ABSTRACT

This project focuses on visualizing housing market trends using Tableau to simplify complex real estate data and uncover meaningful insights. Housing data often includes numerous features like sale price, location, number of rooms, square footage, and year built—making manual analysis difficult for most users. By leveraging Tableau's powerful visualization capabilities, this project transforms raw data into interactive dashboards that highlight patterns and relationships within the housing market.

The analysis includes time-based pricing trends, regional comparisons, and correlations between property features and sale prices. Users can explore the data through filters such as location, price range, and property size, allowing for a customized and insightful experience. The project supports real estate stakeholders—including buyers, sellers, and analysts—by providing a clear, datadriven view of market dynamics.

Visual tools such as heatmaps, bar graphs, and line charts make it easier to identify trends and outliers quickly. While the solution is highly informative, it also faces challenges such as data quality issues and performance limitations with large datasets. Overall, the project bridges the gap between raw housing data and actionable insights, enabling smarter, evidence-based decision-making in the real estate sector.

Project Report Format

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    Source Code(if any)

    Dataset Link

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Project Report Format

1. INTRODUCTION

1.1 Project Overview

This project seeks to visualize and examine housing market trends through interactive Tableau dashboards. Through the study of datasets with housing sales prices and corresponding features (e.g., number of bedrooms, square meters, location, year constructed), we reveal dominant patterns driving house prices. The visualizations assist in determining market hotspots, time-series pricing trends, and variability in prices by features. These observations facilitate data-driven decisions among homebuyers, sellers, and real estate agents. The initiative focuses on simple, interactive dashboards that expose high-level trends and detailed information about the housing market

1.2 Purpose

The aim of this project is to visualize and compare major housing market trends using Tableau in order to gain a better idea of how different property characteristics—location, size, number of rooms, etc.—impact prices. By bringing difficult data to life in interactive visualization dashboards, the aim is to deliver actionable insights to buyers, sellers, and real estate analysts to enable smarter decision-making.

