



MUESLI DISTRIBUTION COMPANY

A Data Analytics Project Presentation
November, 2022

Agenda

01. Project Goal

**02. Muesli
Distribution
Company Workflow**

**03. Key Performance
Indicators**

**04. Data Set and
EDA**

**05. Conclusion and
Outlook**



The Project

The project aims to provide Muesli Distribution Company with a data-based understanding of its delivery process.

Task 1: Business understanding and extraction of information from stakeholder briefing

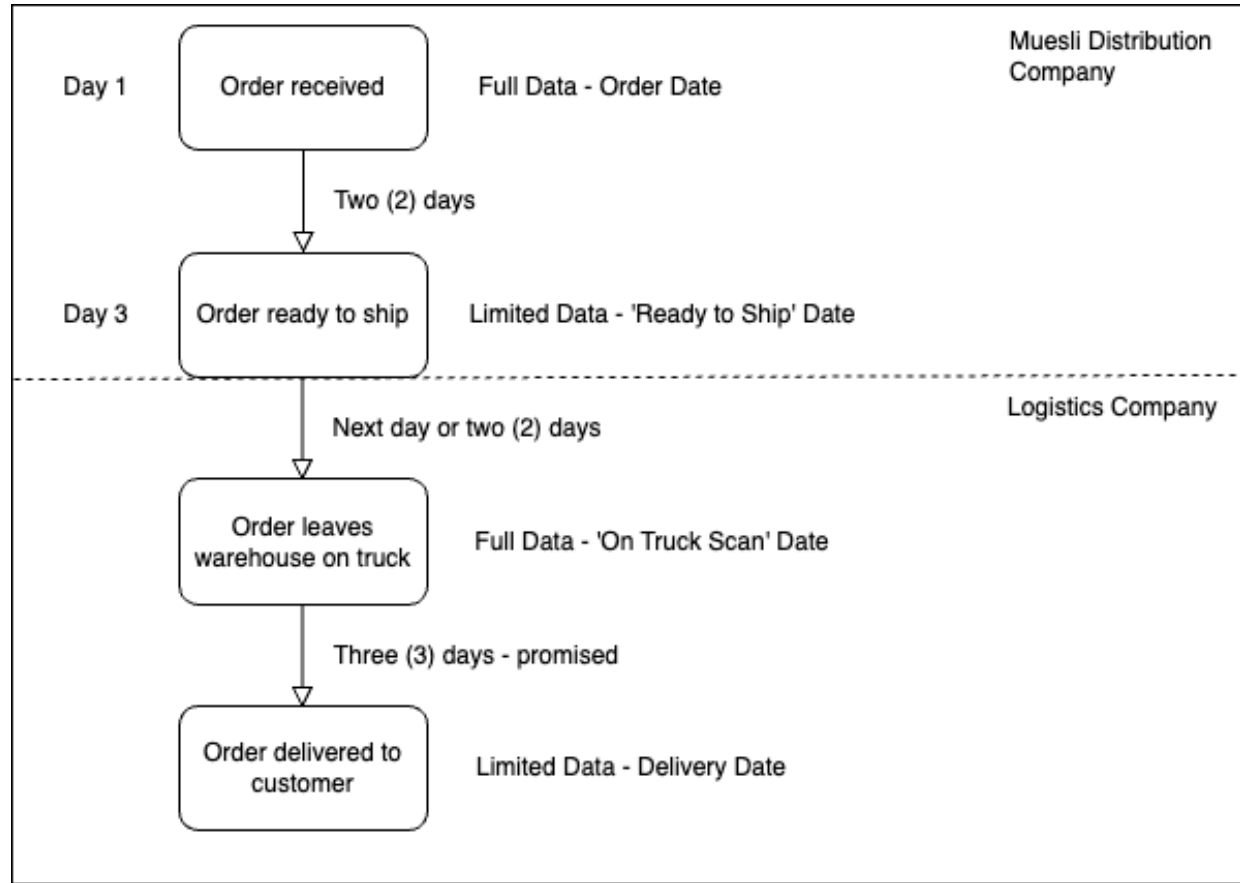
Task 2: Development of KPIs to assist the company in keeping track of the health of their business and improve their services to their customers

Task 3: Performing EDA based on the developed KPIs

Task 4: A presentation to stakeholders describing how the business is performing based on the KPIs developed



Muesli Distribution Company Workflow



Additional Note

Customers can pay for Express Processing. That is, orders leave on the truck the day the order is ready for shipping.

Assumption

Exact delivery dates for some shipments were gathered via marketing promotions where customers scanned a QR code on the package to register for a price. The assumption here is that customers always scan the code on their arrival.


Data

The company, on some occasions, sent some interns into the warehouse to record the 'Ready to Ship' date for as many orders as possible.

Key Performance Indicators



Order Lead Time



The average time taken for customers to physically receive their orders from the time they were placed

Order Cycle Time

The average time taken to get orders ready to be shipped

Delivery Time

The average order delivery time, i.e., the time taken by the logistics partner to deliver the order to customers

On-Time Ready-to-Ship Rate

The rate at which orders were dispatched on schedule or ahead of schedule

On-Time Delivery Rate

The rate at which orders were delivered on schedule or ahead of schedule

Other Metrics

Data Set

Data

Four raw datasets were provided by Museli

- Orders Data
- Intern Data
- Order Process Data
- Campaign Data

Initial Data Exploration

The data was loaded into pandas, cleaned, and simple EDA was performed to describe the data, carry out descriptive statistics, and identify missing values (e.g., postal code for Vermont) and outliers.

