Guided Tour for Case Study and Report

Diagnostic Analysis Project

Call Centre Data Analysis for Sales Manager

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Project Title: Call Centre Data Analysis for Sales Manager

Project Summary: This project focused on analyzing and interpreting sales data from a call center to uncover patterns and trends in agent performance, busyness across various days of the week, and differences between shifts. The analysis was conducted using Excel, with tools such as pivot tables, statistical analysis, and data visualizations to support data-driven decision-making.

Key Responsibilities:

- Analyzed call center sales data to address multiple key issues, including:
  - Examining how busyness varies across different days of the week and shifts.
  - Performing statistical tests to determine whether Shift 1 is busier than Shift 2.
  - Creating pivot tables to compare agent types, shifts, days of the week, and trends monthly.
- Developed detailed analysis reports that included visualizations of trends, helping the Sales Manager to make informed staffing decisions.
- Designed and delivered a comprehensive "Guided Tour" in the form of a written report, including screen captures and explanations of analytical findings.
- Packaged the results into a professional case study report, including a cover letter and a Statement of Academic Integrity.

Skills & Tools:

- **Data Analysis:** Data cleaning, statistical analysis, and trend identification.
- **Excel:** Pivot tables, data modeling, charting, advanced formulas.
- **Reporting & Documentation:** Writing detailed reports and creating a guided tour of the analysis process.
- **Communication:** Presenting insights and recommendations to senior stakeholders.

Outcome:

- Delivered actionable insights on call center agent busyness and shift comparisons, providing the Sales Manager with the data needed to optimize staffing decisions.
- Successfully packaged and delivered a comprehensive case study for review by senior management, showcasing thorough analysis and professional reporting skills.

Guided Tour: Data Analytics Product for Busy-ness

This report presents an overview of the Data Analytics product developed for a Call Centre Outsourcing firm. The product is designed to analyze two similar call center datasets provided by a potential client, each representing two distinct business divisions. The analysis aims to support decision-making regarding a potential contract for call center services.

The Excel workbook used for this analysis is titled **"Case_Study_1_Call_Center_Analysis.xlsx"**. The focus of the analysis is on the **"Expert DM"** worksheet, which contains key data models and insights related to agent performance, busyness trends, and shift comparisons. The findings from this analysis will help the firm assess the potential client's needs and determine staffing requirements, thereby optimizing the decision-making process for contracting call center services.

Uncovering the Discoveries: A Detailed Inspection of the Supplied Call Analysis Data Files.

ID	Table(s) Involved	Data Test Name	Data Test Type	Data Test Description	Issue Name	Issue Description
1	TO-Calls-Sprts	Tables with no records	No Records?	TO-Calls-Sprts Table has records.	None	
2		Columns with no entries, that are entirely blank	Empty Column	TO-Calls-Sprts Table has a column which has no entries and is completely blank.	Quantity	Empty Column
3		Columns with no entries, that are entirely blank	Empty Column	TO-Calls-Sprts Table has a column which has no entries and is completely blank.	Inactive	Empty Column
4		Columns that have some blank cells	Some Blank Cells	TO-Calls-Sprts Table has a column with blank cells, i.e., missing data.	CallStartTime	Blank Cells
5		Columns that have some blank cells	Some Blank Cells	TO-Calls-Sprts Table has a column with blank cells, i.e., missing data.	CallTimeSecs	Blank Cells
6		Columns that have both positive and negative numbers	<0 and >0 Values	TO-Calls-Sprts Table has no column with both positive and negative numbers.	None	
7	ProvStates	Tables with no records	No Records?	ProvStates Table has records.	None	
8		Columns with no entries, that are entirely blank	Empty Column	ProvStates Table has a column which has no entries and is completely blank.	CountryID	Empty Column
9		Columns with no entries, that are entirely blank	Empty Column	ProvStates Table has a column which has no entries and is completely blank.	Inactive	Empty Column
10		Columns that have both blank and numbers	Some Blank Cells	ProvStates Table has a column with blank cells, i.e., missing data.	Timestamp	Blank Cells
11		Columns that have both blank and numbers	Some Blank Cells	ProvStates Table has a column with blank cells, i.e., missing data.	zLnk	Blank Cells
12		Columns that have both positive and negative numbers	<0 and >0 Values	ProvStates Table has no column with both positive and negative numbers.	None	

