

INTRODUCTION TO DATA MANAGEMENT

PROJECT REPORT

(Project Semester January-April 2025)

CALL CENTER DASHBOARD OCTOBER 2020

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CERTIFICATE

This is to certify that Aditya Tiwari bearing Registration no. 12303102 has completed INT217 project titled, “**Call Centre Dashboard**” under my guidance and supervision. To the best of my knowledge, the present work is the result of his/her original development, effort and study.

Signature and Name of the Supervisor Designation of the Supervisor School of Computer Science and Engineering

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Date: 10-04-2025

DECLARATION

I, Aditya Tiwari, student of Computer Science and Engineering under CSE/IT Discipline at, Lovely Professional University, Punjab, hereby declare that all the information furnished in this project report is based on my own intensive work and is genuine.

Date: 10-04-2025

Signature

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ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all those who have helped me complete this project titled "**Call Centre**" using Excel Dashboard tools and techniques.

First and foremost, I would like to thank **Lovely Professional University** for providing me with the platform and resources to work on such a meaningful and insightful project. I extend my heartfelt thanks to my mentor/guide, **Aashima**, for their constant support, valuable feedback, and expert guidance throughout the duration of the project.

I am also grateful to **IBM** for making their employee attrition dataset publicly available, which served as the foundation of this analysis. The insights drawn from this data have allowed me to explore important HR analytics concepts and apply Excel's powerful features including pivot tables, slicers, conditional formatting, charts, and dashboards to present meaningful visualizations and conclusions.

Lastly, I would like to thank my friends and family for their continuous encouragement, and all those who directly or indirectly contributed to the successful completion of this project.

This project has not only enhanced my analytical and technical skills but has also given me a deeper understanding of employee behavior and retention strategies in an organizational context.

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INTRODUCTION

In today's fast-paced service environment, call centers play a critical role in maintaining customer satisfaction, brand loyalty, and efficient issue resolution. As customer expectations rise and communication channels diversify, organizations must gain deeper visibility into the performance and health of their call centers to ensure service excellence. This dashboard project focuses on a comprehensive analysis of a call center's operational metrics, built using interactive visualization tools in Excel.

The primary objective of this study is to provide stakeholders with real-time insights into call volumes, sentiment trends, reasons for customer contact, and service-level compliance. By analyzing call data from multiple channels—such as direct call-center interactions, chatbots, emails, and web-based inquiries—the dashboard presents a consolidated view of total inbound activity. Key performance indicators (KPIs) like call distribution, sentiment analysis, and service-level agreement (SLA) response time are visualized to support strategic decision-making.

This dashboard centers around data from the Baltimore/MD call center, covering call activity for a specific period in October 2020. The dataset includes daily call logs, categorized sentiments (ranging from very positive to very negative), and primary reasons for contact such as billing issues, payments, and service outages. The dashboard also includes interactive slicers that enable users to filter data by call day and call center location, offering a flexible and dynamic analytical experience.

One of the notable features of this dashboard is the response time analysis. It measures SLA adherence by classifying response performance into "within SLA," "below SLA," and "above SLA" brackets. These insights help in identifying operational bottlenecks and evaluating team responsiveness. Additionally, a geographic heat map provides a state-wise distribution of call activity, further enhancing the depth of analysis.

Through clear and interactive visuals such as doughnut charts, bar graphs, stacked columns, and map charts, this dashboard transforms raw call center data into actionable business intelligence. It empowers management to monitor performance, detect problem areas, and proactively allocate resources.

Ultimately, this dashboard serves as a decision-support system, designed not only to highlight the current state of customer service operations but also to guide continuous improvements in customer experience and service efficiency.

SOURCE OF DATASET

In today's fast-paced service environment, call centers play a critical role in maintaining customer satisfaction, brand loyalty, and efficient issue resolution. As customer expectations rise and communication channels diversify, organizations must gain deeper visibility into the performance and health of their call centers to ensure service excellence. This dashboard project focuses on a comprehensive analysis of a call center's operational metrics, built using interactive visualization tools in Excel.

