

Case Study: Optimising a Health Insurance Call Centre Using SQL, Power Query, and Excel

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1. Background

Industry: Health Insurance

Business Unit: Medical Call Centre (handling ambulance, outpatient, and inpatient assistance requests).

Following the onboarding of a large corporate client, the call centre experienced a substantial increase in call volumes. This rapid surge highlighted operational bottlenecks and prompted an in-depth analysis of call-centre performance, customer satisfaction, and outsourcing efficiency.

2. Business Problem

Performance Issues:

- The percentage of missed calls rose sharply to 20%.
- The average answer time exceeded 1 minute, negatively impacting client experience.

Operational Visibility Gaps:

- Customer complaints increased significantly, particularly regarding:
 - long waiting times, and
 - inability to reach the call centre.
- The corporate database contained only manually entered records for cases requiring post-call work or follow-up, limiting visibility into overall activity.
- The CCaaS (Contact Centre as a Service) provider supplied detailed call logs, but the reports were too complex and not actionable for operational managers.
- The team lacked clear insight into when and why peak loads occurred, making effective staffing nearly impossible.

Call Complexity:

- Different call categories require varying amounts of post-call work.
For example, inpatient treatment requests often require several days of follow-up, significantly impacting staff workload.

Outsourced Call Centre Issues:

- An external call centre was engaged to handle overflow.
- Its performance appeared insufficient: many calls were returned due to overload.
- Managers lacked reliable reporting on the outsourced provider's efficiency.

Customer Satisfaction Data Gap:

- Complaints alone did not provide a full picture of customer satisfaction or tolerance for waiting times.
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3. Objectives

The project focused on delivering actionable insights and fast improvements:

1. Collect and process daily call logs from the CCaaS provider.
 2. Transform raw data into clear, manager-friendly reporting.
 3. Identify patterns in call volumes by weekday and time of day to support staffing decisions.
 4. Count call types (inpatient, outpatient, ambulance, general requests, etc.).
 5. Evaluate the outsourced call centre's performance.
 6. Monitor customer satisfaction through a short post-call questionnaire.
 7. Create a daily management dashboard in PowerPoint for top management.
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4. Solution Approach

4.1 Data Acquisition:

- Downloaded daily Excel files containing call logs, CDR (Call Detail Records), and hourly ACD (Automatic Call Distributor) reports from the CCaaS portal.
- Coordinated with the CCaaS technical team to ensure data consistency.
- Integrated Power Query with the corporate SQL database to automatically retrieve aggregated call-category data (sample SQL shown in Figure 1).

Figure 1

SQL Code for Retrieving Call Category Data

```
SELECT
    mc.CallDate,
    CASE
        WHEN lpu.LPUTextCode IN ('77-278', '77-304') THEN 'general_request'
        ELSE 'medical_request'
    END AS request_type,
    CASE
        WHEN lpu.LPUTextCode IN ('77-278', '77-304') THEN NULL
        ELSE mct.Abr
    END AS subtype,
    COUNT(mc.Code) AS call_count
FROM MedCall mc
LEFT JOIN MedCallType mct ON mct.Code = mc.CallTypeCode
LEFT JOIN MedLPU lpu ON lpu.Code = mc.LPUCode
WHERE mc.PolNum LIKE 'CORP-%'
    AND mc.IsDraft = 'N'
    AND mc.CallDate >= DATE '2024-04-01'
GROUP BY mc.CallDate, request_type, subtype
ORDER BY mc.CallDate ASC, request_type DESC, subtype ASC;
```

- Established daily data transfer from the outsourced call centre.
- Implemented a post-call customer satisfaction questionnaire and downloaded responses daily.

4.2 Data Transformation:

- Cleaned and consolidated data using Power Query.
- Built automated and repeatable ETL processes for daily updates.
- Standardised columns, corrected data types, and removed mismatches between CCaaS, internal data, and outsourced call-centre reports.

