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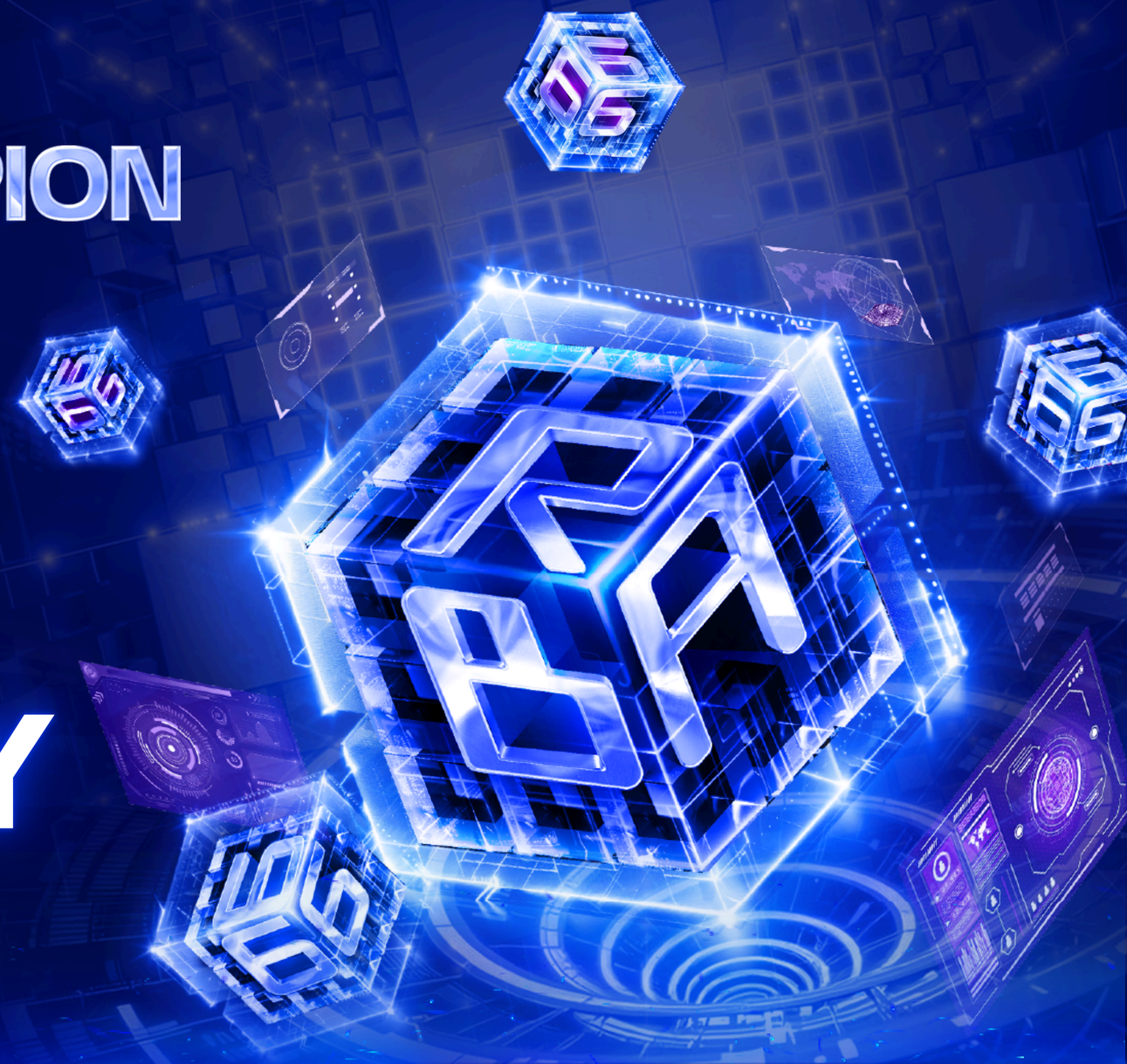
RMIT BUSINESS ANALYTICS CHAMPION SEASON 6

ROUND 2 CASE STUDY



CASE STUDY PURPOSES

In Round 2 of this competition, your team will assume the roles of a Business Analyst team reporting to the Head of the department of Colgate-Palmolive.

This case study aims to apply data-driven analytical techniques to identify key factors contributing to machine downtime and product defects in Colgate-Palmolive's toothbrush manufacturing process. It aims to enhance participants' ability to interpret production data, assess business impact, and propose evidence-based recommendations to improve operational efficiency and product quality. Plus, the ability to illustrate slides, do data storytelling, and use critical thinking are also tested by requiring participants to submit their answers in PDF format.