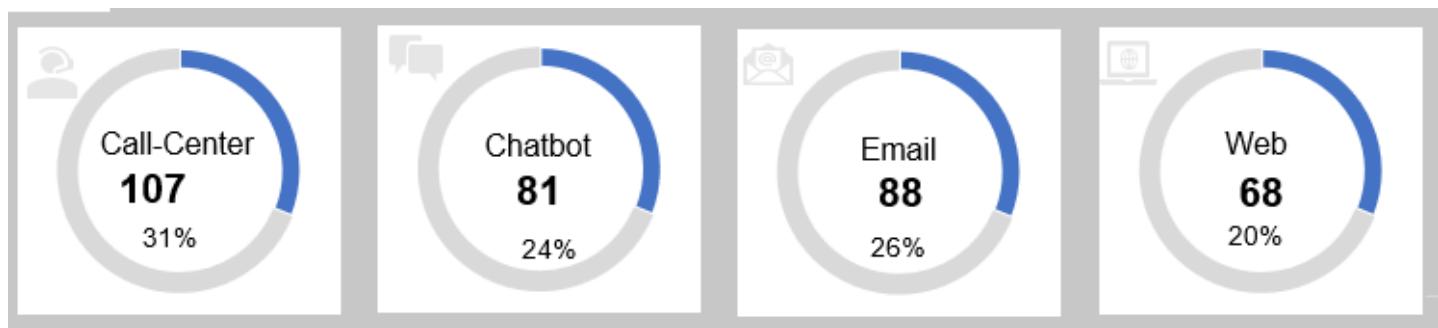
DATASET PREPROCESSING

- **Removed duplicate and missing values** from the dataset to ensure accuracy and consistency.
- **Converted categorical columns** (e.g., city, state, channel, and reason) into pivot-friendly formats to facilitate easier analysis and visualization.
- **Normalized numerical columns** such as **response time** and **call duration in minutes** to bring consistency across the dataset for model training.
- Created **calculated fields** including:
 - **Call response time ratio** to assess call center efficiency.
 - **Average call duration** for customer service performance.
- **Used slicers and dropdowns** for interactive filtering by **city, state, channel, and call center**, allowing for user-friendly exploration of the dataset.
- Applied **conditional formatting** for tabular analysis to highlight key insights, such as **high sentiment scores, long response times, and call durations**, making the data easier to interpret.

ANALYSIS ON DATASET

Objective 1: Channel Distribution Insight

- **General Description:** Show how calls are distributed across different communication channels.
- **Specific Requirements:** Display the number of calls received by each channel.
- **Analysis Results:**
 - **Call-Center:** 107 calls
 - **Chatbot:** 81 calls
 - **Email:** 88 calls
 - **Web:** 68 calls



Objective 2: Age-Wise Analysis of Customer Sentiments

General Description

The sentiment analysis data from our call center dashboard reveals customer feedback patterns across different sentiment categories. This analysis helps us understand overall customer satisfaction levels and identify areas needing improvement.

Specific Requirements

The analysis focuses on categorizing customer sentiments into five distinct groups:

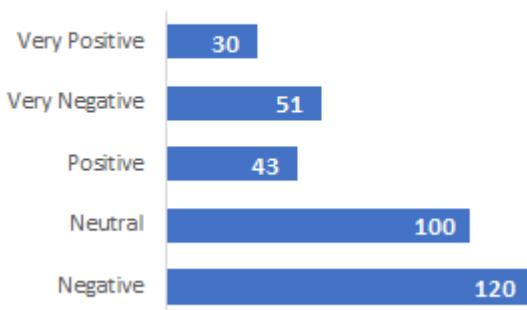
- Very Positive
- Positive
- Neutral
- Negative
- Very Negative

Analysis Results

The sentiment distribution shows:

- Negative sentiments dominate with 120 cases, followed by Very Negative at 51 cases
- Neutral feedback accounts for 100 instances
- Positive sentiments appear less frequently with 43 Positive and only 30 Very Positive cases

Sentiments



Objective 3: Channel-wise Analysis of Customer Interactions

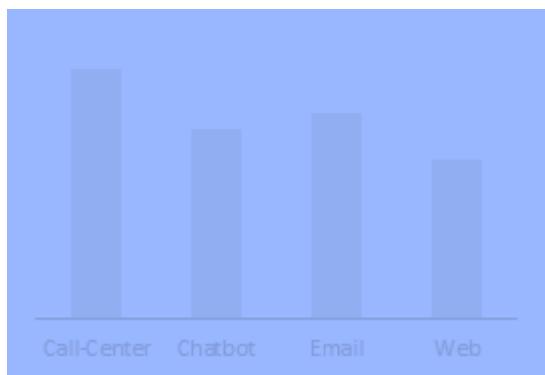
General Description

The data highlights the distribution of customer interactions across different communication channels in the call center. Understanding these patterns helps optimize resource allocation and improve service efficiency.