Joining of DataFrames

DataFrames were combined and augmented to generate the needed data to validate assumptions and KPIs.

```
# Order date - full data
orders_data = pd.read_csv('data/Muesli Project raw data - Orders.csv')
orders_data.head(2)
```

	Index	Order ID	Order Date	Ship Mode	Customer ID	Customer Name	Origin Channel	Country/Region	City	State	Postal Code	Region	Category	Sub-Category	Product ID	Sales	Quantity	Discount	Profit
0	1	CA-2019-152156	8/11/2019	Second Class	CG-12520	Claire Gute	Email	United States	Henderson	Kentucky	42420.0	South	Toasted Muesli	With Fruit	FUR-BO-10001798	261.96	2	0.0	41.9136
1	2	CA-2019-152156	8/11/2019	Second Class	CG-12520	Claire Gute	Email	United States	Henderson	Kentucky	42420.0	South	Toasted Muesli	With Nuts	FUR-CH-10000454	731.94	3	0.0	219.5820

```
# 'Ready to Ship' date - limited data
ready_to_ship_data = pd.read_csv('data/Muesli Project raw data - InternData Study.csv')
ready_to_ship_data.head(2)
```

	Order ID	Ready to Ship Date	Pickup Date
0	CA-2019-116540	02/09/2019	03/09/2019
1	CA-2019-116540	02/09/2019	03/09/2019

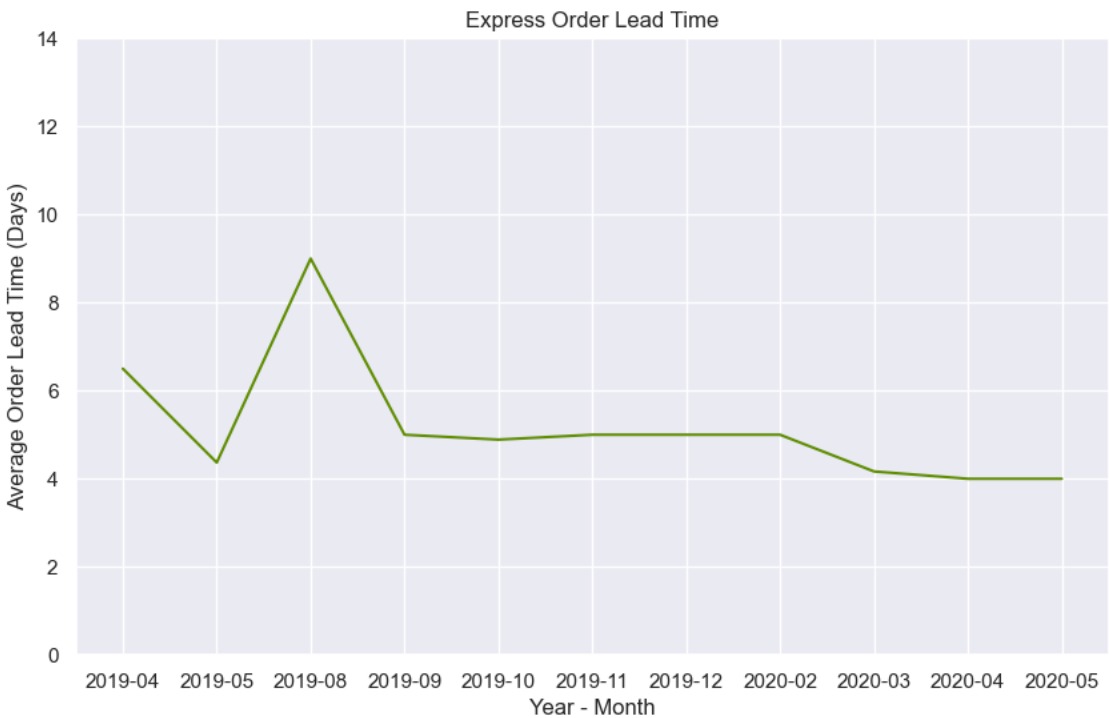
```
# 'On Truck Scan' Date - full data
on_truck_scan_data = pd.read_csv('data/Muesli Project raw data - Order Process Data.csv')
on_truck_scan_data.head(2)
```

	Row ID	Order ID	Order Date	On Truck Scan Date	Ship Mode
0	1	CA-2019-152156	8/11/2019	13/11/2019	Standard Processing
1	2	CA-2019-152156	8/11/2019	13/11/2019	Standard Processing

```
# Delivery date - limited data
delivery_date_data = pd.read_csv('data/Muesli Project raw data - Campaign Data.csv')
delivery_date_data.head(2)
```

	Order ID	Arrival Scan Date	Customer Name
0	CA-2019-109666	03/05/2019	Kunst Miller
1	CA-2019-138933	03/05/2019	Jack Lebron

KPI 1 - Order Lead Time (Monthly and Yearly)



