Proyek Analisis Data: E-Commerce Public Dataset

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Menentukan Pertanyaan Bisnis

- Pertanyaan 1: Bagaimana Performa penjualan pada beberapa tahun terakhir dalam skala per bulan? (performa banyaknya order dan total revenue per month) done
- Pertanyaan 2: Produk apa yang paling menghasilkan revenue dan paling laku serta produk paling tidak laku dan tidak menghasilkan revenue?
- Pertanyaan 3: State apa yang menghasilkan revenue dan jumlah order paling tinggi?
- Pertanyaan 4: Metode pembayaran apa yang paling banyak jumlah pembayarannya dan sering digunakan dari berbagai states?
- Pertanyaan 5: RFM Analysis
- Pertanyaan 6: Bagaimana jika distribusi customer berdasarkan lokasi geografis dalam bentuk map? (Geospatial Analysis)
- Pertanyaan 7: Bagaimana jika mengkategorikan customer berdasarkan jumlah total pengeluaran untuk pembelian produk di platform ini? (Clustering)

Import Semua Packages/Library yang Digunakan

```
# import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

print('Setup Complete!')
```

```
Setup Complete!
```

Data Wrangling

Gathering Data

```
# import data-data dalam format csv
customers_df = pd.read_csv('customers_dataset.csv')
orders_dataset_df = pd.read_csv('orders_dataset.csv')
order_items_df = pd.read_csv('order_items_dataset.csv')
order_payments_df = pd.read_csv('order_payments_dataset.csv')
order_reviews_df = pd.read_csv('order_reviews_dataset.csv')
products_df = pd.read_csv('products_dataset.csv')
```

```
products_english_df =
pd.read_csv('product_category_name_translation.csv')
sellers_df = pd.read_csv('sellers_dataset.csv')
geolocation_df = pd.read_csv('geolocation_dataset.csv')
print('Data loaded.')
```

```
Data loaded.
```

```
customers_df.head()
```

```
                        customer_id                customer_unique_id
\
0  06b8999e2fba1a1fbc88172c00ba8bc7  861eff4711a542e4b93843c6dd7febb0

1  18955e83d337fd6b2def6b18a428ac77  290c77bc529b7ac935b93aa66c333dc3

2  4e7b3e00288586ebd08712fdd0374a03  060e732b5b29e8181a18229c7b0b2b5e

3  b2b6027bc5c5109e529d4dc6358b12c3  259dac757896d24d7702b9acbbff3f3c

4  4f2d8ab171c80ec8364f7c12e35b23ad  345ecd01c38d18a9036ed96c73b8d066


   customer_zip_code_prefix          customer_city customer_state
0                     14409                 franca             SP
1                      9790  sao bernardo do campo             SP
2                      1151              sao paulo             SP
3                      8775        mogi das cruzes             SP
4                     13056               campinas             SP
```

```
orders_dataset_df.head()
```

```
                           order_id                        customer_id
\
0  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

1  53cdb2fc8bc7dce0b6741e2150273451  b0830fb4747a6c6d20dea0b8c802d7ef

2  47770eb9100c2d0c44946d9cf07ec65d  41ce2a54c0b03bf3443c3d931a367089

3  949d5b44dbf5de918fe9c16f97b45f8a  f88197465ea7920adcdbec7375364d82

4  ad21c59c0840e6cb83a9ceb5573f8159  8ab97904e6daea8866dbdbc4fb7aad2c


  order_status order_purchase_timestamp    order_approved_at  \
0    delivered      2017-10-02 10:56:33  2017-10-02 11:07:15
1    delivered      2018-07-24 20:41:37  2018-07-26 03:24:27
2    delivered      2018-08-08 08:38:49  2018-08-08 08:55:23
3    delivered      2017-11-18 19:28:06  2017-11-18 19:45:59
4    delivered      2018-02-13 21:18:39  2018-02-13 22:20:29
```

```
  order_delivered_carrier_date order_delivered_customer_date  \
0          2017-10-04 19:55:00           2017-10-10 21:25:13
1          2018-07-26 14:31:00           2018-08-07 15:27:45
2          2018-08-08 13:50:00           2018-08-17 18:06:29
3          2017-11-22 13:39:59           2017-12-02 00:28:42
4          2018-02-14 19:46:34           2018-02-16 18:17:02

  order_estimated_delivery_date
0           2017-10-18 00:00:00
1           2018-08-13 00:00:00
2           2018-09-04 00:00:00
3           2017-12-15 00:00:00
4           2018-02-26 00:00:00

order_items_df.head()

                           order_id  order_item_id  \
0  00010242fe8c5a6d1ba2dd792cb16214              1
1  00018f77f2f0320c557190d7a144bdd3              1
2  000229ec398224ef6ca0657da4fc703e              1
3  00024acbcdf0a6daa1e931b038114c75              1
4  00042b26cf59d7ce69dfabb4e55b4fd9              1

                         product_id                         seller_id
\
0  4244733e06e7ecb4970a6e2683c13e61  48436dade18ac8b2bce089ec2a041202

1  e5f2d52b802189ee658865ca93d83a8f  dd7ddc04e1b6c2c614352b383efe2d36

2  c777355d18b72b67abbeef9df44fd0fd  5b51032eddd242adc84c38acab88f23d

3  7634da152a4610f1595efa32f14722fc  9d7a1d34a5052409006425275ba1c2b4

4  ac6c3623068f30de03045865e4e10089  df560393f3a51e74553ab94004ba5c87


   shipping_limit_date   price  freight_value
0  2017-09-19 09:45:35   58.90          13.29
1  2017-05-03 11:05:13  239.90          19.93
2  2018-01-18 14:48:30  199.00          17.87
3  2018-08-15 10:10:18   12.99          12.79
4  2017-02-13 13:57:51  199.90          18.14

order_payments_df.head()

                           order_id  payment_sequential
payment_type  \
0  b81ef226f3fe1789b1e8b2acac839d17                   1  credit_card

1  a9810da82917af2d9aefd1278f1dcfa0                   1  credit_card
```

```
2  25e8ea4e93396b6fa0d3dd708e76c1bd                    1  credit_card

3  ba78997921bbcdc1373bb41e913ab953                    1  credit_card

4  42fdf880ba16b47b59251dd489d4441a                    1  credit_card


   payment_installments  payment_value
0                     8          99.33
1                     1          24.39
2                     1          65.71
3                     8         107.78
4                     2         128.45

order_reviews_df.head()

                          review_id                           order_id
\
0  7bc2406110b926393aa56f80a40eba40  73fc7af87114b39712e6da79b0a377eb

1  80e641a11e56f04c1ad469d5645fdfde  a548910a1c6147796b98fdf73dbeba33

2  228ce5500dc1d8e020d8d1322874b6f0  f9e4b658b201a9f2ecdecbb34bed034b

3  e64fb393e7b32834bb789ff8bb30750e  658677c97b385a9be170737859d3511b

4  f7c4243c7fe1938f181bec41a392bdeb  8e6bfb81e283fa7e4f11123a3fb894f1


   review_score review_comment_title  \
0             4                   NaN
1             5                   NaN
2             5                   NaN
3             5                   NaN
4             5                   NaN

                               review_comment_message
review_creation_date  \
0                                                 NaN  2018-01-18
00:00:00
1                                                 NaN  2018-03-10
00:00:00
2                                                 NaN  2018-02-17
00:00:00
3              Recebi bem antes do prazo estipulado.  2017-04-21
00:00:00
4  Parabéns lojas lannister adorei comprar pela I...  2018-03-01
00:00:00

  review_answer_timestamp
0     2018-01-18 21:46:59
```

```
1     2018-03-11 03:05:13
2     2018-02-18 14:36:24
3     2017-04-21 22:02:06
4     2018-03-02 10:26:53

products_df.head()

                         product_id  product_category_name  \
0  1e9e8ef04dbcff4541ed26657ea517e5            perfumaria
1  3aa071139cb16b67ca9e5dea641aaa2f                 artes
2  96bd76ec8810374ed1b65e291975717f          esporte_lazer
3  cef67bcfe19066a932b7673e239eb23d                 bebes
4  9dc1a7de274444849c219cff195d0b71  utilidades_domesticas

   product_name_lenght  product_description_lenght  product_photos_qty
\
0                 40.0                       287.0                 1.0

1                 44.0                       276.0                 1.0

2                 46.0                       250.0                 1.0

3                 27.0                       261.0                 1.0

4                 37.0                       402.0                 4.0


   product_weight_g  product_length_cm  product_height_cm
product_width_cm
0             225.0               16.0               10.0
14.0
1            1000.0               30.0               18.0
20.0
2             154.0               18.0                9.0
15.0
3             371.0               26.0                4.0
26.0
4             625.0               20.0               17.0
13.0

products_english_df.head()

    product_category_name product_category_name_english
0            beleza_saude                  health_beauty
1  informatica_acessorios         computers_accessories
2             automotivo                          auto
3         cama_mesa_banho                bed_bath_table
4        moveis_decoracao               furniture_decor

sellers_df.head()
```

```
                         seller_id  seller_zip_code_prefix  \
0  3442f8959a84dea7ee197c632cb2df15                   13023
1  d1b65fc7debc3361ea86b5f14c68d2e2                   13844
2  ce3ad9de960102d0677a81f5d0bb7b2d                   20031
3  c0f3eea2e14555b6faeea3dd58c1b1c3                    4195
4  51a04a8a6bdcb23deccc82b0b80742cf                   12914

         seller_city seller_state
0           campinas           SP
1         mogi guacu           SP
2     rio de janeiro           RJ
3          sao paulo           SP
4  braganca paulista           SP
```

```
geolocation_df.head()
```

```
   geolocation_zip_code_prefix  geolocation_lat  geolocation_lng  \
0                         1037       -23.545621       -46.639292
1                         1046       -23.546081       -46.644820
2                         1046       -23.546129       -46.642951
3                         1041       -23.544392       -46.639499
4                         1035       -23.541578       -46.641607

  geolocation_city geolocation_state
0        sao paulo                SP
1        sao paulo                SP
2        sao paulo                SP
3        sao paulo                SP
4        sao paulo                SP
```

Insight:

- Pada dataframe order_items_df terdapat paling banyak column dengan foreign key.
- Analisis nanti kita harus men-translate product_category_name ke bahasa inggris dari column product_category_name_english
- Pada tabel geolocation_df, kita bisa analisis dengan library khusus untuk spatial analysis, seperti geopandas.
- Pada tabel order_reviews_df yang kita ambil hanya review_score saja