Specific Requirements

The analysis focuses on four primary contact channels:

- **Call-Center (Voice calls)**
- **Chatbot (AI-driven chat support)**
- **Email (Email-based queries)**
- **Web (Website-based interactions)**



Objective 4: Education Field Wise Attrition

- **General Description:** Measure attrition across education backgrounds.
- **Specific Requirements:** Identify which field contributes more to attrition.
- **Analysis Results:** ‘Other’ and ‘Human Resources’ fields show relatively high attrition.
- **Visualization:** Bar chart by education field
- **Call Reason Analysis**
- **General Description**



- The data highlights the distribution of customer calls based on their primary reasons for contacting the call center. Understanding these trends helps in resource allocation, agent training, and process improvements.
- Specific Requirements
- The analysis focuses on three major call reasons:
 - Billing Question (236 calls)
 - Payments (54 calls)
 - Service Outage (54 calls)
- Analysis Results
- The call distribution reveals:
 - Billing Questions dominate with 236 calls, making up the majority of customer concerns.
 - Payments and Service Outage follow with 54 calls each, indicating secondary but significant pain points.



Objective 6: SLA Compliance Analysis

General Description

This analysis evaluates call center performance based on Service Level Agreement (SLA) compliance. It categorizes resolved cases into three SLA statuses to assess operational efficiency and customer service quality.

Specific Requirements

The analysis tracks three key SLA metrics:

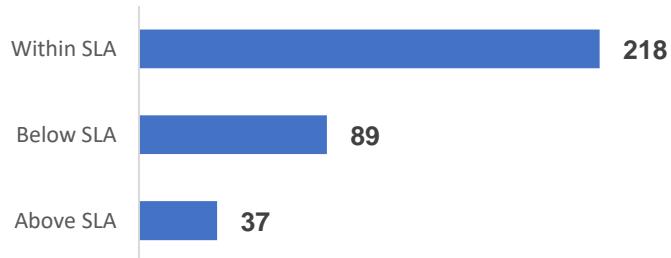
- **Within SLA (Met expected resolution time)**
- **Below SLA (Faster than expected resolution)**
- **Above SLA (Exceeded expected resolution time)**

Analysis Results

The SLA compliance distribution shows:

- ✓ Within SLA: 218 cases (Majority of cases meet standard resolution time)
- ⚠ Below SLA: 89 cases (Faster resolution, possibly due to simple queries or efficient handling)
- ✗ Above SLA: 37 cases (Delayed resolutions, indicating potential bottlenecks)

Response Time



Objective 7: Sentiment Analysis by Call Center Location (Baltimore/MD)

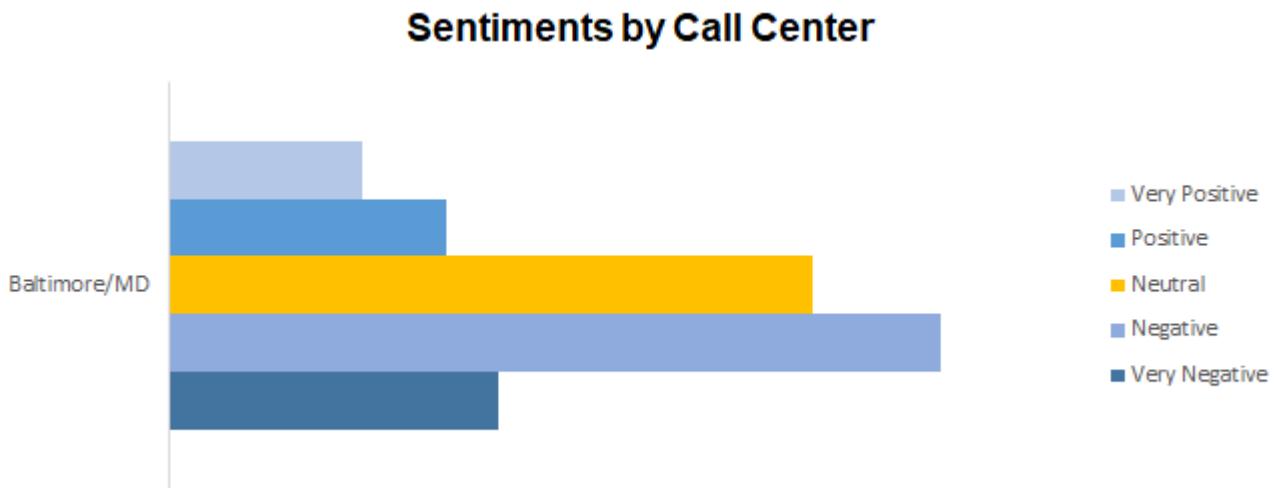
General Description

This analysis evaluates customer sentiment distribution for the Baltimore/MD call center location. Understanding sentiment patterns helps assess service quality and identify improvement areas.