4.3 Data Modelling and Analysis:

- Built a data model with five fact tables and a date dimension (Figure 2).
- Used the date table to support:
 - weekday analysis,
 - weekend vs working day classification,
 - rolling 7-day metrics.
- Created DAX measures to calculate:
 - total, received, handled, and abandoned calls;
 - weighted average answer time;
 - percentage of missed calls;
 - CSAT averages and moving averages (sample shown in Table 1).

Figure 2

Power Query Data Model

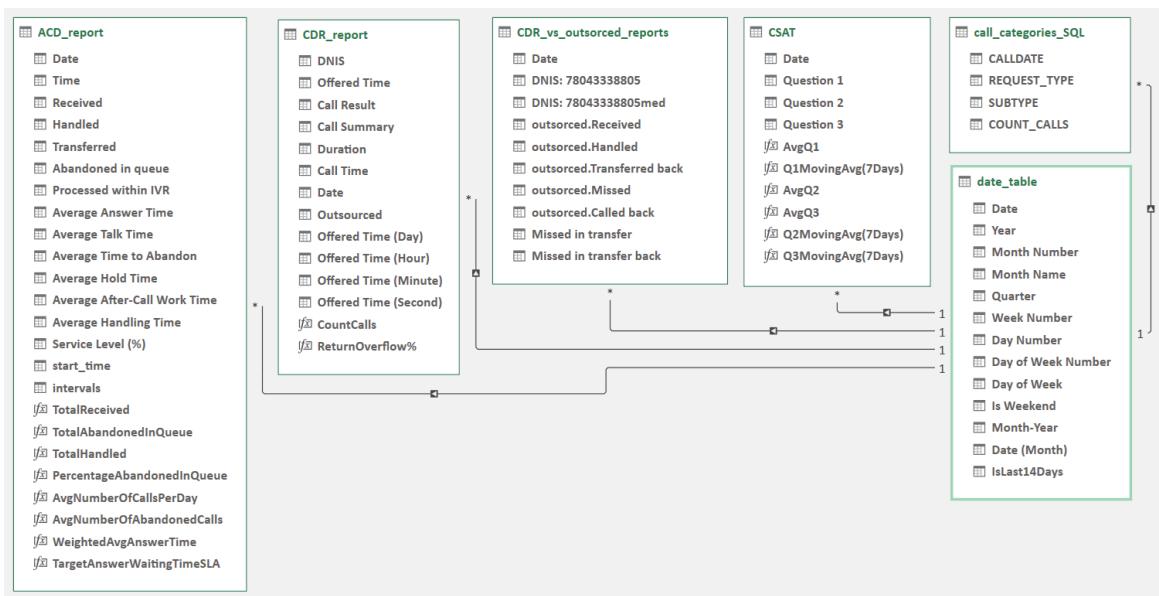


Table 1*Sample DAX measures*

Measure	Description	Expression	Comments
AvgNumber OfAbandonedCalls	Average number of abandoned calls per day	DIVIDE ([TotalAbandonedInQueue], DISTINCTCOUNT (ACD_report[Date]) , 0)	Divides total abandoned calls by number of distinct days.
AvgNumber OfCallsPerDay	Average number of received calls per day	DIVIDE ([TotalReceived], DISTINCTCOUNT (ACD_report[Date]) , 0)	Total calls / number of days.
Percentage AbandonedInQueue	Share of calls abandoned in queue	DIVIDE ([TotalAbandonedInQueue], [TotalReceived], 0)	Abandoned calls / total received.
Target AnswerWaitingTime SLA	Show SLA target (20 seconds) in the chart if any calls received	IF (SUM ([Received]) > 0, TIME (0, 0, 20), BLANK ())	Shows 20 seconds only if there were calls; blank otherwise.
Weighted AvgAnswerTime	Average answer time weighted by call volume	DIVIDE (SUMX ('ACD_report', 'ACD_report'[Average Answer Time] * 'ACD_report'[Received] , [Sum of Received], 0)	1) Multiply Avg Answer Time x Received for each row. 2) Sum all weighted values. 3) Divide by total received calls.
CountCalls	Total number of call records	COUNTROWS (CDR_report)	Simple row count.
ReturnOverflow%	Share of overflow calls returned to main line	DIVIDE (CALCULATE ([CountCalls], CDR_report[DNIS] = "DNIS: 78043338805med"), CALCULATE ([CountCalls], CDR_report[DNIS] = "DNIS: 78043338805"), 0)	1) Count returned overflow DNIS calls. 2) Count overflow DNIS calls. 3) Returned overflow ÷ Overflow.
Q1MovingAvg (7Days)	7-day moving average for CSAT Q1	VAR CurrentDate = MAX ('date_table'[Date]) VAR Period = DATESINPERIOD ('date_table'[Date], CurrentDate, -7, DAY) RETURN IF ([AvgQ1] <> BLANK (), CALCULATE ([AvgQ1], Period))	1) Identify current date 2) Build 7-day window 3) Recalc AvgQ1 only over that window, blank if no data.