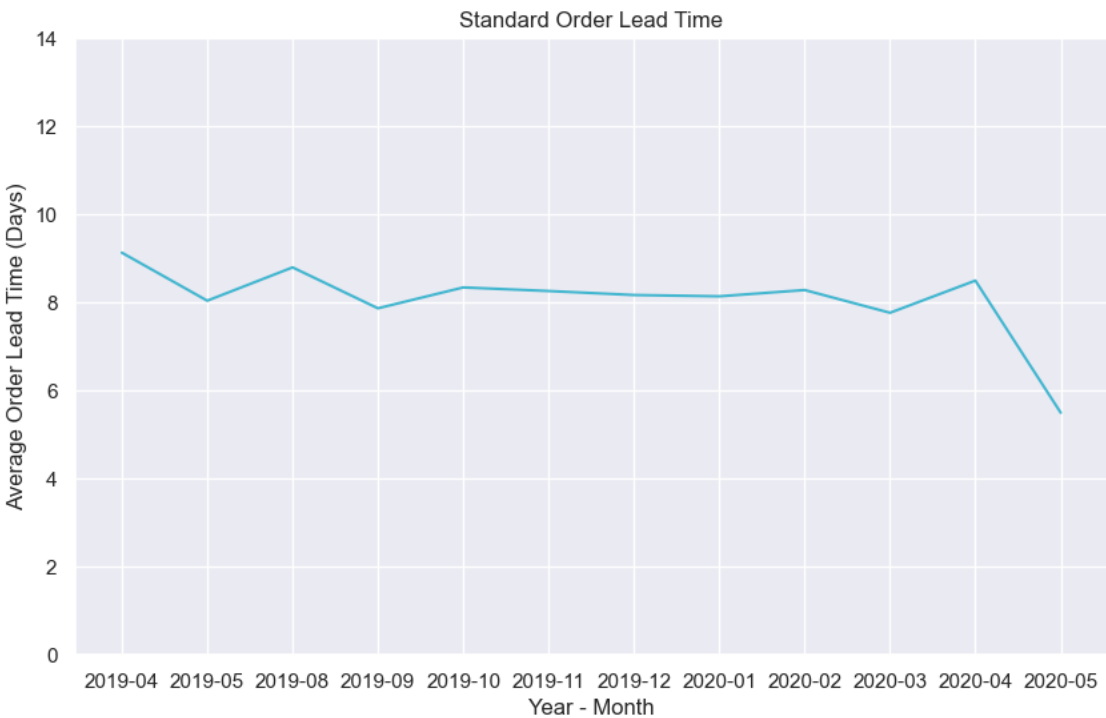
Avg. OLT - 2019

5 Days

Avg. OLT - 2020

5 Days

The average order lead time in 2019 and 2020 for express orders was five days. Five days were promised for express delivery (Two days for processing the orders, the order leaves the warehouse once it is ready to ship and three days for delivery as promised by the logistics company).



Avg. OLT - 2019

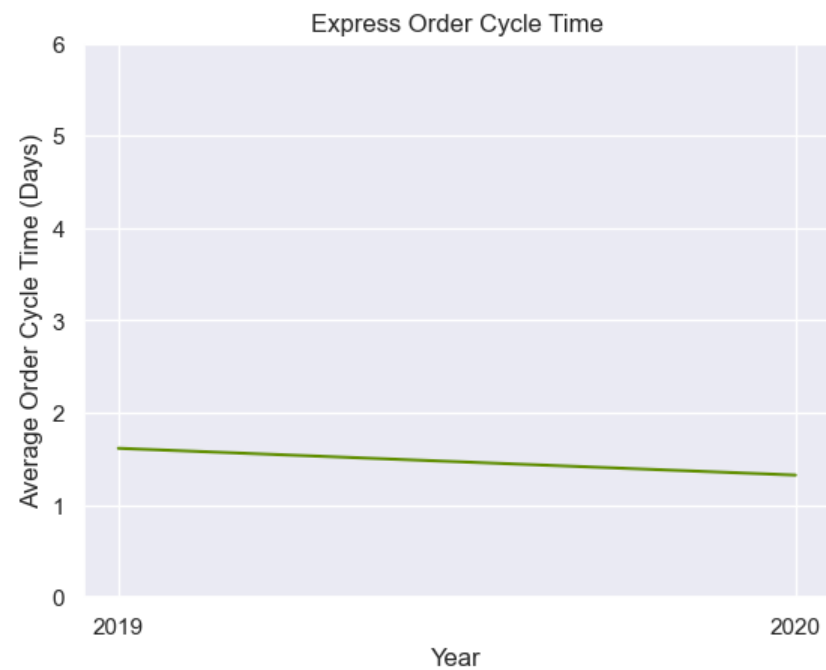
9 Days

Avg. OLT - 2020

8 Days

The average order lead time in both years was nine days and eight days, respectively. This is **above the promised seven days** maximum for standard order delivery (Two days for order processing, two days maximum to load on the truck and three days maximum promised by the logistics company).

KPI 2 - Order Cycle Time (Yearly)