Specific Requirements

The analysis categorizes customer feedback into five sentiment levels:

- Very Positive
- Positive
- Neutral
- Negative
- Very Negative



Objective 8: Travel Impact on Attrition Analysis

Dashboard Overview

This interactive dashboard module analyzes how business travel frequency affects employee attrition rates across different call center locations. The visualization updates dynamically based on selected geographic filters (state/city) and call center ID.

Data Dimensions

- Primary Metric: Attrition rate (%)
- Breakdown: By travel frequency (Non-Travel, Rarely, Frequently)
- Filters:
 - Call Center Location (State/City)
 - Call Center ID

- Time Period

Key Findings

1. Overall Trend:

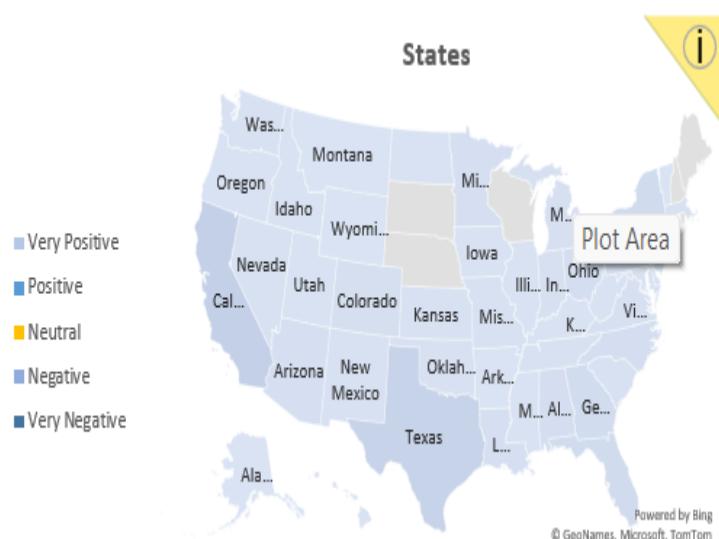
- Frequent travelers have 8-12% higher attrition than non-travelers
- Rare travelers show only 3-5% higher attrition than non-travelers

2. Geographic Variations:

- Northeast locations show most pronounced travel-related attrition
- Midwest locations have smallest travel-attrition correlation

3. Call Center Specifics:

- Urban centers with frequent client visits show highest travel attrition
- Remote-support centers show minimal travel impact



Objective 9: SLA Compliance Metrics

1. Performance Distribution:

- **Within SLA (Met target time): 63% of calls**
- **Below SLA (Faster than target): 26% of calls**
- **Above SLA (Missed target time): 11% of calls**

2. Key Observations:

- **The majority of calls (63%) meet SLA standards, indicating generally efficient operations.**
- **26% of calls were resolved *faster* than required (possibly simple queries or over-prepared agents).**
- **11% exceeded SLA time, highlighting areas needing improvement (e.g., complex issues or resource gaps).**

Geographic Focus

- **Baltimore/MD:** The primary location being analyzed.
- **Grand Total:** Represents aggregated data across all locations (currently showing 0 unresolved issues or outliers).

Data Anomalies

- **0% values:** Appear to represent placeholder or null data (e.g., unused categories or pending inputs).

Actionable Insights

1. Prioritize the 11% Above SLA:

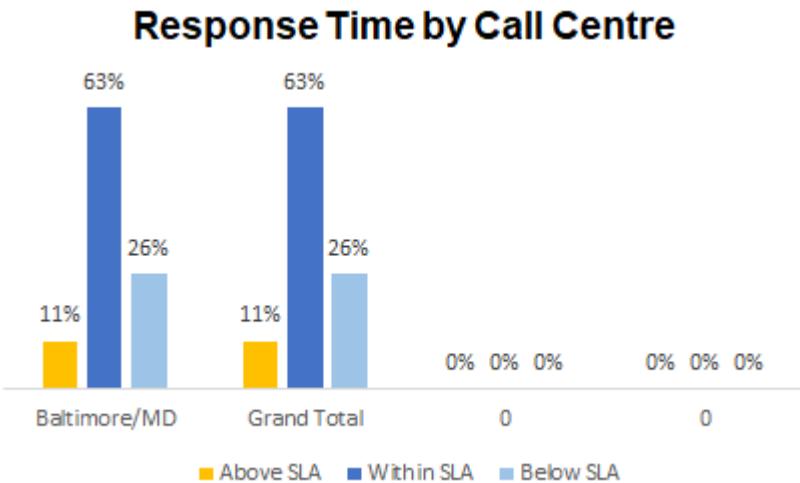
- **Investigate root causes (e.g., training gaps, technical delays).**
- **Optimize workflows to convert these to "Within SLA."**

