

SPRINT #5

POWER BI: INTRODUCTION AND INDICATORS

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Date: 30/11/2024

SUMMARY

In this sprint, I am exploring key concepts such as data transformation and loading, creating key performance indicators, Data Analysis Expressions (DAX), developing a comprehensive understanding and practical application of specific Power BI concepts, acquiring the skills and knowledge necessary for maximally effective utilization of the platform in various analytical scenarios.

RESULT

In this folder on the GitHub repository, you will find:

/db_data: csv-files with data and equivalent database dump

S5_01.pbix: dashboard in pbix

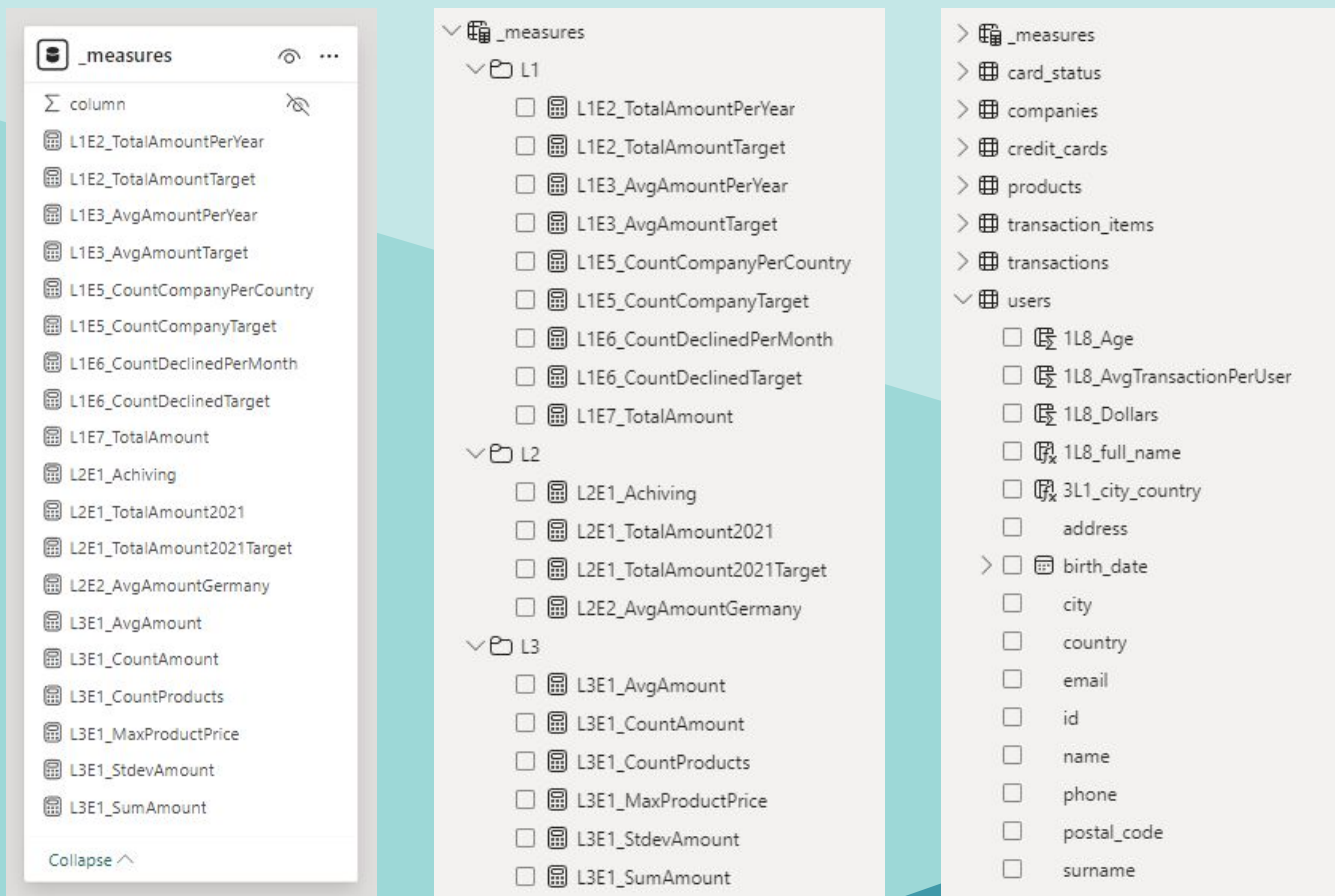
S5_01.pdf: dashboard in pdf

Sprint_5.pdf: interpretation of exercises and DAX formulas and descriptions with screenshots of all visuals and their results with comments

https://github.com/leocareer/DA_specialization/tree/main/Sprint_05

I analyzed all the tasks and modeled a dashboard from them. For each level, I made a separate page, three pages in total. For the first and second levels, the visuals of each task are organized into a separate block. I added visuals and dependencies between the blocks that I considered optimal in each case. Before each new level, I will show the corresponding dashboard page with a description.

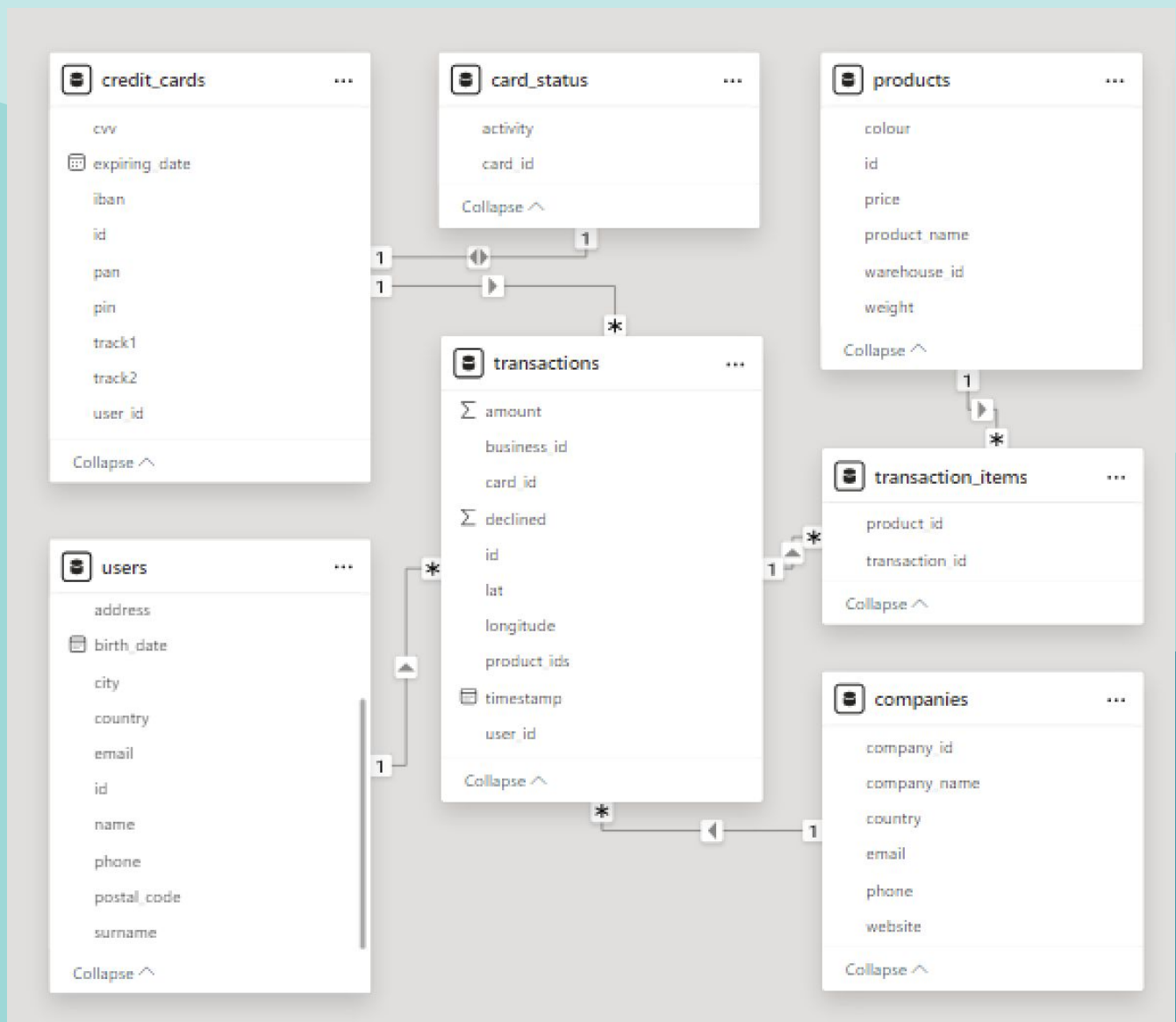
All the measures I created are in a separate table called ' _measures ' and are grouped into folders that correspond to levels (dashboard pages), the name of each measure consists of the level number and the task number. In addition, the 'users' table contains several calculated columns:



LEVEL 1 EXERCISE 1

It is necessary to import data from the previously used data base. After loading data, the database model is displayed in Power BI.