- Combined internal call data with outsourced call-centre data to:
 - identify inconsistencies,
 - quantify returned overflow calls,
 - evaluate the external provider's efficiency.

4.4 Reporting and Forecasting:

- Delivered results through Excel pivot tables and charts.
 - Integrated visuals into PowerPoint for daily managerial updates.
 - Built a Poisson-based forecasting model for expected call volumes during peak periods.
 - Provided insights into call categories and identified areas requiring improved classification.
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5. Key Findings

5.1. Peak Load Patterns

- Late evenings on working days had:
 - the longest answer times (Figure 3), and
 - the highest rate of missed calls (Figure 4).

5.2. Staffing Mismatch

- The number of available operators did not align with hourly call fluctuations, resulting in overload during peak hours.

Figure 3

Number of Incoming Calls and Average Answer Time by Interval on a Working Day

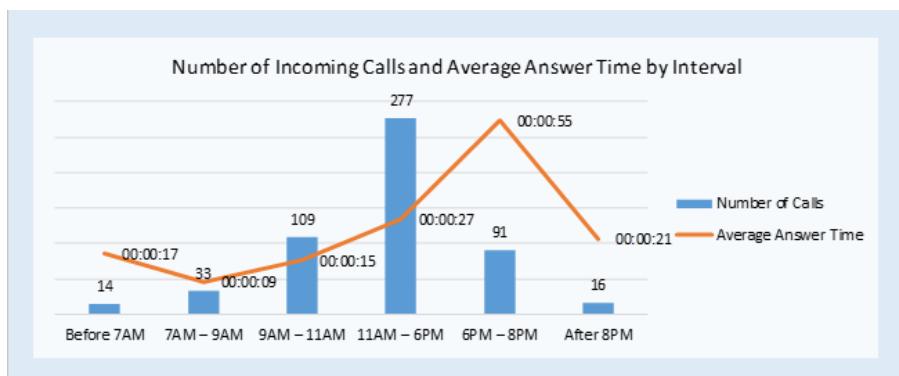
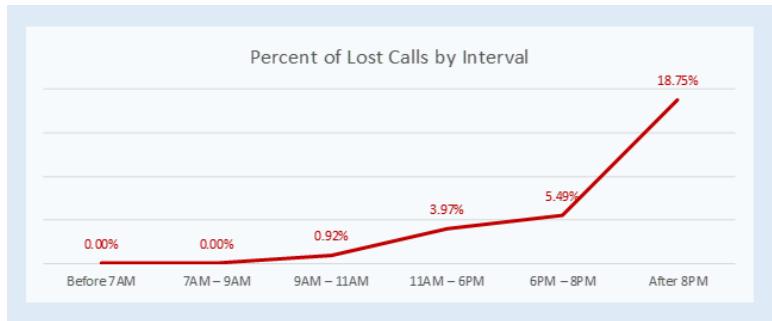


Figure 4

Percent of Lost Calls by Interval on a Working Day



5.3. Outsourced Call Centre Performance

- The outsourced provider returned up to 70% of overflow calls back to the main line (Figure 5), indicating severe performance issues.

5.4. Call Categories

- General calls represented only a small share of total activity.
- Most calls were medical requests, with service approval calls being the most frequent (Figure 6).
- A large proportion of calls fell into the “Other” category, showing that classification procedures required refinement.

