Logistics Operations Analyst Test

3. Tasks

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print(df_onDay.info())
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3.1 - Understand the Industry

1. Explain the money flow and the information flow in the acquirer market and the role of the main players.

The money and information flow are the direction which the capital and information goes through during a transaction; By starting it through the act of buying, it will send money and information to the company. It will process it and redirect it to the supplier, which ultimately holds the item. Once this flow is complete, the material will be then sent to the company, and from the company to the user.

The flow, indicates the direction which they are moving, and by flowing, it allows the function of creating/delivering what was bought;

2. Explain the difference between acquirer, sub-acquirer and payment gateway and how the flow explained in question 1 changes for these players.

As the digitalization brought upon more players to the flow, we started to have a more complex way of working with the money flow. As now as the payment flow, it adds entities that test and verify if the payment can ocurre: that's the job of the payment gateway. As it manages the response and habilitation of the payment, it doesn't have any way of actually checking the payment capabilities.it access and "asks" to the acquirer to process the payment. It will then check the card if everything is okay. The sub-acquirer in other hand, have the duty to relay the information to the other members of the payment flow, as an intermediary between the acquire and the store;

3. Talk about how the supply chain fits into the ecosystem of means of payments.

It not only fits, but it seems to live with it. As informational capacities grow, and more players enter the payment flow such as paypal, mercado livre , c6, nubank and etc, it needs to adapt so it acoplate and faster the raw flow capacity. As a result, we can now buy things from other countries, or just buy our food and have it delivered to us wherever we are. As The means of payment grow and diverse themselves, the supply chain have a urge to grow with it;

4. Based on the above points, please explain how the agile delivery of the card machine would benefit everyone involved.

The agile delivery of card machines effectively enables more people to access the payment flow - and faster. This means more flow inside the company and suppliers, as well as the higher necessity to access and upgrade the acquires, sub-acquires and credit card brands and issuing banks. We can see it as a circle that grows and possibilities that every actor inside of it has a chance to use it to grow together. This enables for more credit, more suppliers and more customers;

3.3 - Solve the problem

Action plan - what would you do?

We make deliveries from a nationally structured logistics partner with distribution centers and delivery partners strategically spread to serve all zip code ranges in the country.
Based on the data already analyzed, what would you do to reduce the average delivery time to 3 days?

4. Deliverables

You are expected to submit a compacted git repository with your answers and your project.

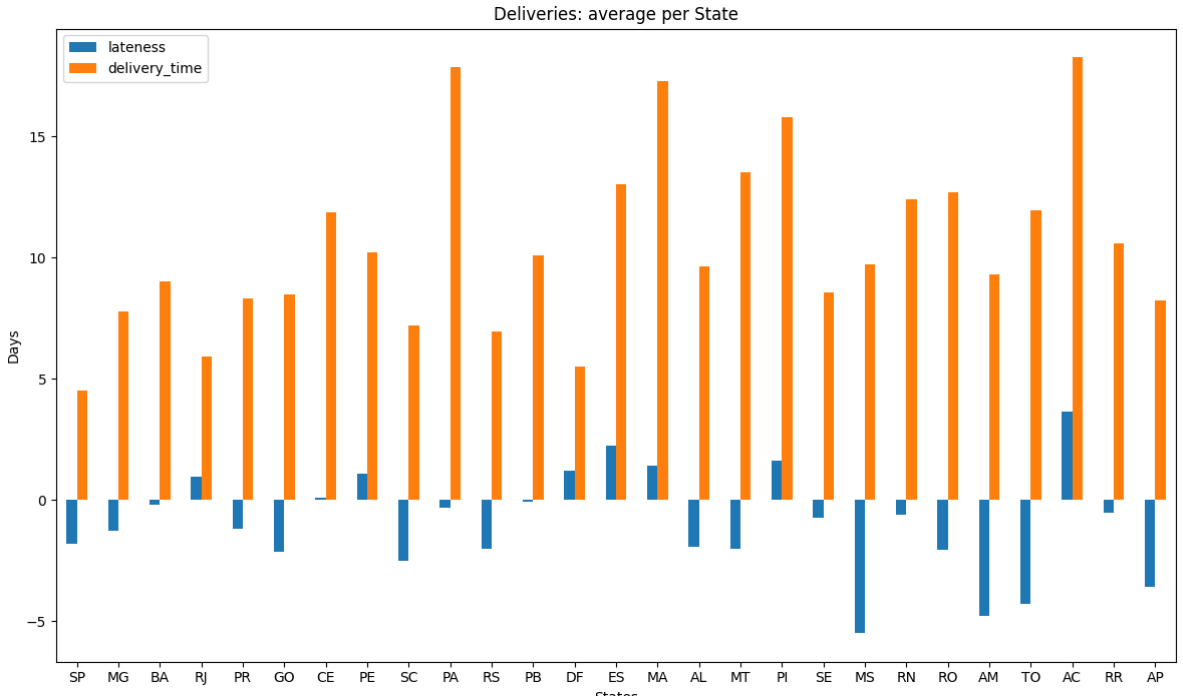
We hope you have fun, learn and challenge yourself during this task :)