Sample Size	Found Date	Found Time	Priority of Issue to be Fixed	Method to Fix	Reason to Fix Data	Result	Done Date	Done Time
	16-Feb	6:50 PM	None				2024-02-16	7:00 PM
	16-Feb	7:00 PM	None	Find the missing IDs			2024-02-16	7:10 PM
	16-Feb	7:10 PM	None	Find the missing IDs			2024-02-16	7:23 PM
509/13572	16-Feb	7:23 PM	High	Find the missing CallStartTime for TO-Calls-Sprts			2024-02-16	7:29 PM
509/13572	16-Feb	7:29 PM	High	Find the missing CallTimeSecs for TO-Calls-Sprts			2024-02-16	7:29 PM
	16-Feb	7:29 PM	None				2024-02-16	7:33 PM
	16-Feb	7:33 PM	None				2024-02-16	7:35 PM
	16-Feb	7:35 PM	High	Find the missing IDs			2024-02-16	7:40 PM
	16-Feb	7:40 PM	None	Find the missing IDs			2024-02-16	7:42 PM
65/88	16-Feb	7:42 PM	Low	Find the missing Timestamp for ProvStates			2024-02-16	7:42 PM
65/88	16-Feb	7:42 PM	Low	Find the missing zLnk for ProvStates			2024-02-16	7:44 PM
	16-Feb	7:44 PM	None				2024-02-16	7:46 PM
	16-Feb	7:46 PM					2024-02-16	7:48 PM

- **Guided Tour of Data Inspection Results:**

In this section, I have carefully examined the provided data to identify any issues that might affect its integrity and overall quality. Below is a summary of the key findings and areas that may require further attention:

1. **No Missing Records in Key Tables:** Both the **TO-Calls-Sprts** and **ProvStates** tables contain records, which addresses initial concerns regarding missing data. This suggests that the datasets are largely intact, but a more thorough review may be necessary to confirm the relevance and accuracy of the records.

2. **Empty Columns in the TO-Calls-Sprts Table:** Upon inspection, I found that two columns—**Quantity** and **Inactive**—are entirely blank in the **TO-Calls-Sprts** table. This raises questions about whether these columns should contain data, whether they were inadvertently left empty, or if they have been intentionally excluded. Further investigation into the purpose of these columns is recommended.

3. **Blank Cells in Critical Columns:** I identified **509 blank cells** in the **CallStartTime** and **CallTimeSecs** columns of the **TO-Calls-Sprts** table, out of a total of **13,572 records**. These missing values could potentially affect any time-based analysis or insights drawn from these fields. It would be prudent to address the missing data by either filling in the blanks, investigating the cause of the missing information, or excluding these records from certain analyses if they cannot be corrected.

4. **No Mixed Numeric Values Found:** I did not find any columns in the **TO-Calls-Sprts** table containing a mix of positive and negative numeric values. This suggests consistency in the data, which is an encouraging sign for further analysis, as it reduces the likelihood of errors or inconsistencies in numeric fields.

5. **Empty Columns in the ProvStates Table:** Similar to the **TO-Calls-Sprts** table, the **ProvStates** table also contains empty columns, specifically **CountryID** and **Inactive**. It is important to clarify whether these columns were meant to contain values, if they are necessary for analysis, or if they are irrelevant. Further clarification on their intended use will help ensure the completeness and accuracy of the dataset.

6. **Blank Cells with Mixed Data in the ProvStates Table:** In the **ProvStates** table, I observed **65 blank cells** in the **Timestamp** and **zLnk** columns, out of **88 records**. The presence of these blank cells could hinder the ability to perform time-based or linked data analyses. It is recommended to investigate the cause of these blanks and determine if they can be filled or if adjustments to the dataset are necessary.