I used a connection between MySQL Workbench and Power BI to load the data. In the sprint folder on Git I also posted the equivalent csv-files and a dump of the database used (the '/db_data' folder). The base model in Power BI:



The database diagram is exactly the same as in the previous sprint, here I will skip the description of fields and relationships, it can be seen here:

github.com/leocareer/DA_specialization/blob/main/Sprint_04/Sprint_4.pdf

As for data types, I converted all the columns I needed to decimal or whole number, taking into account the need for rounding. I checked the date format, I decided not to create a separate table for the calendar, since I analyzed that the 'timestamp' field in the 'transactions' table in the 'Data Hierarchy' format would satisfy me. I also needed to convert the data for 'lat' and 'longitude', since some commas were lost when loading the data.

The first level and the first page of the dashboard. There are no common dependencies here and each block works separately. I considered the option of making a common filter by year and by country, and decided that it would be unnecessary and defocusing. Firstly, it was not requested. Secondly, the tasks are not related to each other, in fact, these are separate reports for different stakeholders, and common filters would create the illusion of connectivity. Thirdly, a filter by period would not bring good profit since all months and years are already presented on the charts and we only have 13 months. The third level will be presented as a single report and I practice with common filters there.

LEVEL 1: SALES PERFORMANCE MARKETING REPORT

Total Sales Sum

107.671 €

Goal: 25,000 € (+330,68%)

Average Ticket Sum

266 €

Goal: 250 € (+6,34%)

2021

2022

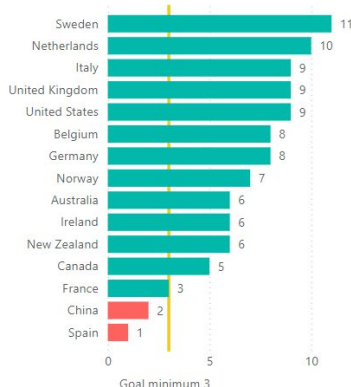
Number of Declined Transactions per Month



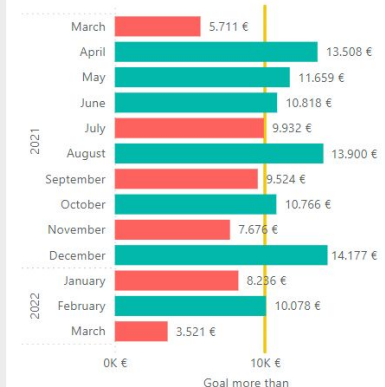
Average Ticket Sum by Client

Client Name	Age	Euros	Dollars
Abra Doyle	38	0,00	0,00
Acton Gallegos	35	283,15	305,80
Aiko Chaney	38	278,36	300,62
Ainsley Herrera	28	105,51	113,95
Alan Vazquez	28	257,86	278,48
Alika Kinney	28	394,59	426,16
Alika Valdez	34	0,00	0,00
Allegra Stanton	34	0,00	0,00
Allen Calhoun	37	286,60	309,53
Allistair Holmes	34	0,00	0,00
Amal Kennedy	38	411,64	444,57
Amber Blevins	45	193,33	208,80
Amelia Valenzuela	38	321,39	347,10
Andrew Strong	27	375,48	405,51
Aquila Haley	28	0,00	0,00
Aquila Strickland	42	0,00	0,00

Number of Purchasing Companies by Country



Total Sales Sum per Month



I analyzed the following three tasks, they ask for metrics that stakeholders often want to see at the same time, and also they are asked for the same period, and also the same 'card' visual suits them, so I decided to combine them into one block. Now I will give the three tasks for which this block was created, then I will give a description of the formulas and an analysis of the result.

LEVEL 1 EXERCISE 2

Your company is interested in evaluating the total sum of transactions carried out over the years. To achieve this, the creation of a key performance indicator (KPI) has been requested. The KPI must provide a clear visualization of the business objective of achieving a total sum of €25,000 for each year.

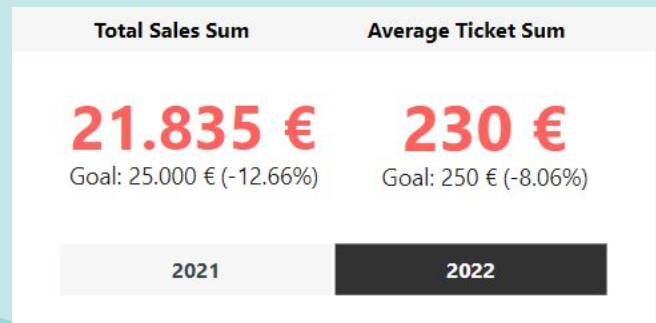
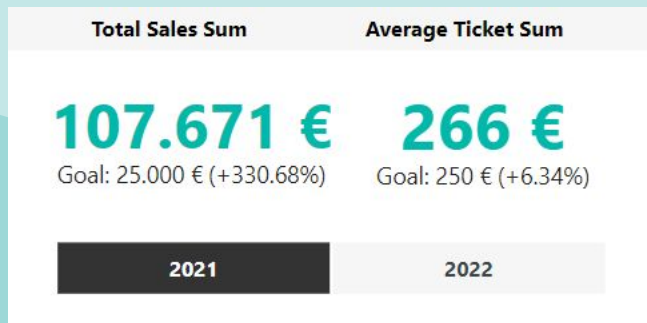
LEVEL 1 EXERCISE 3

Marketing asks you to create a new DAX measure that calculates the average sum of the transactions made during the year 2021. Visualize this average in a meter that reflects the sales made, remember that the company has a target of 250.

LEVEL 1 EXERCISE 4

Follow the same procedure as in Exercise 3 for 2022.

The widget (next screenshot) shows cards with the main sales metrics for 2021 and 2022. By default, 2021 is selected and we see a screenshot on the left. In this screenshot, the card on the left shows the Total Sales Sum for 2021 of 107671 euros, only approved transactions are taken into account, the green color of the value tells us that we have reached the set goal. Under the value, the goal of 25000 euros is signed, in brackets we see the percentage of +330.68%, which means that we have exceeded the goal by this much. The card on the right shows the Average Ticket Sum for 2021 of 266 euros, the green color tells us that the goal has been achieved. Under the value, the goal of 250 euros is signed and the increase in exceeding the goal of +6.34% in brackets. Under the value below is the year switch, when you click 2022, we will see the second screenshot. The card on the left shows the Total Sales Sum for 2022 of 21835 euros, the red color of the value indicates that we have not reached the goal, under the value we see the goal of 25,000 euros and in brackets the percentage of shortfall to the goal of -12.66%. The card on the right shows the Average Ticket Sum for 2022, the red color indicates that the goal has not been reached. Under the value is written the goal of 250 euros and the missing percentage to the goal of -8.06%.



Over the past 2021, the goal for total sales was exceeded by 330%, and will obviously be achieved in the current 2022 in the first or second quarter, our company is doing an excellent job with this indicator, but I would also like to ask questions whether our goal is underestimated, probably It's time for the company to reconsider it, given that before this I was convinced that all departments had the correct data. The results of the average ticket look more realistic, but at the moment the company is not managing to achieve the figure of 250 euros, I would like to conduct an analysis to compare the current readings with the first quarter of last year – this is a period of low demand in many niches and perhaps we are reaching the annual figure in other quarters, I would also like to check for outliers in the data, perhaps we recently had a sale that could have affected the average check amount.

To create these visuals, I added measures that count the sum and average, and measures to achieve goals. I added a year selection in DAX. I set transactions[declined] = 0 to only count sales for sales that are not rejected, because obviously we only care about actual sales for which the company has received money.

```
1 L1E2_TotalAmountPerYear = CALCULATE(  
2     SUM(transactions[amount]),  
3     YEAR(transactions[timestamp]) = SELECTEDVALUE(transactions[timestamp].[Year]),  
4     transactions[declined] = 0  
5 )
```

```
1 L1E2_TotalAmountTarget = 25000
```



```

1 L1E3_AvgAmountPerYear = CALCULATE(
2     AVERAGE(transactions[amount]),
3     YEAR(transactions[timestamp]) = SELECTEDVALUE(transactions[timestamp].[Year]),
4     transactions[declined] = 0
5 )