The case study is designed for the purposes of the competition only.
All provided datasets do not represent any real cases

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SUBMISSION GUIDELINE

Your team will have 6 days (**9:00 17/10** to **23:59 22/10**) to analyze and uncover insights from the given datasets. Subsequently, you must provide appropriate recommendations to help the company improve its performance (external sources could be used to support your arguments; in that case, proper references should be provided). You are required to submit your answers in:

- A PowerPoint or PDF File presenting your key analysis and recommendations. The **maximum number of slides is 15**, IN WHICH:
  - Including executive summary, divider page, and ending page
  - Excluding cover page, references, and appendices

- For each extra slide, 5% of the total mark will be deducted.

- Your Excel/coding files with detailed notes demonstrating your analysis process

SUBMISSION GUIDELINE

Submission Details:

- Only Team Leader can submit the work.
- Each team only has ONE ATTEMPT of submission.
- In the scenario of any issues with the submitted files, please kindly contact the organizers as soon as possible. Any enquiry regarding those issues after 10.00 AM Thursday, 23th October 2025 will be rejected and the team will be disqualified.
- Your presentation slides should follow the given template and must contain the following parts:
  - A cover page (Report Name, Your Team Name and Team Members)
  - An Executive Summary
  - Analysis and Recommendation
  - Reference List (any style)

Please named your submitted files as **Your Team Name_Round 2_RBAC 2025**
Please submit your work via this submission form: **LINK**

DEADLINE OF SUBMISSION: 11:59PM, 22th OCTOBER 2025

OVERVIEW

Theme: Enhancing Toothbrush Manufacturing Throughput: A Focus on Downtime and Quality Control.

Scenario: Colgate-Palmolive wants to boost the efficiency of its primary toothbrush manufacturing facility. Management knows that machine downtime and product defects lead to significant financial losses, but they need a data-driven analysis to pinpoint the most critical areas for improvement. You have been provided with one year of production and machine data to identify the root causes of inefficiency and quantify their impact on production potential.

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OVERVIEW

Theme: Enhancing Toothbrush Manufacturing Throughput: A Focus on Downtime and Quality Control.

- **Key Tasks**: Exploratory Data Analysis (EDA), Root Cause Analysis, Business Impact Assessment.
- **Deliverable**: A report (maximum 15 slides) that presents your key findings on operational bottlenecks and quantifies the potential losses. Provide actionable recommendations to improve machine uptime and product quality.
- **Timeline**: 6 Days.
- **Data Format**: Three CSV files (production_log.csv, maintenace_order.csv, cross_reference.csv).
- **Data Types**: A mix of categorical (e.g., LINE_NAME, UTIL_REASON_DESCRIPTION) and numerical (e.g., DOWNTIME, GOOD_PRODUCTION_QTY).

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BUSINESS QUESTIONS

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BUSINESS QUESTIONS

QUESTION 1. PERFORMANCE OVERVIEW

Provide a comprehensive dashboard of the factory's operational performance. What are the average values for key metrics like Overall Equipment Effectiveness, Defect Rate, and Production Throughput Yield?

BUSINESS QUESTIONS

QUESTION 2. ROOT CAUSE ANALYSIS

What are the primary causes of machine downtime and product defects? Identify if specific machines, shifts, or product types are the main drivers of these issues. What data or metrics would you analyze to categorize these causes effectively, and how would you differentiate between these categories to prioritize areas for improvement (systemic or repeated & emerging issue)?

BUSINESS QUESTIONS

QUESTION 3. IMPACT QUANTIFICATION

Quantify the business impact of these inefficiencies. Calculate the total potential production units lost during downtime. Estimate the scale of material loss by calculating the total number of defective units produced. Consider not only direct losses but also indirect impacts such as reduced customer satisfaction or missed delivery targets (based on your own assumption).

BUSINESS QUESTIONS

QUESTION 4. ACTIONABLE RECOMMENDATIONS

Based on your analysis, propose three data-driven strategies focused on mitigating the primary causes of downtime and defects to increase overall production throughput and reduce waste.

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DATASET

YOUR TEAM CAN ACCESS THE DATASET HERE:

LINK

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DATASET DESCRIPTION

DATASET

production_log.csv: Daily operational data.