Unlocking Insights: Data Discovery through Cluster Analysis for Agent type Expert DM

- **Expert DM Modes Screenshot.**

			A		B	H	J	K	L	P	Q	M	N
			=VLOOKUP(E8,Modes!$F$8:$G$108,2,FALSE)										
			Accepted by <Div A> Tech Expert		CallerID ReVerify Duration	More Scoping Duration	Tech Discussion Duration	Good Result EscService		Open Issue and Case		Caller Abandons Discussion	
NY-T-SupportID	ShiftDate	ShiftNbr	Mode64	Mode64Dur	Mode65Dur	Mode66Dur	Mode67Dur	Mode68	Mode68Dur	Mode69	Mode69Dur	Mode70	Mode70Dur
2158	01-Jun-22	1	0	0	24	68	45	0	32	0	41	0	18
2159	01-Jun-22	2	0	0	42	87	39	0	33	0	22	0	29
2160	02-Jun-22	1	0	0	27	69	35	0	33	0	44	0	25
2161	02-Jun-22	2	0	0	42	37	49	0	34	0	42	0	21
2162	03-Jun-22	1	0	0	44	83	33	0	33	0	18	0	23
2163	03-Jun-22	2	0	0	45	69	58	0	34	0	21	0	25
2164	04-Jun-22	1	0	0	23	46	77	0	35	0	21	0	14
2165	06-Jun-22	1	0	0	28	88	79	0	33	0	24	0	29
2166	06-Jun-22	2	0	0	31	41	62	0	37	0	27	0	28
2167	07-Jun-22	1	0	0	29	65	88	0	33	0	40	0	18
2168	07-Jun-22	2	0	0	15	41	82	0	32	0	25	0	28

- **Expert DM Calculation Screenshot.**

= A * (B + H + J)	= (K * L) + (M * N) + (P * Q)				Season (Quarter) of the ShiftDate		
=E9*(G9+H9+I9)	=(J9*K9)+(N9*O9)+(L9*M9)	=P9+Q9	=R9/(60*60)			= INT((U9 +2)/3)	=WEEKDAY(C9)
All Calls - The General Conversation	Time spent on 3 Different Outcomes / Cases	'=P8+Q8	= Busy-ness secs / 60 secs per minute / 60 minutes per hr	=YEAR(C9)	=MONTH(C9)	Quarter = INT ((Month of Year +2)/3)	Weekday= (Weekday(ShiftDate)
Part 1	Part 2	Busy-ness Se	Busy-ness Hours	Year	Month	Season	Weekday
0	0	0	0	2022	6	2	4
0	0	0	0	2022	6	2	4
0	0	0	0	2022	6	2	5
0	0	0	0	2022	6	2	5
0	0	0	0	2022	6	2	6
0	0	0	0	2022	6	2	6
0	0	0	0	2022	6	2	7
0	0	0	0	2022	6	2	2
0	0	0	0	2022	6	2	2
0	0	0	0	2022	6	2	3
0	0	0	0	2022	6	2	3

Guided Tour of Expert DM: Busy-ness Calculations and Temporal Analysis

This section provides a detailed look into the **Expert DM** dataset, focusing on the busy-ness calculations and how various temporal attributes are used to gain insights into call support operations. Below is an overview of the key components involved in the analysis:

1. **Data Columns:** The **Expert DM** dataset contains multiple columns, each representing different aspects of call support. Key columns include:
    - **NY-T-SupportID**: Unique identifiers for support calls.
    - **ShiftDate**: The date of the shift during which the call took place.
    - **Mode64 to Mode70**: Call modes, which categorize the types of calls.
    - Temporal attributes like **Year**, **Month**, **Season (Quarter)**, and **Weekday** are also incorporated, providing additional layers for analysis and helping to identify patterns over time.
2. **VLOOKUP Function:** The **VLOOKUP** function, such as =VLOOKUP(E8, Modes!$F$8:$G$108, 2, FALSE), is employed for data retrieval and cross-referencing. In **Expert DM**, this function helps extract the mode descriptions for the respective modes (from Mode64 to Mode70) by referencing the **Modes** tab. This enables the dataset to contain detailed information about the type of calls, making the analysis more comprehensive.
3. **Calculation Operations:** Several formulas are used to compute important metrics, such as:
    - =E9*(G9+H9+I9) and =(J9*K9)+(N9*O9)+(L9*M9) are used to calculate **Part 1: "All Calls - The General Conversation"** and **Part 2: "Time Spent on 3 Different Outcomes / Cases"**, respectively.
    - The formula =P9+Q9 aggregates these two parts, potentially representing the

total **Busy-ness Seconds** for the given call.

- To standardize time and make it more interpretable, the formula =R9/(60*60) converts the **Busy-ness Seconds** into **hours**, which helps in presenting the data in a more digestible format (i.e., hours instead of seconds).