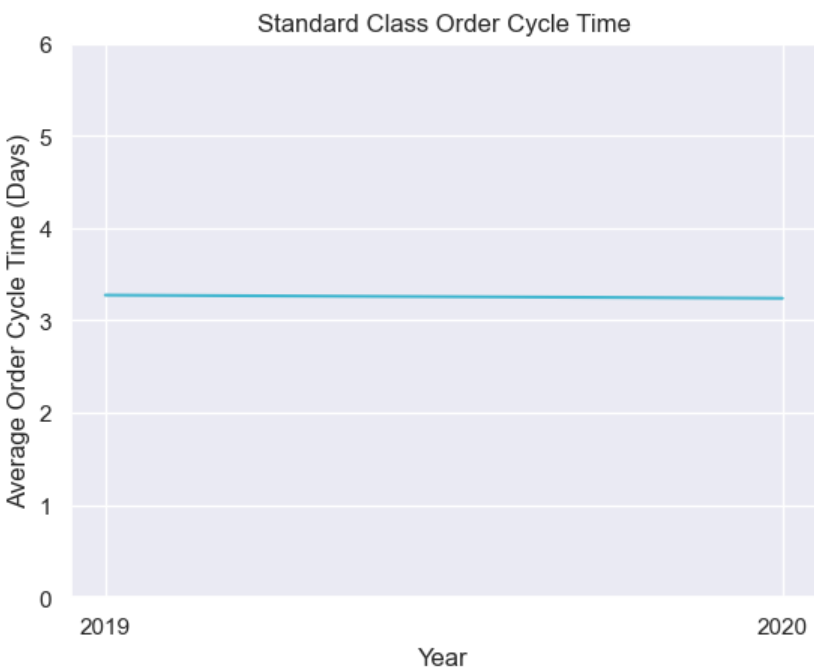
Avg. OLT - 2019

2 Days

Avg. OLT - 2020

2 Days

- This KPI was aggregated yearly due to the limited data on the 'ready to ship date'. Data was not available for some of the months
- The order cycle time for express orders improved slightly between 2019 and 2020. Overall, even though it takes more than one day to get an express order ready for shipping, the target of two days by the warehouse is met.



Avg. OLT - 2019

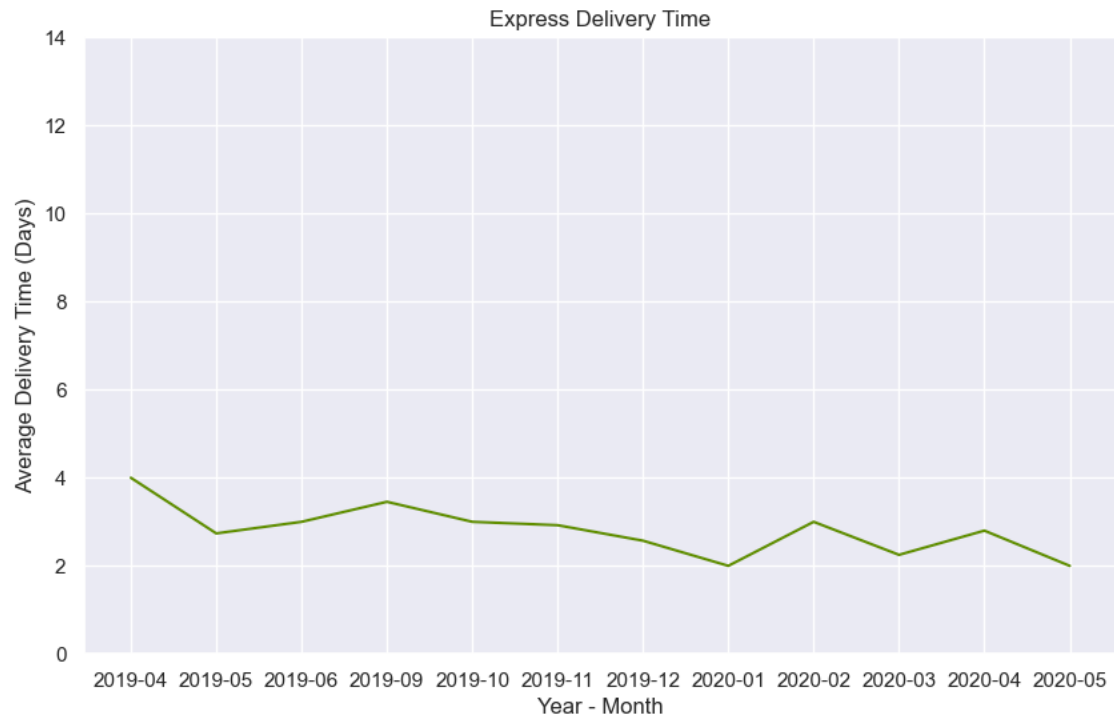
4 Days

Avg. OLT - 2020

4 Days

The order cycle here should also be two days or less. In 2019 and 2020, it took more than three days to get a standard order ready. This is **above the target** and has to be focused on for improvement by the warehouse management.

KPI 3 – Order Delivery Time (Monthly and Yearly)