```

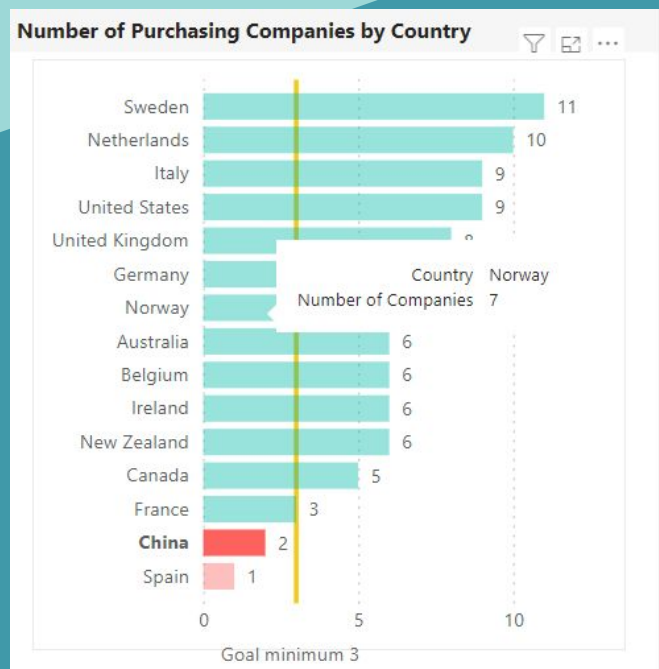
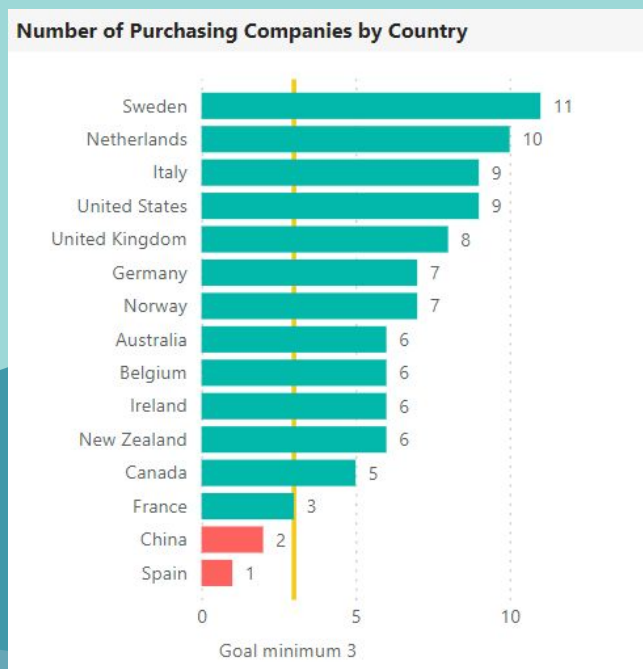
```

1 L1E3_AvgAmountTarget = 250

```

LEVEL 1 EXERCISE 5

The objective of this exercise is to create a KPI that visualizes the number of companies per country that participate in transactions. The business goal is to ensure that there are at least 3 participating companies per country. To achieve this, it will be necessary to use DAX to calculate and represent this information in a clear and concise way.



By default, we see the widget on the screenshot on the left. There is a Clustered Bar Chart, which shows the number of buying companies in each country for the entire period. The Y axis shows the countries, at the bottom are the countries with the least number of companies and this increases upwards. The X axis shows the number of companies, the values of the number of companies are shown to the right of each bar, the largest number of 11 companies we see in Sweden at the very top, and the smallest number of 1 company in Spain at the very bottom. The yellow line on the X axis corresponds to the goal that we want to achieve and is equal to 3 companies, under the line there is a signature 'Goal minimum 3'. Green bars indicate that the goal has been achieved for these countries: France, Canada, New Zealand, Ireland, Belgium, Australia, Norway, Germany, the United Kingdom, the United States, Italy, the Netherlands, Sweden. Red bars indicate that the goal has not been achieved for these countries: Spain and China. when you hover over a bar, a hint appears. The bar can be highlighted when clicked.

To achieve the target of having at least 3 participating companies from each country, I recommend focusing efforts on attracting partners from China and Spain, where the current numbers fall short of the minimum target of 3 companies. Meanwhile, the success in Sweden demonstrates the country's potential for further collaboration and offers an example of successful participant engagement.

To create these visuals, I added DAX measure that counts the number of companies[company_id] with a filter that selects only those companies that participated in the transactions, and measure to achieve goals equal to 3 companies:

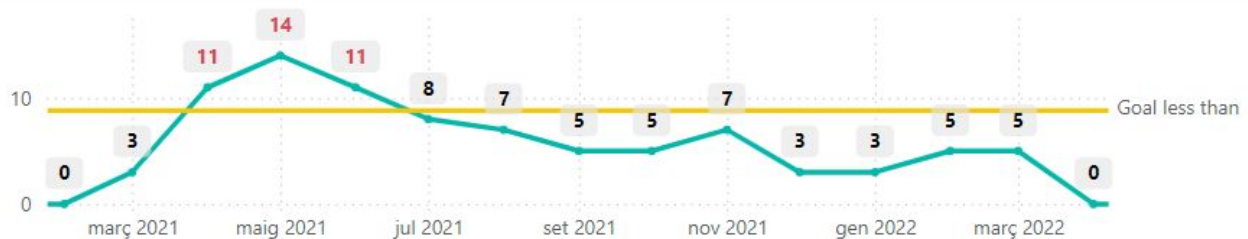
```
1 L1E5_CountCompanyPerCountry = CALCULATE(  
2     COUNT(companies[company_id]),  
3     FILTER(  
4         companies,  
5         companies[company_id] IN VALUES(transactions[business_id])  
6     )  
7 )
```

```
1 L1E5_CountCompanyTarget = 3
```

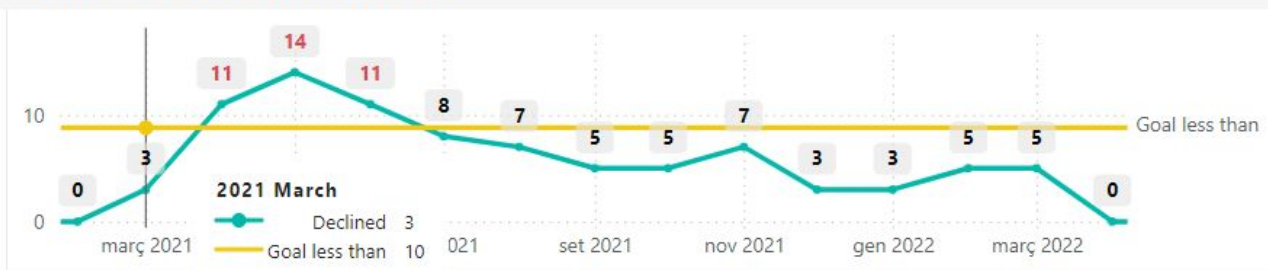

LEVEL 1 EXERCISE 6

Create a new KPI that allows you to visualize the number of declined transactions over time. The company has set a goal of having fewer than 10 declined transactions per month.

Number of Declined Transactions per Month



Number of Declined Transactions per Month



The widget shows a Line chart that shows the change in the number of declined transactions over time for the entire existing period. Time is located on the X axis, one value corresponds to one month, the first available month is March 2021, the last is March 2022, before and after them we see zero and no transactions were made there. Not all months are signed on the X axis, to see the month you can hover over the value and look at the tooltip. The Y axis shows the number of declined transactions. The smallest number of 3 declined transactions was in March 2021, December 2021, January 2022, the largest number of 14 was in May 2021. The yellow line corresponds to the goal of less 10 declined transactions, which we do not want to exceed. Along the graph line itself there are labels with the value of the number of declined transactions for each month of the period, the red color of the value on the label means that we exceeded the permissible target value of 10 transactions, this was in April 2021 with 11 declined transactions, in May 2021 with 14, and in June 2021 with 11.

We see three periods when the company exceeded the limit, but this was in the second quarter of the previous year and the trend is decreasing, so in the current year the company does not exceed even half of the limit, which means that measures to reduce rejected transactions were effective. Although in the last two months there are more than at the beginning of the year, it is necessary to pay attention to this and check the reasons.

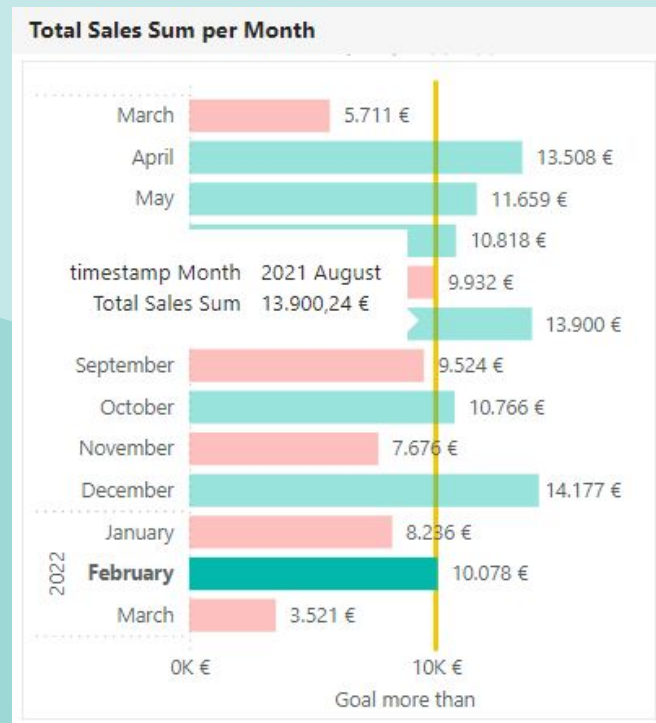
To create this view I added a measure that counts the number of transaction[id] when declined = 1 with. In this measure I use the COALESCE function, as I wanted to display the zero boundary periods on the chart, so that it would be clear that this is the entire existing period. The second measure I added is the target of 10 transactions.

```
1 L1E6_CountDeclinedPerMonth = COALESCE(  
2   CALCULATE(  
3     COUNT(transactions[id]),  
4     transactions[declined] = 1  
5   ),  
6   0  
7 )
```

```
1 L1E6_CountDeclinedTarget = 10
```

LEVEL 1 EXERCISE 7

Create a grouped bar chart that summarizes sales by month. The company's goal is to complete at least 10,000 transactions per month.