Assessing Data

Check Data Type

```
customers_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 5 columns):
 #   Column                    Non-Null Count  Dtype
---  ------                    --------------  -----
```

```
 0   customer_id               99441 non-null  object
 1   customer_unique_id        99441 non-null  object
 2   customer_zip_code_prefix  99441 non-null  int64
 3   customer_city             99441 non-null  object
 4   customer_state            99441 non-null  object
dtypes: int64(1), object(4)
memory usage: 3.8+ MB

orders_dataset_df.info()
# terlihat dtype tabel yang mengandung informasi waktu masih dalam
bentuk object

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column                         Non-Null Count  Dtype
---  ------                         --------------  -----
 0   order_id                       99441 non-null  object
 1   customer_id                    99441 non-null  object
 2   order_status                   99441 non-null  object
 3   order_purchase_timestamp       99441 non-null  object
 4   order_approved_at              99281 non-null  object
 5   order_delivered_carrier_date   97658 non-null  object
 6   order_delivered_customer_date  96476 non-null  object
 7   order_estimated_delivery_date  99441 non-null  object
dtypes: object(8)
memory usage: 6.1+ MB

order_items_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112650 entries, 0 to 112649
Data columns (total 7 columns):
 #   Column               Non-Null Count   Dtype
---  ------               --------------   -----
 0   order_id             112650 non-null  object
 1   order_item_id        112650 non-null  int64
 2   product_id           112650 non-null  object
 3   seller_id            112650 non-null  object
 4   shipping_limit_date  112650 non-null  object
 5   price                112650 non-null  float64
 6   freight_value        112650 non-null  float64
dtypes: float64(2), int64(1), object(4)
memory usage: 6.0+ MB

order_payments_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 103886 entries, 0 to 103885
Data columns (total 5 columns):
 #   Column                Non-Null Count   Dtype
```

```
---  ------                 --------------   -----
 0   order_id               103886 non-null  object
 1   payment_sequential     103886 non-null  int64
 2   payment_type           103886 non-null  object
 3   payment_installments   103886 non-null  int64
 4   payment_value          103886 non-null  float64
dtypes: float64(1), int64(2), object(2)
memory usage: 4.0+ MB

order_reviews_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99224 entries, 0 to 99223
Data columns (total 7 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   review_id                99224 non-null  object
 1   order_id                 99224 non-null  object
 2   review_score             99224 non-null  int64
 3   review_comment_title     11568 non-null  object
 4   review_comment_message   40977 non-null  object
 5   review_creation_date     99224 non-null  object
 6   review_answer_timestamp  99224 non-null  object
dtypes: int64(1), object(6)
memory usage: 5.3+ MB

products_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 32951 entries, 0 to 32950
Data columns (total 9 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   product_id                   32951 non-null  object
 1   product_category_name        32341 non-null  object
 2   product_name_lenght          32341 non-null  float64
 3   product_description_lenght   32341 non-null  float64
 4   product_photos_qty           32341 non-null  float64
 5   product_weight_g             32949 non-null  float64
 6   product_length_cm            32949 non-null  float64
 7   product_height_cm            32949 non-null  float64
 8   product_width_cm             32949 non-null  float64
dtypes: float64(7), object(2)
memory usage: 2.3+ MB

sellers_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3095 entries, 0 to 3094
Data columns (total 4 columns):
 #   Column                  Non-Null Count  Dtype
```

```
---  ------                  --------------  -----
 0   seller_id               3095 non-null   object
 1   seller_zip_code_prefix  3095 non-null   int64
 2   seller_city             3095 non-null   object
 3   seller_state            3095 non-null   object
dtypes: int64(1), object(3)
memory usage: 96.8+ KB

geolocation_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000163 entries, 0 to 1000162
Data columns (total 5 columns):
 #   Column                       Non-Null Count    Dtype
---  ------                       --------------    -----
 0   geolocation_zip_code_prefix  1000163 non-null  int64
 1   geolocation_lat              1000163 non-null  float64
 2   geolocation_lng              1000163 non-null  float64
 3   geolocation_city             1000163 non-null  object
 4   geolocation_state            1000163 non-null  object
dtypes: float64(2), int64(1), object(2)
memory usage: 38.2+ MB
```

Check Missing Value

```
customers_df.isna().sum()

customer_id                 0
customer_unique_id          0
customer_zip_code_prefix    0
customer_city               0
customer_state              0
dtype: int64

orders_dataset_df.isna().sum()
# terdapat missing value pada beberapa kolom

order_id                            0
customer_id                         0
order_status                        0
order_purchase_timestamp            0
order_approved_at                 160
order_delivered_carrier_date     1783
order_delivered_customer_date    2965
order_estimated_delivery_date       0
dtype: int64

order_items_df.isna().sum()

order_id               0
order_item_id          0
```

```
product_id              0
seller_id               0
shipping_limit_date     0
price                   0
freight_value           0
dtype: int64
```

```
order_payments_df.isna().sum()
```

```
order_id                0
payment_sequential      0
payment_type            0
payment_installments    0
payment_value           0
dtype: int64
```

```
order_reviews_df.isna().sum()
# review_comment_title dan review_comment_message akan di-drop, karena
tidak akan dianalisis sentimen di tahap selanjutnya.
```

```
review_id                     0
order_id                      0
review_score                  0
review_comment_title      87656
review_comment_message    58247
review_creation_date          0
review_answer_timestamp       0
dtype: int64
```

```
products_df.isna().sum()
# terdapat missing value pada beberapa kolom
```

```
product_id                    0
product_category_name       610
product_name_lenght         610
product_description_lenght  610
product_photos_qty          610
product_weight_g              2
product_length_cm             2
product_height_cm             2
product_width_cm              2
dtype: int64
```

```
sellers_df.isna().sum()
```

```
seller_id               0
seller_zip_code_prefix  0
seller_city             0
seller_state            0
dtype: int64
```

```
geolocation_df.isna().sum()
```

```
geolocation_zip_code_prefix    0
geolocation_lat                0
geolocation_lng                0
geolocation_city               0
geolocation_state              0
dtype: int64
```

Check Duplicate Value

```
customers_df.duplicated().sum()
```

```
0
```

```
orders_dataset_df.duplicated().sum()
```

```
0
```

```
order_items_df.duplicated().sum()
```

```
0
```

```
order_payments_df.duplicated().sum()
```

```
0
```

```
order_reviews_df.duplicated().sum()
```

```
0
```

```
products_df.duplicated().sum()
```

```
0
```

```
sellers_df.duplicated().sum()
```

```
0
```

Check Inaccurate & Inconsistent Value

```
customers_df.customer_state.value_counts()
```

```
customer_state
SP    41746
RJ    12852
MG    11635
RS     5466
PR     5045
SC     3637
BA     3380
DF     2140
ES     2033
```

```
GO     2020
PE     1652
CE     1336
PA      975
MT      907
MA      747
MS      715
PB      536
PI      495
RN      485
AL      413
SE      350
TO      280
RO      253
AM      148
AC       81
AP       68
RR       46
Name: count, dtype: int64
```

```
orders_dataset_df['order_status'].value_counts()
# hanya order_status yang delivered yang akan dianalisis di tahap
selanjutnya
```

```
order_status
delivered      96478
shipped         1107
canceled         625
unavailable      609
invoiced         314
processing       301
created            5
approved           2
Name: count, dtype: int64
```

```
order_payments_df['payment_type'].value_counts()
```

```
payment_type
credit_card    76795
boleto         19784
voucher         5775
debit_card      1529
not_defined        3
Name: count, dtype: int64
```

```
order_payments_df[order_payments_df['payment_type']=='not_defined']
```

```
                               order_id  payment_sequential
payment_type  \
51280  4637ca194b6387e2d538dc89b124b0ee                   1
not_defined
```

```
57411  00b1cb0320190ca0daa2c88b35206009                     1
not_defined
94427  c8c528189310eaa44a745b8d9d26908b                     1
not_defined

       payment_installments  payment_value
51280                     1            0.0
57411                     1            0.0
94427                     1            0.0
```

	Data Type	Missing Value	Duplicate Value	Inaccurate Value
customers_df				
orders_dataset_df	order_purchase_timestamp	order_approved_at = 160		
	order_approved_at	order_delivered_carrier_date = 1783		
	order_delivered_carrier_date	order_delivered_customer_date = 2		
	order_delivered_customer_date			
	order_estimated_delivery_date			
order_items_df				
order_payments_df				
order_reviews_df		review_comment_title 87656		
		review_comment_message 58247		
products_df		product_category_name = 610		
		product_name_lenght = 610		
		product_description_lenght = 610		
		product_photos_qty = 610		
		product_weight_g = 2		
		product_length_cm = 2		
		product_height_cm = 2		
		product_width_cm = 2		
products_eng				

	Data Type	Missing Value	Duplicate Value	Inaccurate Value
lish_df				
sellers_df				
geolocation_df				

Insight:

- Terdapat kesalahan data type pada table orders_dataset_df
- Terdapat missing value pada table orders_dataset_df, order_reviews_df, dan products_df
- Pada kolom 'order_status' di tabel orders_dataset_df, hanya status yang delivered yang akan dianalisis nantinya, selain itu akan di-drop.
- Pada tabel order_reviews_df, hanya rating score yang akan dianalisis lebih lanjut, sisanya akan didrop seperti comment title, message, etc.

Cleaning Data

orders_dataset_df

```
orders_dataset_df =
orders_dataset_df[orders_dataset_df['order_status'] ==
'delivered'].reset_index(drop=True)
orders_dataset_df.head()
```

```
                           order_id                       customer_id
\
0  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

1  53cdb2fc8bc7dce0b6741e2150273451  b0830fb4747a6c6d20dea0b8c802d7ef

2  47770eb9100c2d0c44946d9cf07ec65d  41ce2a54c0b03bf3443c3d931a367089

3  949d5b44dbf5de918fe9c16f97b45f8a  f88197465ea7920adcdbec7375364d82

4  ad21c59c0840e6cb83a9ceb5573f8159  8ab97904e6daea8866dbdbc4fb7aad2c


  order_status order_purchase_timestamp    order_approved_at  \
0    delivered      2017-10-02 10:56:33  2017-10-02 11:07:15
1    delivered      2018-07-24 20:41:37  2018-07-26 03:24:27
2    delivered      2018-08-08 08:38:49  2018-08-08 08:55:23
3    delivered      2017-11-18 19:28:06  2017-11-18 19:45:59
4    delivered      2018-02-13 21:18:39  2018-02-13 22:20:29

  order_delivered_carrier_date order_delivered_customer_date  \
0          2017-10-04 19:55:00           2017-10-10 21:25:13
1          2018-07-26 14:31:00           2018-08-07 15:27:45
2          2018-08-08 13:50:00           2018-08-17 18:06:29
```

```
3          2017-11-22 13:39:59           2017-12-02 00:28:42
4          2018-02-14 19:46:34           2018-02-16 18:17:02

  order_estimated_delivery_date
0           2017-10-18 00:00:00
1           2018-08-13 00:00:00
2           2018-09-04 00:00:00
3           2017-12-15 00:00:00
4           2018-02-26 00:00:00
```

```
drop_columns = ['order_approved_at','order_delivered_carrier_date',
'order_delivered_customer_date']
orders_dataset_df.drop(drop_columns, axis=1, inplace=True)
orders_dataset_df.head()
#Orders_dataset selesai
```

```
                           order_id                       customer_id
\
0  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

1  53cdb2fc8bc7dce0b6741e2150273451  b0830fb4747a6c6d20dea0b8c802d7ef

2  47770eb9100c2d0c44946d9cf07ec65d  41ce2a54c0b03bf3443c3d931a367089

3  949d5b44dbf5de918fe9c16f97b45f8a  f88197465ea7920adcdbec7375364d82

4  ad21c59c0840e6cb83a9ceb5573f8159  8ab97904e6daea8866dbdbc4fb7aad2c


  order_status order_purchase_timestamp order_estimated_delivery_date

0    delivered      2017-10-02 10:56:33           2017-10-18 00:00:00

1    delivered      2018-07-24 20:41:37           2018-08-13 00:00:00

2    delivered      2018-08-08 08:38:49           2018-09-04 00:00:00

3    delivered      2017-11-18 19:28:06           2017-12-15 00:00:00

4    delivered      2018-02-13 21:18:39           2018-02-26 00:00:00
```

```
columns_to_datetime = ['order_purchase_timestamp',
'order_estimated_delivery_date']
for column in columns_to_datetime:
    orders_dataset_df[column] =
pd.to_datetime(orders_dataset_df[column])

orders_dataset_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 96478 entries, 0 to 96477
```

```
Data columns (total 5 columns):
 #   Column                         Non-Null Count  Dtype
---  ------                         --------------  -----
 0   order_id                       96478 non-null  object
 1   customer_id                    96478 non-null  object
 2   order_status                   96478 non-null  object
 3   order_purchase_timestamp       96478 non-null  datetime64[ns]
 4   order_estimated_delivery_date  96478 non-null  datetime64[ns]
dtypes: datetime64[ns](2), object(3)
memory usage: 3.7+ MB
```

order_reviews_df

```
order_reviews_df.head()
drop_columns = ['review_comment_message', 'review_comment_title',
'review_creation_date', 'review_answer_timestamp']
order_reviews_df.drop(drop_columns, axis=1, inplace=True)
order_reviews_df.head()
```

```
                          review_id                          order_id
\
0  7bc2406110b926393aa56f80a40eba40  73fc7af87114b39712e6da79b0a377eb

1  80e641a11e56f04c1ad469d5645fdfde  a548910a1c6147796b98fdf73dbeba33

2  228ce5500dc1d8e020d8d1322874b6f0  f9e4b658b201a9f2ecdecbb34bed034b

3  e64fb393e7b32834bb789ff8bb30750e  658677c97b385a9be170737859d3511b

4  f7c4243c7fe1938f181bec41a392bdeb  8e6bfb81e283fa7e4f11123a3fb894f1


   review_score
0             4
1             5
2             5
3             5
4             5
```

```
order_reviews_df.head()
```

```
                          review_id                          order_id
\
0  7bc2406110b926393aa56f80a40eba40  73fc7af87114b39712e6da79b0a377eb

1  80e641a11e56f04c1ad469d5645fdfde  a548910a1c6147796b98fdf73dbeba33

2  228ce5500dc1d8e020d8d1322874b6f0  f9e4b658b201a9f2ecdecbb34bed034b

3  e64fb393e7b32834bb789ff8bb30750e  658677c97b385a9be170737859d3511b
```

```
4  f7c4243c7fe1938f181bec41a392bdeb  8e6bfb81e283fa7e4f11123a3fb894f1


   review_score
0             4
1             5
2             5
3             5
4             5
```