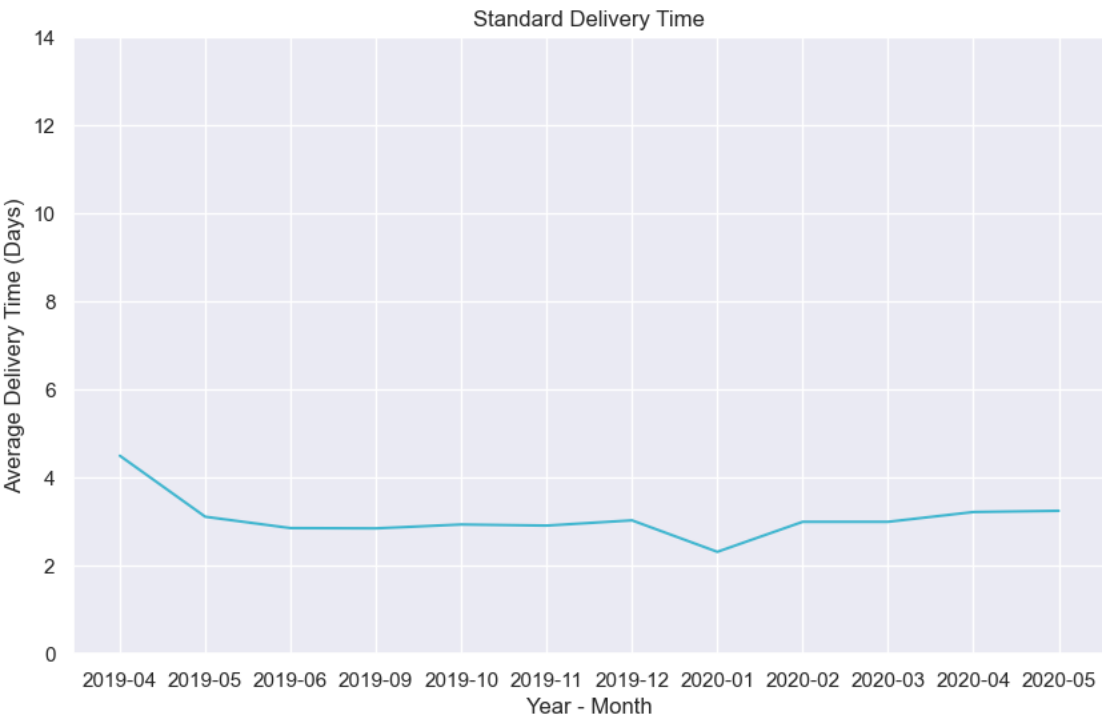
Avg. ODT - 2019

3 Days

Avg. ODT - 2020

3 Days

According to the stakeholder, three days was promised by the delivery company for delivery. This was achieved in the two years under consideration. Express delivery took three days on the average as promised.



Avg. ODT - 2019

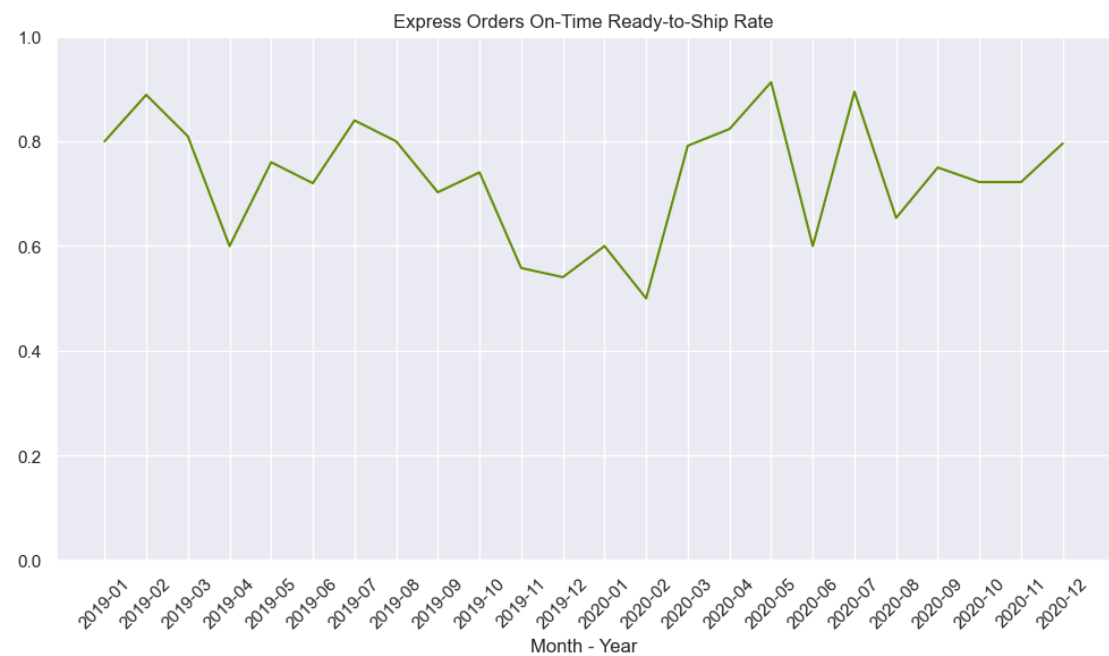
3 Days

Avg. ODT - 2020

3 Days

Same as the express delivery, on the average the delivery time in 2019 and 2020 was three days. In line with the goal of the logistics company.

KPI 4 – On-Time Ready-to-Ship Rate (Monthly and Yearly)