3.2 Get your hands dirty

Analyze the data provided and present your conclusions.

Using [this csv](https://github.com/fabiomdlima/Logistics/blob/main/logistics-case-v3.csv) with hypothetical delivery data, imagine that you are analyzing the performance of our logistics operator in the deliveries of our products.
In addition to the data in the spreadsheet, do a query in SQL and graph it and try to explain the anomalous behavior you found.

The first analysis done is comparing the average time taken to deliver:



graph 1: average delivery times by state

What we can see in graph 1 is the difference between average delivery time and average late delivery times in days. By looking at the overall data, we find that the global average delivery time is 9 days, usually delivering 1 day before.

Looking at it, it seems we have solid partnership, but we should look the data as it is and not as we wanted it to be:

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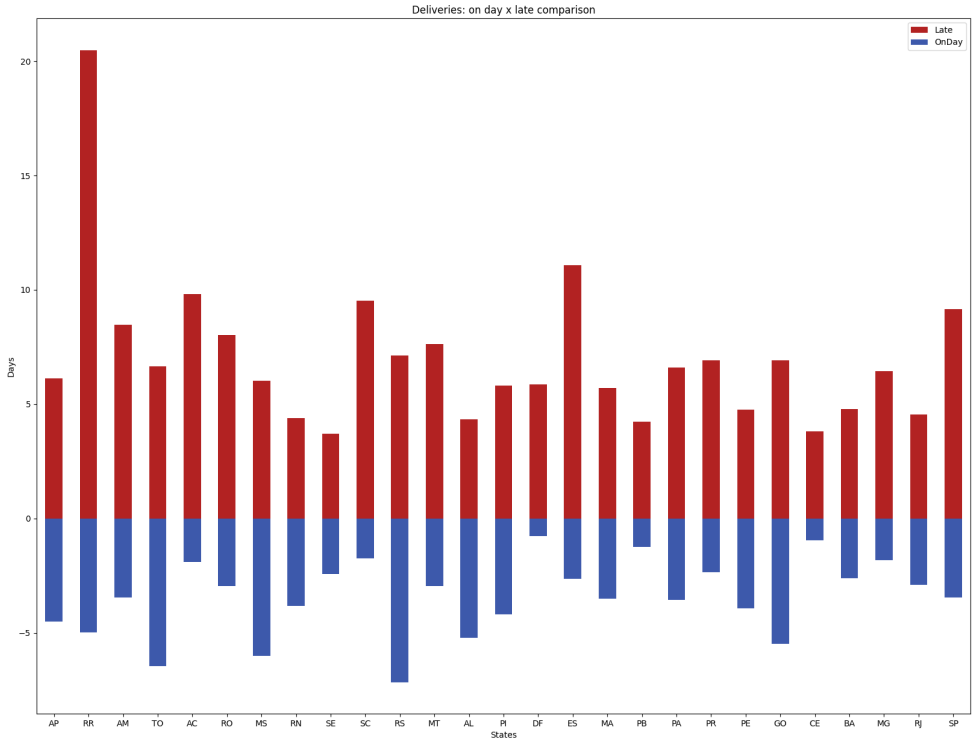
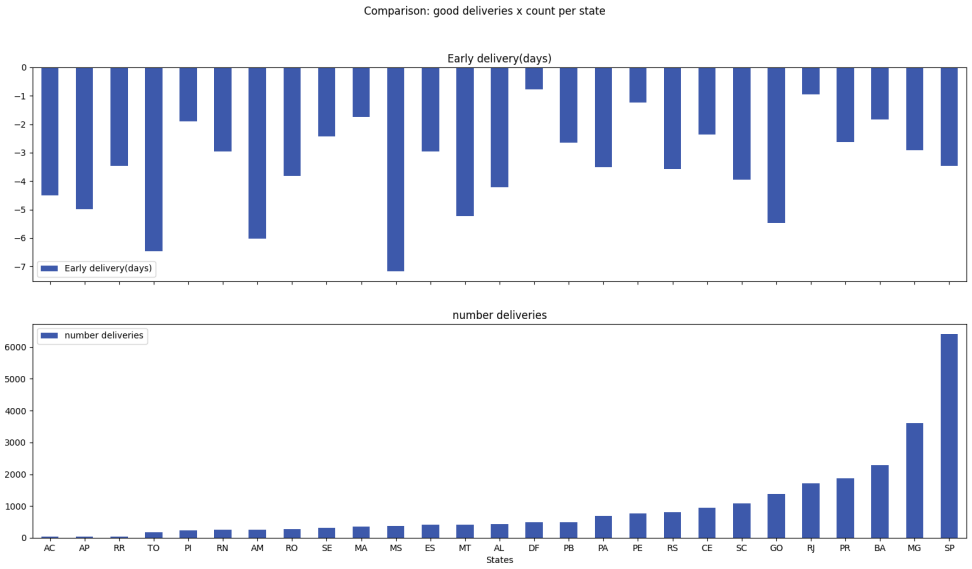
By separating the on time and late ones, separating by state, we have the one bellow