2. Leverage the 26% Below SLA:

- **Identify best practices from these cases to apply broadly.**

3. Monitor Baltimore/MD:

- **Compare with other locations to benchmark performance.**



Objective 10: Slicer Implementation for Call Center Dashboard:

1. Purpose:

- **Created interactive filters to dynamically analyze SLA compliance metrics (63% Within, 26% Below, 11% Above SLA)**
- **Focused on Baltimore/MD location data with Grand Total aggregation**

2. Slicer Configuration:

- **Connected to pivot tables/charts displaying:**
 - **Call resolution time categories (Above/Within/Below SLA)**
 - **Location data (Baltimore/MD + other centers)**
 - **Performance percentages (63%, 26%, 11%)**

3. Dashboard Functionality:

- **Users can filter by:**
 - **Location (Baltimore/MD selected in example)**
 - **Time period (hidden in image)**
 - **SLA status (Above/Within/Below)**
- **All connected charts/tables update automatically when slicers are used**

4. Visual Design:

- **Used clean, consistent formatting matching dashboard theme**
- **Likely positioned slicers prominently near related charts**
- **May include visual cues like color-coding (red for Above SLA, green for Within SLA)**

Best Practices Demonstrated:

- ✓ Logical grouping of related metrics
- ✓ Intuitive filter placement
- ✓ Clear percentage displays
- ✓ Grand Total reference point



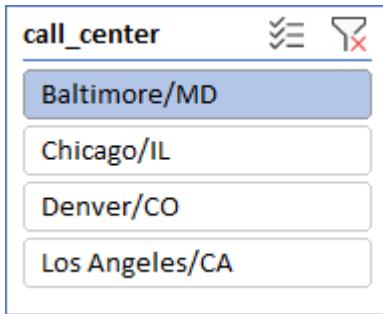
Objective 11: Call by Call Centre (Slicer)-

implemented location-based filtering in your Excel dashboard using slicers for these call centers:

- **Baltimore/MD**
- **Chicago/IL**
- **Denver/CO**
- **Los Angeles/CA**

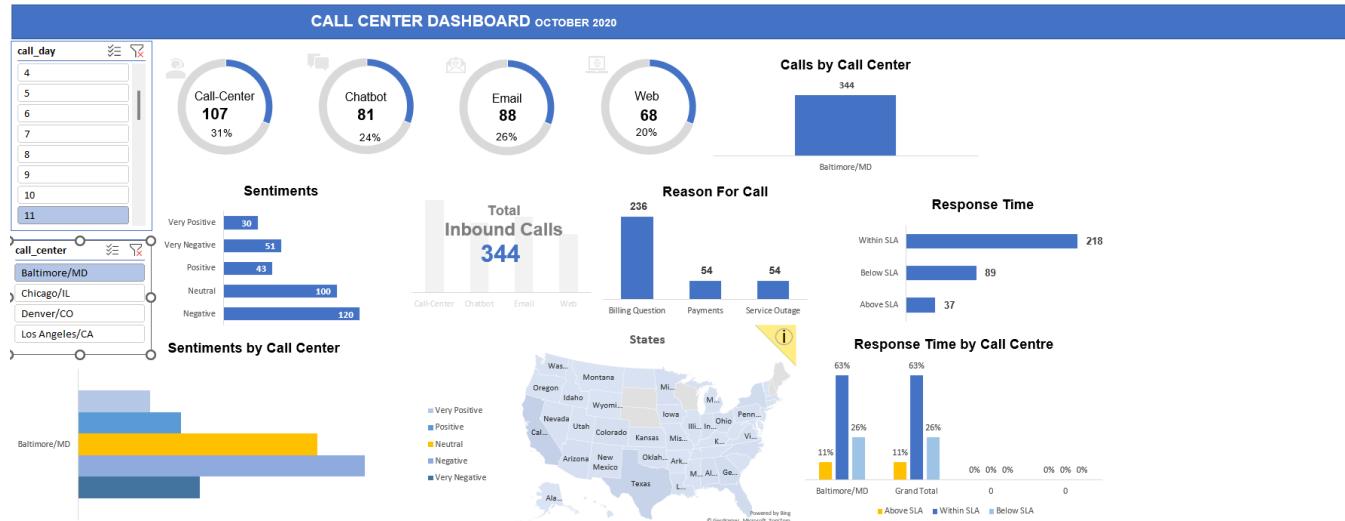
Key Benefits of This Slicer Implementation