DATA NAME	DATA TYPE	DATA DESCRIPTION	REMARK
PRODUCTIONDATE_DAY_LOC	Date	The specific date of the production run.	Primary key component for daily aggregation. E.g., 2024-10-25.
SHIFT_NAME	String	The name for the production shift.	Categorical. E.g., Day-1, Afternoon-2, Night-3. Useful for comparing performance across different shifts.
LINE_NAME	String	The specific production line where the activity was recorded.	Categorical. E.g., MKBC0501, MKZA1501.
CO_TYPE	String	The category of the production changeover or activity type.	Categorical. E.g., Material_Handle, Material_Filament. Helps in analyzing time spent on specific types of changeover activities.
CREW_ID	String	An identifier for the specific work crew or team operating the line during the shift.	Categorical. E.g., A, B. Allows for analysis of crew performance and training needs.
AE_MODEL_CATEGORY	String	A high-level category defining the state of the machine/line.	Categorical. E.g., Runtime, Unplanned, Planned.
UTIL_REASON_DESCRIPTION	String	A detailed text description explaining the reason for a specific status (e.g., downtime).	Categorical. E.g., Mechanical Failure, Material Shortage. Crucial for root cause analysis of downtime and inefficiencies.
SIZE_TYPE	String	Specifies the product for the current run.	Categorical. E.g., Pro-Clean 5000, Total Defense Shield. Useful for analyzing performance related to specific product types.

Disclaimer: All data is hypothetical and does not represent real business figures for Colgate-Palmolive or any competitor.

DATASET

production_log.csv: Daily operational data.

DOWNTIME	Float	Total time the machine was not running when it was scheduled to be.	Numeric. This is a key metric for calculating Overall Equipment Effectiveness (OEE).
EFFECTIVE_RUNTIME	Float	The time the machine was producing goods at its standard rate, excluding losses in rate.	Numeric. EFFECTIVE_RUNTIME = RUN_TIME - (Time lost to speed loss).
LUNCH_AND_BREAK	Float	Time allocated for scheduled employee breaks.	Numeric. Often categorized as a planned stop.
MEETING_AND_TRAINING	Float	Time spent on scheduled meetings or training sessions.	Numeric. Often categorized as a planned stop.
NO_DEMAND	Float	Time the line was available but not run due to a lack of production orders.	Numeric. A business-related loss, not an operational failure.
PLANT_AVAILABLE_TIME	Float	The total time the plant is scheduled to be operational.	Numeric. Represents the maximum potential production time.
PLANT_EXPERIMENTATION	Float	Time dedicated to R&D, trials, or experiments on the production line.	Numeric. A type of planned stop.
PRODUCTION_AVAILABLE_TIME	Float	The time the line is staffed and available to run production.	Numeric. PLANT_AVAILABLE_TIME minus any planned stops like PLANNED_MAINTENANCE, PLANT_EXPERIMENTATION, MEETING_AND_TRAINING, etc
RUN_TIME	Float	The actual time the machine was running, regardless of speed or quality.	Numeric. This is a core component of OEE calculation. RUN_TIME = PRODUCTION_AVAILABLE_TIME - DOWNTIME.

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DATASET

production_log.csv: Daily operational data.

CHANGEOVER_DURATION	Float	Time taken to switch from producing one product to another.	Numeric. A major source of planned downtime.
CLEANING_AND_SANITIZATION	Float	Time spent on required cleaning procedures.	Numeric. Can be a significant part of planned downtime, especially in regulated industries.
BUSINESS_EXTERNAL_TIME	Float	Downtime caused by external factors not controlled by the plant.	Numeric. E.g., Power Outage, Supplier Delay.
PLANNED_MAINTENANCE	Float	Scheduled time for preventive maintenance of equipment.	Numeric. A planned stop that is essential for long-term machine health.
WAITING_TIME	Float	Time the machine is idle waiting for materials, operators, or upstream processes.	Numeric.
TOTAL_TIME	Float	The total duration of the shift or observation period (e.g., 480 minutes for an 8-hour shift).	Numeric. Serves as the baseline for all other time calculations.
GOOD_PRODUCTION_QTY	Integer	The number of units produced that meet quality standards.	Numeric. This is the final output of the process. Used to calculate performance and yield.
REJECT_PRODUCTION_QTY	Integer	The number of units produced that were rejected for quality reasons.	Numeric. A direct measure of quality loss. Total Production = GOOD_PRODUCTION_QTY + REJECT_PRODUCTION_QTY.
PRODUCTION_ORDER_RATE	Float	The standard or ideal production rate (units per minute) for the specific product being run.	Numeric. Also known as Ideal Cycle Time. Essential for calculating performance/speed loss in OEE.

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DATASET

maintenace_order.csv: Static data for each machine.

DATA NAME	DATA TYPE	DATA DESCRIPTION	REMARK
ORDER	Integer	Unique identifier for the maintenance or production order.	Numeric. Example: 10299248. Can be used to join with other maintenance datasets.
EQUIPMENT_ID	String	A unique identifier for each piece of equipment.	Alphanumeric. Example: 10003380. Primary key for joining maintenace_order.csv with production_log.csv using cross_reference.csv.
BASIC_START_DATE	DateTime	The scheduled start date and time for the order.	DateTime. Example: 2025-06-30. Crucial for scheduling and planning analysis.
ORDER_TYPE	String	The classification of the order (e.g., preventive maintenance, autonomous maintenance).	Categorical. Example: PM10.
DESCRIPTION	String	A short description of the task or object.	Categorical/Text. Example: RM TF1E0501. Provides specific details about the work order.