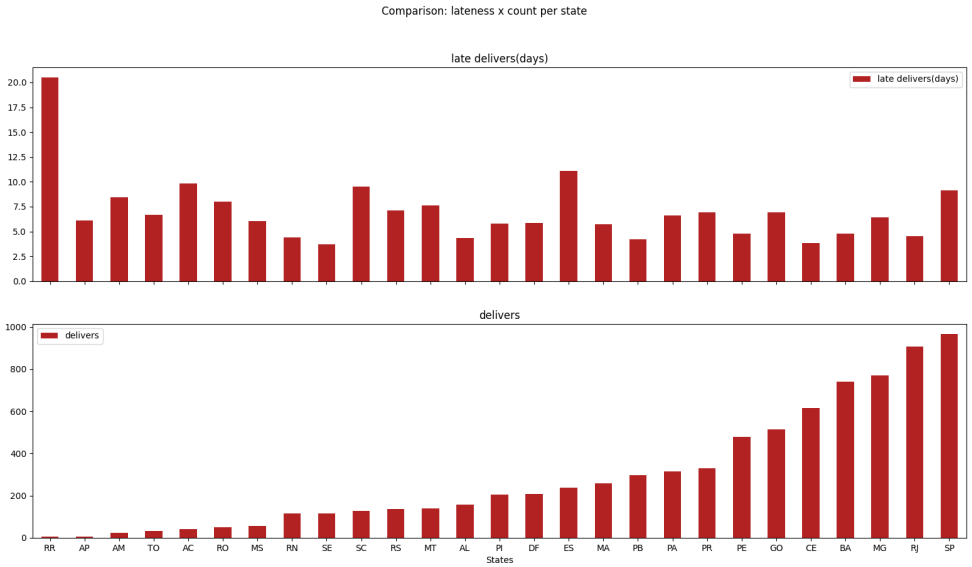
graph 2: Deliveries: on day x late comparison

where we can see that the average delay is bigger than average early delivery. As the number of on time deliveries are greater than the late ones, we need to check the data and see what are we seeing now.

Lets start comparing while comparing the number of times the delivery was late in each region:



graph 3: early deliveries and number of early deliveries by state

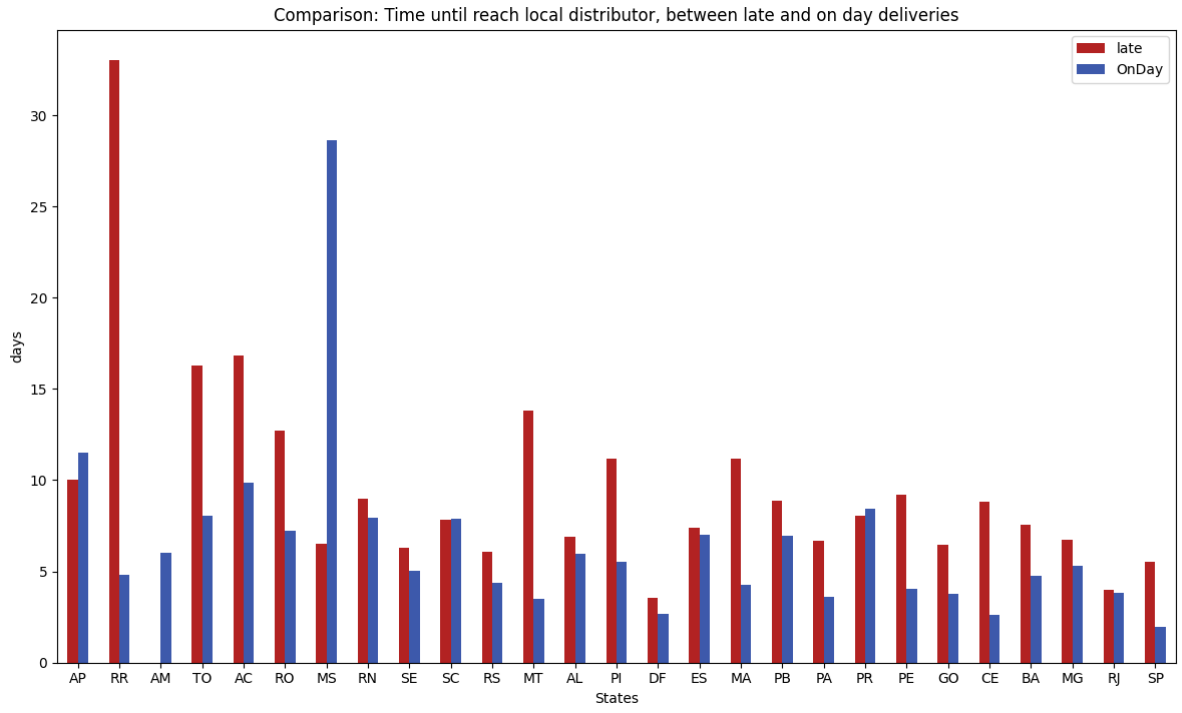


graph 4: late deliveries and occurrences per state

Where we can find that SP, MG, BA, PR RJ and GO account with 50% of the successed deliveries, averaging more than 2 days prior delivery, and that SP, RJ, MG and BA represent about 50% of the late deliveries, and the average delay is about a week.

We need to have in mind that those states will have the biggest impacts when faced with new policies and solutions, and should be prioritized as most of our customers are from those areas.

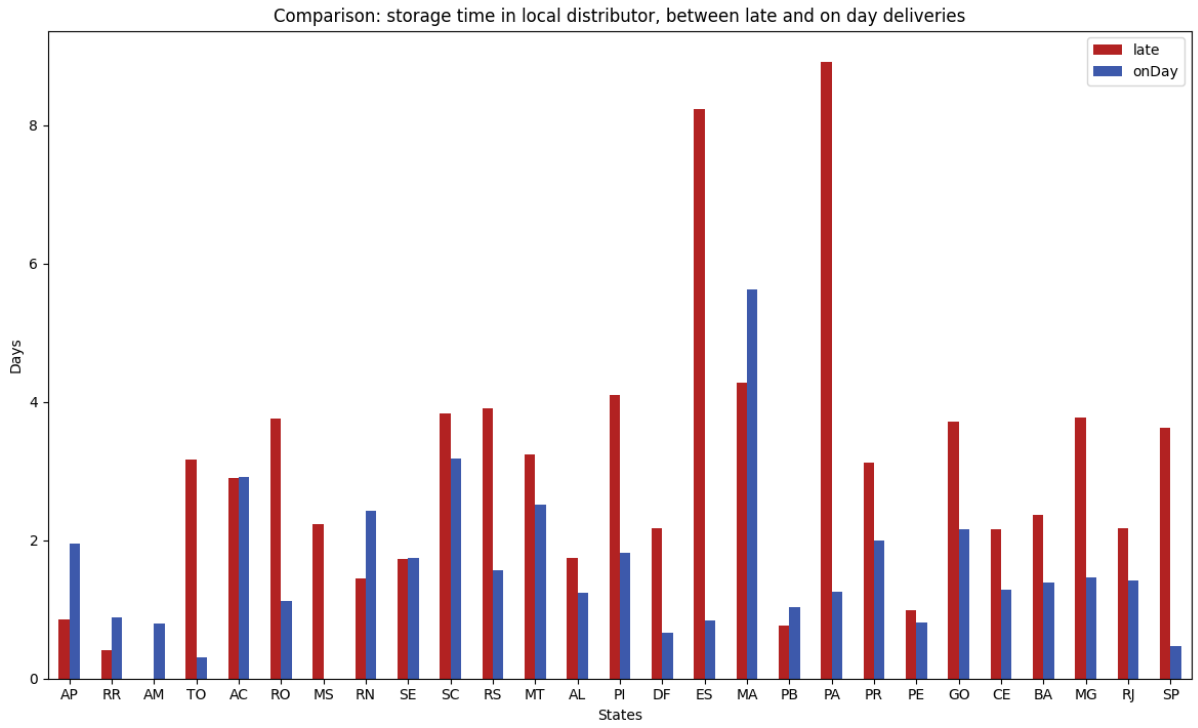
Now, we have the most important symptoms and we should try looking for the reason of it. By getting the times in days between the checkpoints, we have data to compare: what happens in each checkpoint when the delilvers fail and succeed?