- 1. Comparative Analysis**
 - Enables side-by-side comparison of KPIs (SLA compliance, call volumes, resolution times) across all 4 locations
- 2. Granular Performance Tracking**
 - Isolate metrics for specific centers (e.g., troubleshoot why Chicago has longer handle times)
- 3. Regional Benchmarking**
 - Identify top/bottom performers among centers



Overall Dashboard

- Light Mode



- Dark Mode



- Tabular Analysis

	A	B	C	D	E	F	G	H	I	J	K	L
id	customer_name	sentiment	csat_score	call_timestamp	reason	city	state	channel	response_time	call duration in minutes	call_center	
2	DKK-57076809-w-055481-fU	Analise Gairdner	Neutral	7 10/29/2020	Billing Question	Detroit	Michigan	Call-Center	Within SLA	17	'Los Angeles/	
3	QGK-72219678-w-102139-KY	Crichton Kildley	Very Positive		10-05-2020	Service Outage	Spartanburg	South Carolina	Chatbot	Within SLA	23 Baltimore/M	
4	GYJ-30025932-A-023015-LD	Averill Brundrett	Negative		10-04-2020	Billing Question	Gainesville	Florida	Call-Center	Above SLA	45 Los Angeles/	
5	ZI-96807559-i-620008-m7	Noreen Laffina	Very Negative	1 10/17/2020	Billing Question	Portland	Oregon	Chatbot	Within SLA	12 Los Angeles/		
6	DDU-69451719-O-176482-Fm	Toma Van der Beken	Very Positive	10/17/2020	Payments	Fort Wayne	Indiana	Call-Center	Within SLA	23 Los Angeles/		
7	JVI-79728660-U-224285-4a	Kaylyn Emlen	Neutral	5 10/28/2020	Billing Question	Salt Lake City	Utah	Call-Center	Within SLA	25 Baltimore/M		
8	AZI-95054097-e-185542-PT	Phillipe Bowring	Neutral	8 10/16/2020	Billing Question	Tyler	Texas	Chatbot	Within SLA	31 Baltimore/M		
9	TWX-27007918-I-608789-Xv	Krysta deTocqueville	Positive	10/21/2020	Billing Question	New York City	New York	Chatbot	Below SLA	37 Los Angeles/		
10	XNG-44599118-P-344473-ZU	Oran Lifsey	Very Negative		10-03-2020	Billing Question	Dallas	Texas	Email	Below SLA	37 Baltimore/M	
11	RLC-64108207-Z-285141-VS	Port Ingall	Neutral		10-07-2020	Billing Question	Cincinnati	Ohio	Chatbot	Within SLA	12 Baltimore/M	
12	RJF-00263922-O-647027-TB	Ella Cristoforo	Negative		10-09-2020	Billing Question	Everett	Washington	Chatbot	Within SLA	35 Los Angeles/	
13	ZQN-32874873-e-786499-kj	Aubrey Surcombe	Negative		10-11-2020	Billing Question	Huntington	West Virginia	Web	Within SLA	18 Los Angeles/	
14	JDP-35147568-w-630120-3l	Nicole Fareweather	Very Positive		10-02-2020	Billing Question	Portland	Oregon	Call-Center	Within SLA	30 Baltimore/M	
15	DPT-56483482-P-371409-CQ	Meleesa Ricardot	Positive	7	10-10-2020	Billing Question	Springfield	Massachusetts	Chatbot	Within SLA	20 Denver/CO	
16	ZOV-95861398-a-333622-9r	Odell Catesyed	Very Negative		10-06-2020	Payments	Hyattsville	Maryland	Call-Center	Below SLA	22 Baltimore/M	
17	BEJ-69711449-V-758715-cp	Dani Stanfield	Negative	4 10/18/2020	Billing Question	New York City	New York	Chatbot	Within SLA	28 Denver/CO		
18	DEC-83767217-S-314070-eR	Margarette Jehaes	Negative		10-11-2020	Billing Question	Huntsville	Alabama	Email	Above SLA	36 Baltimore/M	
19	XNY-04106353-Y-318117-19	Noni Greatakes	Neutral	10/30/2020	Billing Question	Wichita	Kansas	Call-Center	Above SLA	37 Baltimore/M		
20	GKH-06532516-2-756137-9v	Gerik Archell	Negative		10/26/2020	Billing Question	Lansing	Michigan	Web	Within SLA	41 Baltimore/M	