By default, we see the widget on the left screenshot, it shows the change in the total sales amount over time for the entire existing period. Time is located on the Y axis, one value corresponds to one month, which are signed on the axis. The X axis shows the total amount of realized sales. The yellow line corresponds to the goal of 10,000 euros that we want to achieve each month, and has a signature about this at the bottom. To the right of each bar there is a value of the total sales for the corresponding month. The red color of the bars tells us that the goal has not been achieved in this month, green – it has been achieved. We have the smallest values in March 2021 and March 2022, this is normal since we started sales in mid-March 2021 and March 2022 is not over yet, and in November 2021 – 7676 euros, in January 2022 – 8236 euros. In July and September 2021, we were close to the target with 9932 and 9524 euros, respectively. There is a gradual decline trend from April to July 2021, where we gradually slid from 13508 to 9932 euros. The most successful were April 2021 with 13508 euros, August 2021 with 13900 euros, December 2021 with 14177 euros. In the last completed month of February, we barely reached the goal with 10078 euros, and before that there was a disastrous January with 8236 euros.

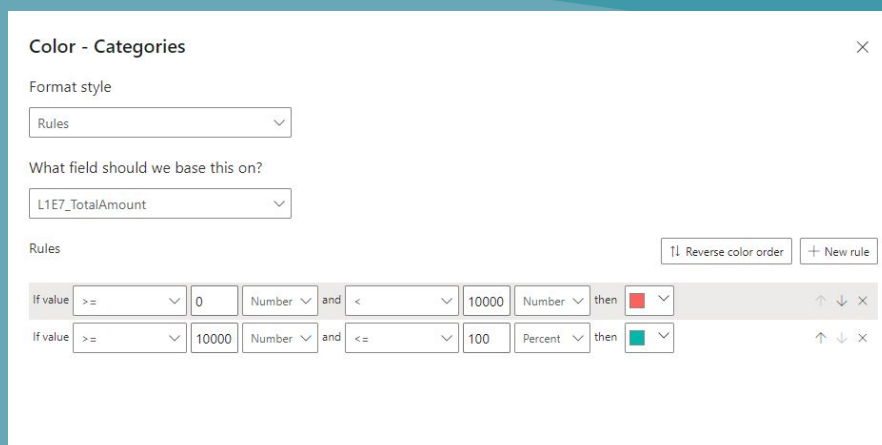
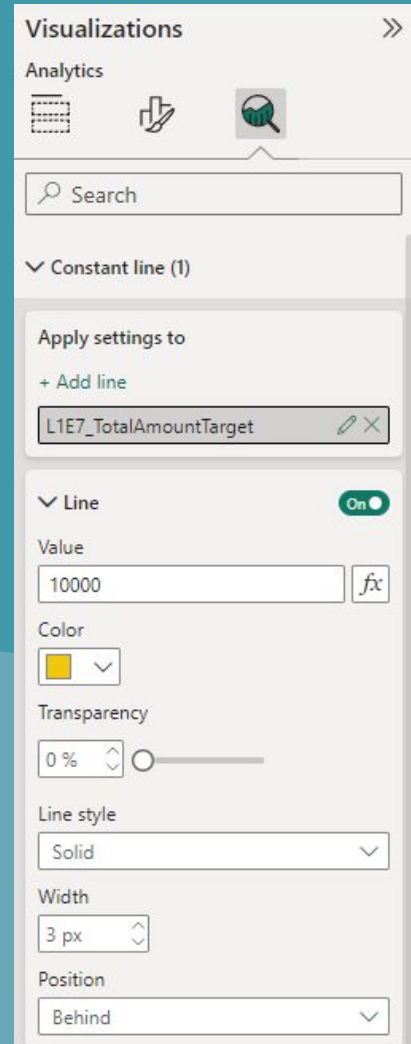
The trend is not very good because one month with the achieved goal is followed by months where the company does not reach it, it seems that last year the situation was more stable. It is necessary to study this indicator in more depth in order to plan measures to increase the indicators to achieve stable goal fulfillment.

To create these visuals, I added measures that count the sum of amount with declined = 0 to only count sales that were not rejected, because we only care about sales for which the company has received money.

```
1 L1E7_TotalAmount = CALCULATE(
2     SUM(transactions[amount]),
3     transactions[declined] = 0
4 )
```

For this visual, I set up a goal via 'Constant Line' in the 'Analytics' block. →

I highlighted the columns of months that did not reach the target using the customize column color by rules feature. I got the impression that this functionality of Power BI is not perfect, for example, it does not work if you set the Max value in the final rule:



LEVEL 1 EXERCISE 8

In this exercise, we want to dig deeper into the transactions performed by each user and present the information in a clear and understandable form. In the table, present the following information:

- first and last name of users (a new column must be created to combine this information);
- age of users;
- average transactions in EUR;
- average transaction value in USD (conversion: 1 EUR equals 1.08 USD);
- necessary changes must be made to identify users who had an average of 300 or more EUR and 320 or more USD in transactions.

The widget shows a table (look at scr 1), the first column shows the full names of clients, the second the age of the client, the third the average check amount of this client for the entire existing period in euros, the fourth in dollars at the rate of 1 euro = 1.08 dollars. The green color of the amounts tells us about the achievement of the goal of 300 euros and 320 dollars. For clients who did not make a transaction, 0 is shown.

With a superficial analysis, we can say that customers aged 40-42 and 30-32 buy more (look at scr 2), here a detailed analysis is needed to verify this hypothesis. We see the achievement (look at scr 3) and non-achievement of the goal for the same check in euros and dollars due to the disproportionate conversion of goals, it is necessary to clarify this point for an error. We also see that in our system there is a large number of clients who have not made a single purchase (look at scr 4), we need to see if their transactions were rejected and then stimulate them to buy.

Average Ticket Sum by Client

Client Name	Age	Euros	Dollars
Abra Doyle	38	0,00	0,00
Acton Gallegos	35	283,15	305,80
Aiko Chaney	38	278,36	300,62
Ainsley Herrera	28	105,51	113,95
Alan Vazquez	28	257,86	278,48
Alika Kinney	28	394,59	426,16
Alika Valdez	34	0,00	0,00
Allegra Stanton	34	0,00	0,00
Allen Calhoun	37	286,60	309,53
Allistair Holmes	34	0,00	0,00
Amal Kennedy	38	411,64	444,57
Amber Blevins	45	193,33	208,80
Amelia Valenzuela	38	321,39	347,10
Andrew Strong	27	375,48	405,51
Aquila Haley	28	0,00	0,00
Aquila Strickland	42	0,00	0,00

scr 1

Average Ticket Sum by Client

Client Name	Age	Euros	Dollars
Cassandra Ferguson	32	274,28	296,22
Francis Bryant	32	0,00	0,00
Garrett Mcconnell	32	0,00	0,00
Linda Gaines	32	399,33	431,28
Linus Willis	32	270,78	292,44
Melissa Cameron	32	359,14	387,87
Philip Carey	32	234,52	253,28
Wyatt Morris	32	358,36	387,03
Burke Graham	31	414,58	447,74
Camilla Roach	31	445,48	481,12
Gisela Johnston	31	295,55	319,19
Keane Mckinney	31	308,12	332,77
Keiko Guerra	31	234,49	253,24
Lionel Griffith	31	0,00	0,00
Medge Nieves	31	147,46	159,25
Molly Gilliam	31	219,83	237,42

scr 2

Average Ticket Sum by Client

Client Name	Age	Euros	Dollars
Nora Reeves	35	148,97	160,89
Nyssa Shaffer	33	0,00	0,00
Ocean Nelson	33	251,00	271,08
Odysseus Frye	41	0,00	0,00
Oleg Coleman	43	95,59	103,24
Olga Case	33	298,08	321,92
Oprah Nicholson	43	149,89	161,88
Oscar Neal	41	354,45	382,81
Patrick Reyes	38	0,00	0,00
Philip Carey	32	234,52	253,28
Phoebe Roth	43	275,71	297,76
Phyllis Holt	37	133,39	144,06
Porter Francis	33	154,92	167,31
Preston Hood	38	279,35	301,70
Preston Hubbard	24	165,38	178,61
Priscilla Skinner	44	52,97	57,21

scr 3

Average Ticket Sum by Client

Client Name	Age	Euros	Dollars
Abra Doyle	38	0,00	0,00
Alika Valdez	34	0,00	0,00
Allegra Stanton	34	0,00	0,00
Allistair Holmes	34	0,00	0,00
Aquila Haley	28	0,00	0,00
Aquila Strickland	42	0,00	0,00
Aretha Chang	26	0,00	0,00
Astra Alexander	41	0,00	0,00
Barrett Andrews	29	0,00	0,00
Benedict Wheeler	25	0,00	0,00
Bruce Gill	34	0,00	0,00
Chase Yang	25	0,00	0,00
Ciaran Harrison	26	0,00	0,00
Daquan Kirk	30	0,00	0,00
Deacon Sharpe	45	0,00	0,00
Diana Williamson	33	0,00	0,00

scr 4

To create this visual, I added several calculated columns to the users table. For the full name of the customers, I used the CONCATENATE function to glue the first and last names together. Age is obtained using DATADIFF, which returns the number of years between the birthday date and today's date. Average ticket sum is calculated with a filter by user. And the ticket sum in dollars takes this value and multiplies it by the exchange rate.


```
1 1L8_full_name = CONCATENATE(users[name], " " & users[surname])
```

```
1 1L8_Age = DATEDIFF(users[birth_date].[Date], TODAY(), YEAR)
```

```
1 1L8_AvgTransactionPerUser =  
2     CALCULATE(  
3         AVERAGE(transactions[amount]),  
4         FILTER(transactions, transactions[user_id] = users[id])  
5     )
```

```
1 1L8_Dollars = users[1L8_AvgTransactionPerUser] * 1.08
```

LEVEL 1 EXERCISE 9

Write a short paragraph (up to 50 words) explaining the meaning of the numbers presented in Power BI visualizations. You can interpret the data as a whole or focus on a specific country. Accompany your interpretations with screenshots of the visualizations you will analyze.