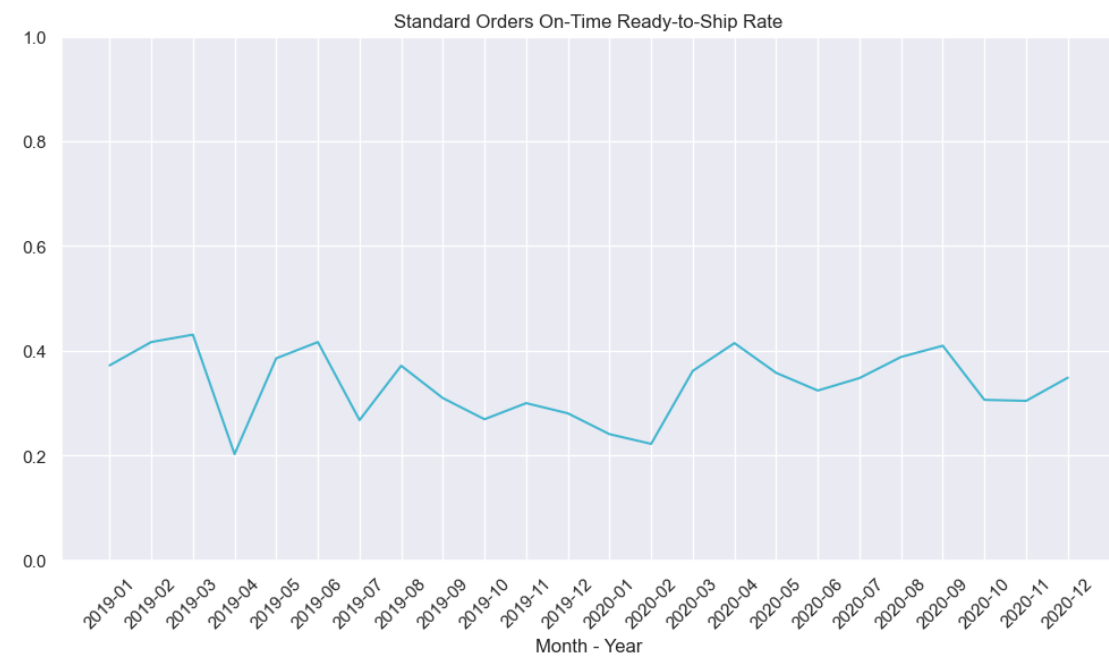
On-Time RTS Rate - 2019

0.70

On-Time RTS Rate - 2020

0.75

- On-time ready_to_ship rate is well above the average, with some months recording as high as 0.9. The average score started to see some improvements in 2020
- PS - Both orders data and on-truck scan date data used to analyze this KPI are complete data sets hence the reason for the data spanning the twelve months of both years



On-Time RTS Rate - 2019

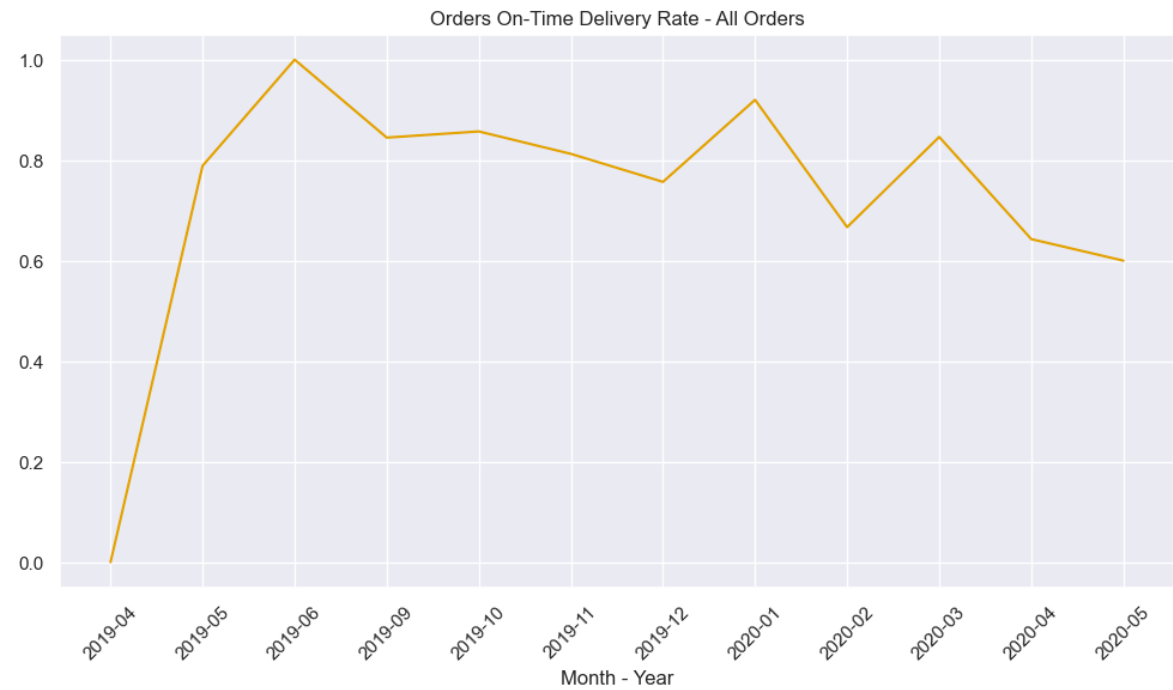
0.32

On-Time RTS Rate - 2020

0.34

- The on-time ready-to-ship rate for standard orders was **below average**. This indicator buttresses what previous KPIs highlighted – order lead time and order cycle time. Most standard orders were not processed on schedule, as seen in the order cycle time, and this undoubtedly contributed to the prolonged order lead time.

KPI 5 – On-Time Delivery Rate (Monthly and Yearly)