Figure 5

Return Overflow Calls by Date

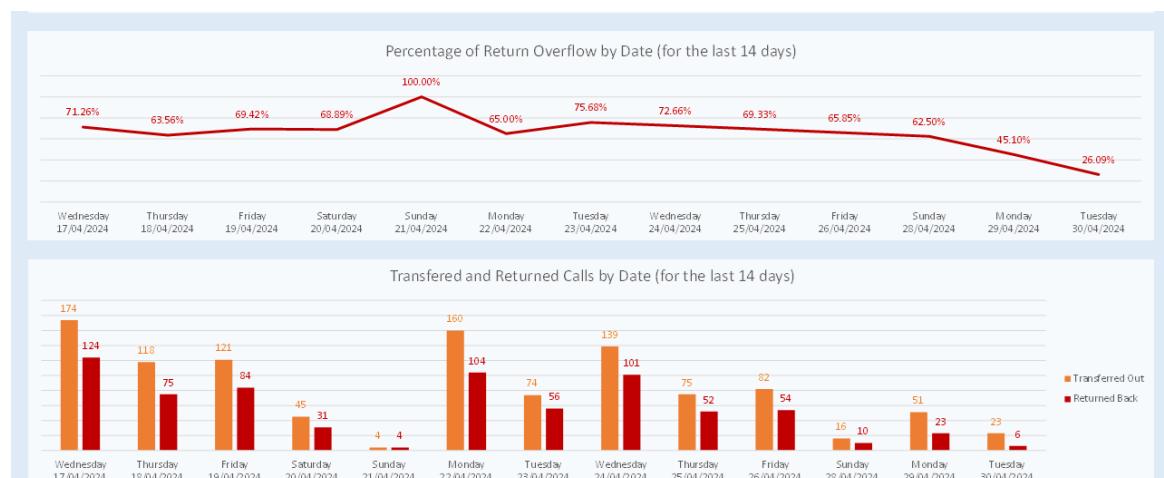
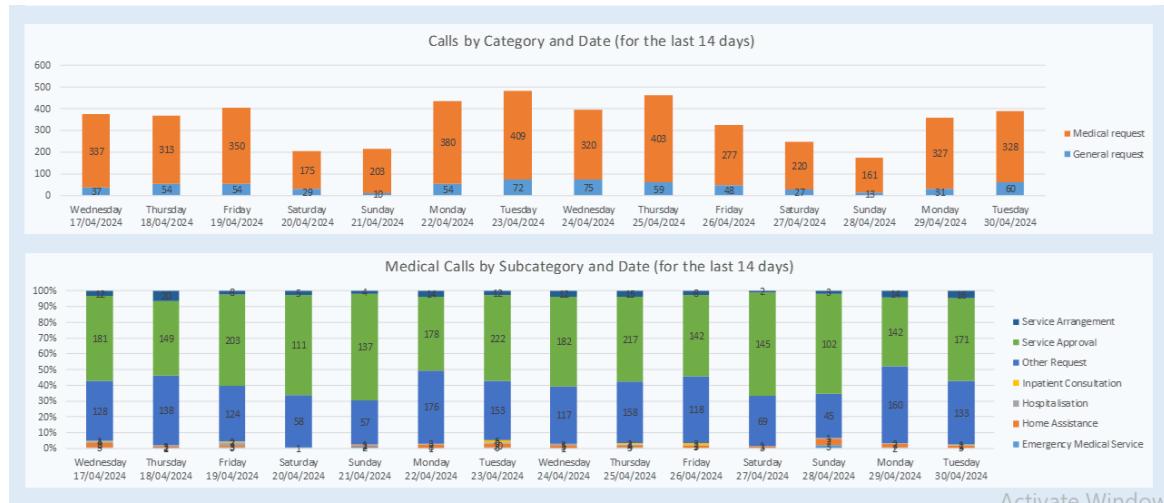