products_df

```
# We need to translate the words from column product_category_name in
products_df table to english to get a better understanding at the
data.
products_df= pd.merge(left=products_df, right=products_english_df,
how='left', on='product_category_name')

products_df.head()
```

```
                         product_id  product_category_name  \
0  1e9e8ef04dbcff4541ed26657ea517e5             perfumaria
1  3aa071139cb16b67ca9e5dea641aaa2f                  artes
2  96bd76ec8810374ed1b65e291975717f          esporte_lazer
3  cef67bcfe19066a932b7673e239eb23d                  bebes
4  9dc1a7de274444849c219cff195d0b71  utilidades_domesticas

   product_name_lenght  product_description_lenght  product_photos_qty
\
0                 40.0                       287.0                 1.0

1                 44.0                       276.0                 1.0

2                 46.0                       250.0                 1.0

3                 27.0                       261.0                 1.0

4                 37.0                       402.0                 4.0


   product_weight_g  product_length_cm  product_height_cm
product_width_cm  \
0             225.0               16.0               10.0
14.0
1            1000.0               30.0               18.0
20.0
2             154.0               18.0                9.0
15.0
3             371.0               26.0                4.0
26.0
4             625.0               20.0               17.0
```

```
13.0
```

```
  product_category_name_english
0                     perfumery
1                           art
2                sports_leisure
3                          baby
4                     housewares
```

```
# Since only 610 rows that have null values, removing these rows won't
have significant impact to the analysis
products_df.dropna(inplace=True)
```

order_payments_df

```
order_payments_df.drop(order_payments_df.loc[order_payments_df['paymen
t_type']=='not_defined'].index, inplace=True)
```

```
order_payments_df[order_payments_df['payment_type']=='not_defined']
```

```
Empty DataFrame
Columns: [order_id, payment_sequential, payment_type,
payment_installments, payment_value]
Index: []
```

```
order_payments_df.groupby('payment_type').count()
```

```
              order_id  payment_sequential  payment_installments  \
payment_type
boleto           19784               19784                 19784
credit_card      76795               76795                 76795
debit_card        1529                1529                  1529
voucher           5775                5775                  5775

              payment_value
payment_type
boleto                19784
credit_card           76795
debit_card             1529
voucher                5775
```

Insight:

- semua tabel sudah siap dan tahap selanjutnya harus di merge dengan tabel yang berkaitan agar bisa memunculkan insight
- geolocation akan dianalisis di akhir

Exploratory Data Analysis (EDA)

Explore customers_df

```
customers_df.describe(include="all")
```

```
                                customer_id
customer_unique_id  \
count                                99441
99441
unique                               99441
96096
top     06b8999e2fba1a1fbc88172c00ba8bc7
8d50f5eadf50201ccdcedfb9e2ac8455
freq                                     1
17
mean                                   NaN
NaN
std                                    NaN
NaN
min                                    NaN
NaN
25%                                    NaN
NaN
50%                                    NaN
NaN
75%                                    NaN
NaN
max                                    NaN
NaN

        customer_zip_code_prefix customer_city customer_state
count                99441.000000         99441          99441
unique                        NaN          4119             27
top                           NaN     sao paulo             SP
freq                          NaN         15540          41746
mean                35137.474583           NaN            NaN
std                 29797.938996           NaN            NaN
min                  1003.000000           NaN            NaN
25%                 11347.000000           NaN            NaN
50%                 24416.000000           NaN            NaN
75%                 58900.000000           NaN            NaN
max                 99990.000000           NaN            NaN
```

```
# jumlah customer dari berbagai state
customers_df.groupby('customer_state')
['customer_id'].nunique().sort_values(ascending=False)
```

```
customer_state
SP    41746
```

```
RJ    12852
MG    11635
RS     5466
PR     5045
SC     3637
BA     3380
DF     2140
ES     2033
GO     2020
PE     1652
CE     1336
PA      975
MT      907
MA      747
MS      715
PB      536
PI      495
RN      485
AL      413
SE      350
TO      280
RO      253
AM      148
AC       81
AP       68
RR       46
Name: customer_id, dtype: int64
```

```
# jumlah customer dari berbagai city
customers_df.groupby('customer_city')
['customer_id'].nunique().sort_values(ascending=False)
```

```
customer_city
sao paulo         15540
rio de janeiro     6882
belo horizonte     2773
brasilia           2131
curitiba           1521
                  ...
ibiara                1
rio espera            1
rio dos indios        1
rio dos cedros        1
lagoao                1
Name: customer_id, Length: 4119, dtype: int64
```

Explore orders_dataset_df

```
# membuat variabel delivery time
delivery_time = orders_dataset_df["order_estimated_delivery_date"] -
```

```
orders_dataset_df["order_purchase_timestamp"]
delivery_time = delivery_time.apply(lambda x: x.total_seconds())
orders_dataset_df["delivery_time"] = round(delivery_time/86400)

orders_dataset_df.describe(include="all")
```

```
                                order_id
customer_id  \
count                            96478
96478
unique                           96478
96478
top     e481f51cbdc54678b7cc49136f2d6af7
9ef432eb6251297304e76186b10a928d
freq                                 1
1
mean                               NaN
NaN
min                                NaN
NaN
25%                                NaN
NaN
50%                                NaN
NaN
75%                                NaN
NaN
max                                NaN
NaN
std                                NaN
NaN

       order_status       order_purchase_timestamp  \
count         96478                          96478
unique            1                            NaN
top       delivered                            NaN
freq          96478                            NaN
mean            NaN  2018-01-01 23:29:31.939913984
min             NaN            2016-09-15 12:16:38
25%             NaN  2017-09-14 09:00:23.249999872
50%             NaN            2018-01-20 19:45:45
75%             NaN            2018-05-05 18:54:47
max             NaN            2018-08-29 15:00:37
std             NaN                            NaN

        order_estimated_delivery_date  delivery_time
count                           96478   96478.000000
unique                            NaN            NaN
top                               NaN            NaN
freq                              NaN            NaN
mean    2018-01-25 17:09:52.325711616      23.644188
```

```
min                  2016-10-04 00:00:00       2.000000
25%                  2017-10-05 00:00:00      18.000000
50%                  2018-02-16 00:00:00      23.000000
75%                  2018-05-28 00:00:00      28.000000
max                  2018-10-25 00:00:00     155.000000
std                                  NaN       8.769316
```

Explore orders_customers_df

```
# menambah column baru yaitu status untuk mengetahui status user aktif atau non aktif
customers_id_in_orders_df = orders_dataset_df.customer_id.tolist()
customers_df['status'] = customers_df['customer_id'].apply(lambda x: 'Active' if x in customers_id_in_orders_df else 'Non Active')
customers_df.sample(5)
```

```
                             customer_id
customer_unique_id  \
45346  563c5a6fccb510f26534e34cc177b87e
60d2403e6d0b05d5213ae7d7d9b70080
55751  60c9c9568fdcbbccfc7ddc387f76e200
5cdbff27ae9bb0812d23e36f517feb23
38777  10e4208d1da23cd8f6ee0477f6b5cc9a
af32334783564756b0928aac81c2606b
26549  c0c563d66d3d0182b86b18db6eecda05
4c4cb7298a837849426bea982a676ae8
65244  735c9db72feaec11cefd42d50c2b7f66
6267d5c4c84591fa44e9c56c4e31af20

       customer_zip_code_prefix    customer_city customer_state
status
45346                      4363        sao paulo             SP
Active
55751                     29208        guarapari             ES
Active
38777                     28930  arraial do cabo             RJ
Active
26549                     14811       araraquara             SP
Active
65244                     11660    caraguatatuba             SP
Active
```

```
customers_df.groupby('status').customer_id.count()
```

```
status
Active        96478
Non Active     2963
Name: customer_id, dtype: int64
```

```
orders_customers_df = pd.merge(left=orders_dataset_df,
right=customers_df, how='left', on='customer_id')
orders_customers_df.head()
```

```
                           order_id                         customer_id
\
0  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

1  53cdb2fc8bc7dce0b6741e2150273451  b0830fb4747a6c6d20dea0b8c802d7ef

2  47770eb9100c2d0c44946d9cf07ec65d  41ce2a54c0b03bf3443c3d931a367089

3  949d5b44dbf5de918fe9c16f97b45f8a  f88197465ea7920adcdbec7375364d82

4  ad21c59c0840e6cb83a9ceb5573f8159  8ab97904e6daea8866dbdbc4fb7aad2c


  order_status order_purchase_timestamp order_estimated_delivery_date
\
0    delivered      2017-10-02 10:56:33                    2017-10-18

1    delivered      2018-07-24 20:41:37                    2018-08-13

2    delivered      2018-08-08 08:38:49                    2018-09-04

3    delivered      2017-11-18 19:28:06                    2017-12-15

4    delivered      2018-02-13 21:18:39                    2018-02-26


   delivery_time                customer_id
customer_zip_code_prefix  \
0           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
1           19.0  af07308b275d755c9edb36a90c618231
47813
2           27.0  3a653a41f6f9fc3d2a113cf8398680e8
75265
3           26.0  7c142cf63193a1473d2e66489a9ae977
59296
4           12.0  72632f0f9dd73dfee390c9b22eb56dd6
9195

             customer_city customer_state  status
0                sao paulo             SP  Active
1                barreiras             BA  Active
2               vianopolis             GO  Active
3  sao goncalo do amarante             RN  Active
4              santo andre             SP  Active
```

```
# Jumlah order berdasarkan state
orders_customers_df.groupby('customer_state').order_id.nunique().sort_
values(ascending=False).reset_index().head(10)
```

```
  customer_state  order_id
0             SP     40501
1             RJ     12350
2             MG     11354
3             RS      5345
4             PR      4923
5             SC      3546
6             BA      3256
7             DF      2080
8             ES      1995
9             GO      1957
```

```
# Jumlah order berdasarkan city
orders_customers_df.groupby(by="customer_city").order_id.nunique().sor
t_values(ascending=False).reset_index().head(10)
```

```
           customer_city  order_id
0              sao paulo     15045
1         rio de janeiro      6601
2         belo horizonte      2697
3               brasilia      2071
4               curitiba      1489
5               campinas      1406
6           porto alegre      1342
7               salvador      1188
8              guarulhos      1144
9  sao bernardo do campo       911
```

Explore order_payment_df

```
order_payments_df.describe(include='all')
```

```
                                order_id  payment_sequential
payment_type  \
count                           103883       103883.000000
103883
unique                           99437                 NaN
4
top     fa65dad1b0e818e3ccc5cb0e39231352                 NaN
credit_card
freq                                29                 NaN
76795
mean                               NaN            1.092681
NaN
std                                NaN            0.706594
NaN
```

```
min                                    NaN             1.000000
NaN
25%                                    NaN             1.000000
NaN
50%                                    NaN             1.000000
NaN
75%                                    NaN             1.000000
NaN
max                                    NaN            29.000000
NaN
```

```
        payment_installments  payment_value
count          103883.000000  103883.000000
unique                   NaN            NaN
top                      NaN            NaN
freq                     NaN            NaN
mean                2.853402     154.104831
std                 2.687071     217.495628
min                 0.000000       0.000000
25%                 1.000000      56.800000
50%                 1.000000     100.000000
75%                 4.000000     171.840000
max                24.000000   13664.080000
```

```
order_payments_df.groupby('payment_type').agg({
    'payment_installments' : 'sum',
    'payment_value' : 'sum'
}).sort_values(by='payment_value',ascending=False)
# Credit card merupakan metode pembayaran paling banyak, lalu disusul
dengan boleto
```

```
              payment_installments  payment_value
payment_type
credit_card                 269332    12542084.19
boleto                       19784     2869361.27
voucher                       5775      379436.87
debit_card                    1529      217989.79
```