On-Time Delivery Rate - 2019

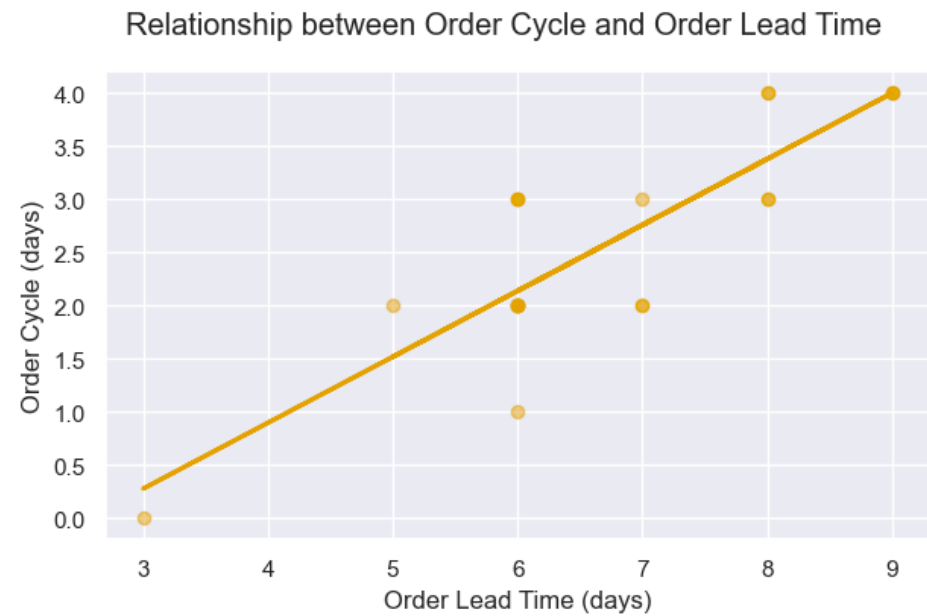
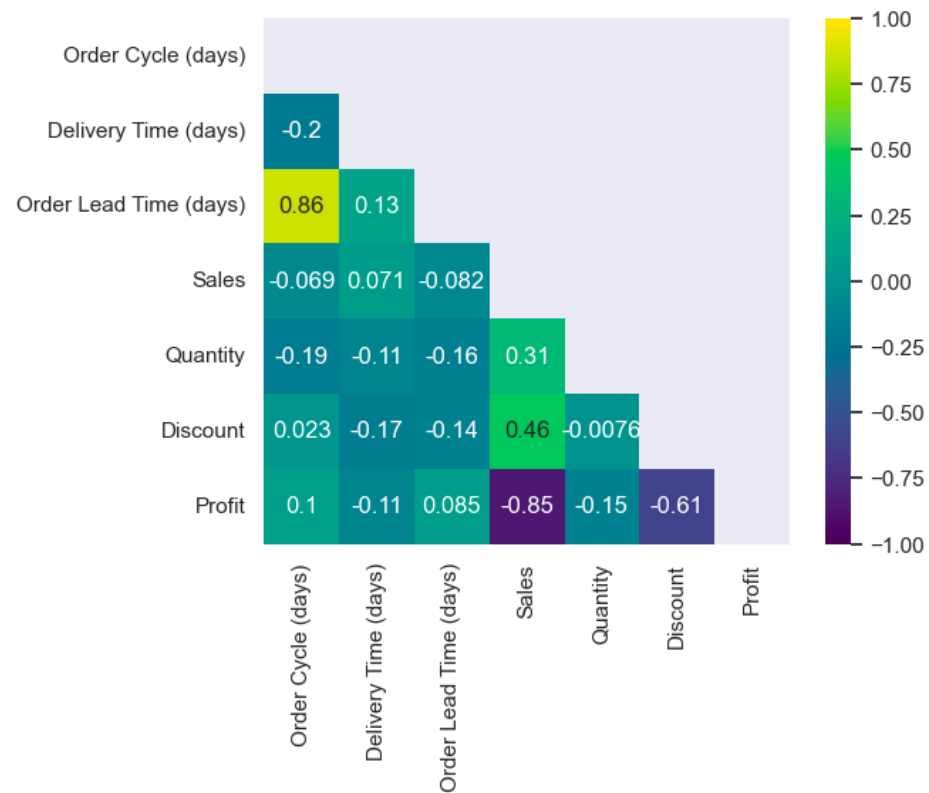
0.81

On-Time Delivery Rate - 2020

0.78

- The chart above showed the rate of on-time delivery for the months when there was a marketing promotion that provided a means of obtaining data on the delivery date of an order.
- There is no distinction between express and standard deliveries in terms of delivery duration. The promise from the logistics company was simply three days' delivery for orders.
- Above average on-time delivery rate. There was a decline in the rate in 2020, mainly in the last two months. The reason for this has yet to be verified, as this could have resulted from the promotion ending or the logistics company taking more time to deliver the orders.