graph 5: Time until reach local distributor, between late and on day deliveries;

When looking at MG, RJ, and BA, we see that there is an interesting increase in days to get it to the local distributor; That increase, doesn't happens in RJ, whichgraph 4: late deliveries and occurrences per stategraph 4: late deliveries and occurrences per stategraph 4: late deliveries and occurrences per state already is a error that starts to pile up;

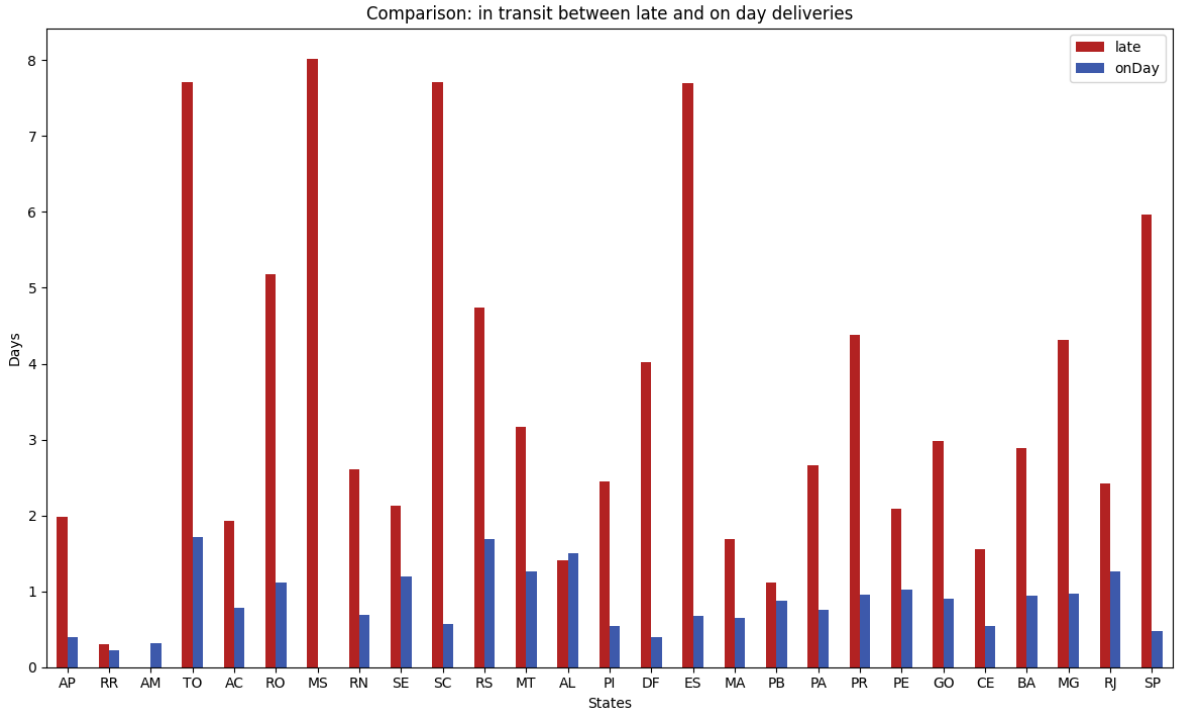
Now, the next part, after the item is at the local distributor:



graph 6: storage time, days between the arrival and getting out do deliver to costumer;

We can see the same patter here. there is a huge increase in SP for the late deliveries and GO, BA, and RJ get a mild increase, about 1 to 2 days; We need to point out PA and ES, which have massive increase time, where the item is locked for more than a week at the failed deliveries;