2. IDEATION PHASE

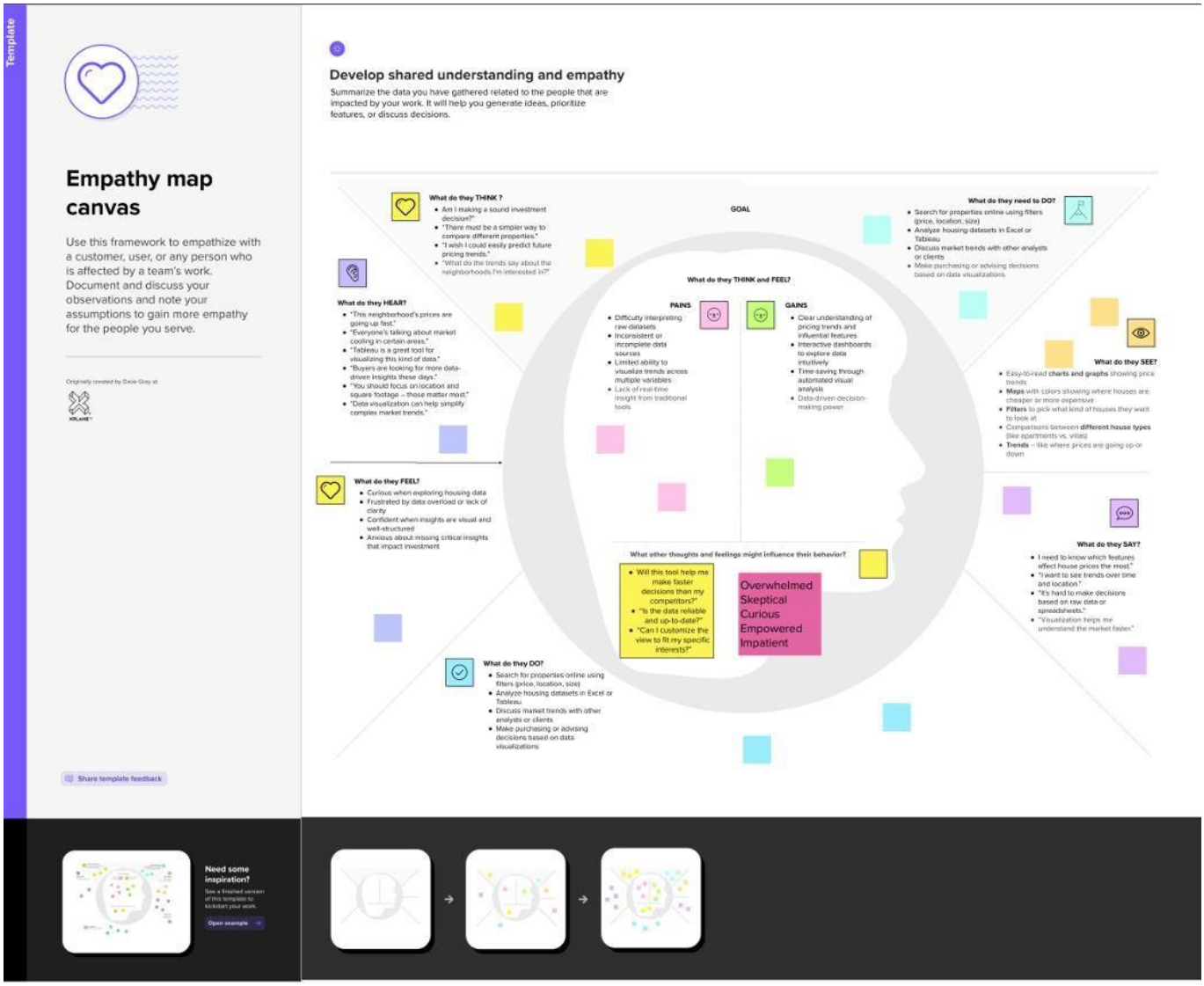
2.1 Problem Statement

The housing market produces a large amount of complex data, which is difficult to interpret without technical skills. Buyers often struggle to judge fair prices, sellers face challenges in setting competitive rates, and analysts need help identifying trends. Current tools lack clarity and visual insight into how home features impact prices. This gap limits smart decision-making in the real estate sector. A visual, interactive solution is needed to simplify and explore these trends effectively

I am	A data-driven homebuyer or real estate investor who values informed decision-making, is time-constrained, and lacks technical skills to process raw data.
I'm trying to	Understand how property features and locations impact sale prices to make confident buying or investment decisions.
But	I find it hard to interpret raw data and correlate different housing features due to lack of visual clarity or missing insights.
Because	The available dashboards are not intuitive, lack interactivity, and often do not reflect up-to-date or easily comparable information.
Which makes me feel	Frustrated, uncertain, and less confident in making a financial decision that could impact my future

2.2 Empathy Map Canvas

Users see property listings, market reports, graphs, maps, and online tools that show housing prices and trends. They often deal with confusing or inconsistent data and rely on visual comparisons to understand the market and make decisions



2.3 Brainstorming

The project will use housing datasets with features like price, location, and size to uncover trends. Key questions include how property features affect pricing and how prices vary by area and over time. Visual tools like heatmaps, bar charts, and filters will make insights clear and interactive. The goal is to support buyers, sellers, and analysts with easy-to-understand dashboards. Challenges may include handling missing data and designing user-friendly visuals**. Step 1: Team Gathering, Collaboration and Select the Problem Statement Participants:**