Explore orders_customers_payments_df

```
orders_customers_payments_df = pd.merge(left=orders_customers_df,
right=order_payments_df, how='left', on='order_id')
orders_customers_payments_df.head()
```

```
                           order_id                        customer_id
\
0  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

1  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d
```

```
2  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

3  53cdb2fc8bc7dce0b6741e2150273451  b0830fb4747a6c6d20dea0b8c802d7ef

4  47770eb9100c2d0c44946d9cf07ec65d  41ce2a54c0b03bf3443c3d931a367089


  order_status order_purchase_timestamp order_estimated_delivery_date
\
0    delivered      2017-10-02 10:56:33                    2017-10-18

1    delivered      2017-10-02 10:56:33                    2017-10-18

2    delivered      2017-10-02 10:56:33                    2017-10-18

3    delivered      2018-07-24 20:41:37                    2018-08-13

4    delivered      2018-08-08 08:38:49                    2018-09-04


   delivery_time                customer_unique_id
customer_zip_code_prefix  \
0           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
1           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
2           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
3           19.0  af07308b275d755c9edb36a90c618231
47813
4           27.0  3a653a41f6f9fc3d2a113cf8398680e8
75265

  customer_city customer_state  status  payment_sequential
payment_type  \
0     sao paulo             SP  Active                 1.0
credit_card
1     sao paulo             SP  Active                 3.0
voucher
2     sao paulo             SP  Active                 2.0
voucher
3     barreiras             BA  Active                 1.0
boleto
4    vianopolis             GO  Active                 1.0
credit_card

   payment_installments  payment_value
0                   1.0          18.12
1                   1.0           2.00
2                   1.0          18.59
```

```
3                   1.0         141.46
4                   3.0         179.12
```

```
orders_customers_payments_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100757 entries, 0 to 100756
Data columns (total 15 columns):
 #   Column                         Non-Null Count   Dtype         
---  ------                         --------------   -----         
 0   order_id                       100757 non-null  object        
 1   customer_id                    100757 non-null  object        
 2   order_status                   100757 non-null  object        
 3   order_purchase_timestamp       100757 non-null  datetime64[ns]
 4   order_estimated_delivery_date  100757 non-null  datetime64[ns]
 5   delivery_time                  100757 non-null  float64       
 6   customer_unique_id             100757 non-null  object        
 7   customer_zip_code_prefix       100757 non-null  int64         
 8   customer_city                  100757 non-null  object        
 9   customer_state                 100757 non-null  object        
 10  status                         100757 non-null  object        
 11  payment_sequential             100756 non-null  float64       
 12  payment_type                   100756 non-null  object        
 13  payment_installments           100756 non-null  float64       
 14  payment_value                  100756 non-null  float64       
dtypes: datetime64[ns](2), float64(4), int64(1), object(8)
memory usage: 11.5+ MB
```

```
orders_customers_payments_df.isna().sum()
```

```
order_id                         0
customer_id                      0
order_status                     0
order_purchase_timestamp         0
order_estimated_delivery_date    0
delivery_time                    0
customer_unique_id               0
customer_zip_code_prefix         0
customer_city                    0
customer_state                   0
status                           0
payment_sequential               1
payment_type                     1
payment_installments             1
payment_value                    1
dtype: int64
```

```
orders_customers_payments_df[orders_customers_payments_df.isna().any(a
xis=1)]
```

```
#Drop 1 rows 4 values kayaknya tidak akan berpengaruh secara
signifikan dari keseluruhan data.
```

```
                                order_id
customer_id  \
31175  bfbd0f9bdef84302105ad712db648a6c
86dc2ffce2dfff336de2f386a786e574

      order_status order_purchase_timestamp
order_estimated_delivery_date  \
31175    delivered      2016-09-15 12:16:38                    2016-
10-04

       delivery_time                customer_unique_id  \
31175           18.0  830d5b7aaa3b6f1e9ad63703bec97d23

       customer_zip_code_prefix         customer_city customer_state
status  \
31175                     14600  sao joaquim da barra              SP
Active

       payment_sequential payment_type  payment_installments
payment_value
31175                 NaN          NaN                   NaN
NaN
```

```
orders_customers_payments_df.dropna(inplace=True)
```

```
orders_customers_payments_df.duplicated().sum()
```

```
0
```

Explore order_customers_payments_reviews_df

```
order_customers_payments_reviews_df =
pd.merge(left=orders_customers_payments_df, right=order_reviews_df,
how='left', on='order_id')
order_customers_payments_reviews_df.head()
```

```
                           order_id                           customer_id
\
0  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

1  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

2  e481f51cbdc54678b7cc49136f2d6af7  9ef432eb6251297304e76186b10a928d

3  53cdb2fc8bc7dce0b6741e2150273451  b0830fb4747a6c6d20dea0b8c802d7ef

4  47770eb9100c2d0c44946d9cf07ec65d  41ce2a54c0b03bf3443c3d931a367089
```

```
  order_status order_purchase_timestamp order_estimated_delivery_date
\
0    delivered      2017-10-02 10:56:33                   2017-10-18

1    delivered      2017-10-02 10:56:33                   2017-10-18

2    delivered      2017-10-02 10:56:33                   2017-10-18

3    delivered      2018-07-24 20:41:37                   2018-08-13

4    delivered      2018-08-08 08:38:49                   2018-09-04


   delivery_time                customer_unique_id
customer_zip_code_prefix  \
0           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
1           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
2           16.0  7c396fd4830fd04220f754e42b4e5bff
3149
3           19.0  af07308b275d755c9edb36a90c618231
47813
4           27.0  3a653a41f6f9fc3d2a113cf8398680e8
75265

  customer_city customer_state  status  payment_sequential
payment_type  \
0     sao paulo             SP  Active                 1.0
credit_card
1     sao paulo             SP  Active                 3.0
voucher
2     sao paulo             SP  Active                 2.0
voucher
3     barreiras             BA  Active                 1.0
boleto
4    vianopolis             GO  Active                 1.0
credit_card

   payment_installments  payment_value
review_id  \
0                   1.0          18.12
a54f0611adc9ed256b57ede6b6eb5114
1                   1.0           2.00
a54f0611adc9ed256b57ede6b6eb5114
2                   1.0          18.59
a54f0611adc9ed256b57ede6b6eb5114
3                   1.0         141.46
8d5266042046a06655c8db133d120ba5
```

```
4                    3.0         179.12
e73b67b67587f7644d5bd1a52deb1b01
```

```
   review_score
0           4.0
1           4.0
2           4.0
3           4.0
4           5.0
```

```
order_customers_payments_reviews_df.isna().sum()
```

```
order_id                          0
customer_id                       0
order_status                      0
order_purchase_timestamp          0
order_estimated_delivery_date     0
delivery_time                     0
customer_unique_id                0
customer_zip_code_prefix          0
customer_city                     0
customer_state                    0
status                            0
payment_sequential                0
payment_type                      0
payment_installments              0
payment_value                     0
review_id                       676
review_score                    676
dtype: int64
```

```
order_customers_payments_reviews_df.dropna(inplace=True)
```

```
order_customers_payments_reviews_df.groupby('review_score')
['order_id'].nunique().reset_index().sort_values(by='order_id',
ascending=False)
```

```
   review_score  order_id
4           5.0     56817
3           4.0     18943
0           1.0      9380
2           3.0      7942
1           2.0      2938
```

Explore order_items_df dan products_df

```
# Kita harus langsung merge dengan products_df agar mengetahui nama
dari produk-produk didalam table order_items_df.
product_order_items_df = pd.merge(left=order_items_df,
```

```
right=products_df, how='left', on='product_id')
product_order_items_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112650 entries, 0 to 112649
Data columns (total 16 columns):
 #   Column                         Non-Null Count   Dtype  
---  ------                         --------------   -----  
 0   order_id                       112650 non-null  object 
 1   order_item_id                  112650 non-null  int64  
 2   product_id                     112650 non-null  object 
 3   seller_id                      112650 non-null  object 
 4   shipping_limit_date            112650 non-null  object 
 5   price                          112650 non-null  float64
 6   freight_value                  112650 non-null  float64
 7   product_category_name          111022 non-null  object 
 8   product_name_lenght            111022 non-null  float64
 9   product_description_lenght     111022 non-null  float64
 10  product_photos_qty             111022 non-null  float64
 11  product_weight_g               111022 non-null  float64
 12  product_length_cm              111022 non-null  float64
 13  product_height_cm              111022 non-null  float64
 14  product_width_cm               111022 non-null  float64
 15  product_category_name_english  111022 non-null  object 
dtypes: float64(9), int64(1), object(6)
memory usage: 13.8+ MB
```

```
product_order_items_df.isna().sum()
```

```
order_id                           0
order_item_id                      0
product_id                         0
seller_id                          0
shipping_limit_date                0
price                              0
freight_value                      0
product_category_name           1628
product_name_lenght             1628
product_description_lenght      1628
product_photos_qty              1628
product_weight_g                1628
product_length_cm               1628
product_height_cm               1628
product_width_cm                1628
product_category_name_english   1628
dtype: int64
```

```
# There are so many missing values, but removing these null values
still not significantly impact the analysis
product_order_items_df.dropna(inplace=True)
```

```
# Jumlah revenue dari berbagai kategori produk
product_order_items_df.groupby('product_category_name_english').price.
sum().reset_index().sort_values(by='price', ascending=False)
```

```
   product_category_name_english       price
43                 health_beauty  1258681.34
70                 watches_gifts  1205005.68
7                 bed_bath_table  1036988.68
65                sports_leisure   988048.97
15         computers_accessories   911954.32
..                           ...         ...
35                       flowers     1110.04
46                  home_comfort_2      760.27
11              cds_dvds_musicals      730.00
29     fashion_childrens_clothes      569.85
61         security_and_services      283.29

[71 rows x 2 columns]
```

```
# Jumlah biaya pengiriman dari kategori produk yang paling besar
product_order_items_df.groupby('product_category_name_english').freigh
t_value.max().reset_index().sort_values(by='freight_value',
ascending=False)
```

```
      product_category_name_english  freight_value
6                               baby         409.68
49                      housewares         375.28
43                   health_beauty         338.30
17  construction_tools_construction         321.46
50   industry_commerce_and_business         317.47
..                              ...            ...
61           security_and_services          25.77
35                         flowers          22.93
27           fashio_female_clothing          22.84
46                  home_comfort_2          19.36
29       fashion_childrens_clothes          17.07

[71 rows x 2 columns]
```