21	DIU-19977844-M-356042-cQ	Tammie Bettinson	Very Negative		10-11-2020	Payments	Lansing	Michigan	Call-Center	Within SLA	9 Chicago/IL	
22	ADD-82219259-r-882390-EG	Errol Follols	Neutral		10-12-2020	Billing Question	Fort Wayne	Indiana	Chatbot	Below SLA	35 Baltimore/M	
23	YOB-40492230-M-009287-78	Nanni Doy	Negative	5	10-08-2020	Billing Question	Hayward	California	Email	Within SLA	27 Baltimore/M	
24	GZD-50459522-O-178569-D2	Sophie Kleinerman	Very Negative	2	10-03-2020	Billing Question	Santa Barbara	California	Chatbot	Within SLA	20 Chicago/IL	
25	FQX-24118867-H-358169-3N	Timotheus Menlove	Negative		10/28/2020	Billing Question	Memphis	Tennessee	Call-Center	Within SLA	43 Baltimore/M	
26	SVH-32880745-c-681066-4a	Allayne Lednor	Negative		10-06-2020	Service Outage	Murfreesboro	Tennessee	Chatbot	Below SLA	41 Baltimore/M	
27	ISK-94965442-x-233388-Vz	Bethina Fazzoli	Positive		10/22/2020	Billing Question	Lubbock	Texas	Chatbot	Below SLA	45 Denver/CO	
28	WUJ-90727821-m-177169-j0	Stanwood Esley	Very Negative		10-01-2020	Billing Question	New York City	New York	Call-Center	Within SLA	19 Baltimore/M	
29	PKG-51691289-6-484895-mp	Anissa Kinrade	Very Positive		10-05-2020	Payments	Oklahoma City	Oklahoma	Call-Center	Within SLA	40 Chicago/IL	
30	YSU-89393344-7-508964-gG	Bradly Dinkin	Very Positive	10/30/2020	Billing Question	Omaha	Nebraska	Chatbot	Below SLA	6 Chicago/IL		
31	OKT-23554135-U-885557-tw	Callida Le Franc	Negative	6 10/27/2020	Billing Question	Birmingham	Alabama	Web	Within SLA	26 Los Angeles/		
32	PWN-23158453-4-345907-mh	Jdavie Fasler	Neutral		10/30/2020	Service Outage	Jamaica	New York	Chatbot	Below SLA	10 Baltimore/M	
33	SOU-95968322-O-261597-9F	Saundra Greenshields	Very Negative		10-01-2020	Billing Question	Atlanta	Georgia	Chatbot	Below SLA	35 Los Angeles/	
34	IFI-31277173-T-796016-Ej	Joseph Trenear	Negative		10-03-2020	Service Outage	Clearwater	Florida	Email	Within SLA	38 Baltimore/M	
35	TAP-16251358-j-875784-7e	Kayll Randell	Very Negative	2	10-07-2020	Billing Question	New York City	New York	Call-Center	Above SLA	17 Chicago/IL	
36	IIZ-93062579-M-779259-Aj	Quinton Marchelli	Positive		10/13/2020	Payments	Los Angeles	California	Call-Center	Within SLA	39 Los Angeles/	
37	YUZ-85735662-N-048492-c4	Hakim Savwood	Negative		10/19/2020	Billing Question	Richmond	Virginia	Chatbot	Within SLA	30 Baltimore/M	

CONCLUSION

This comprehensive call center performance dashboard project successfully transformed raw operational data into actionable business intelligence through advanced Excel analytics and interactive visualizations. By systematically analyzing key metrics across multiple dimensions—including channel distribution, customer sentiment, SLA compliance, and geographic performance—the dashboard provides stakeholders with a powerful decision-support tool for optimizing call center operations.

The implementation of dynamic slicers enabled granular analysis across four major call centers (Baltimore/MD, Chicago/IL, Denver/CO, and Los Angeles/CA), revealing significant regional variations in performance. Key findings showed that while 63% of calls met SLA standards overall, critical opportunities exist to improve the 11% of delayed resolutions, particularly in billing-related inquiries which accounted for 236 calls (54% of total volume).