The annual plan for total sales and average check amounts was successfully fulfilled in 2021, and is on track for 2022 (look at **purple line** on screenshot). The company has secured a successful trend in the number of rejected transactions (**pink line**). Overall, we have fulfilled the plan for the number of companies in countries (**orange line**), but we need to pay attention to the monthly sales amount (**red line**).

LEVEL 1: SALES PERFORMANCE MARKETING REPORT

Total Sales Sum

Average Ticket Sum

107.671 €

Goal: 25,000 € (+330.68%)

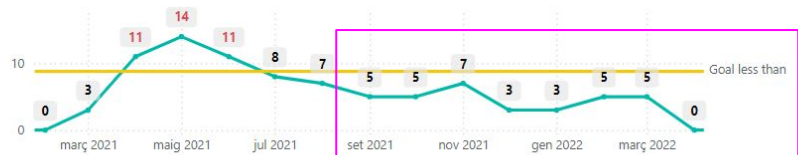
266 €

Goal: 250 € (+6.34%)

2021

2022

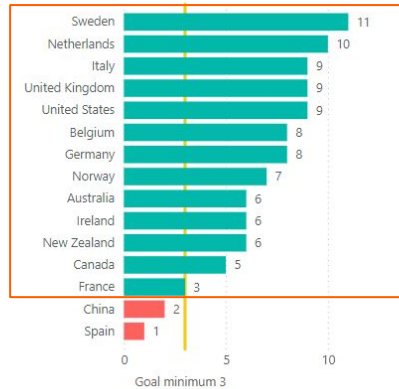
Number of Declined Transactions per Month



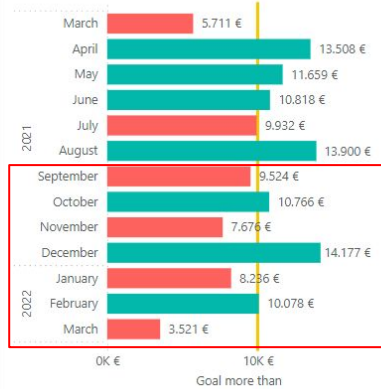
Average Ticket Sum by Client

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Number of Purchasing Companies by Country



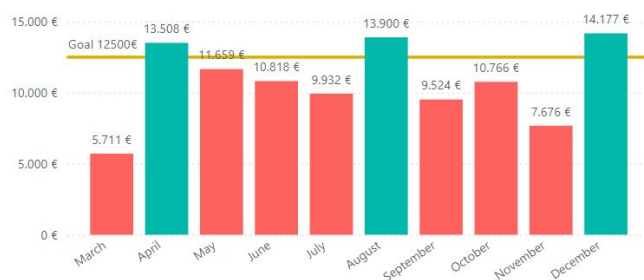
Total Sales Sum per Month



The second level and the second page of the dashboard. There are also no common dependencies here, and the two blocks work separately.

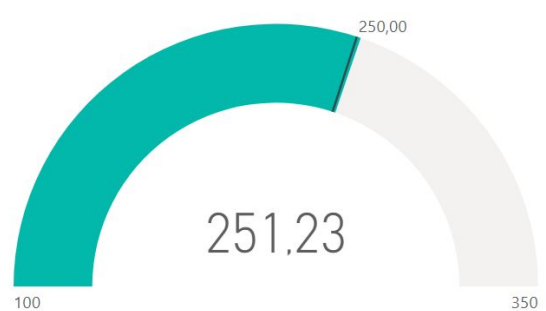
LEVEL 2: SALES METRICS ANALYSIS REPORT

Total Sales Sum in 2021 per Month



Month	Total Amount 2021	Achieving
December	14.177 €	achieved
August	13.900 €	achieved
April	13.508 €	achieved
May	11.659 €	not achieved
June	10.818 €	not achieved
October	10.766 €	not achieved
July	9.932 €	not achieved
September	9.524 €	not achieved
November	7.676 €	not achieved
March	5.711 €	not achieved

Average Ticket Sum by Germany



2021

2022

Company Name	Number of Sales	Email
Nunc Interdum Incorporated	86	non@outlook.com
Ac Fermentum Incorporated	2	donec.porttitor.tellus@yahoo.net
Ac Industries	2	ipsum@yahoo.com
Aliquam PC	2	scelerisque.mollis@icloud.org
Auctor Mauris Corp.	2	eget.metus@protonmail.ca
Convallis In Incorporated	2	mauris.ut@aol.couk
Augue Foundation	1	mauris@yahoo.com

LEVEL 2 EXERCISE 1

From a marketing perspective, they need to study the monthly trend of transactions made in 2021, in particular, they want to know the change in transactions depending on the month. Remember to visualize the business goal of achieving a transaction amount of at least €12,500 per month. In this exercise, you will need to be able to identify the months in which the set goal was not achieved. If necessary, two views can be made.



By default, we see the widget on the screenshot on the left, there is a graph and a table that show the change in the amount of total monthly sales during 2021. On the column chart, the months are located on the X axis, starting with March, since we started sales in this month. The Y axis shows the sales amount, and at the top of each column, a specific value of the sales amount for the corresponding month is shown. The yellow line on the Y axis shows the goal of 12,500 euros that we want to achieve every month. The green color of the bars tells us that the goal has been achieved, the red one – not achieved. Below the graph, there is a table, in the first column the months, in the second the sales amount, this is the same amount as at the top of the bars on the graph, in the third column we see 'achived' or 'not achieved', so for the red columns that have not reached the goal, it says 'not achieved', and for the green ones, 'achieved'. By clicking on the bar or row in the table, you can highlight the desired month (screenshot on the right). The table can be sorted by sales amount and achievement.

Thus, we see that the smallest amount of sales was in March, this is normal and the month cannot be considered a failure since we did not start sales at the beginning of the month, then in April we reached and exceeded the target with 13,508 euros, but after that we observe a tendency for a gradual regular decrease in sales with failure to reach the target until July, where we find 9,932 euros. August and December were distinguished by explosive excellent sales with 13,900 and 14,177 euros respectively, but from September to November we consistently did not reach the target, the most disastrous was November with 7,676 euros.

Given that the company met the monthly transaction target of 12,500 euros in just three months, I recommend investigating the factors that contributed to the high-performing months. For example, the last month's earnings were nearly double those of the previous month. Identifying these events could help replicate successful strategies in lower-performing months.