Merge all dataset

```
all_df = pd.merge(left=order_customers_payments_reviews_df,
right=product_order_items_df, how='left', on='order_id')

all_df.isna().sum()
# Banyak missing value karena pada tabel order_items_df, semua
order_status masih terbawa, termasuk canceled, shipped, dll. Sehingga
di-drop saja mising value tersebut.
```

```
order_id                          0
customer_id                       0
```

```
order_status                        0
order_purchase_timestamp            0
order_estimated_delivery_date       0
delivery_time                       0
customer_unique_id                  0
customer_zip_code_prefix            0
customer_city                       0
customer_state                      0
status                              0
payment_sequential                  0
payment_type                        0
payment_installments                0
payment_value                       0
review_id                           0
review_score                        0
order_item_id                    1433
product_id                       1433
seller_id                        1433
shipping_limit_date              1433
price                            1433
freight_value                    1433
product_category_name            1433
product_name_lenght              1433
product_description_lenght       1433
product_photos_qty               1433
product_weight_g                 1433
product_length_cm                1433
product_height_cm                1433
product_width_cm                 1433
product_category_name_english    1433
dtype: int64
```

```
all_df.dropna(inplace=True)
all_df.reset_index(inplace=True)

all_df = pd.merge(left=all_df, right=sellers_df, how='left',
on='seller_id')
# Sekarang sudah selesai, lalu ke tahap visualisasi

all_df.groupby('product_category_name_english').agg({
    'price' : 'max',
    'freight_value' : 'max',
    'payment_value' : 'sum'
}).sort_values(by='payment_value', ascending=False)
```

product_category_name_english	price	freight_value	payment_value
bed_bath_table	1999.98	225.71	1707029.45
health_beauty	3124.00	338.30	1611835.65
computers_accessories	3699.99	134.17	1557712.98

```
furniture_decor                1899.00         215.43     1391930.08
watches_gifts                  3999.90         209.63     1380487.85
...                                ...            ...            ...
flowers                          65.90          22.93        1922.77
home_comfort_2                  219.99          19.36        1458.54
cds_dvds_musicals                65.00          52.58        1199.43
fashion_childrens_clothes       110.00          17.07         718.98
security_and_services           183.29          25.77         324.51

[71 rows x 3 columns]
```

```
all_df.groupby('product_category_name_english').agg({
    'delivery_time' : 'max',
}).sort_values(by='delivery_time', ascending=False)
```

```
                               delivery_time
product_category_name_english
furniture_decor                        155.0
market_place                           146.0
housewares                             140.0
art                                    116.0
bed_bath_table                         109.0
...                                      ...
home_comfort_2                          34.0
flowers                                 34.0
fashion_childrens_clothes               31.0
la_cuisine                              28.0
arts_and_craftmanship                   25.0

[71 rows x 1 columns]
```

```
all_df.groupby('product_category_name_english').agg({
    'review_score' : 'mean'
}).sort_values(by='review_score', ascending=False)
```

```
                                    review_score
product_category_name_english
fashion_childrens_clothes               5.000000
cds_dvds_musicals                       4.642857
books_imported                          4.525424
books_general_interest                  4.502752
small_appliances_home_oven_and_coffee   4.453333
...                                          ...
fashion_male_clothing                   3.649635
home_comfort_2                          3.642857
office_furniture                        3.553204
diapers_and_hygiene                     3.378378
security_and_services                   2.500000

[71 rows x 1 columns]
```

Insight:

- all_df diperlukan guna melihat insight dari data customer dengan produk kategori
- geolocation_df akan dimerge pada bagian geospatial analysis
- payment_value merupakan hasil dari freight_value + price
- review produk tertinggi dari kategori produk fashion children, lalu cds_dvds_musical, dan books_imported (analisis ini tidak melihat jumalah nilai rating dari setiap kategori produk)
- delivery_time terlama berada di produk furniture_decor, market_place, dan housewares.

Visualization & Explanatory Analysis

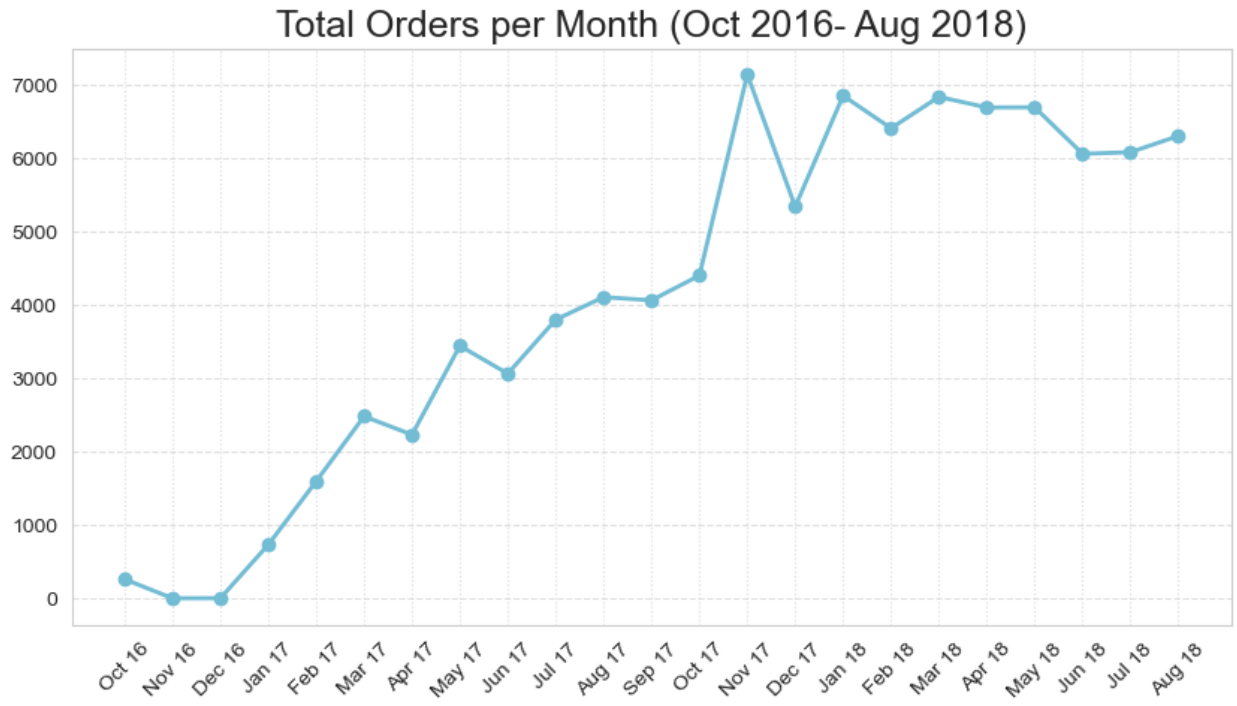
- Pertanyaan 1: What Bagaimana Performa penjualan pada beberapa tahun terakhir dalam skala per bulan? (performa banyaknya order dan total revenue per month) done
- Pertanyaan 2: Produk apa yang paling menghasilkan revenue dan paling laku serta produk paling tidak laku dan tidak menghasilkan revenue?
- Pertanyaan 3: State apa yang menghasilkan revenue dan jumlah order paling tinggi?
- Pertanyaan 4: Metode pembayaran apa yang paling banyak jumlah pembayarannya dan sering digunakan dari berbagai states?
- Pertanyaan 5: RFM Analysis
- Pertanyaan 6: Bagaimana jika distribusi customer berdasarkan lokasi geografis dalam bentuk map? (Geospatial Analysis)
- Pertanyaan 7: Bagaimana jika mengkategorikan customer berdasarkan jumlah total pengeluaran untuk pembelian produk di platform ini? (Clustering)

Pertanyaan 1: Bagaimana performa penjualan pada beberapa tahun terakhir dalam skala per bulan? (performa banyaknya order dan total revenue per month)

```
monthly_orders_df = all_df.resample(rule='M',
on='order_purchase_timestamp').agg({
    "order_id": "nunique",
    "payment_value": "sum"
})
monthly_orders_df.index = monthly_orders_df.index.strftime('%b %y')
#mengubah format order date menjadi nama bulan
monthly_orders_df = monthly_orders_df.reset_index()
monthly_orders_df.rename(columns={
    "order_id": "order_count",
    "payment_value": "revenue"
}, inplace=True)
monthly_orders_df.head().sort_values(by='revenue', ascending=False)

plt.figure(figsize=(10, 5))
plt.plot(monthly_orders_df["order_purchase_timestamp"],
monthly_orders_df["order_count"], marker='o', linewidth=2,
color="#72BCD4")
plt.title("Total Orders per Month (Oct 2016- Aug 2018)", loc="center",
```

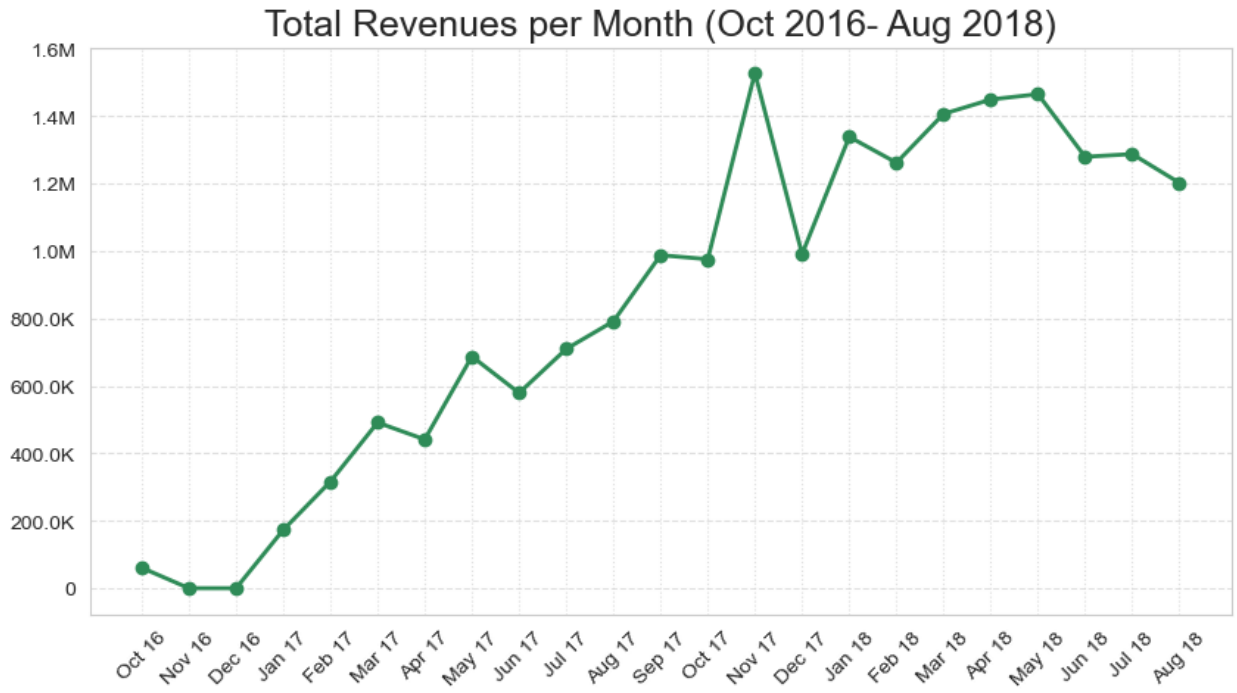
```
fontsize=18)
plt.xticks(fontsize=10, rotation=45)
plt.yticks(fontsize=10)
plt.grid(linestyle='--', alpha= 0.6, which='major', axis='y')
plt.grid(linestyle='dotted', alpha= 0.6, which='major', axis='x')

plt.show()
```

```
C:\Users\Doni\AppData\Local\Temp\ipykernel_8616\3260640141.py:1:
FutureWarning: 'M' is deprecated and will be removed in a future
version, please use 'ME' instead.
  monthly_orders_df = all_df.resample(rule='M',
on='order_purchase_timestamp').agg({
```




```
from matplotlib.ticker import FuncFormatter
def format_with_units(x, pos):
    if x >= 1e6:
        return f'{x/1e6:.1f}M'
    elif x >= 1e3:
        return f'{x/1e3:.1f}K'
    else:
        return f'{x:.0f}'
plt.figure(figsize=(10, 5))
plt.plot(
    monthly_orders_df['order_purchase_timestamp'],
    monthly_orders_df['revenue'],
    marker ='o',
```

```
    color = 'seagreen',
    linewidth=2
    )
plt.title("Total Revenues per Month (Oct 2016- Aug 2018)",
loc="center", fontsize=18)
plt.xticks(fontsize=10, rotation=45)
plt.yticks(fontsize=10)
plt.gca().yaxis.set_major_formatter(FuncFormatter(format_with_units))
plt.grid(linestyle='--', alpha= 0.6, which='major', axis='y')
plt.grid(linestyle='dotted', alpha= 0.6, which='major', axis='x')
plt.show()
```

