Requirements Analysis
Technology Stack (Architecture & Stack)

Date	15 February 2026
Team ID	LTVIP2026TMIDS74272
Project Name	Cosmetic Insights: Navigating Cosmetic Trends and consumer Insights with tableau
Maximum Marks	4 Marks

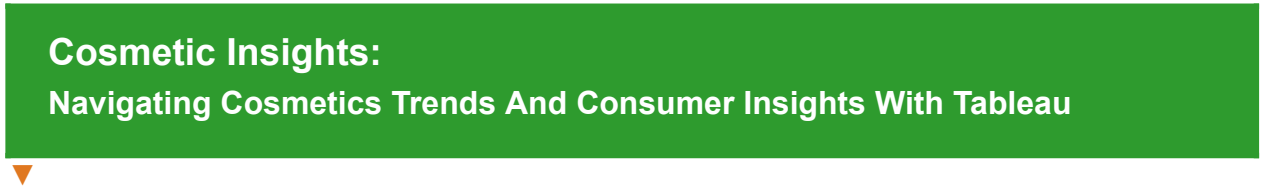
Technical Architecture Overview

The Cosmetic Insights project delivers a Tableau-powered analytics platform designed to transform raw cosmetics data into actionable consumer insights. The architecture follows a 3-tier model: (1) Data Layer — collection from Kaggle datasets, CSV exports, and social APIs; (2) Processing Layer — Tableau Prep Builder and Python for cleaning, transformation, and predictive modeling; (3) Presentation Layer — interactive Tableau dashboards, stories, and web-embedded visualizations.

The deliverable includes the full project flow as seen in the project workspace (Technical Architecture → Project Flow → Data Collection → Data Preparation → Data Visualization → Dashboard → Story → Performance Testing → Web Integration), detailed component tables, and application characteristics.

A Technical Architecture — Project Flow Diagram

The diagram below mirrors the project workspace flow from the guided project platform, showing the end-to-end pipeline from the Cosmetic Insights platform down through each technical layer:



Technical Architecture

System design • Data flow • Component mapping

Project Flow

End-to-end pipeline from raw data to insight delivery

Data Collection & Extraction From Database

CSV / API ingestion • Kaggle datasets • SQL extraction

Data Preparation

Cleaning • Transformation • Joins • Calculated fields

Data Visualization

Charts • Graphs • Filters • Trend analysis

Dashboard

Interactive multi-view dashboards for stakeholders

Story

Narrative-driven Tableau stories for presentations

Performance Testing

Load testing • Query optimization • Extract tuning

Web Integration

Tableau Public / Server embed • API publishing

B Technology Stack Summary — Key Tools & Platforms

📊 Visualization & BI

- Tableau Desktop 2024.x
- Tableau Public
- Tableau Prep Builder
- Tableau Story & Dashboard
- Tableau Forecast (built-in)

🗄️ Data & Storage

- MySQL / PostgreSQL
- CSV / Excel flat files
- Kaggle public datasets
- Tableau Hyper Extract (.hyper)
- Google Drive cloud storage

🐍 Processing & ML

- Python 3.11 (Pandas, NumPy)
- Scikit-learn (ML models)
- Prophet (trend forecasting)
- Tableau TabPy integration
- Jupyter Notebook (EDA)

☁️ Infrastructure & Web

- Tableau Public (hosting)
- Tableau Cloud (SaaS)
- HTTPS / TLS 1.3 security
- Role-Based Access Control
- Web browser embed (JS API)

C Table 1 — Components & Technologies

S.No	Component	Description	Technology
1	**User Interface**	Tableau Desktop / Tableau Public is the primary interface. Users interact via interactive dashboards, story pages, and filter controls. End-users access insights through web browsers via Tableau Server or Public embed.	Tableau Desktop, Tableau Public, Tableau Server, Web Browser (Chrome / Edge)
2	**Data Visualization Layer**	Core visualization logic including bar charts, line graphs, scatter plots, heatmaps, treemaps, and geographic maps for cosmetics trend analysis and consumer preference tracking.	Tableau Worksheets, Calculated Fields, Dual-Axis Charts, LOD Expressions
3	**Dashboard & Storytelling**	Interactive multi-view dashboards combining multiple worksheets. Story points provide narrative-driven walkthroughs for stakeholder presentations aligned to the 3 project scenarios.	Tableau Dashboard, Tableau Story, Layout Containers, Actions & Filters
4	**Data Collection & Extraction**	Cosmetics datasets sourced from Kaggle, web scraping review platforms (Sephora, Ulta), and structured CSV exports from CRM and sales systems. SQL extraction from relational databases.	Kaggle Datasets, CSV / Excel Files, SQL (MySQL / PostgreSQL), Python (web scraping)
5	**Data Preparation**	Data cleaning, null handling, column renaming, data type conversions, joins between product, review, and sales tables. Creation of calculated fields and groupings for segmentation analysis.	Tableau Prep Builder, Python (Pandas), SQL, Excel Power Query
6	**Database**	Structured relational storage for cosmetics product data, consumer reviews, ingredient lists, and sales figures. Supports direct live connection or extract refresh in Tableau.	MySQL, PostgreSQL, CSV Flat Files, Excel (.xlsx)