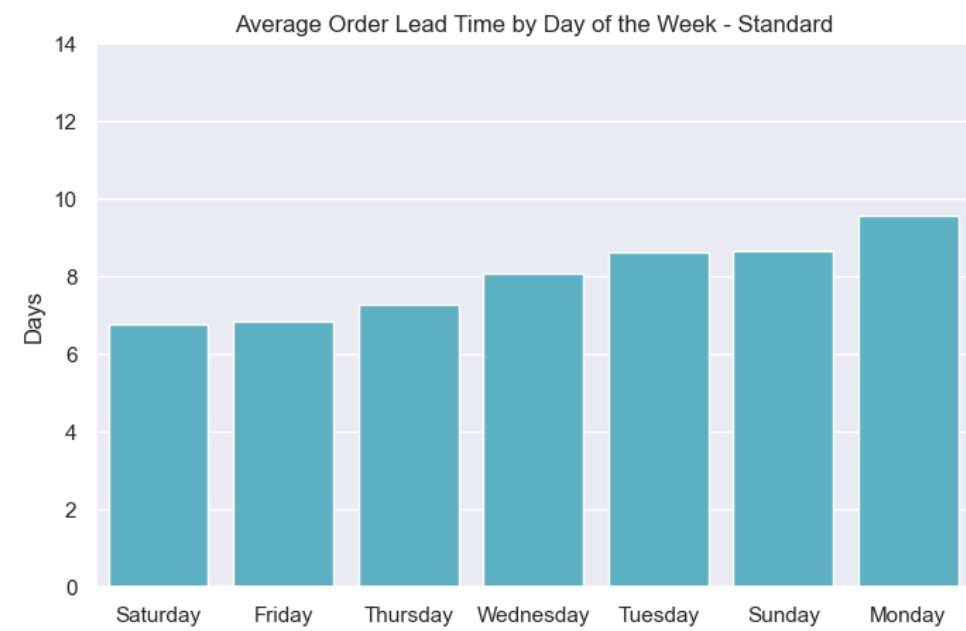
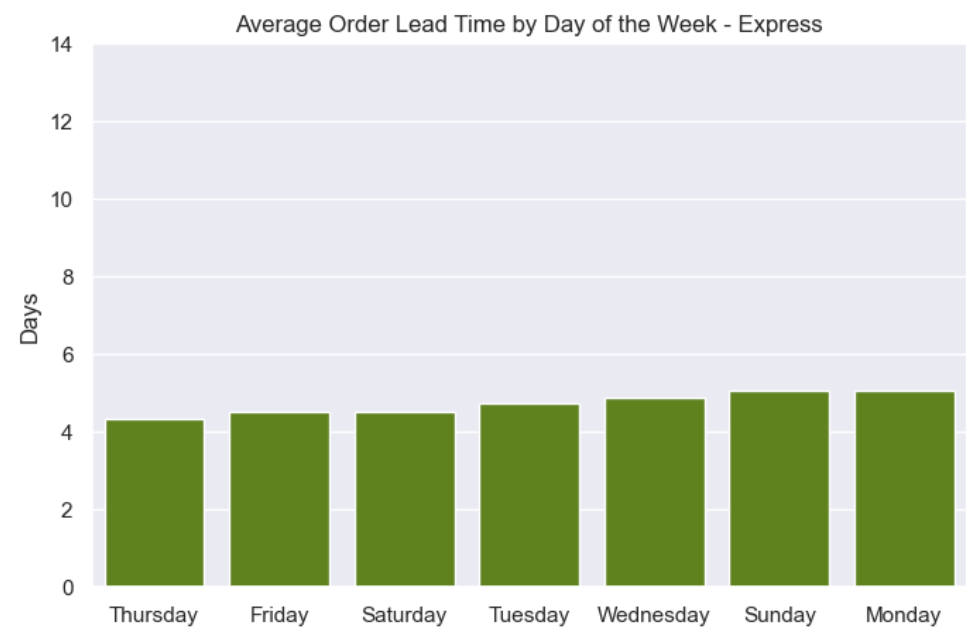
Correlation Matrix



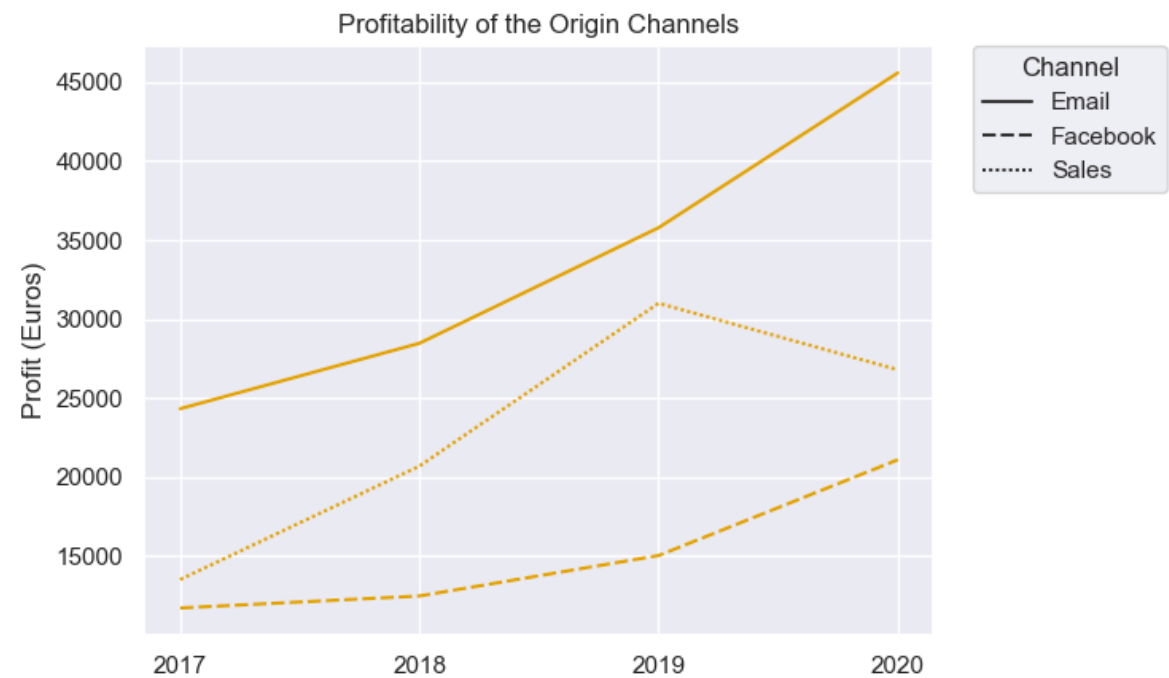
R_Squared - 0.733 i.e. 73% of the variation in Order Cycle data is explained by the model

P > |t| = 0.000 - Less than the confidence level (0.05). There is a statistically significant relationship between the order lead time and the order cycle

Order Lead Time by Day of the Week



Profitability of the Origin Channels



Summary



Standard Order Cycle Time

This is an important KPI that should be focused on by the business. Changes should be made in the warehouse operations to reduce this indicator from four days to two days.

Standard Order Lead Time

Reduction in the order cycle time will consequently bring down the order lead time, which should also be kept below the target level of seven days.



Thank you