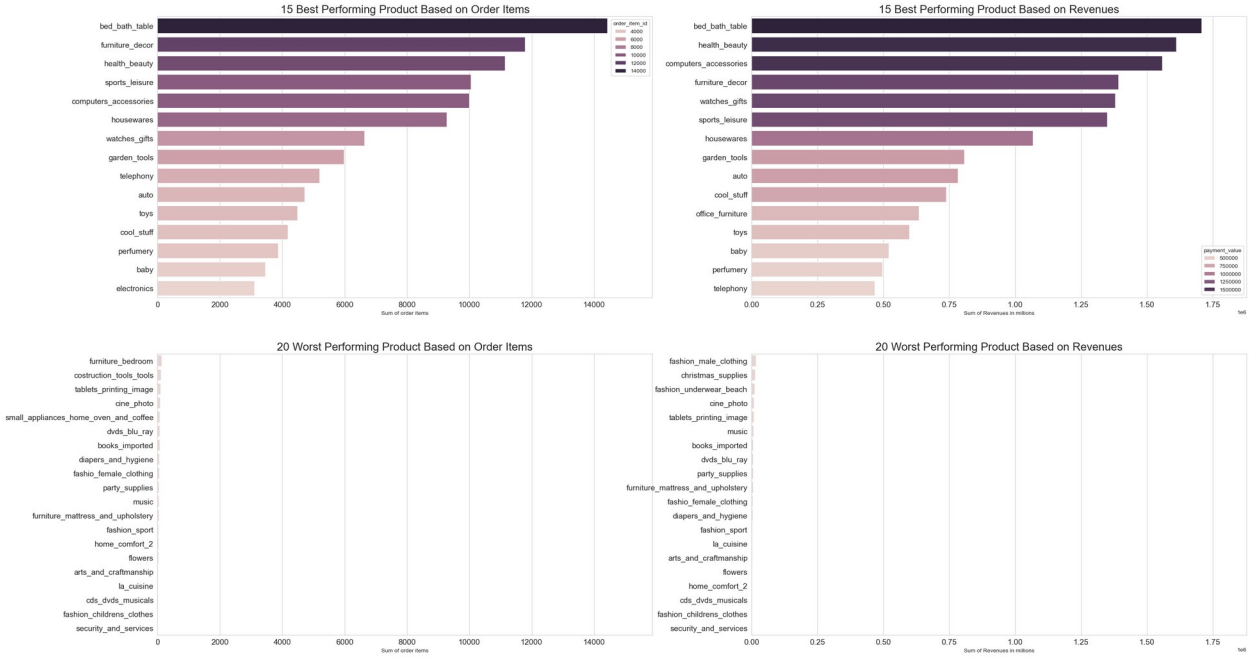



```
sum_orders_items_df =
all_df.groupby(['product_category_name_english']).agg({
    'order_item_id' :'sum'
}).sort_values(by='order_item_id', ascending=False).reset_index()
sum_orders_revenues_df =
all_df.groupby(['product_category_name_english']).agg({
    'payment_value' :'sum'
}).sort_values(by='payment_value', ascending=False).reset_index()
```

Pertanyaan 2: Produk apa yang paling menghasilkan revenue dan paling laku serta produk paling tidak laku dan tidak menghasilkan revenue?

```
# Pola korelasi dari jumlah banyaknya order dengan jumlah revenue yang didapat dalam beberapa kategori produk
max_order_items = sum_orders_items_df['order_item_id'].max()
max_payment = sum_orders_revenues_df['payment_value'].max()
max_x_order = max_order_items * 1.1
max_x_payment = max_payment * 1.1

fig, ax = plt.subplots(2,2, figsize=(35,20))
sns.barplot(y='product_category_name_english', x='order_item_id',
data=sum_orders_items_df.head(15), ax=ax[0, 0],hue="order_item_id")
ax[0, 0].set_ylabel(None)
ax[0, 0].tick_params(axis ='both', labelsize=14)
ax[0, 0].set_xlabel('Sum of order items')
ax[0, 0].set_title("15 Best Performing Product Based on Order Items",
loc="center", fontsize=20)
ax[0, 0].set_xlim(0, max_x_order)

sns.barplot(y='product_category_name_english', x='payment_value',
data=sum_orders_revenues_df.head(15), ax=ax[0, 1],
hue='payment_value')
ax[0, 1].set_ylabel(None)
ax[0, 1].set_xlabel('Sum of Revenues in millions')
ax[0, 1].tick_params(axis ='both', labelsize=14)
ax[0, 1].set_title("15 Best Performing Product Based on Revenues",
loc="center", fontsize=20)
ax[0, 1].set_xlim(0, max_x_payment)

sns.barplot(y='product_category_name_english', x='order_item_id',
data=sum_orders_items_df.tail(20).sort_values(by='order_item_id',ascen
ding=False), ax=ax[1, 0], color= '#e9d4d0')
ax[1, 0].set_ylabel(None)
ax[1, 0].set_xlabel('Sum of order items')
ax[1, 0].tick_params(axis= 'both', labelsize=14)
ax[1, 0].set_title("20 Worst Performing Product Based on Order Items",
loc="center", fontsize=20)
ax[1, 0].set_xlim(0, max_x_order)

sns.barplot(y='product_category_name_english', x='payment_value',
data=sum_orders_revenues_df.tail(20).sort_values(by='payment_value',as
cending=False), ax=ax[1, 1], color= '#e9d4d0')
ax[1, 1].set_ylabel(None)
ax[1, 1].set_xlabel('Sum of Revenues in millions')
ax[1, 1].tick_params(axis ='both', labelsize=14)
ax[1, 1].set_title("20 Worst Performing Product Based on Revenues",
loc="center", fontsize=20)
```

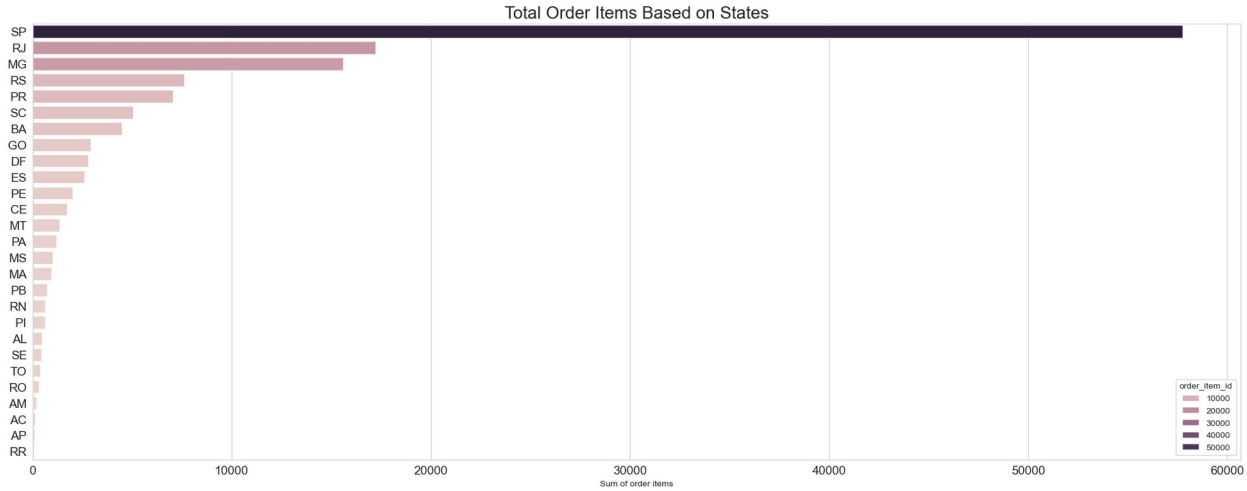
```
ax[1, 1].set_xlim(0, max_x_payment)

plt.show()
```

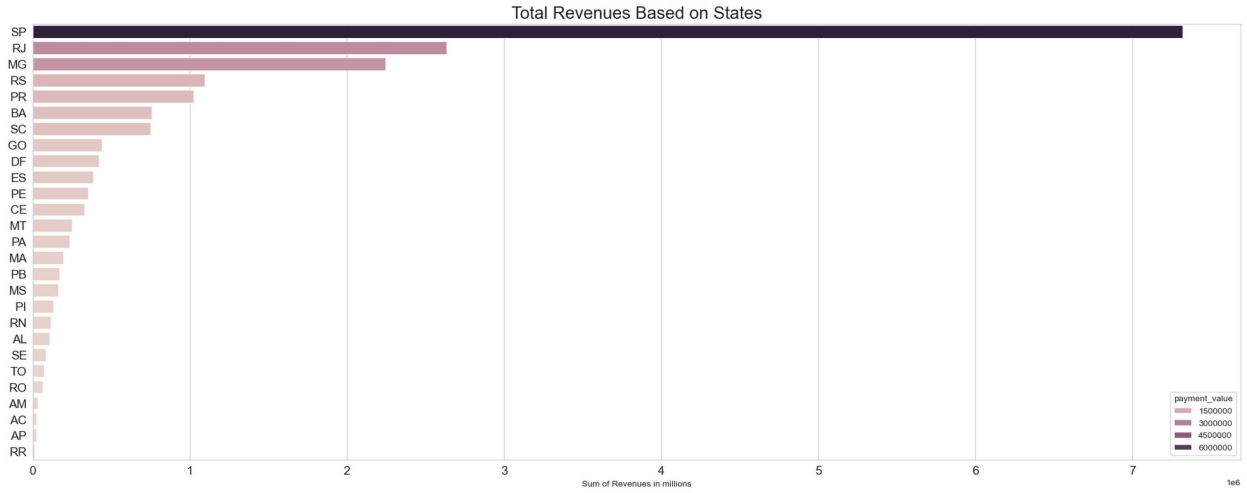


Pertanyaan 3: State apa yang menghasilkan revenue dan jumlah order paling tinggi?

```
sum_orders_items_state_df = all_df.groupby(['customer_state']).agg({
    'order_item_id' :'sum'
}).sort_values(by='order_item_id', ascending=False).reset_index()
sum_orders_revenues_state_df =
all_df.groupby(['customer_state']).agg({
    'payment_value' :'sum'
}).sort_values(by='payment_value', ascending=False).reset_index()

fig, ax = plt.subplots(2,1, figsize=(25, 20))
sns.barplot(y='customer_state', x='order_item_id',
data=sum_orders_items_state_df, ax=ax[0], hue="order_item_id")
ax[0].set_ylabel(None)
ax[0].tick_params(axis ='both', labelsize=14)
ax[0].set_xlabel('Sum of order items')
ax[0].set_title("Total Order Items Based on States", loc="center",
fontsize=20)

sns.barplot(y='customer_state', x='payment_value',
data=sum_orders_revenues_state_df, ax=ax[1], hue="payment_value")
ax[1].set_ylabel(None)
ax[1].set_xlabel('Sum of Revenues in millions')
ax[1].tick_params(axis ='both', labelsize=14)
```

```
ax[1].set_title("Total Revenues Based on States", loc="center",
fontsize=20)

plt.show()
```





Pertanyaan 4: Metode pembayaran apa yang paling banyak jumlah pembayarannya dan sering digunakan dari berbagai states?

```
payment_type_df = all_df.groupby(['customer_state', 'payment_type'])
['payment_value'].sum().unstack()
payment_type_df['total'] = payment_type_df.sum(axis=1)
payment_type_df = payment_type_df.sort_values(by='total',
ascending=False).drop(columns='total')
payment_type_df.head()
```