4. **Year, Month, and Weekday Calculation:** Temporal analysis is central to understanding trends in call support. The formulas =Year(C9), =Month(C9), and =Weekday(C9) extract the **Year**, **Month**, and **Weekday** from the **ShiftDate (C9)**. These attributes are essential for grouping and analyzing call patterns across different times of the year, months, and weeks.
5. **Season (Quarter) Calculation:** To segment the data further, the formula =INT((U9 + 2) / 3) is used to determine the **Season (Quarter)** corresponding to each **ShiftDate (C9)**. This allows for the analysis of call patterns and busy-ness trends based on quarterly cycles, providing insights into seasonal effects of on-call support operations.
6. **Temporal Attributes:** The columns for **Year**, **Month**, **Season**, and **Weekday** are key for identifying temporal trends in the data. These attributes allow for more granular analysis of call patterns over time, helping to uncover insights into call volume fluctuations, agent performance, and overall call center efficiency.

Analysis of Busy-ness Seconds Across Weekdays and Years (For week 2)

Analysis of Busy-ness Seconds Across Weekdays and Years

The table below illustrates the distribution of "Busy-ness Seconds" throughout weekdays (Weekday 2) and years (2022 and 2023). Here are a few observations.

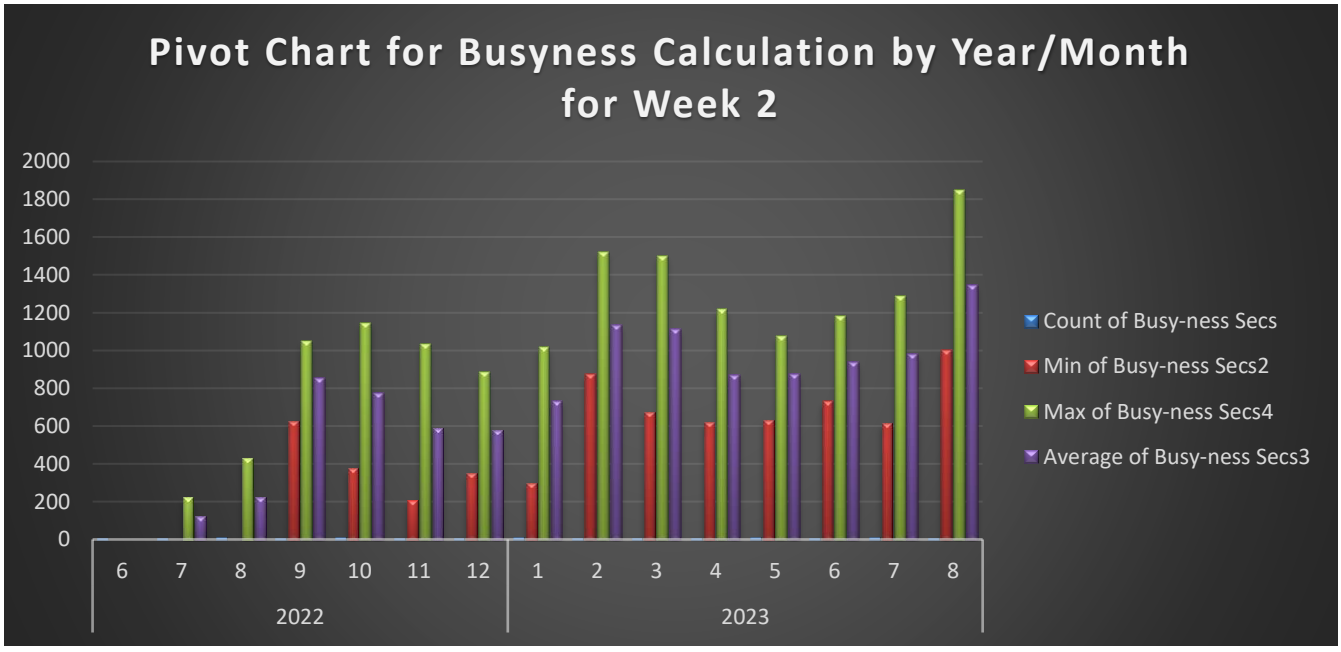
Overall Trend: The number of busy-ness seconds increased from 60 in 2022 to 70 in 2023. The average busy-ness seconds are also growing, from 450.6 in 2022 to 985.56 in 2023, significantly increasing workload or activity.

