FINAL PROJECT REPORT

Empowering India: Analysing the Evolution of Union Budget Allocations for Sustainable Growth

Submitted by

Team ID: LTVIP2026TMIDS24962

Team Leader:
Maddi Ganesh

Team Members:
Satwik Vemuri
Sobha Vinay Babu Merugumala
Polimetla Naveen Kumar

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Contents

1 Introduction

1.1 Project Overview

India's Union Budget is a comprehensive financial plan presented annually by the Government of India, outlining its revenue and expenditure for the upcoming fiscal year (April 1st to March 31st). This project, titled **"Empowering India"**, focuses on analyzing the Union Budget allocations from fiscal years 2021-2022 to 2023-2024.

Against the backdrop of significant global and domestic challenges, including the COVID-19 pandemic, these budgets reflect India's aspirations to emerge as one of the world's leading economies. The project utilizes data analytics to visualize how funds are allocated to revitalize the economy, foster inclusive growth, and enhance resilience across various sectors.

1.2 Purpose

The primary purpose of this project is to decode complex financial data into actionable insights for specific stakeholders. The budget covers allocations across various sectors and ministries, aiming to address the country's socio-economic needs. We have identified three key scenarios where this analysis is critical:

- **Scenario 1 (Renewable Energy):** A tech startup specializing in renewable energy solutions wants to expand its operations and invest in R&D. They need to explore government support mechanisms and funding constraints.

- **Scenario 2 (Electric Vehicles):** A manufacturing company specializing in EVs aims to ramp up production. They are interested in understanding government policies and incentives supporting the EV industry.

- **Scenario 3 (Healthcare):** A prominent pharmaceutical company is poised to expand its healthcare portfolio. Recognizing the critical role of government funding, they seek a comprehensive analysis to inform strategic decisions.

2 Ideation Phase

2.1 Problem Statement

The Core Problem: Stakeholders in niche sectors (Energy, Auto, Pharma) struggle to extract relevant funding trends from the massive, unstructured volume of Union Budget documents.

How Might We (HMW): *"How might we transform the complex, tabular data of the Indian Union Budget into an interactive, visual format so that stakeholders can easily identify funding opportunities and trends?"*

2.2 Empathy Map Canvas

To better understand our users (e.g., The Startup Founder), we developed the following Empathy Map:

THINK & FEEL	HEAR
- "Is the government actually prioritizing my sector?" - "I hope I don't miss application deadlines." - "This financial jargon is confusing."	- Competitors getting grants. - News anchors discussing "Capex boosts". - Investors asking about "Policy Support".
SEE	**SAY & DO**
- 500-page PDF documents. - Complex Excel sheets. - Twitter threads summarizing the budget.	- Searches "Budget 2024 Solar Grants". - Manually copies numbers to Excel. - Complains about unstructured data.

Pain Points: Wasting hours searching for specific schemes; Misinterpreting estimates as actuals.

Gain Points: Instant visualization of sector-wise allocation; Ability to filter by Ministry.

2.3 Brainstorming Prioritization

During the brainstorming session, the team generated the following ideas, prioritized using the Impact vs. Feasibility matrix:

- **High Priority (Do Now):**
    - Create Tableau Dashboards for "Actuals vs Estimates".
    - Implement Ministry-wise filters.
    - Integrate into a Flask Web Application.

- **Medium Priority (Plan):**

- **Low Priority (Drop):** User Login System (Complexity not required for MVP).

3 Requirement Analysis

3.1 Customer Journey Map

Persona: Arjun, Renewable Energy Startup Founder.
Goal: Find grants for Green Hydrogen.

Stage	Activities	Emotions	Touchpoints
1. Entice	Hears news about "Green Growth". Searches Google.	Curious, Hopeful	Google Search, News Sites
2. Enter	Lands on "Empowering India" Dashboard.	Relieved (Clean UI)	Web Browser, Flask App
3. Engage	Filters by "Ministry of Renewable Energy". Drills down to schemes.	Focused	Tableau Filters, Tooltips
4. Exit	Finds the specific allocation chart. Downloads the view.	Satisfied	Download Button
5. Extend	Uses the chart in Investor Pitch Deck.	Confident	PDF/Image Export

3.2 Solution Requirements

3.2.1 Functional Requirements (FR)

1. **FR-1 Data Visualization:** System must generate Treemaps, Bar Charts, and Scatter plots.