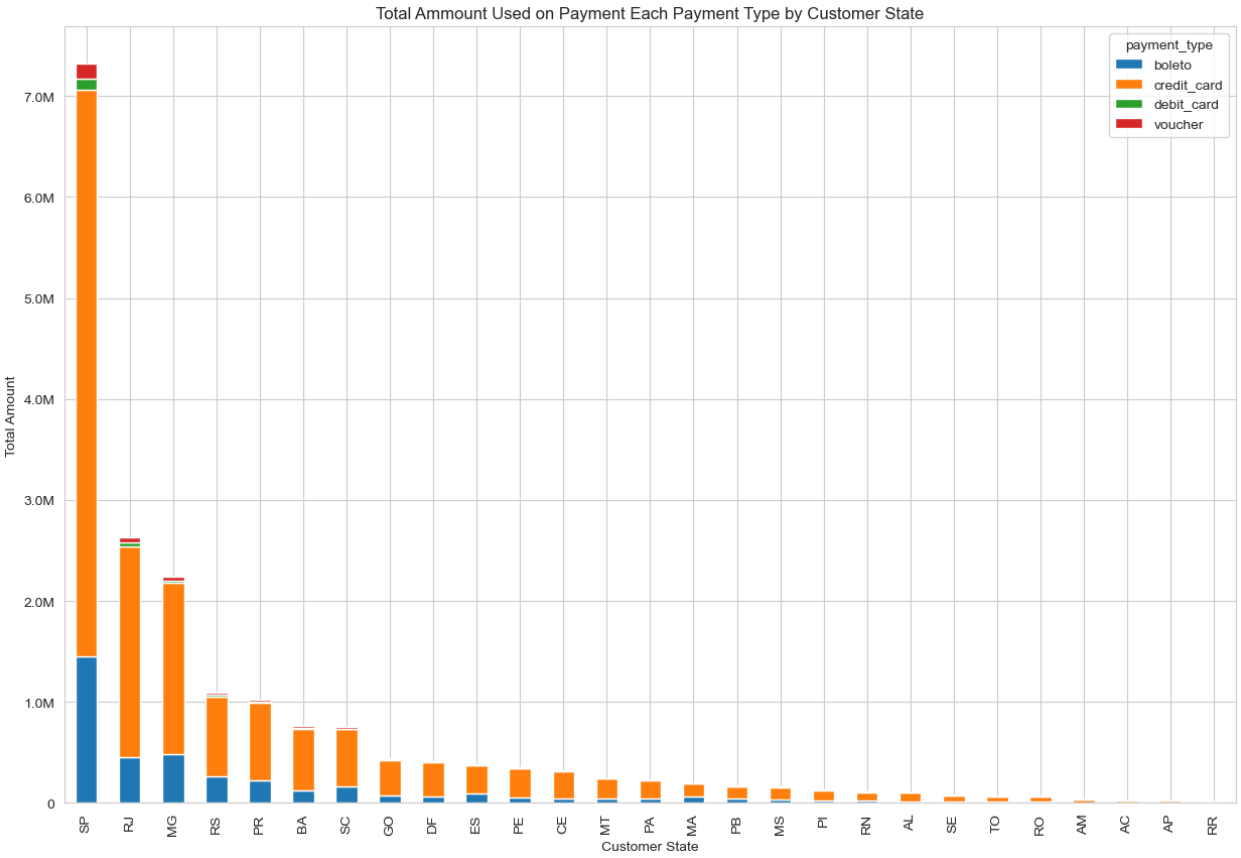
payment_type	boleto	credit_card	debit_card	voucher
customer_state				
SP	1455551.18	5612269.64	101543.62	152087.26
RJ	455897.67	2082298.82	41396.07	53389.33

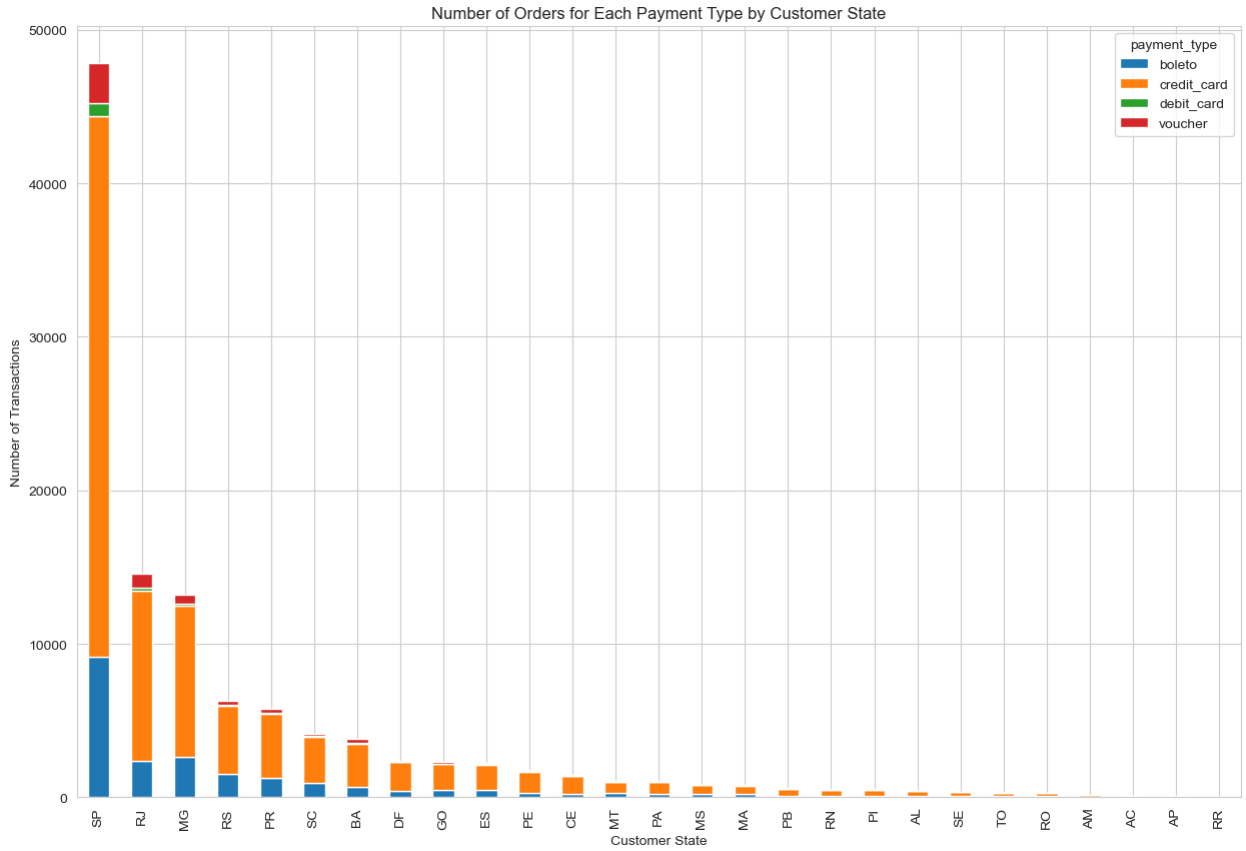
```
MG                480977.97   1699006.55    25584.75   40050.10
RS                261426.66    794579.00    12315.64   25609.54
PR                219597.59    771443.51    10313.67   21443.90
```

```
transaction_counts_df= all_df.groupby(['customer_state',
'payment_type']).size().unstack()
transaction_counts_df['total'] = transaction_counts_df.sum(axis=1)
transaction_counts_df = transaction_counts_df.sort_values(by='total',
ascending=False).drop(columns='total')
transaction_counts_df.head()
```

```
payment_type    boleto  credit_card  debit_card  voucher
customer_state
SP              9137.0      35240.0       829.0   2616.0
RJ              2405.0      11032.0       200.0    929.0
MG              2620.0       9835.0       148.0    615.0
RS              1548.0       4395.0        76.0    294.0
PR              1249.0       4185.0        72.0    284.0
```

```
from matplotlib.ticker import FuncFormatter

def format_with_units(x, pos):
    if x >= 1e6:
        return f'{x/1e6:.1f}M'
    elif x >= 1e3:
        return f'{x/1e3:.1f}K'
    else:
        return f'{x:.0f}'

payment_type_df.plot(kind='bar', stacked=True, figsize=(15,10))
plt.xlabel('Customer State')
plt.ylabel('Total Amount')
plt.title('Total Ammount Used on Payment Each Payment Type by Customer
State')
plt.gca().yaxis.set_major_formatter(FuncFormatter(format_with_units))

transaction_counts_df.plot(kind='bar', stacked=True, figsize=(15,10))
plt.xlabel('Customer State')
plt.ylabel('Number of Transactions')
plt.title('Number of Orders for Each Payment Type by Customer State')

plt.show()
```


Total Ammount Used on Payment Each Payment Type by Customer State
payment_type
boleto
credit_card
debit_card
voucher
Total Amount
7.0M
6.0M
5.0M
4.0M
3.0M
2.0M
1.0M
0
SP
RJ
MG
RS
PR
BA
SC
GO
DF
ES
PE
CE
MT
PA
MA
PB
MS
PI
RN
AL
SE
TO
RO
AM
AC
AP
RR
Customer State



Insight:

- Ada kemungkinan tren musiman dengan puncak pada bulan-bulan tertentu bulan November 2017 dan Desember2017 serta penurunan pada bulan-bulan lain (seperti Februari atau Maret). Tren pendapatan seringkali sejalan dengan volume order, tetapi mungkin menunjukkan perbedaan tergantung pada promosi, kategori produk, atau order bernilai tinggi di bulan-bulan tertentu.
- bed_bath_table, furniture_decor, health beauty dan computer_accessories menjadi kategori 3 produk paling laris

Analisis Lanjutan (Opsional)

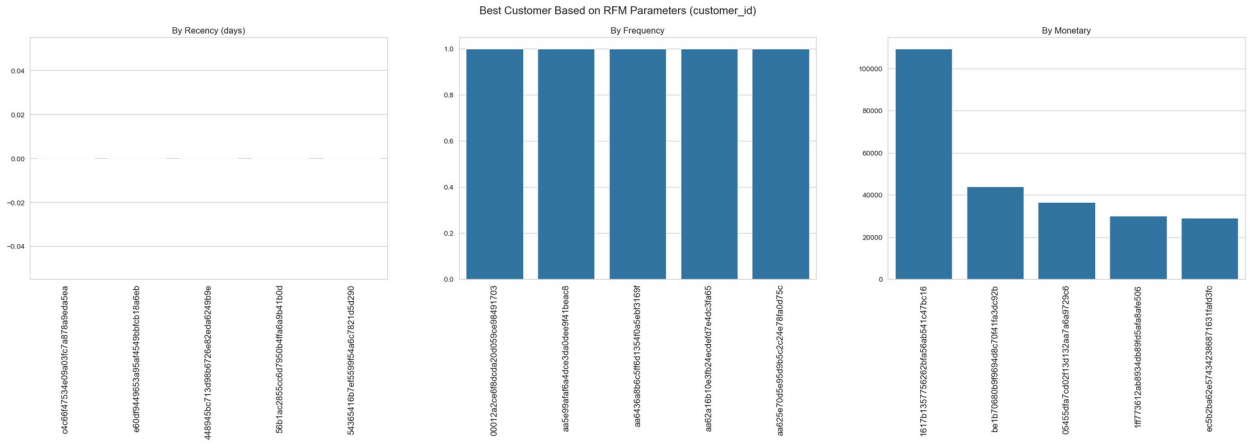
Pertanyaan 5: RFM Analysis

```
rfm_df = all_df.groupby(by="customer_id", as_index=False).agg({
    "order_purchase_timestamp": "max", # mengambil tanggal order
terakhir
    "order_id": "nunique", # menghitung jumlah order
    "payment_value": "sum" # menghitung jumlah revenue yang dihasilkan
})
rfm_df.rename(columns={
    'payment_value' : 'monetary',
    'order_id' : 'frequency',
    'order_purchase_timestamp' : 'max_order_timestamp'
```

```
}, inplace=True)

# menghitung kapan terakhir pelanggan melakukan transaksi (hari)
rfm_df["max_order_timestamp"] = rfm_df["max_order_timestamp"].dt.date
recent_date = all_df["order_purchase_timestamp"].dt.date.max()
rfm_df["recency"] = rfm_df["max_order_timestamp"].apply(lambda x:
(recent_date - x).days)

rfm_df.drop("max_order_timestamp", axis=1, inplace=True)
rfm_df.head()
```

	customer_id	frequency	monetary	recency
0	00012a2ce6f8dcda20d059ce98491703	1	114.74	288
1	000161a058600d5901f007fab4c27140	1	67.41	409
2	0001fd6190edaaf884bcaf3d49edf079	1	195.42	547
3	0002414f95344307404f0ace7a26f1d5	1	179.35	378
4	000379cdec625522490c315e70c7a9fb	1	107.01	149

```
fig, ax = plt.subplots(nrows=1, ncols=3, figsize=(30, 6))

sns.barplot(y="recency", x="customer_id",
data=rfm_df.sort_values(by="recency", ascending=True).head(5),
ax=ax[0])
ax[0].set_ylabel(None)
ax[0].set_xlabel(None)
ax[0].set_title("By Recency (days)", loc="center", fontsize=12)
ax[0].tick_params(axis ='x', labelsize=12, rotation=90)

sns.barplot(y="frequency", x="customer_id",
data=rfm_df.sort_values(by="frequency", ascending=False).head(5),
ax=ax[1])
ax[1].set_ylabel(None)
ax[1].set_xlabel(None)
ax[1].set_title("By Frequency", loc="center", fontsize=12)
ax[1].tick_params(axis='x', labelsize=12, rotation=90)

sns.barplot(y="monetary", x="customer_id",
data=rfm_df.sort_values(by="monetary", ascending=False).head(5),
ax=ax[2])
ax[2].set_ylabel(None)
ax[2].set_xlabel(None)
ax[2].set_title("By Monetary", loc="center", fontsize=12)
ax[2].tick_params(axis='x', labelsize=12, rotation=90)

plt.suptitle("Best Customer Based on RFM Parameters (customer_id)",
fontsize=15)
plt.show()
```



