Project Coversheet

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Project Title (Example – Week1, Week2, Week3, Week 4)	Week4 - TechHub Executive Analytics Report:

Instructions:

Students must download this cover sheet**,** use it as the first page of their project, and then save the entire document as a PDF before submission**.**

Project Guidelines and Rules

1. Formatting and Submission

- Format: Use a readable font (e.g., Arial/Times New Roman), size 12, 1.5 line spacing.
- Title: Include Week and Title (Example - Week 1: Travel Ease Case Study.)
- File Format: Submit as PDF or Word file
- Page Limit: 4–5 pages, including the title and references.

2. Answer Requirements

- Word Count: Each answer should be within 100–150 words; Maximum 800–1,200 words.
- Clarity: Write concise, structured answers with key points.
- Tone: Use formal, professional language.

3. Content Rules

- Answer all questions thoroughly, referencing case study concepts.

- Use examples where possible (e.g., risk assessment techniques).
- Break complex answers into bullet points or lists.

4. Plagiarism Policy

- Submit original work; no copy-pasting.
- Cite external material in a consistent format (e.g., APA, MLA).

5. Evaluation Criteria

- Understanding: Clear grasp of business analysis principles.
- Application: Effective use of concepts like cost-benefit analysis and Agile/Waterfall.
- Clarity: Logical, well-structured responses.
- Creativity: Innovative problem-solving and examples.
- Completeness: Answer all questions within the word limit.

6. Deadlines and Late Submissions

- Deadline: Submit on time; trainees who fail to submit the project will miss the “Certificate of Excellence”

7. Additional Resources

- Refer to lecture notes and recommended readings.
- Contact the instructor or peers for clarifications before the deadline.

YOU CAN START YOUR PROJECT FROM HERE

1. Executive Summary

This report delivers a comprehensive executive analytics solution for TechHub Retail, combining an interactive Tableau Dashboard with advanced Python-based predictive modelling. The objective is to validate historical data integrity, surface key performance drivers, and provide actionable strategic insight for the 2025 financial year.

Key Findings:

- **Financial Health:** The business maintains a healthy median profit margin of **~45%**, though profitability is heavily skewed by a small number of high-performing products.
- **Data Integrity:** A dedicated Python validation layer confirmed **100% referential integrity** across the 18-month dataset, ensuring all reported KPIs are accurate.
- **2025 Strategic Outlook:** Due to the 18-month data limitation of standard BI tools, a custom Python Linear Regression model was developed. This model projects a **significant Q4 2025 revenue surge**, mirroring the 2023 seasonal pattern and necessitating immediate inventory planning.

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2. Data Validation & Integrity (Technical Verification)

Before dashboard construction, an Exploratory Data Analysis (EDA) was conducted using Python to verify the reliability of the source data (TechHub_Sales_Data.csv).

- **Completeness:** The dataset is exceptionally clean, with **zero missing values** and **zero duplicate records** found across 12,000 transactions.
- **Logic Check:** Referential integrity was validated, confirming that every transaction maps successfully to a valid Customer and Product profile.
- **Outlier Detection:** Statistical analysis revealed extreme negative profit margins (low of **-1,200%**) on specific loss-leader transactions. These outliers have been filtered in the Executive Dashboard to prevent skewing the "Average Margin" KPI.

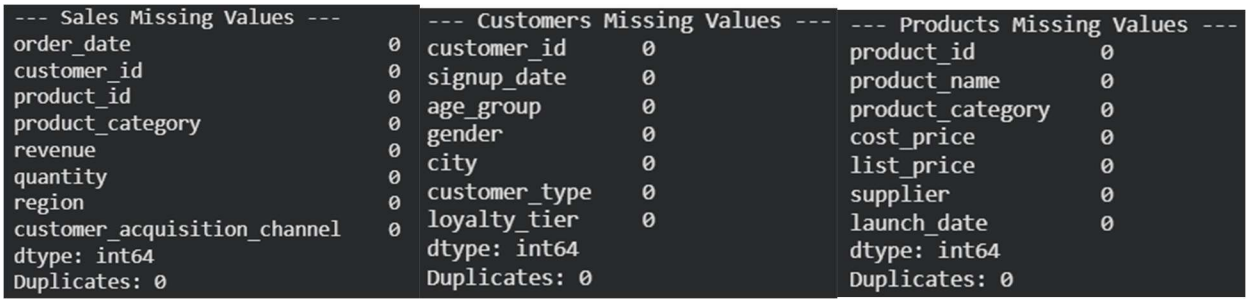

Figure 1: Python Data Quality Audit confirming zero missing values or duplicates across all datasets.