Lastly, we have the in transit delivery, where the item will get to customer;



graph 7: comparison between the time taken after getting out from the local distributor to the client;

Again we can see the surge in SP where it takes about 6 days on a failed deliver; GO, RJ and BA increase too, but not in such alarming way; TO, SC, ES and MA too have huge increases, but have a lesser share of our customers;

3.2.1 The data

The majority of the data was queried from a SQLite database. To enable the analysis, all the graphs were generated by the main.py program at the root, and the majority of the insights were made through the queries listed at the /sql directory;

The em_dia.csv and the em_atraso.csv were created by the em_dia.sql and em_atraso.sql, respectively, due to a optimization in consulting rather than querying every run;

3.2.2 Analysis

Our system works in huge disparity. When we succeed we have a very good margin, and we fail, we have a huge margin as well; This data can't present the reasons of the delays, but we can pinpoint that storing, transporting and enabling the item to travel are overheads on our site; By fixing those, we can assure a better time to deliver, which could grant us economy in storage and transport expenses as well in overhead ones, and create a better experience to our customer;

One thing to bring to attention is the number of null data we have in this set. We can suppose its due to lack of infrastructure or documentation.

The data being from a partner, we can help them in some points; By locating those overheads we can create more questions: "Why is taking so long to process this item in the warehouse?", "Should we increase the number of trucks in any state?","Should we increase the number of warehouses?", "Should we downsize the warehouses we own?" So on and so forth;

3.3 Action Plan

Based on the data already analyzed, what would you do to reduce the average delivery time to 3 days?

Looking on the data of the succeeded delivers, we find that

- average delivery time: 7 days
- average estimated time: 9 days
- average delay: 3 day prior

and the global average at

- average delivery time: 8 days
- average estimated time: 9 days
- average delay: 1 day prior

As the numbers are greater than the wanted 3 days average, the solutions will tackle the overheads and bottlenecks:

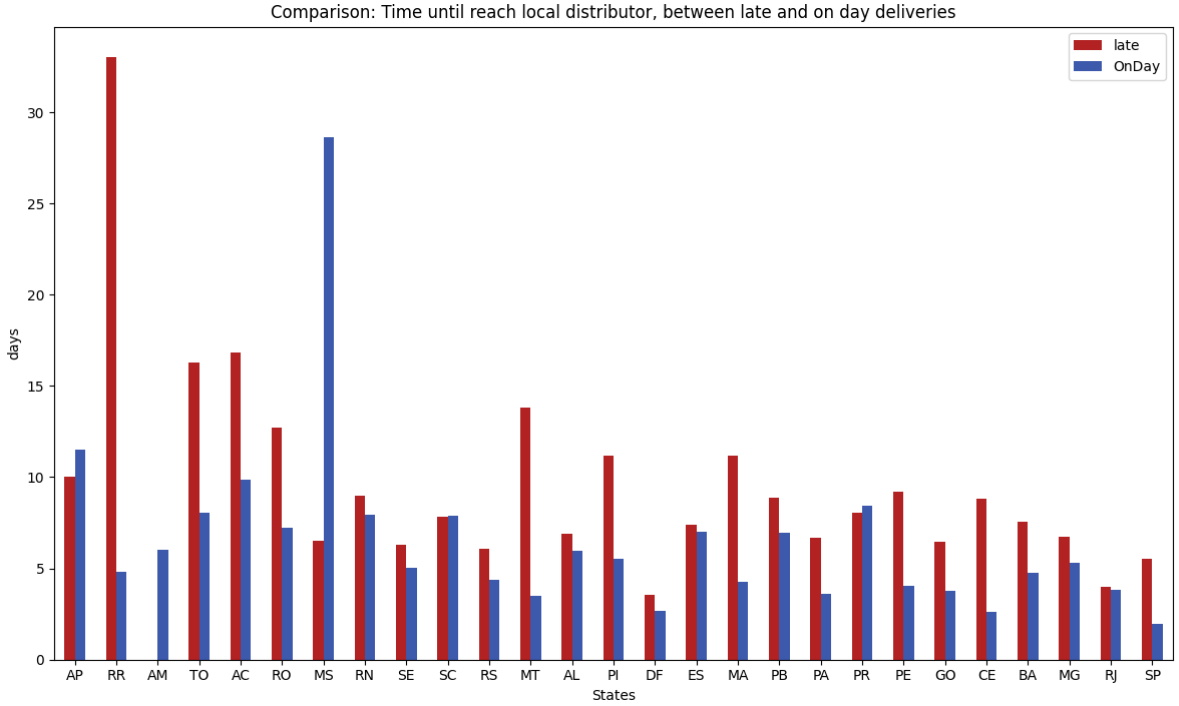
3.3.1 Reduce Overheads

Looking at graphs 5,6 and 7 we can see that its possible to reduce the process time to average 1 day, as seen in some states;