Figure 7

Call Categories and Subcategories by Date

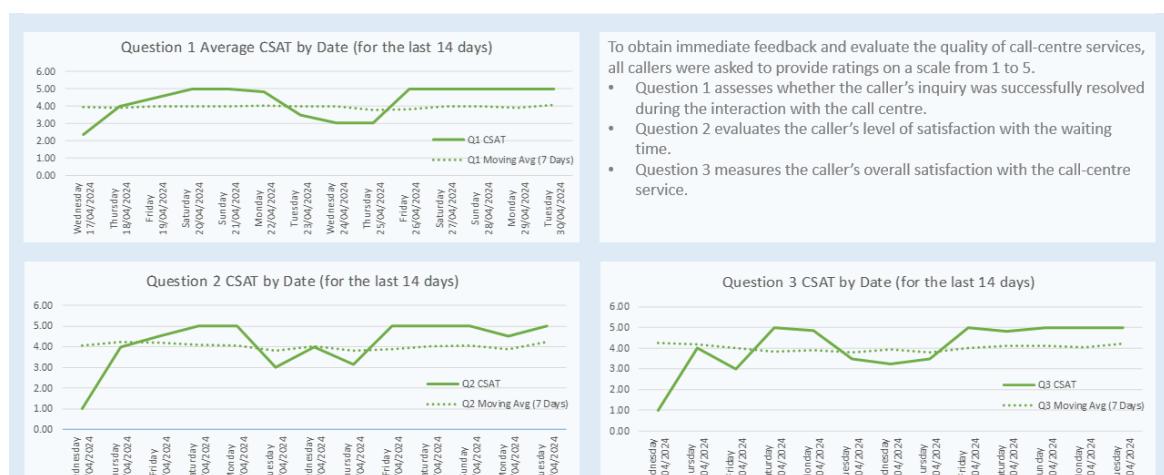


5.5. Customer Satisfaction

- Surprisingly, overall customer satisfaction remained relatively high despite long waiting times and missed calls (Figure 7).

Figure 6

Customer Satisfaction (CSAT) by Date



6. Recommendations

1. Increase staffing during late evening peak periods rather than uniformly across the day.
Where possible, dynamically reallocate operators during high-load intervals.
 2. Review outsourced call-centre performance:
 - a. Evaluate SLA compliance,
 - b. Consider contractual revisions,
 - c. Assess alternative providers or transitioning back to fully internal handling.
 3. Improve call categorisation to reduce the “Other” category and enhance reporting accuracy.
 4. Continue monitoring CSAT metrics using moving averages to detect trends early.
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7. Results & Impact

The implementation of these recommendations delivered measurable improvements:

- Significant reduction in missed calls
 - from 20% down to approximately 5% during peak intervals.
 - Optimised staffing strategy, reducing operational costs by avoiding unnecessary overstaffing.
 - Improved outsourced call-centre performance
 - returned call percentage fell from 70% to nearly 0%.
 - Enhanced service quality for insured clients, with faster response times and more predictable service levels.
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8. Skills & Tools Demonstrated

- Excel Power Query: Automated ETL (extract–transform–load) processes for daily data refresh.
- SQL: Extracted, filtered, and aggregated internal medical call data.
- Data Analysis: Identification of patterns, peak loads, and resource-mismatch issues.
- Data Visualisation: Clear and concise reporting for non-technical managers.
- Business Communication: Translating technical data into clear, actionable recommendations.

9. Terms and Abbreviations

Abbreviation	Description
ACD	Automatic Call Distributor – routes incoming calls to agents based on rules.
CCaaS	Contact Centre as a Service – a cloud-based platform that provides contact-centre functionality without requiring on-premise infrastructure.
CDR	Call Detail Record – log of telecommunication events.
CSAT	Customer Satisfaction Score – measures customer satisfaction via surveys.
DNIS	Dialled Number Identification Service – identifies the number originally dialled.
ETL	Extract–Transform–Load process extracts data from sources, transforms it for consistency, and loads it into a target system for analysis
IVR	Interactive Voice Response – automated system guiding callers via menu options.
SLA	Service Level Agreement – a formal agreement that defines the expected service performance standards between a provider and a client.