Weekly Patterns: Weekday 9 consistently has the highest average busy-ness seconds in both 2022 and 2023, indicating that this day may peak in workload. Weekdays 6 and 7 have the lowest average busy-ness seconds, with weekday 6 possibly reaching zero busy-ness seconds by 2022.

Monthly Variations: The average busy-ness seconds varies by month in 2023, with February (month 2) having the greatest and January (month 1) having the lowest.

Minimum and Maximum Values: The minimum and maximum values of busy-ness seconds differ throughout weekdays and years, suggesting variations in workload intensity.

Weekday	2			
Year/Month	**Count of Busy-ness**	**Min of Busy-ness Se**	**Max of Busy-ness Se**	**Average of Busy-ness Secs3**
2022	**60**	**0**	**1146**	**450.6**
6	8	0	0	0
7	8	0	221	121.125
8	10	0	430	221.2
9	8	624	1047	851.5
10	10	374	1146	772.2
11	8	204	1033	589.625
12	8	350	882	575.5
2023	**70**	**299**	**1845**	**985.5571429**
1	10	299	1015	733.6
2	8	872	1519	1130.375
3	8	672	1499	1110.125
4	8	621	1216	868.625
5	10	631	1076	874.5
6	8	731	1182	939.375
7	10	612	1286	977.6
8	8	998	1845	1343
Grand Total	**130**	**0**	**1845**	**738.6538462**



Analysis of Busy-ness Seconds Across Weekdays and Years (For multiple weeks 3 and 4)

Analysis of Busy-ness Seconds Across Weekdays and Years

The table below shows the distribution of "Busy-ness Seconds" by weekday (Weekday 2) and year (2022 and 2023). Here are some of my observations.

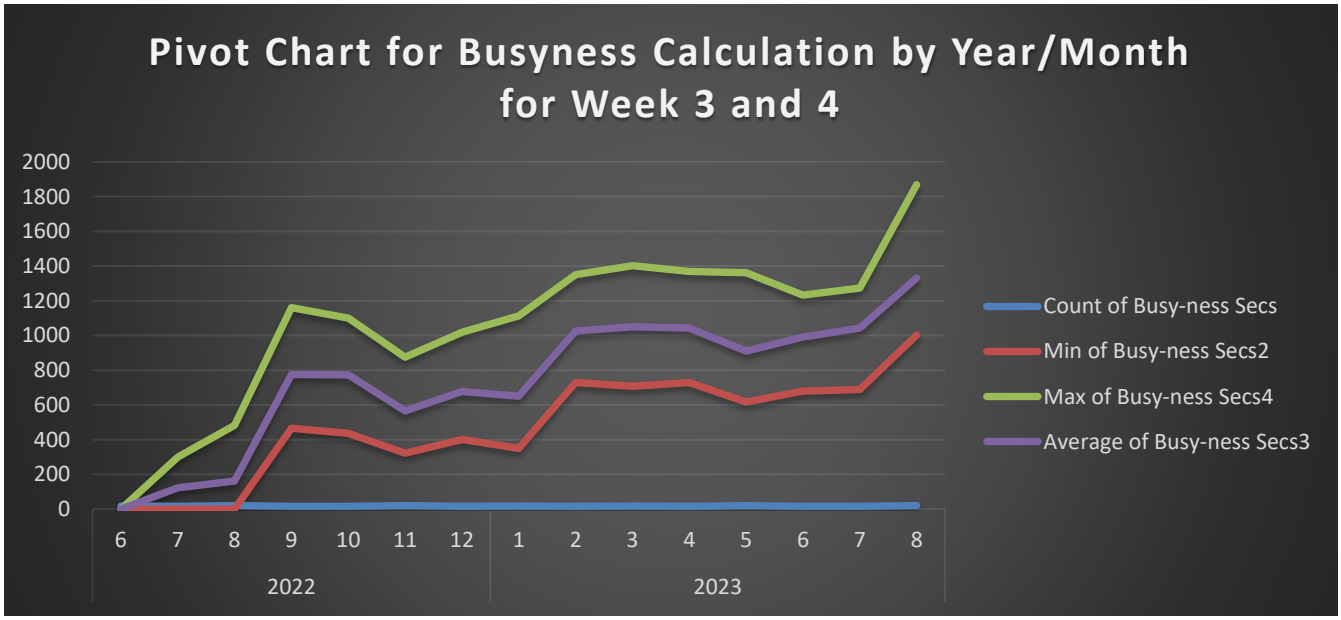
Overall Trend: There is a substantial increase in busy-ness seconds from 2022 to 2023, with 122 in 2022 and 140 in 2023. The average busy-ness seconds are also growing, from 427.31 in 2022 to 1007.79 in 2023, showing a significant increase in workload or activity.