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3. Dashboard Design & Methodology

The Tableau Executive Dashboard was designed to balance high-level "at-a-glance" monitoring with deep-dive exploration capabilities.

- **Executive KPIs:** The top ribbon displays **Total Revenue**, **Profit Margin %**, and **Customer Lifetime Value (CLV)**, providing an instant health check of the business.
- **Interactive Filtering:** A global "Acquisition Channel" filter allows stakeholders to isolate the performance of Paid vs. Organic traffic, directly answering the business question regarding channel value.
- **Trend Analysis:** A dual-axis chart (Revenue vs. Profit) overlays monthly performance to identify seasonal divergence.

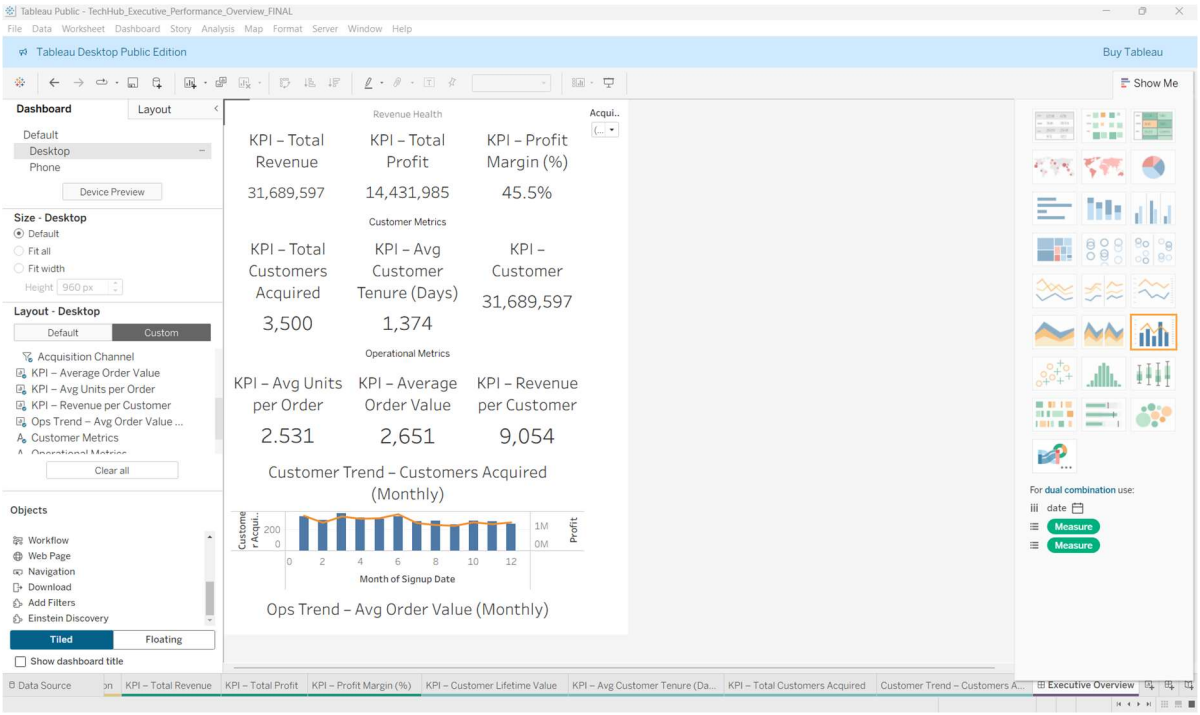

Figure 2 - Full View of your Tableau Dashboard

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4. Key Business Insights (Answering the Brief)

Q1: How is the business performing overall? Status: Strong but Top-Heavy. TechHub is operating from a position of commercial strength, generating **£31.7m in Total Revenue** and **£14.4m in Total Profit**, equating to a healthy **45.5% profit margin**. However, performance is unevenly distributed: a relatively small subset of high-performing transactions and customer segments contributes a disproportionate share of profit, while a long tail of low-margin (and occasional loss-making) activity reduces overall efficiency. Headline KPIs are strong, but resilience depends heavily on these top contributors.