7	**Cloud / File Storage**	Tableau extracts (.hyper files) stored on local filesystem or cloud drives. Published workbooks hosted on Tableau Public or Tableau Cloud for sharing and collaboration.	Local Filesystem, Google Drive, Tableau Public Cloud, Tableau Cloud (SaaS)
8	**External API / Data Feed**	Social media sentiment APIs for real-time consumer trend monitoring. Review platform APIs to pull product ratings and feedback for sentiment analysis in Tableau.	Twitter / X API, Sephora Reviews API, Google Trends (CSV Export), Kaggle API
9	**Performance Testing**	Dashboard load time testing, query execution optimization, extract size reduction. Ensures dashboards render under 3 seconds with full cosmetics dataset loaded.	Tableau Performance Recorder, Tableau Server Admin Views, SQL EXPLAIN / Query Profiler
10	**Machine Learning / Predictive**	Time-series forecasting for trend prediction (Scenario 3). Tableau's built-in forecast model extended with Python integration for advanced regression and clustering of consumer segments.	Tableau Forecast (built-in), Python (Scikit-learn, Prophet), Tableau TabPy Integration
11	**Infrastructure (Server / Cloud)**	Local system for development and testing. Published to Tableau Public for sharing. Tableau Cloud as scalable deployment option for enterprise stakeholder access. Local: Windows 10/11, 16GB RAM, i7 processor Cloud: Tableau Cloud (formerly Tableau Online) SaaS subscription	Local Machine (Windows), Tableau Public (free hosting), Tableau Cloud (enterprise option)

D Table 2 — Application Characteristics

S.No	Characteristics	Description	Technology
1	**Open-Source Frameworks**	The project leverages open-source Python libraries for data preparation, analysis, and ML integration. Tableau Desktop has a free Public edition. All supporting tools have open-source alternatives.	Python, Pandas, NumPy, Scikit-learn, Prophet (Meta), Matplotlib, Seaborn, Jupyter Notebook
2	**Security Implementations**	Data access controlled through Tableau Server row-level security. Published dashboards use permission-based access. Sensitive consumer data anonymized before loading. HTTPS enforced on all Tableau Cloud endpoints.	Tableau Row-Level Security, HTTPS / TLS 1.3, Data Anonymization, Role-Based Access Control (RBAC)
3	**Scalable Architecture**	Three-tier architecture: data source layer (databases/APIs), processing layer (Tableau Prep + Python), and presentation layer (Tableau dashboards). Supports horizontal scaling via Tableau Cloud's multi-node server infrastructure.	3-Tier Architecture, Tableau Cloud Multi-Node, Python Microservices, Modular Workbook Design
4	**Availability**	Tableau Public provides 99.9% uptime SLA for public dashboards. Tableau Cloud offers enterprise-grade availability with load balancing and distributed processing. Extracts scheduled for off-peak refresh to minimize downtime.	Tableau Cloud SLA (99.9%), Scheduled Extract Refresh, Distributed Tableau Server Nodes
5	**Performance**	Tableau extract (.hyper) used instead of live connection for optimal render speed (<3 sec target). Aggregated data sources reduce query load. Dashboard actions replace filter-heavy designs. Performance Recorder used to identify bottlenecks.	Tableau Hyper Extract Engine, Aggregate Extracts, Context Filters, Tableau Performance Recorder, CDN (Tableau Cloud)

E Technology Mapping to Project Scenarios

Scenario 1 *Monitoring Consumer Preferences*	Scenario 2 *Addressing Product Concerns*	Scenario 3 *Predictive Analysis & Innovation*
• Tableau real-time dashboard filters • Consumer interest trend line charts • Sentiment heatmaps by category • Automated threshold alerts • Twitter API for social signal feed • Tableau Actions for drill-down	• Review aggregation pipeline (Python) • NLP sentiment scoring on complaints • Ingredient safety flag dashboard • Recall readiness severity scoring • Sephora / brand reviews API ingestion • Tableau Story for crisis communication	• Prophet time-series forecasting model • TabPy Python integration in Tableau • Innovation white-space heatmap • Trend lifecycle visualizer (Tableau) • Historical data regression (Scikit-learn) • Predictive ROI estimator dashboard