, we can see that the green part is the expected revenue, and the blue part is the actual revenue circumstances. Obviously, all the blue part is under the reference line 0. It indicates that none of these shipments are helping the company to earn money. They can be regarded as the cancer of the entire business revenue.

## Stage Four

In this stage, we want to discovery more information from the other small details. We broke down into other columns to see if there exists any interesting patterns:

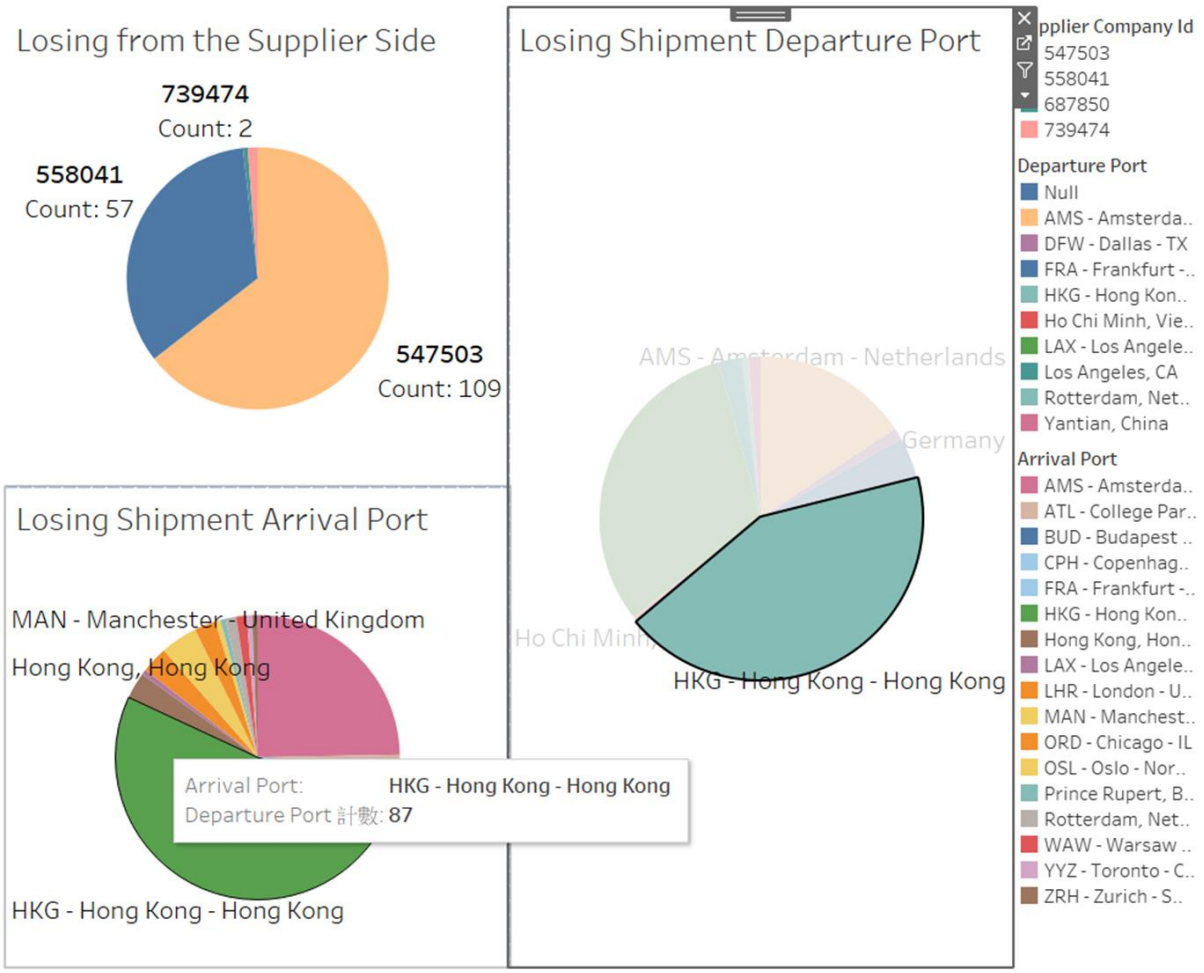


**Figure 11. Port and Supplier**

When we further explored these problematic business processes, a large part of their suppliers came from the same company. Coincidentally, this supplier happened to be one of the most problematic consignees. Unfortunately, since there is no more information or related data, we have no way to further determine what potential problems this company may have. But this will be our first suggestion to Flexport: make a good investigation of the relationship with this company (547503). In addition, we also found that most of these problematic cargoes are imported and exported from Hong Kong. The cargo situation in Hong Kong may require further investigation.