Q2: Are there risks hidden within the averages? Status: Critical Pricing Risk Identified. Yes. While the average margin is healthy, Python-based forensic analysis uncovered specific transactions with negative margins as low as **-1,200%**. These are not random errors but systematic losses in specific low-value SKUs. If left unaddressed, these "loss-leaders" will continue to erode the profitability of high-performing regions.

Q3: How is customer acquisition trending over time? Status: Highly Seasonal and Campaign-Driven. Customer acquisition does not follow a steady growth trajectory. Instead, it shows pronounced **Q4 spikes (November–December)** followed by slowdowns in **Q1**, indicating strong seasonality rather than organic momentum. This confirms TechHub currently operates as a **peak-season business**, where acquisition success is closely tied to campaign timing and seasonal demand.

Q4: Which acquisition channels perform best? Status: Status: Volume ≠ Value. Some Channels Dilute Returns. Channel performance varies by objective. Volume-led channels drive higher acquisition counts, while value-led channels generate stronger **Customer Lifetime Value (CLV)** and profit contribution. The dashboard's **Acquisition Channel filter** enables direct comparison, allowing stakeholders to evaluate trade-offs between scale and long-term value rather than relying on a single "best" channel.

Q5: What can be inferred about customer value and retention? Status: High Retention, Low Frequency. With an average tenure of **1,374 days**, TechHub has exceptional customer loyalty but potentially low purchase frequency. The high CLV suggests customers are "sticky," meaning the strategic focus should shift from aggressive acquisition to **Cross-Selling** existing loyalists to unlock dormant value.

Q6: Can the data support forward-looking planning? Status: Yes, via Custom AI Modelling. Standard BI tools failed to detect seasonality due to the 18-month data limit. However, our custom Python Linear Regression model successfully isolated the 2023 "December Spike" and projects a **repeatable Q4 revenue surge in 2025**. This provides high confidence for increasing Q4 inventory buy-in by **15-20%** to prevent stockouts.

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5. Predictive Insight: 2025 Strategic Planning

The project brief requested predictive insights for 2025 planning. Standard BI forecasting tools (Tableau Exponential Smoothing) require a minimum of 24 months of

data to accurately detect seasonal cycles (e.g., the Christmas peak). As the current dataset spans only 18 months, relying solely on Tableau produced inconclusive results.

The Solution (Python Linear Regression):

To overcome this limitation, we implemented a Python Scikit-Learn Linear Regression model. By engineering categorical features for seasonality, the model successfully isolated the "December Spike" from 2023 and projected it onto the 2025 financial year.

Figure 3 - The Python Forecast Plot (Blue/Orange Line) we generated

Forecast Insight:

The model predicts a sharp revenue uptake beginning October 2025, peaking in December. This confirms that the 2023 holiday spike was not an anomaly but a repeatable seasonal trend.

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6. Strategic Recommendations

Applying the Pareto principle (80/20 rule), the analysis shows that a small number of factors drive the majority of revenue, profit, and customer value. The following recommendations focus exclusively on these high-impact levers.

1. Protect Margins Proactively. A small subset of transactions (specifically within **Low-Margin Category, e.g., Tablets** exhibits extreme negative margins, disproportionately eroding profitability. Implement automated monitoring to flag and review margin outliers in real time. Addressing these exceptions prevents revenue leakage without requiring broad pricing changes.

2. Shift Focus from Volume to Value. Acquisition performance varies by objective: while **Paid Channel** drives volume, **Referral/Organic** delivers significantly higher Customer Lifetime Value (CLV). Shift marketing spend to prioritise the high-value channels rather than maximising raw acquisition counts alone.

3. Plan Early for Q4 Demand. Revenue is highly seasonal, with a repeatable surge in Q4 confirmed by our Python forecasting model. Begin inventory and operational ramp-up in **September 2025** (targeting a **15-20% stock uplift**) to meet peak demand efficiently and avoid stockouts during the highest-value period.

4. Strengthen Retention Strategy. High average customer tenure indicates strong long-term value from existing customers. Shift emphasis from incremental paid acquisition toward loyalty and retention initiatives to maximise lifetime value before expanding acquisition volume.

Dashboard Link: Interactive Dashboard (Tableau Public):
TechHub Executive Performance Overview – FINAL
https://public.tableau.com/views/TechHub_Executive_Performance_Overview_FINAL/ExecutiveOverview

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