Disclaimer: All data is hypothetical and does not represent real business figures for Colgate-Palmolive or any competitor.

DATASET

cross_reference.csv: Table for maintenance and operational data relationship

DATA NAME	DATA TYPE	DATA DESCRIPTION	REMARK
EQUIPMENT_ID	String	A unique identifier for each piece of equipment.	Alphanumeric. Example: 10003380. Primary key for joining maintenace_order.csv with production_log.csv
LINE_NAME	String	An operational name for the equipment, linking it to a production line.	Categorical. Links the physical asset to an operational production line.

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MARKING RUBRICS

MARKING RUBRICS

CRITERIA	Excellent (4)	Good (3)	Fair (2)	Poor (1)
DATA PREPARATION & EDA (15%)	Data and key metrics are meticulously cleaned and prepared. The EDA is comprehensive, using insightful visualizations to uncover deep, non-obvious patterns in downtime and quality issues. All choices are clearly justified.	Data and key metrics are well-prepared with only minor issues. The EDA is thorough and correctly identifies key operational trends and bottlenecks. Justifications are mostly clear.	Data and key metrics preparation is adequate but contains noticeable errors. The EDA is superficial, identifying only the most obvious patterns without deeper investigation.	Data and key metrics are poorly prepared with significant errors that undermine the analysis. Little to no meaningful EDA is performed.

MARKING RUBRICS

CRITERIA	Excellent (4)	Good (3)	Fair (2)	Poor (1)
ROOT CAUSE & BUSINESS IMPACT ANALYSIS (45%)	A comprehensive and evidence-based root cause analysis is conducted, clearly identifying the primary drivers of inefficiency (e.g., machines, shifts, or product types). Appropriate data and metrics are used to categorize issues effectively, with a clear distinction between systemic/repeated and emerging problems. The rationale for categorization is well-justified using quantitative evidence. Business impact is comprehensively quantified, including both direct losses (production downtime, defective units) and indirect impacts (customer dissatisfaction, delayed deliveries, or assumed opportunity costs). The analysis demonstrates clear reasoning, strong evidence, and prioritizes high-impact areas for improvement.	Root cause analysis is sound and identifies major problem areas with reasonable accuracy. Some categorization between issue types is attempted but may lack full clarity or quantitative justification. Business impact quantification is accurate for direct losses, with partial consideration of indirect impacts. Some assumptions are made but not fully justified. Findings are clear but could include deeper prioritization or contextual analysis.	Root cause analysis provides a general overview of causes but lacks depth or clarity in differentiating between systemic and emerging issues. The metrics used are partially appropriate or insufficiently explained. Business impact quantification focuses mostly on direct impacts and overlooks indirect or assumed effects. Estimates are simplistic or lack transparency in calculation methods.	Fails to identify credible or data-supported root causes of downtime or defects. No clear categorization or prioritization of issues. Business impact is not meaningfully quantified or entirely omits indirect and assumed impacts. The analysis fails to provide actionable insight.

MARKING RUBRICS

CRITERIA	Excellent (4)	Good (3)	Fair (2)	Poor (1)
ACTIONABLE RECOMMENDATIONS (30%)	Recommendations are specific, data-driven, and directly address the identified root causes. They are practical, creative, and demonstrate a strong understanding of the operational context.	Recommendations are logical and supported by the analysis but could be more specific or innovative. They are generally practical.	Recommendations are generic (e.g., "increase monitoring") and not strongly tied to the analytical findings. Feasibility may be questionable.	Recommendations are impractical, unsupported by the analysis, or are completely missing.
COMMUNICATION & PRESENTATION (10%)	The report is exceptionally clear, concise, and professionally structured with a compelling narrative. Visualizations are insightful and expertly designed to enhance understanding and support the key findings.	The report is well-structured and easy to follow. Visualizations are appropriate and generally clear. The key findings are communicated effectively.	The report has structural or clarity issues that impact understanding. Visualizations are used but may be confusing or poorly designed.	The report is disorganized, unclear, and difficult to follow. Visualizations are absent, irrelevant, or detract from the presentation.

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SLIDE TEMPLATE

Use this Slide Template for your Round 2 submission.
Please duplicate it from the link below:

LINK

CONTACT INFORMATION

SHOULD YOU HAVE ANY QUESTIONS, PLEASE CONTACT US VIA:

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