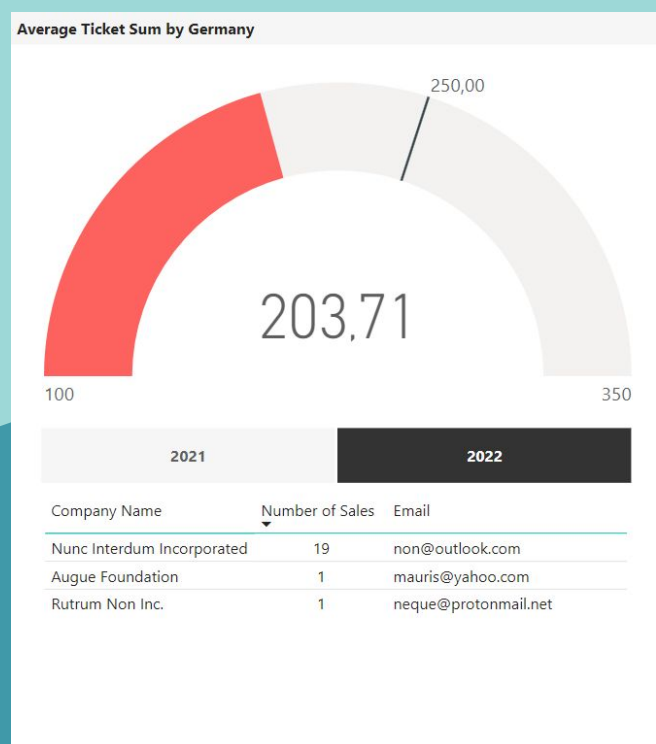
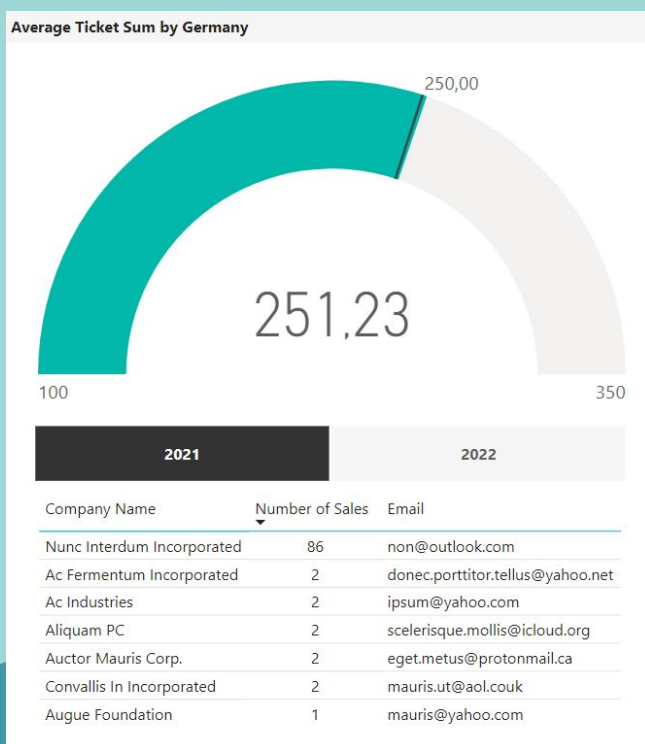
To create the graph, I added a measure as in the previous tasks with SUM and declined = 0, only specifically for 2021. I set up a goal via 'Constant Line' in the 'Analytics' block and highlighted the columns using the customize column color by rules feature. I added a table visual to be able to sort by amount and achievement. For the table I added a measure of goal achievement by practicing with the IF operator in DAX:

```
1 L2E1_TotalAmount2021 = CALCULATE(  
2     SUM(transactions[amount]),  
3     YEAR(transactions[timestamp]) = 2021,  
4     transactions[declined] = 0  
5 )
```

```
1 L2E1_Achiving = IF(  
2     [L2E1_TotalAmount2021] >= [L2E1_TotalAmount2021Target],  
3     "achieved",  
4     IF(  
5         [L2E1_TotalAmount2021] <> 0,  
6         "not achieved"  
7     )  
8 )
```

LEVEL 2 EXERCISE 2

In your work, you want to gain a deeper understanding of transactions conducted in Germany. Therefore, you are asked to develop DAX metrics to create visualizations that reflect average sales in Germany. Keep in mind that the company is aiming to achieve a figure of 250 euros per year. Set the display so that the minimum value is 100 and the maximum is 350, thus providing a more effective presentation of the information.



The widget shows a graph, a year selection slicer and a table, 2021 is selected by default and we see the widget in the screenshot on the left. The graph shows the achievement of the target of 250 euros for the average check in Germany for the selected year, the green color tells us that the goal has been achieved, the red color tells us that it has not been achieved, the average check amount is indicated in the middle of the graph, the yellow line corresponds to the goal. In the table under the graph in the first column are the names of the companies that made sales in the selected period, their number of transactions in the second column and email for communication in the third, sorting by the number of checks is available.

Thus, we see that in 2021 the goal was achieved with the amount of 251.23 euros, and all sales were made mainly by one company 'Nunc Interdum Incorporated' with 86 sales, the remaining 6 companies made 1-2 sales. In 2022 (screenshot on the right) we see a red chart with an unachieved target of 203.71 euros and three selling companies, among which 'Nunc Interdum Incorporated' is again the undisputed leader with 19 sales. I recommend conducting a study of the sales of the company 'Nunc Interdum Incorporated' to apply the strategy to other companies, as their number of transactions is fantastic compared to the rest.

For this visual I needed one measure with a condition `companies[country] = "Germany"`, and the goal is configured in the Gauge visual itself. I made the number of transactions for the table using the built-in 'Count' in 'Build visual'.

```
1 L2E2_AvgAmountGermany = CALCULATE(  
2     AVERAGE(transactions[amount]),  
3     companies[country] = "Germany",  
4     transactions[declined] = 0,  
5     YEAR(transactions[timestamp]) = SELECTEDVALUE(transactions[timestamp].[Year])  
6 )
```

LEVEL 2 EXERCISE 3

Write a short paragraph, maximum 25 words, indicating in which month you did not achieve the suggested goal of Exercise 1.

The company failed to achieve its goal in 7 months out of 10. Particular attention to November, where we only achieved a little more than half of the goal.

The second level and the second page of the dashboard.

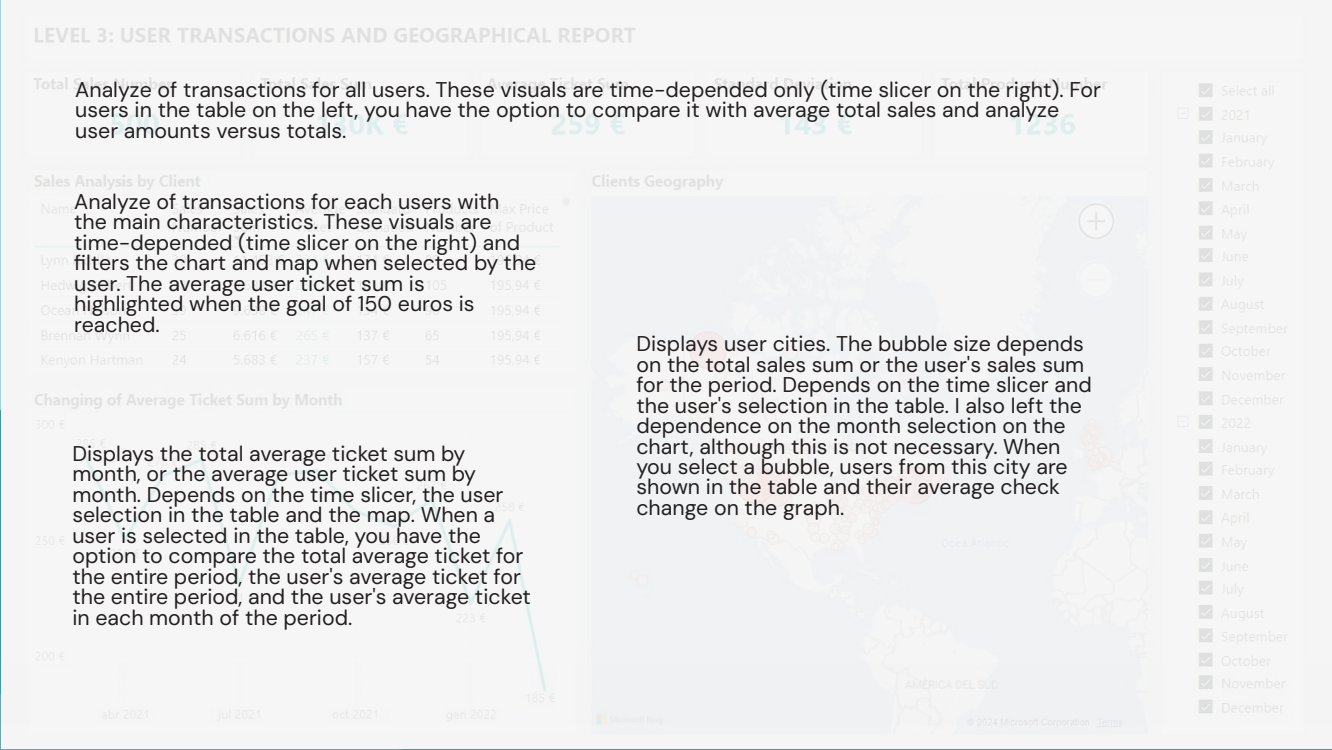
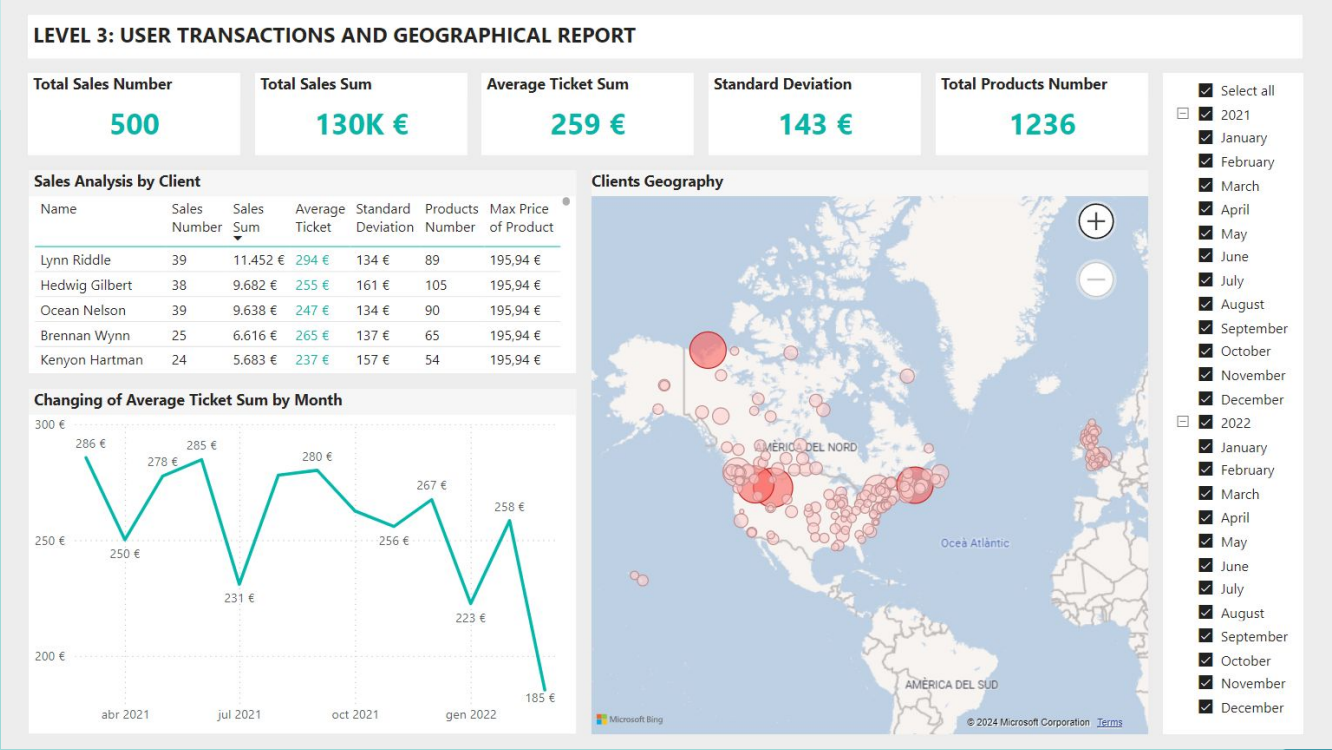
LEVEL 3 EXERCISE 1