2. **FR-2 Interactive Filtering:** Users must be able to filter data by "Ministry" and "Fiscal Year".

3. **FR-3 Comparison:** System must compare "Actuals" (2021) vs "Estimates" (2024).

4. **FR-4 Web Access:** Dashboard must be embedded in a Flask Web Application.

3.2.2 Non-Functional Requirements (NFR)

1. **NFR-1 Usability:** Responsive design for Desktop and Tablet.

2. **NFR-2 Performance:** Dashboard load time under 3 seconds.

3. **NFR-3 Accuracy:** Data must match the Official Union Budget CSVs.

3.3 Data Flow Diagram (DFD)

The system follows a linear data flow:

1. **Source:** Kaggle Dataset (CSV).

2. **Storage:** MySQL Database (Data Validation Storage).

3. **Processing:** Tableau Public (Data Modeling Visualization).

4. **Presentation:** Flask Application (HTML/Bootstrap UI).

3.4   Technology Stack

Layer	Technology	Description
Frontend	HTML5, CSS3	Responsive Web UI
Backend	Python Flask	Server-side rendering
Visualization Dashboards	Tableau Public	Charts
Database	MySQL	Structured Data Storage
Hosting	Tableau Server	Cloud Hosting for Viz

4 Project Design

## 4.1 Problem-Solution Fit

- **Customer Segment:** Startups, Researchers, Policy Analysts.

- **Problem:** Data is buried in 500+ page PDFs; Manual analysis is error-prone.

- **Solution:** A "One-Stop" Dashboard that aggregates and visualizes multi-year data.

- **Unique Value Proposition:** Combines historical "Actuals" with future "Estimates" in a unified Story format.

4.2 Proposed Solution

The proposed solution is a **Web-Integrated Dashboard System**.

1. **Data Ingestion:** Raw CSV files are cleaned and imported into Tableau.

2. **Visualization Logic:** Calculated fields are created for "Total Budget" (Revenue + Capital).

3. **Embedding:** The Tableau Story is embedded into a custom HTML page served by Flask.

4.3 Solution Architecture
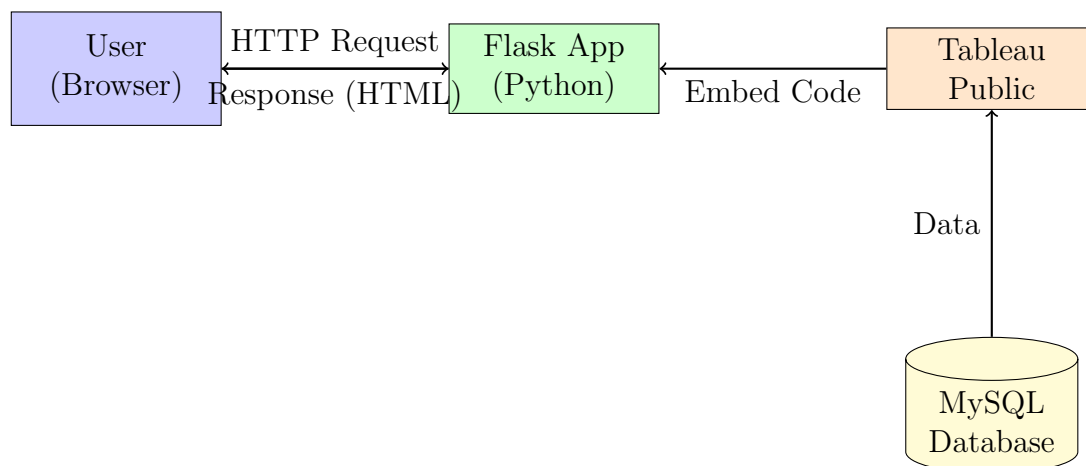
5 Project Planning Scheduling

5.1 Sprint Schedule

The project was executed in 4 Sprints.

Sprint	Focus	Tasks (User Stories)	Status
Sprint-1	Data Eng.	US-01: Collect Union Budget CSV. US-02: Clean data & load to MySQL.	Completed
Sprint-2	Visualization	US-03: Create "Top 5 Schemes" Chart. US-04: Create "Department Wise" Chart.	Completed
Sprint-3	Dashboarding	US-05: Build Interactive Dashboard. US-06: Create Tableau Story.	Completed
Sprint-4	Integration	US-07: Develop Flask App. US-08: Integration & Testing.	Completed

5.2 Velocity Calculation

Total Story Points: 42.
Number of Sprints: 4.
Average Velocity: 10.5 Points / Sprint.