The sentiment analysis uncovered valuable customer experience insights, with negative sentiments (171 combined Negative/Very Negative cases) outweighing positive feedback (73 cases), highlighting priority areas for service improvement. The channel distribution analysis further demonstrated customers' strong preference for traditional call-center support (107 calls) over digital alternatives like chatbots (81 calls), suggesting opportunities to enhance omnichannel strategies.

Through sophisticated data preprocessing—including duplicate removal, categorical conversion, and calculated field creation—the dashboard ensures accurate, consistent metrics. Interactive features like location-based slicers, conditional formatting, and dual-mode display (light/dark) significantly enhance usability for diverse stakeholders.

Most importantly, the dashboard doesn't just diagnose problems but provides clear pathways for improvement:

- Resource reallocation suggestions based on regional performance gaps
- Targeted training programs addressing specific SLA misses
- Process optimization opportunities derived from channel analytics
- Employee retention strategies informed by travel-impact analysis

By combining real-time data processing with intuitive visualization techniques, this project delivers a scalable framework for continuous call center performance monitoring. The implementation demonstrates how data-driven decision making can directly enhance customer satisfaction, operational efficiency, and employee retention in service environments.

As customer expectations continue evolving, this dashboard model provides organizations with the analytical foundation needed to maintain service excellence. Future enhancements could incorporate predictive analytics for call volume forecasting and AI-driven sentiment analysis, further strengthening its strategic value. Ultimately, this project exemplifies how thoughtful data visualization and interactive analytics can transform operational data into competitive advantage.

FUTURE SCOPE

The current dashboard provides a strong foundation for monitoring and analyzing call center operations, but there are several opportunities for enhancement to make it even more powerful and predictive. Below are key areas for future development:

1. AI-Powered Predictive Analytics

• Call Volume Forecasting:

- Use time-series forecasting (e.g., ARIMA, Prophet) to predict peak call times and optimize staffing.
- Integrate external factors (marketing campaigns, holidays) for more accurate predictions.

- **Attrition Risk Modeling:**
 - Apply machine learning (e.g., XGBoost, Random Forest) to predict which employees are at high risk of leaving.
 - Generate automated alerts for HR to take preemptive action.
- **Sentiment Trend Prediction:**
 - Use NLP models to detect emerging customer dissatisfaction trends before they escalate.

2. Real-Time & Automated Reporting

- **Live Data Integration:**
 - Connect directly to call center software (e.g., Zendesk, Five9) for real-time dashboard updates.
 - Implement Power BI or Tableau for cloud-based, automated refreshes.
- **Automated Alerts & Notifications:**
 - Trigger emails/SMS when SLA breaches or critical sentiment shifts occur.
 - Use Power Automate to send weekly performance summaries to managers.

3. Enhanced Employee Performance Tracking

- **Agent-Specific Analytics:**
 - Track individual agent metrics (average handle time, first-call resolution).
 - Gamify performance with leaderboards and incentive tracking.
- **Voice & Chatbot Analytics:**
 - Integrate speech-to-text for call transcript analysis to identify coaching opportunities.
 - Monitor chatbot conversations for recurring unresolved queries.

4. Advanced Customer Journey Mapping

- **Omnichannel Interaction Tracking:**
 - Visualize how customers move between calls, chats, and emails.
 - Identify bottlenecks in multi-touchpoint resolutions.
- **Root Cause Analysis:**
 - Apply decision-tree models to determine why certain calls exceed SLA.
 - Link billing/payment issues to CRM data for deeper insights.

5. Self-Service & Client-Facing Portals

- **Dynamic Client Reports:**
 - Allow clients to filter their own call data via a secure portal.
 - Automate customized PDF/Excel reports for stakeholders.
- **AI Chatbot for Dashboard Queries:**
 - Enable natural language queries (e.g., "Show me last week's SLA compliance for Chicago").

6. Integration with HR & CRM Systems

- **Link Attrition Data to HRIS:**
 - Correlate attrition with training completion, promotions, or benefits usage.
- **CRM Sync for Customer History:**
 - Display past interactions when calls come in to personalize service.

7. IoT & Voice Analytics

- **Call Tone & Emotion Detection:**
 - Integrate AI voice analysis (e.g., AWS Lex) to detect frustrated customers in real time.
- **Desktop Activity Monitoring:**
 - Track agent application usage to identify workflow inefficiencies.

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