Pertanyaan 6: Geospatial Analysis

Bagaimana jika distribusi customer berdasarkan lokasi geografis dalam bentuk map?

```
import pandas as pd
import folium
from folium.plugins import MarkerCluster

customer_geolocation_df = pd.merge(customers_df, geolocation_df,
                    left_on='customer_zip_code_prefix',
                    right_on='geolocation_zip_code_prefix')

customer_geolocation_df =
customer_geolocation_df.groupby('customer_id').apply(lambda x:
x.sample(1, random_state=42)).reset_index(drop=True)
```

```
C:\Users\Doni\AppData\Local\Temp\ipykernel_8616\4279034533.py:1:
DeprecationWarning: DataFrameGroupBy.apply operated on the grouping
columns. This behavior is deprecated, and in a future version of
pandas the grouping columns will be excluded from the operation.
Either pass `include_groups=False` to exclude the groupings or
explicitly select the grouping columns after groupby to silence this
warning.
  customer_geolocation_df =
customer_geolocation_df.groupby('customer_id').apply(lambda x:
x.sample(1, random_state=42)).reset_index(drop=True)
```

```
all_df = pd.merge(all_df, customer_geolocation_df, how='inner',
on='customer_id')

all_df.columns
```

```
Index(['index', 'order_id', 'customer_id', 'order_status',
       'order_purchase_timestamp', 'order_estimated_delivery_date',
       'delivery_time', 'customer_unique_id_x',
'customer_zip_code_prefix_x',
       'customer_city_x', 'customer_state_x', 'status_x',
```

```
'payment_sequential',
       'payment_type', 'payment_installments', 'payment_value',
'review_id',
       'review_score', 'order_item_id', 'product_id', 'seller_id',
       'shipping_limit_date', 'price', 'freight_value',
       'product_category_name', 'product_name_lenght',
       'product_description_lenght', 'product_photos_qty',
'product_weight_g',
       'product_length_cm', 'product_height_cm', 'product_width_cm',
       'product_category_name_english', 'seller_zip_code_prefix',
       'seller_city', 'seller_state', 'customer_unique_id_y',
       'customer_zip_code_prefix_y', 'customer_city_y',
'customer_state_y',
       'status_y', 'geolocation_zip_code_prefix', 'geolocation_lat',
       'geolocation_lng', 'geolocation_city', 'geolocation_state'],
      dtype='object')

all_df.drop(columns=['customer_unique_id_y',
'customer_zip_code_prefix_y', 'customer_city_y', 'customer_state_y',
'status_y'], inplace=True)

all_df.rename(columns={
    'customer_unique_id_x' : 'customer_unique_id',
    'customer_zip_code_prefix_x' : 'customer_zip_code_prefix',
    'customer_city_x' : 'customer_city',
    'customer_state_x' : 'customer_state',
    'status_x' : 'status',
}, inplace=True)

all_df['customer_city'] = all_df['customer_city'].astype('category')
all_df['order_status'] = all_df['order_status'].astype('category')
all_df['customer_state'] = all_df['customer_state'].astype('category')
all_df['payment_type'] = all_df['payment_type'].astype('category')
all_df['seller_city'] = all_df['seller_city'].astype('category')
all_df['geolocation_city'] =
all_df['geolocation_city'].astype('category')
all_df['geolocation_state'] =
all_df['geolocation_state'].astype('category')
all_df['status'] = all_df['status'].astype('category')
all_df['product_category_name'] =
all_df['product_category_name'].astype('category')
all_df['product_category_name_english'] =
all_df['product_category_name_english'].astype('category')

all_df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112912 entries, 0 to 112911
Data columns (total 41 columns):
 #   Column                         Non-Null Count   Dtype
```

```
---  ------                          --------------   -----
 0   index                           112912 non-null  int64
 1   order_id                        112912 non-null  object
 2   customer_id                     112912 non-null  object
 3   order_status                    112912 non-null  category
 4   order_purchase_timestamp        112912 non-null  datetime64[ns]
 5   order_estimated_delivery_date   112912 non-null  datetime64[ns]
 6   delivery_time                   112912 non-null  float64
 7   customer_unique_id              112912 non-null  object
 8   customer_zip_code_prefix        112912 non-null  int64
 9   customer_city                   112912 non-null  category
 10  customer_state                  112912 non-null  category
 11  status                          112912 non-null  category
 12  payment_sequential              112912 non-null  float64
 13  payment_type                    112912 non-null  category
 14  payment_installments            112912 non-null  float64
 15  payment_value                   112912 non-null  float64
 16  review_id                       112912 non-null  object
 17  review_score                    112912 non-null  float64
 18  order_item_id                   112912 non-null  float64
 19  product_id                      112912 non-null  object
 20  seller_id                       112912 non-null  object
 21  shipping_limit_date             112912 non-null  object
 22  price                           112912 non-null  float64
 23  freight_value                   112912 non-null  float64
 24  product_category_name           112912 non-null  category
 25  product_name_lenght             112912 non-null  float64
 26  product_description_lenght      112912 non-null  float64
 27  product_photos_qty              112912 non-null  float64
 28  product_weight_g                112912 non-null  float64
 29  product_length_cm               112912 non-null  float64
 30  product_height_cm               112912 non-null  float64
 31  product_width_cm                112912 non-null  float64
 32  product_category_name_english   112912 non-null  category
 33  seller_zip_code_prefix          112912 non-null  int64
 34  seller_city                     112912 non-null  category
 35  seller_state                    112912 non-null  object
 36  geolocation_zip_code_prefix     112912 non-null  int64
 37  geolocation_lat                 112912 non-null  float64
 38  geolocation_lng                 112912 non-null  float64
 39  geolocation_city                112912 non-null  category
 40  geolocation_state               112912 non-null  category
dtypes: category(10), datetime64[ns](2), float64(17), int64(4),
object(8)
memory usage: 28.4+ MB

customer_geolocation_df = customer_geolocation_df.sample(n=10000,
random_state=42)
```

```
location_counts = customer_geolocation_df.groupby(['geolocation_lat',
'geolocation_lng', 'geolocation_city',
'geolocation_state']).size().reset_index(name='customer_count')
location_counts.head()
```

```
   geolocation_lat  geolocation_lng         geolocation_city  \
0       -33.527671       -53.373545  santa vitoria do palmar
1       -32.204285       -52.179458              rio grande
2       -32.181549       -52.170984              rio grande
3       -32.110758       -52.175673              rio grande
4       -32.095174       -52.179897              rio grande

  geolocation_state  customer_count
0                RS               1
1                RS               1
2                RS               1
3                RS               1
4                RS               1
```

```
center_lat = location_counts['geolocation_lat'].mean()
center_lng = location_counts['geolocation_lng'].mean()
m = folium.Map(location=[center_lat, center_lng], zoom_start=6)

marker_cluster = MarkerCluster().add_to(m)

for idx, row in location_counts.iterrows():
    folium.CircleMarker(
        location=[row['geolocation_lat'], row['geolocation_lng']],
        radius=5,  # Base size of the circle
        popup=f"City: {row['geolocation_city']}, State:
{row['geolocation_state']}<br>Customers: {row['customer_count']}",
        color='blue',
        fill=True,
        fill_color='blue',
        fill_opacity=0.7,
        weight=2
    ).add_to(marker_cluster)

m
```

```
<folium.folium.Map at 0x263d83b91c0>
```

```
m.save("simple_customer_map.html")
print("Simple customer map saved as 'simple_customer_map.html'")
```

```
Simple customer map saved as 'simple_customer_map.html'
```

Pertanyaan 7: Clustering

Bagaimana jika mengkategorikan customer berdasarkan jumlah total pengeluaran untuk pembelian produk di platform ini?

```
bins = [0, 50, 200, 500, 1000, 5000, float('inf')]
customer_value_labels = ['Very Low', 'Low', 'Medium', 'High', 'Very
High', 'Rich Loyalist']
rfm_df['spending_category'] = pd.cut(rfm_df['monetary'], bins=bins,
labels=customer_value_labels, right=False)

rfm_count = rfm_df['spending_category'].value_counts().reset_index()
```

```
bins = [0, 50, 200, 500, 1000, 5000, float('inf')]
customer_value_labels = ['Very Low', 'Low', 'Medium', 'High', 'Very
High', 'Rich Loyalist']
rfm_df['spending_category'] = pd.cut(rfm_df['monetary'], bins=bins,
labels=customer_value_labels, right=False)
rfm_count = rfm_df['spending_category'].value_counts().reset_index()
rfm_count = rfm_count.sort_values(by='count', ascending=False)
rfm_count.head()
```

```
  spending_category  count
0               Low  55629
1            Medium  16330
2          Very Low  15831
3              High   4474
4         Very High   2103
```

```
all_df.to_csv('all_df.csv')
```

Conclusion

Conclusion pertanyaan 1

```
Jumlah Order: Ada kemungkinan tren musiman dengan puncak pada bulan-
bulan tertentu bulan November atau musim liburan di bulan Desember dan
penurunan pada bulan-bulan lain, seperti Februari atau Maret.
Total Revenue: Tren pendapatan seringkali sejalan dengan volume order,
tetapi mungkin menunjukkan perbedaan tergantung pada promosi, kategori
produk, atau order bernilai tinggi di bulan-bulan tertentu.
```

Conclusion pertanyaan 2

```
Produk Terbaik (Revenue): Kategori seperti elektronik, ponsel, atau
peralatan rumah tangga cenderung menghasilkan pendapatan lebih tinggi
karena harga per unit yang lebih tinggi.
Produk Terlaris (Volume Order): Kategori hampir sama dengan produk
terbaik secara revenue mungkin terjual dalam jumlah lebih banyak
tetapi dengan harga yang lebih rendah.
Produk Terburuk (Revenue & Volume): Barang-barang khusus atau produk-
produk niche, terutama dalam kategori barang mewah, mungkin memiliki
volume penjualan dan pendapatan yang lebih rendah.
```

Conclusion pertanyaan 3

```
State Terbaik: São Paulo, Rio de Janeiro, dan Minas Gerais biasanya merupakan state dengan pendapatan dan volume order tertinggi karena populasinya yang besar dan infrastruktur e-commerce yang lebih berkembang.
State Terburuk: State yang kurang padat penduduknya atau yang infrastrukturnya kurang berkembang, seperti Acre atau Roraima, atau yang di dekat hutan amazon, mungkin menunjukkan volume order dan pendapatan yang lebih rendah.
```

Conclusion pertanyaan 4

```
Metode Paling Populer: Pembayaran dengan kartu kredit biasanya paling umum di berbagai state karena fleksibilitasnya untuk pembayaran secara cicilan.
```

Conclusion pertanyaan 5

```
RFM Tinggi: Pelanggan setia yang sering membeli dan menghabiskan banyak uang serta recency yang kecil
RFM Rendah: Pelanggan yang tidak melakukan pembelian baru-baru ini, tidak membeli secara sering, atau menghabiskan lebih sedikit.
Hasilnya berupa segmentasi pelanggan
```

Conclusion pertanyaan 6

```
Pelanggan dengan pengeluaran tinggi (High-Rich Loyalist) yang kemungkinan lebih makmur dan mungkin membeli barang-barang bernilai lebih tinggi seperti elektronik atau barang mewah.
Pengeluaran menengah (Medium) yang membeli barang-barang dengan harga sedang, mungkin fokus pada produk rumah tangga atau perawatan pribadi.
Pengeluaran rendah (Very Low - Low) yang mungkin hanya membeli barang-barang murah dan sering dikonsumsi seperti produk kecantikan atau kebutuhan sehari-hari.
```

Conclusion pertanyaan 7 Sebagian besar pelanggan terkonsentrasi di daerah metropolitan, terutama di sekitar São Paulo dan Rio de Janeiro. Mungkin ada wilayah yang kurang terjangkau (misalnya di bagian Barat Laut Brasil) di mana basis pelanggan jarang karena keterbatasan logistik atau hambatan ekonomi.