Weekly Patterns: Weekday 9 consistently has the highest average busy-ness seconds in both 2022 and 2023, indicating that this day may peak in workload. Weekdays 6 and 7 have the lowest average busy-ness seconds, with weekday 6 possibly reaching zero busy-ness seconds by 2022.

Monthly Variations: In 2023, the average busy-ness seconds vary by month, with August (month 8) having the greatest and January (month 1) having the lowest.

Minimum and Maximum Values: The minimum and maximum values of busy-ness seconds differ throughout weekdays and years, suggesting variations in workload intensity.

Weekday	(Multiple Items)			
Year/Month	**Count of Busy-ness**	**Min of Busy-ness S**	**Max of Busy-ness S**	**Average of Busy-ness Secs3**
2022	**122**	**0**	**1161**	**427.3114754**
6	18	0	0	0
7	16	0	300	122.875
8	20	0	482	162.35
9	16	465	1161	774.6875
10	16	437	1100	773
11	20	322	874	565.8
12	16	401	1018	677.5
2023	**140**	**349**	**1868**	**1007.785714**
1	18	349	1113	649.6666667
2	16	730	1351	1026.625
3	18	707	1402	1049.722222
4	16	729	1368	1043.1875
5	20	617	1362	910.8
6	16	679	1232	991.6875
7	16	689	1273	1042
8	20	1002	1868	1331.45
Grand Total	**262**	**0**	**1868**	**737.4885496**



Analysis of Busy-ness Seconds Across Weekdays and Years (For Week 5)

Analysis of Busy-ness Seconds Across Weekdays and Years

The table shows "Busy-ness Seconds" data for Weekday 5 for 2022 and 2023. Here are a few observations.

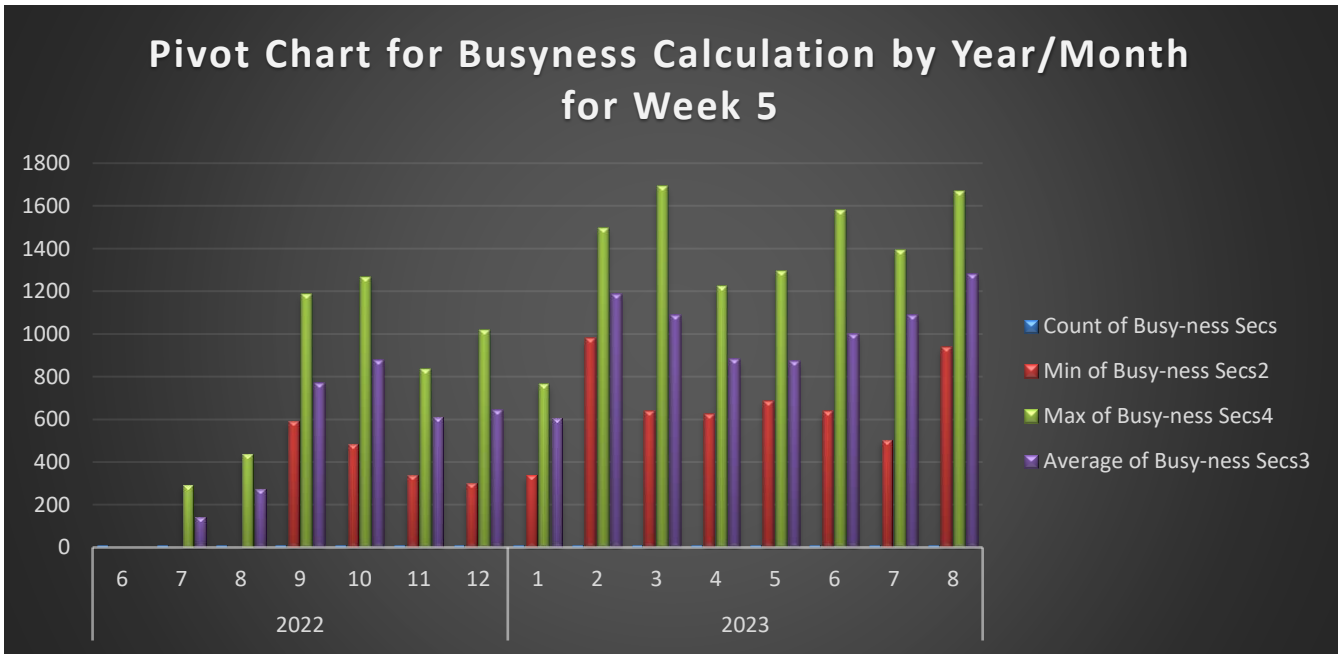
Overall Trend: There is a modest increase in busy-ness seconds from 2022 to 2023, with 62 in 2022 and 70 in 2023. The average busy-ness seconds also increased somewhat, from 472.48 in 2022 to 1009.59 in 2023, indicating a slight increase in workload or activity.

