Reverse Logistics

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1. Introduction

Reverse Logistics is a project that aims to create an application capable to save not only transportations costs but also Co2 emissions.

The idea came after a discussion with a salesperson from the logistics company I am currently working. Freight forwarding are currently facing an industry crisis where spots and bookings are limited and only those willing to pay extra costs will have spots in the shipments. In addition, Environmental Responsibility is being more and more considered for customers when choosing their freight forwarders partners.

1.2 Why is it relevant?

Reverse Logistics (RL) is relevant because it will save supplier and customer's operations costs and it will also reduce Co2 emissions by optimization truck transportations costs.

This translates to a more profitable business for the company I am currently working on and more competitive prices in order to gain more business opportunities.

1.3 What is this project about?

This project is focused on company's key accounts. Every year we received huge Excel documents (Tenders) from our key accounts, this excels contain thousands of rows and each row is a trade lane where our sales colleagues needs to give their best price in order to win as much business as possible.

Each row has very detailed information such as; Origin/Destination Country, port and city, equipment type, commodity description, number of loads and so on.

The aims of this project are the following:

- **Combine inland costs:** Most of cities in the Tender are both Exporters and Importers. The idea is to quickly identify these recurrent cities and combine the truck transport to/from the port of discharge/loading. For example, imagine that Company A from Madrid is shipping 45 containers per month to US, but at the same time, Company B also from Madrid is importing 30 containers per month. Company A would need to hire 45 times a truck to do a round trip to Valencia's port, a truck would go empty from Madrid to Valencia, load and go back loaded to Madrid. This means 90 times the distance from Madrid to Valencia. With Reverse Logistics, we will quickly identify that there is a Company B that needs 30 trips to Madrid fully loaded. In this case, we

could easily combine both companies' logistics. Instead of paying for 75 round trips (45 + 30), we would only have to pay for 45 since we will be able to combine 30 from Company B. This will help a very useful cost-saving tool, and it will also reduce Co2 emissions of 30 round trips from Madrid to Valencia.

- **Data visualization:** This project, will also give the final user, in this case the Key Account manager a better visualization of the Tenders. Instead of having a huge excel with thousands of rows, he/she will have some dashboards that will provide summaries such as: TOP exporters countries/cities/ports, potential origins and destinations to apply RL, and so on.

2. Methodology
2.1 What Data have I used?

For this project, I have used two different Tenders from two key accounts from my company. These documents have been combined into one, which is going to be the template that the final user will need to use. There is some manual work to be done before, such as filling in some ports and cities not provided by our customer.

In future versions of this app, dictionaries will be created for each customer in order to align the writing style.

2.2 Libraries used

Pandas will allow us to play with data frames and manipulate the data.

Numpy will allow us to do some calculations..

Matplotlib will allow us to create some graphs.

Google maps API will provide us Locations (longitudes and latitudes) for cities and ports. It will also help us to calculate distance between cities and ports.

3. What do you need to run the project?

For this project, a front end has been created. This front end will give to the final user a better Data visualization via Streamlit and will also allow the user to do some selections and after that, a summary with C02 costs and trips combined will be displayed according to the user selections.

For the data visualization, you will need to follow the following steps:

1. Clone this repository
2. Create a virtual environment with the following packages:
    a. Pandas
    b. Matplotlib.pyplot
    c. streamlit
    d. numpy
    e. googlemaps
    f. json
    g. geopandas
    h. pyproj
    i. plotly.graph_obj
3. Run the Python file in Streamlit: `Streamlit run ReverseLogistics.py`

4. Limitations and future developments

This first version includes the following:

-   Tender Data visualization
-   City to port combinations
-   Truck tips saved
-   Co2 emissions saved

In future developments, the following will be added:

-   Multiple cities to port combinations (I.eg Madrid to Zaragoza to Bilbao Port)
-   Cost in EUR saved (this will vary depending on Trucks tariffs)
-   Automatic RL combinations

5. Conclusions and lessons learnt

Reverse Logistics project has been very challenging and educational from my experience. From one hand, when I started with my sales colleague the project we saw it as a huge opportunity for our company to expand the business. From his business experience, this is not being applied by our competence since it not only requires an app to help you decide the best combinations, it also requires high sales skills in order to convince clients to collaborate with other customers and high operations skills in order to combine these complex logistics. It can be quite easy with the app to know the best cities to combine, but in terms of logistics, it can be more complicated.

On the other hand, this project has given me the opportunity to develop my first project as a Data Science. I still cannot believe what I have learnt in the past 6 months. It has also involved me more in the freight forwarding real life business.

This has definitely been a good (sometimes-frustrating) experience and I'm exciting to keep working and improving the app in the upcoming months.