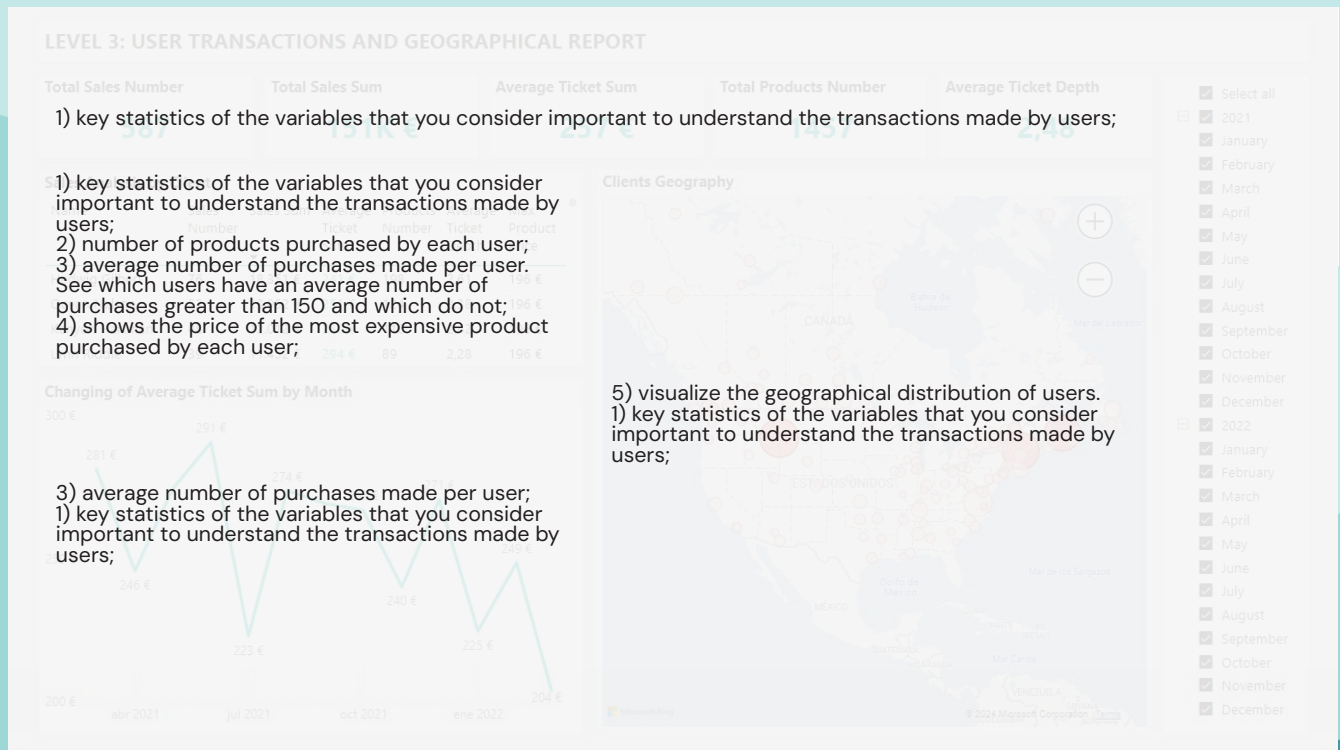
The Marketing department wants to take a deeper look at the transactions made by users. Therefore, you are asked to prepare several visualizations that include:

- 1) key statistics of the variables that you consider important to understand the transactions made by users;
- 2) number of products purchased by each user;
- 3) average number of purchases made per user. See which users have an average number of purchases greater than 150 and which do not;
- 4) shows the price of the most expensive product purchased by each user;
- 5) visualize the geographical distribution of users.

In this exercise, you will need to make the necessary changes to each graph to improve its readability and comprehension. In this task, you are expected to carefully evaluate which variables are relevant to effectively convey the required information.

The approach I took to accomplish this task was to create a single dashboard with adding some views, dependencies, and slices, where you can also see the requested tasks. First, I'll show you a screenshot of the finished dashboard. Next, I will show a screenshot with a description of the graphs and dependencies, and after a screenshot with comments on which graph which requested task is performed. After that, I will provide the measures and the description of the DAX code that were created for this dashboard. I will finish the report with an analysis of two slices and conclusions for the company.





For this dashboard, I chose the following key user-analyzed characteristics: number of transactions, total amount of all transactions, average transactions amount paired with standard deviation, number of purchased products, and I also added the important slice – their change over time. I also added cards for total sales for all these characteristics, so that they could be analyzed in comparison from any slice.

Now I will demonstrate what measures were created for this dashboard. There is a measure that duplicates the measure from the previous tasks, and theoretically it is possible to optimize the measures for all exercises and reduce their number, but since there is not much data and calculations, the dashboard is not loaded, the exercises are not related to each other, I chose as a higher priority in this training example for greater demonstrativeness to organize a full set of measures for each page and organize them by folders by pages. The measures created for this dashboard in the order of their arrangement in the cards and table:

```
1 L3E1_CountAmount = CALCULATE(  
2 |   COUNT(transactions[amount]),  
3 |   transactions[declined] = 0  
4 | )
```

```
1 L3E1_SumAmount = CALCULATE(  
2 |   SUM(transactions[amount]),  
3 |   transactions[declined] = 0  
4 | )
```

```
1 L3E1_AvgAmount = CALCULATE(  
2 |   AVERAGE(transactions[amount]),  
3 |   transactions[declined] = 0  
4 | )
```

```
1 L3E1_StdevAmount = CALCULATE(  
2 |   STDEV.P(transactions[amount]),  
3 |   transactions[declined] = 0  
4 | )
```

```
1 L3E1_CountProducts = CALCULATE(  
2 |   COUNT(transaction_items[product_id]),  
3 |   transactions[declined] = 0  
4 | )
```