Weekly Patterns: Weekday 9 has more excellent average busy-ness seconds in 2022 and 2023 continuously, indicating that this day may have a heavier workload. Weekdays 6 and 7 have the lowest average busy-ness seconds, with weekday 6 possibly reaching zero busy-ness seconds by 2022.

Monthly Variations: In 2023, the average busy-ness seconds varied by month, with August (month 8) having the greatest and January (month 1) having the lowest.

Minimum and Maximum Values: The minimum and maximum values of busy-ness seconds differ throughout weekdays and years, suggesting variations in workload intensity.

Weekday	5			
Year/Month	**Count of Busy-ness**	**Min of Busy-ness Se**	**Max of Busy-ness Se**	**Average of Busy-ness Secs3**
2022	**62**	**0**	**1266**	**472.483871**
6	10	0	0	0
7	8	0	291	141.375
8	8	0	436	273
9	10	593	1186	768.9
10	8	484	1266	875.5
11	8	336	833	610
12	10	300	1018	640.6
2023	**70**	**338**	**1690**	**1009.585714**
1	8	338	763	602.75
2	8	979	1493	1185.375
3	10	638	1690	1088.1
4	8	626	1225	880.625
5	8	686	1295	871.5
6	10	639	1579	998.5
7	8	503	1393	1088.125
8	10	937	1670	1277.8
Grand Total	**132**	**0**	**1690**	**757.3106061**



Analysis of Busy-ness Seconds Across Weekdays and Years (For week 6)

Analysis of Busy-ness Seconds Across Weekdays and Years

The data for weekday 6 shows the following patterns and trends.

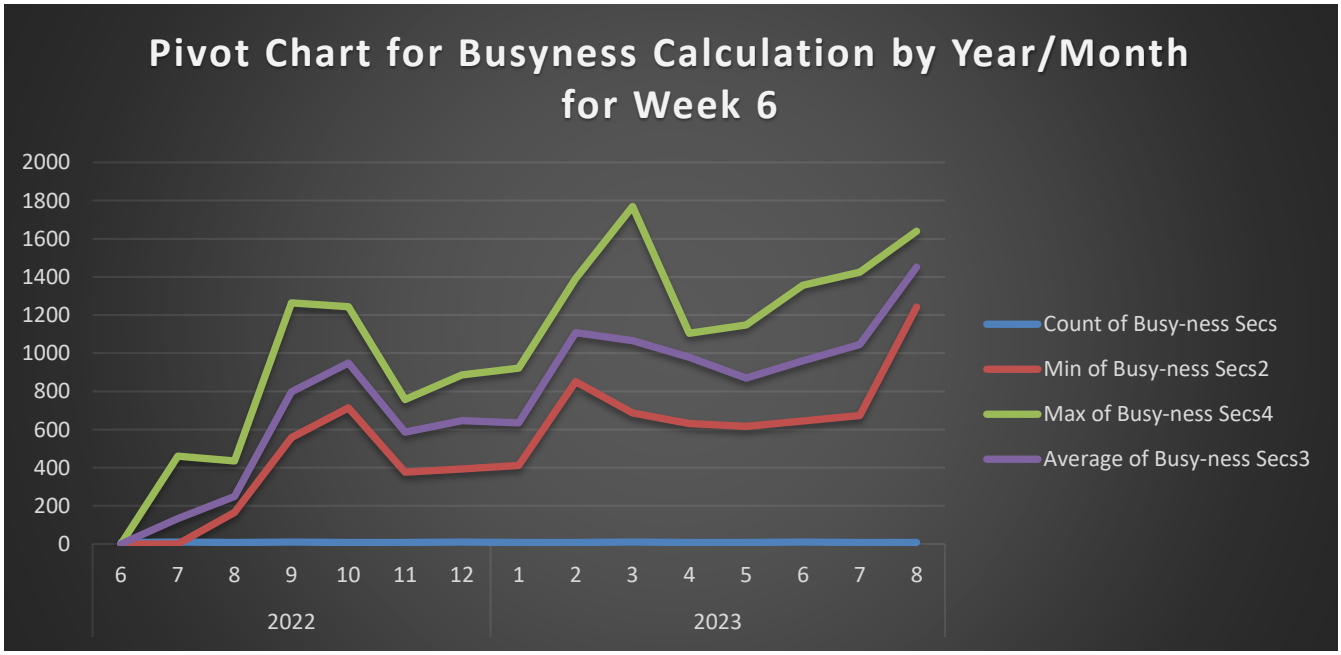
Overall Trend: The number of busy-ness seconds increased slightly between 2022 and 2023, from 62 in 2022 to 68 in 2023. However, the average busy-ness seconds have decreased from 484.56 in 2022 to 456.01 in 2023.