6 Functional and Performance Testing

6.1 Performance Testing Results

No	Parameter	Observation
1	Data Rendered	Successfully rendered 3 years of fiscal data (2021-2024).
2	Filter Latency	Dashboard updates in < 2 seconds when Ministry filter is applied.
3	Visualization Count	7 Visualizations loaded simultaneously without lag.
4	Data Integrity	Validated "Total Budget" calculation against official PDF totals.

6.2 User Acceptance Testing (UAT)

- **Test Case 1 (Registration/Access):** Passed. User can access the Flask local server.

- **Test Case 2 (Filtering):** Passed. User can isolate "Ministry of Railways".

- **Test Case 3 (Responsiveness):** Passed. UI adapts to window resizing.

7 Results

7.1 Visualizations Output

The project successfully generated the following 7 critical visualizations:

1. **Top 5 Schemes 2021-2022:** A Treemap highlighting major spending in Food Subsidy and MGNREGA.

2. **Budget Estimation (Category Wise):** Comparison of Revenue vs Capital expenditure.

3. **Budget Estimation (Department Wise):** Bar charts showing Defence and Railways dominance.

4. **Budget Estimation (Scheme Wise):** Trend analysis of specific schemes.

5. **Top 5 Ministry Wise (2021-2022):** Bubble chart of top spenders.

6. **Total Amount Invested:** KPI Card showing the Grand Total.

7. **Total Budget (Category Wise):** Scatter plot for distribution analysis.

7.2 Dashboard Integration

The dashboards were integrated into the Flask application, providing a seamless user experience. The "Story" feature in Tableau was utilized to guide the user from historical actuals (2021) to future estimates (2024).

8 Advantages & Disadvantages

8.1 Advantages

- **Interactivity:** Unlike static PDF reports, this dashboard allows deep-diving into specific data points.

- **Accessibility:** Web-based deployment ensures access from any device with a browser.

- **Clarity:** Visual storytelling makes complex financial data understandable for non-experts.

- **Scalability:** The architecture supports adding data for future fiscal years (e.g., 2025-2026) easily.

8.2 Disadvantages

- **Dependency:** Relies on Tableau Public server availability.

- **Data Staticity:** The current version uses a static CSV; real-time updates from government APIs are not yet implemented.

9   Conclusion

The "Empowering India" project successfully demonstrates the power of data analytics in public governance. By transforming the Union Budget into an interactive visual story, we have bridged the gap between complex government data and public understanding.

The tool effectively serves its purpose for Startups, Researchers, and Policymakers, enabling them to make data-driven decisions regarding R&D investments and policy planning. The integration of Flask and Tableau provides a robust, scalable platform for financial analysis.

10 Future Scope

- **Real-Time API Integration:** Automate data fetching directly from 'indiabudget.gov.in'.

- **Predictive Analytics:** Use Machine Learning to forecast budget trends for the next 5 years based on historical patterns.

- **Sentiment Analysis:** Integrate Twitter/News sentiment analysis to correlate budget announcements with public reaction.

- **Mobile App:** Develop a native mobile application for better accessibility.

11 Appendix

11.1 A. Dataset Link

https://www.kaggle.com/datasets/prasenjitsharma/indian-union-budget-fy-21-22-till-23-

11.2 B. Source Code

app.py (Flask Backend)

```python
from flask import Flask, render_template

app = Flask(__name__)

@app.route('/')
def home():
    return render_template('app.html')

if __name__ == '__main__':
    app.run(debug=True)
```

templates/app.html (Frontend)

```html
<!DOCTYPE html>
<html>
<head>
    <title>Union Budget Analysis Dashboard</title>
</head>
<body>

<h1>Union Budget Analysis Dashboard</h1>

<div class='tableauPlaceholder' id='viz'></div>

<script type='text/javascript'>
  var divElement = document.getElementById('viz');
  var vizElement = document.createElement('iframe');
  // Tableau Public Embed Link
  vizElement.src = "https://public.tableau.com/views/
    Union_Budget_Analysis_17703901115830/Story1?:showVizHome=no&:embed=
    true";
  vizElement.width = "100%";
  vizElement.height = "800";
  vizElement.frameBorder = "0";
  divElement.appendChild(vizElement);
</script>

</body>
</html>
```