By focusing in in the most important states, such as SP, GO, RJ, BA, as example, reducing the time spent traveling and in storage, we could se a rapid decrease in delivery time; The objective could be achieved by various solutions, and i will enumerate some for each one of the overheads.

The nexts sections will explain each one of the overhead and the data needed to better explore and study each situation

3.3.1.1 The Time to reach local distributor overhead

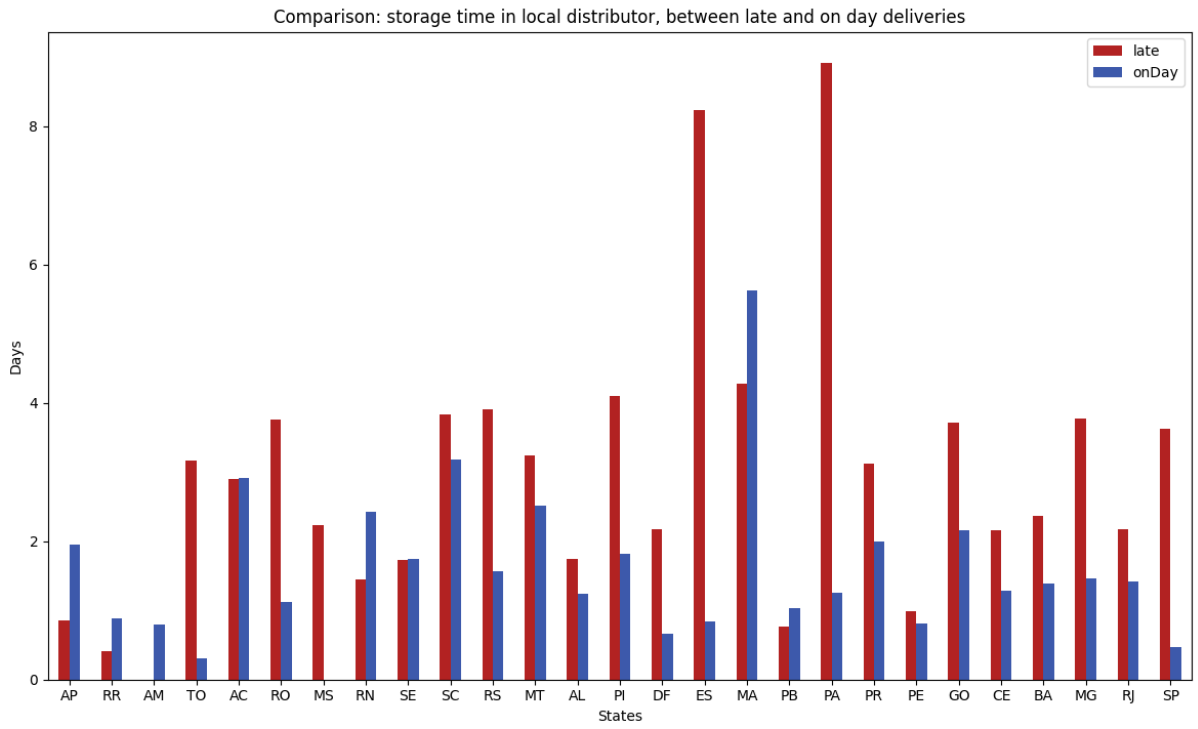


graph 5: Time until reach local distributor, between late and on day deliveries

By loking at graph 5, we can see that this step takes on average 4 days; as its the enabling time + travel time. As an example,we can see the marketplaces like Magalu, Amazon and even Netflix employing the “nearest storage solution”; By having a more dispersed warehouse structures, near the greatest centers, you can cut the travel time, but it needs to have data leading to prepare for upcoming buyers so the stocks can be in order;

Another point here is that by making the buying and authenticating with banks process faster, it can be dispatched sooner. Integrating the information between the local distributor and the sub-acquirer, can make the processing of the next step, faster;