Weekly Patterns: Weekday 10 has the highest average busy-ness seconds in both 2022 and 2023, indicating a possible peak in workload on this day. Weekday 7 has the lowest average busy-ness seconds in 2022, and weekday 6 has the lowest average in 2023.

Monthly Variations: There are variations in busy-ness seconds across different months in both years. For example, in 2023, month 8 has the highest average busy-ness seconds, while in 2022, month 10 has the highest average.

Minimum and Maximum Values: The minimum and maximum values of busy-ness seconds vary across weekdays and years, indicating fluctuations in workload intensity.

Weekday	6			
Year/Month	**Count of Busy-ness**	**Min of Busy-ness Se**	**Max of Busy-ness Se**	**Average of Busy-ness Secs3**
2022	**62**	**0**	**1264**	**484.5645161**
6	8	0	0	0
7	10	0	460	133.7
8	8	165	436	248.875
9	10	557	1264	797.4
10	8	714	1244	948.5
11	8	376	758	585.625
12	10	394	886	646.8
2023	**68**	**412**	**1769**	**1014.014706**
1	8	412	921	634.5
2	8	852	1392	1107.25
3	10	687	1769	1065.3
4	8	631	1105	978.125
5	8	617	1148	869.5
6	10	645	1356	960.2
7	8	674	1425	1046.5
8	8	1242	1640	1451.375
Grand Total	**130**	**0**	**1769**	**761.5076923**



Conclusion: This project has provided comprehensive insights into the call support operations over the two years, with a focus on busy-ness seconds as a key performance metric. The analysis of temporal patterns (such as weekdays, months, and years) has uncovered significant trends, including:

- **Increased Workload:** There is a clear upward trend in busy-ness seconds from 2022 to 2023, highlighting the growing demands on call support teams and emphasizing the need for optimized resource management.
- **Peak Days and Off-Peak Periods:** Certain weekdays, such as **Weekday 9**, show a consistently high workload, suggesting potential areas where additional staffing may be needed. Conversely, **Weekday 6** and **Weekday 7** appear to experience lower activity, offering opportunities for operational adjustments or better resource allocation.
- **Monthly Demand Fluctuations:** Monthly variations, with **August** showing the highest demand and **January** the lowest, point to seasonal effects that could inform strategic planning for peak and off-peak periods.
- **Fluctuating Intensity:** Variations in the minimum and maximum busy-ness values further emphasize the fluctuating nature of call center operations, suggesting the need for adaptive staffing models to account for unpredictable spikes or dips in activity.

Key Recommendations:

- **Staffing Adjustments:** Consider increasing staffing or introducing flexible work arrangements during peak weekdays and months to maintain optimal service levels.
- **Operational Improvements:** For weekdays with consistently low busy-ness, such as Weekdays 6 and 7, explore ways to optimize shift schedules or redistribute resources more effectively.
- **Strategic Planning:** Use insights into busy-ness trends to inform call center strategy, including potential improvements in workload management, scheduling, and resource allocation to enhance overall efficiency and customer satisfaction.