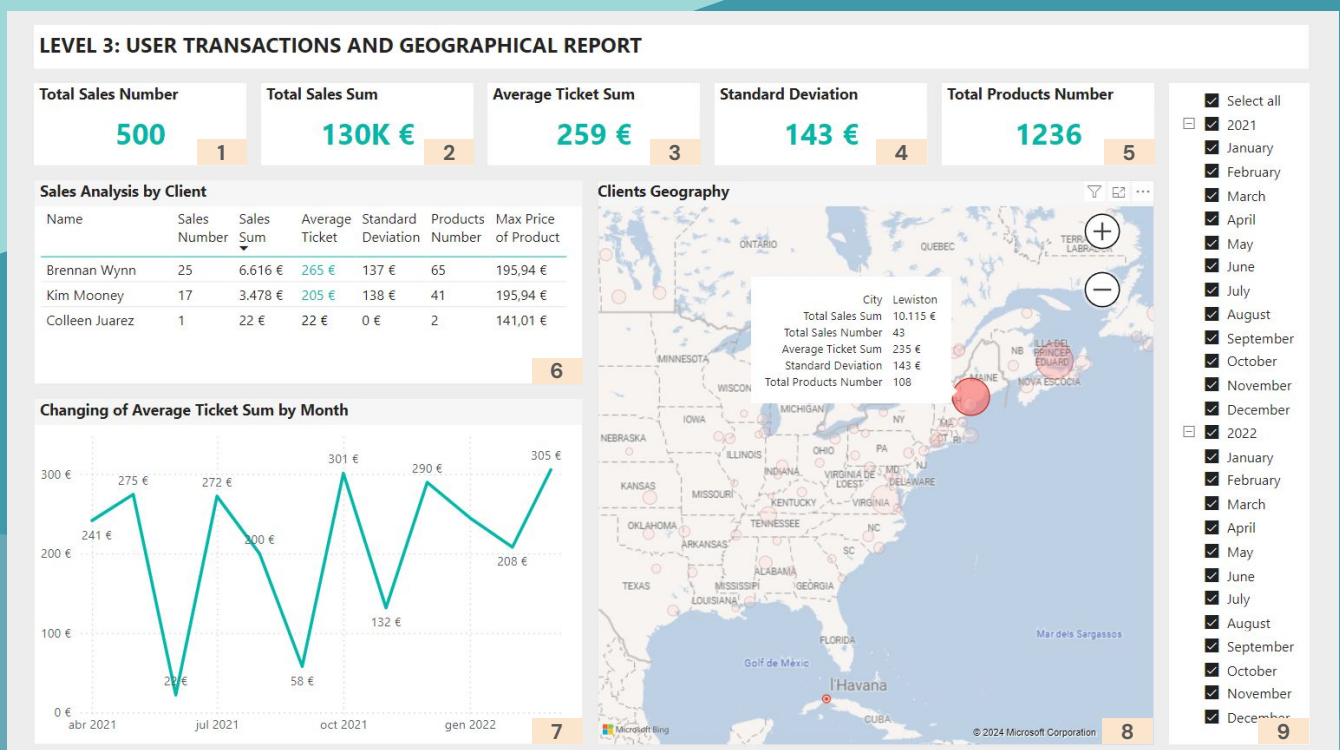
These are simple measures that are considered to be relevant functions and take into account that transactions must be accepted.

```
1 L3E1_MaxProductPrice = MAXX(  
2 |   SUMMARIZE(  
3 |       transaction_items,  
4 |       transactions[user_id],  
5 |       products[id],  
6 |       "MaxPrice", MAX(products[price])  
7 |   ),  
8 |   [MaxPrice]  
9 | )
```

This measure calculates the highest price of a product purchased by each user. SUMMARIZE creates a temporary table that groups rows by each user (transactions[user_id]) and product (products[id]), and for each combination, stores the maximum price of that product in the 'MaxPrice' column in the temporary table. MAXX then takes the maximum value from 'MaxPrice' across all rows in the temporary table, returning the highest price for the product for the user.

In addition to these measures, I also used the calculated columns from the users table: '1L8_full_name' for the 'Name' column in the table visual and '3L1_city_country' for the map, the second is necessary for the correct definition of cities on the map since we have the city of Bathurst, which has the same name in Australia, I solved this issue by creating a column in the format 'City, Country'.

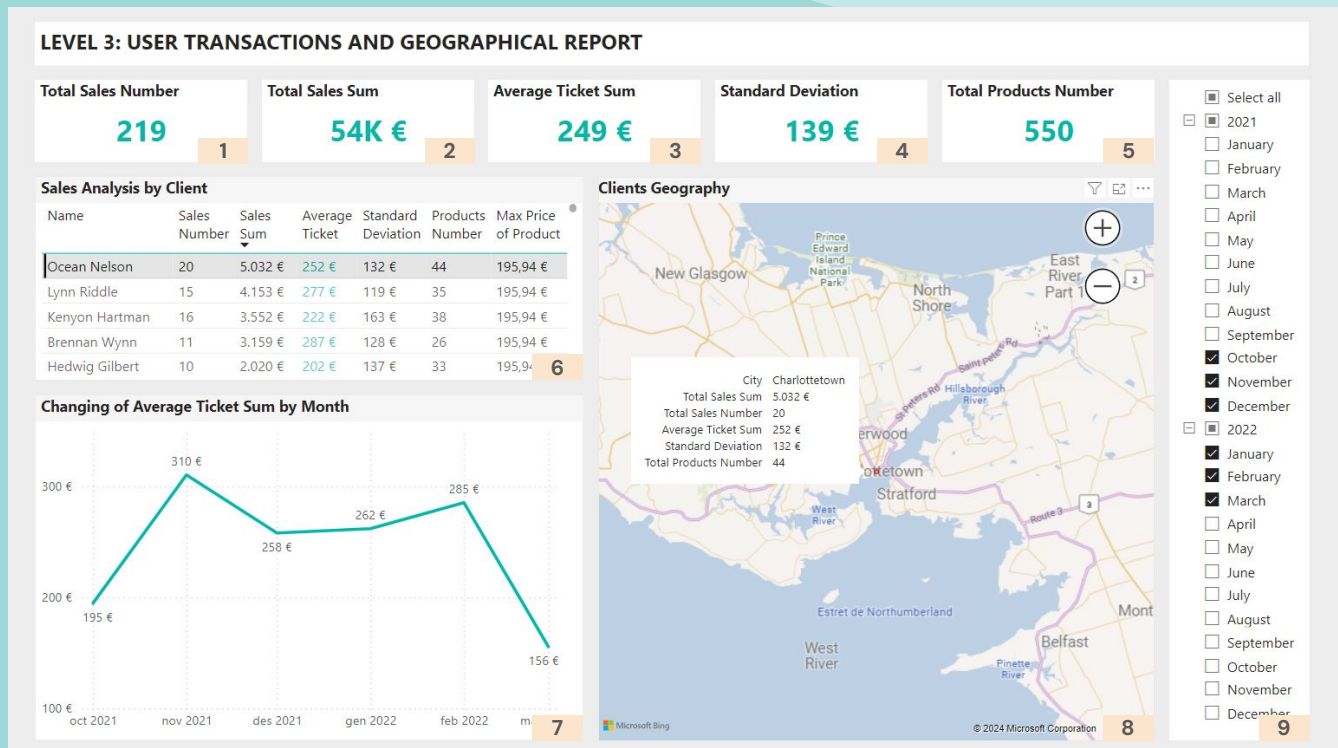
Now I will analyze the results and draw conclusions on the visuals for the company. For this dashboard, I decided to work with the conclusions by selecting user scenarios and analyzing specific slices. The first slice is for the scenario when the stakeholder clicks on the big bubble on the map or purposefully clicks on a specific city to analyze sales in this city and does not interact with the time slicer, thus selecting the entire available period:



On the cards at the very top of the dashboard we see key indicators for all clients in total for the entire existing period. Card 1 shows the total number of sales of 500 (here and below only approved transactions are taken into account), card 2 shows the total sales amount of 130,000 euros, cards 3 and 4 show the average check amount of 259 euros with a standard deviation of 143 euros, card 5 shows the total number of products sold. Table 6 shows the same characteristics for each client as well as the price of the most expensive product purchased by the client, the green color of the average check amount shows us the clients with whom we have reached the goal of 150 euros. Looking at the values in Table 6 for a specific client, we can compare its characteristics with the same characteristics on cards 1-5 for all clients. When you click on a client's line, chart 7 is shown for that client, and the client's city is displayed on the map. Graph 7 shows the change in the average check amount over the entire period. The Y axis shows the amount in euros, and specific amounts for each month are shown on the graph line, and the X axis shows time. The names of not all months are present on the axis, this can be seen in the tooltip when hovering over the label, it also shows the value of the standard deviation paired with the average check amount. On the map in visual 8 we see city bubbles, the size of the ball corresponds to the size of sales of all clients of this city in the general distribution. When you click on the bubble in table 6, clients from this city are filtered, and on graph 7, the average check amount and standard deviation for this city. The bubble tooltip shows all the characteristics for this city as on cards 1-5 and in table 6, so you can compare the values by city, client and general. Year Selection Slicer 9 filters data for selected months/years on all visuals including top cards 1-5.

The city of Lewiston brought the company almost 8% of the money (10115 euros from the tooltip on the map 8 compared to 130 thousand euros from the card 2), while the average ticket sum has potential for growth compared to the total (235 euro from the tooltip on the map 8 compared to 259 euros from the card 3). Here we have three clients, two of which are especially large (look at table 6): Brennan Wynn made 5% of purchases (6616 euros from the table 6 compared to 130 thousand euros from the card 2) and its average amount are above average (265 euros from the table 6 compared to 259 euros from the card 3), we could work with this client to strengthen cooperation; Kim Mooney made more than 3% (3478 euros from the table 6 compared to 130 thousand euros from the card 2) of purchases, but the average amount, on the contrary, are significantly less than average (205 euros from the table 6 compared to 259 euros from the card 3), we should work with a valuable client to learn his needs and not lose him. The general trend of average sales growth in the city in recent months has been more stable (look at 7).

The second slice is for a scenario where the stakeholders are interested in the period from the last quarter of 2021 to the end of the first quarter of 2022 and they select the client with the maximum number of transactions for analysis:



Ocean Nelson, the only client in his city Charlottetown, Canada (data from tooltip on map 8 matches the data in table 6), brought the company about 10% of the number of transactions and money (5032 euros and 20 transactions from the table 6 compared to 54 thousand euros from the card 2 and 219 transactions from the card 1). The client buys consistently every month (we have the data for each month on the chart 7) and chooses premium products (the max price of product in the table 6 is big). In the last month, the client's ticket has fallen almost twice (look at the chart 7), we should process the reasons before it becomes a cause for concern.