3.3.1.2 The storage overhead/bottleneck



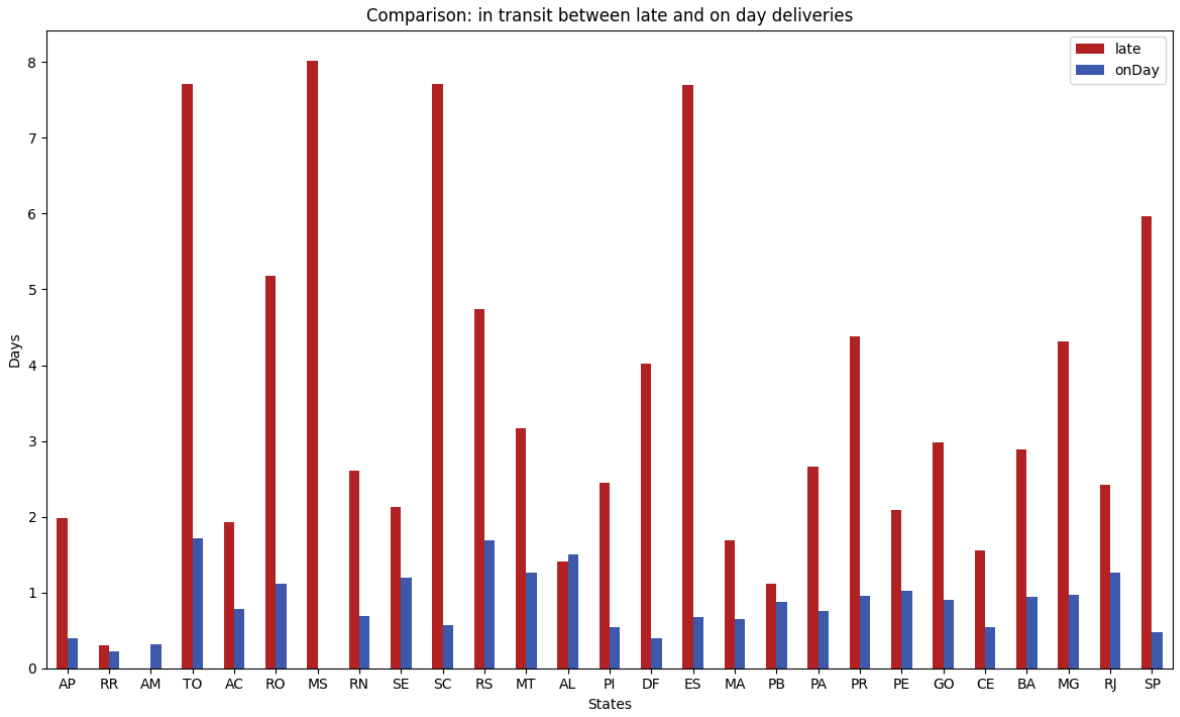
graph 6: storage time, days between the arrival and getting out do deliver to costumer

Here we need to inquire why the package was on hold between being received and sent. Is the documentation being processed in a slow way? Is it waiting for liberation? Or there isn't enough delivery capacity - is it a bottleneck? Does the storage operate in a first-in-first-out or a last-in-first-out protocol?

The questions guided to a information-type solution and an analysis should be put in place; With the current data, its difficult to give a one wonder solution;

However, as we look in the most populated to less populated states, we can argue that the increase in the delivery fleet should be able to help managing and lowering the day count in this step;

3.3.1.3 The delivery bottleneck



graph 7: comparison between the time taken after getting out from the local distributor to the client

The same questions asked in 3.1.2 are relevant here. As the delivery time rises exponentially when delayed, we can suppose that the storehouses aren't being optimally chosen or it is understaffed. This way, a better solution would be create or relocate the chosen distribution centers, increase the delivery fleet and invest a better mapping and storage system, in order to optimize the travel times ;

3.3.2 Why not downsize?

While downsizing and cutting the times from the most distant locations seems to be a great idea, it could work and help, but would not be the best way to optimize the average of 3 days delivery; By cutting the distance, it could theoretically work, but the overheads even in the successed deliveries are enough so that downsizing wouldn't be a key factor on the lesser downtime

3lConclusion

The general solution here is to gather even more data, and make sure that the questions are given answers. This way, we can minimize risks and costs, in the same time as can cut costs in traveling and storing;