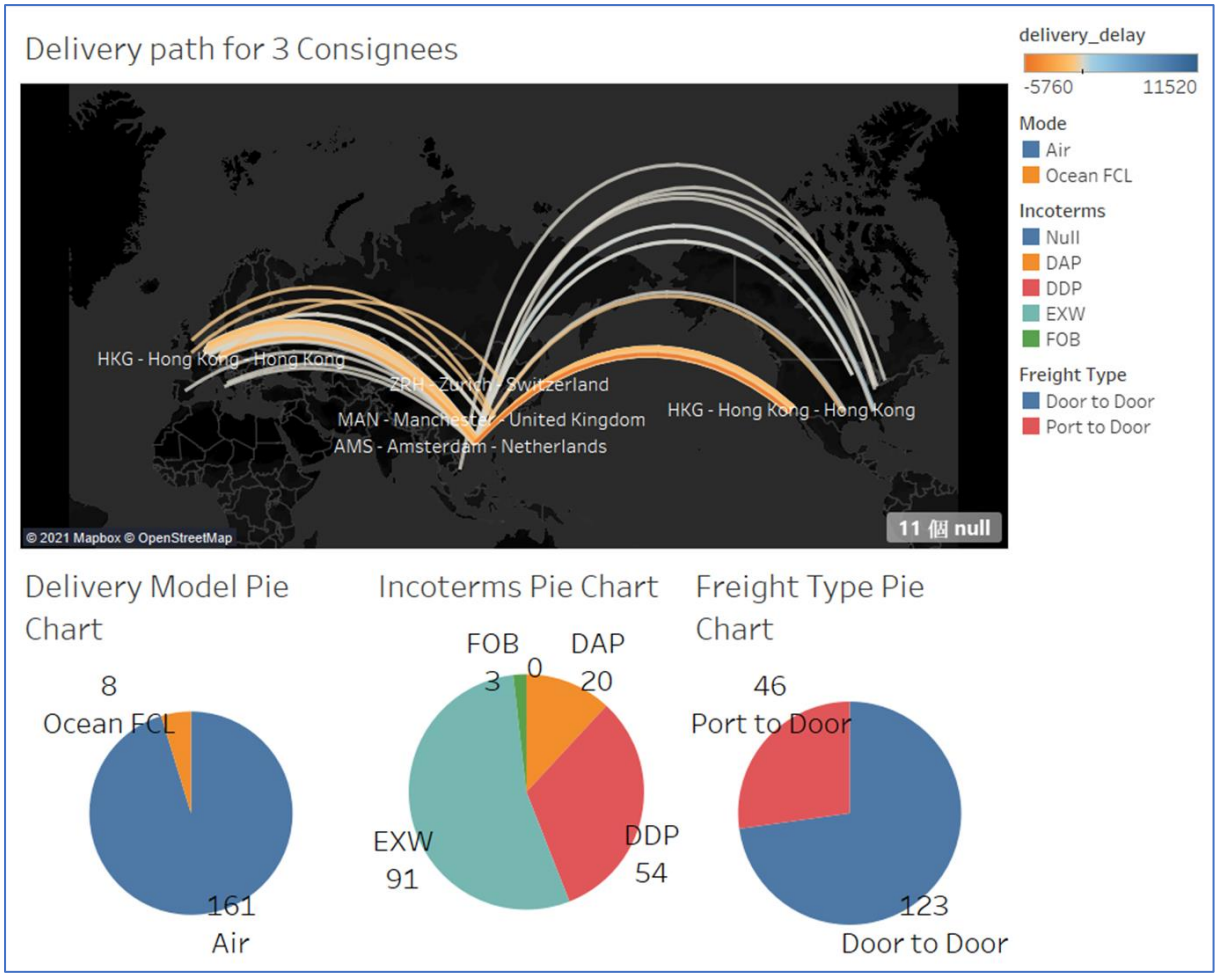


**Figure 12. Freight Business Type**

First, let take a look at the geo-graphic for shipments and ports. We can see that almost all the questionable shipments have a relationship with Hong Kong. However, as we examined the shipping time of these freights, these shipments did not have the delay issue. On contrast, some of them even arrive earlier. We do not have enough evidence to proof that departure/ arrive at Hong Kong can do any money lost. Looking at the pie chart at the bottom, we can see that air delivery, supplier/customer-self responsibility for the shipment and door to door are the majority for these shipments. For example, let us focus on the Incoterms pie chart. Ex Works (EXW) indicates that buyer is responsible for everything from picking up the shipment at origin

to final delivery of the shipment at destination. As for Free on Board (FOB), Seller is responsible for arranging delivery and loading at origin port. Buyer is responsible for everything else. In these freight processes, there will be many third parties or other personnel involved in the delivery, instead of the company being solely responsible. Behaviors beyond the control of others do bring potential risks to the transportation process. This requires further investigation. As for the others, maybe something can be further discerned if we have those data.

## Suggestion

- For stage 1, if it is possible to avoid the instance of freight losing money, the company can recover around 10% revenue in the past three years.
- For stage 2, there around 14% questionable shipment during the time. By lower down the number, the company might have a healthier business flow.
- For stage 3, by solving the business problem between consignee ID 547503, 682827, 728908, the company can reduce lost up to 38%.
- For stage 4, we do not think the port is the main fact of losing. Probably the incoterm type and the freight type play a major role of these losing shipments.

**Reference**

1. Understanding Pyramid Charts, Funnel Charts and Cone Charts https://jscharting.com/blog/pyramid-funnel-cone-charts/#:~:text=A%20funnel%20chart%20is%20essentially,number%20of%20different%20horizontal%20sections.
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