Kunna Pravallika,Bojanapu Chandanasree,S.Gnana Prasanna,N.Lakshmi subhashini.,

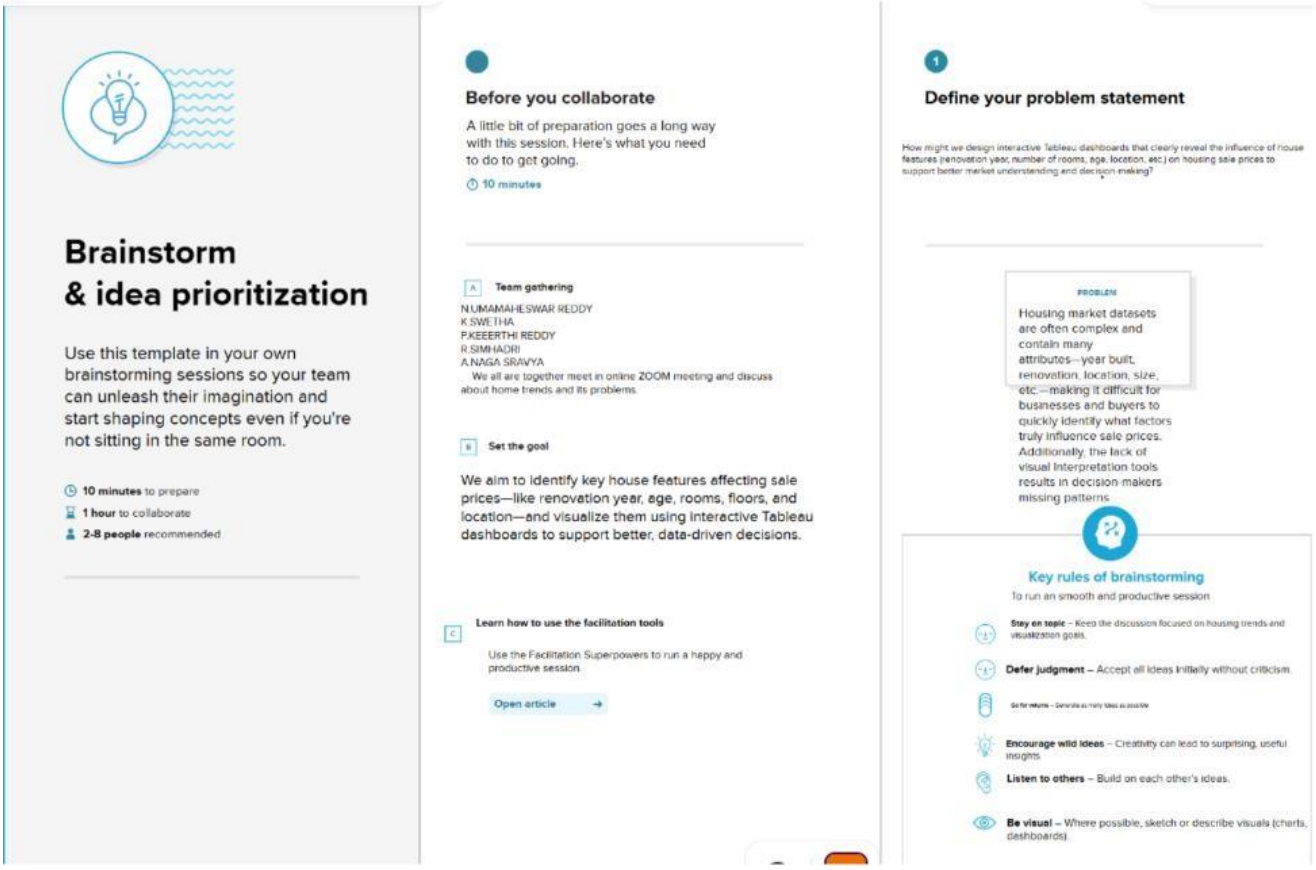
We are all together connect through the ZOOM meeting and discuss about home trends and its problems

Goal:

We aim to identify key house features affecting sale prices-like renovation year, age, rooms, floors, and visualize them using interactive Tableau dashboards to support better, data-driven decisions.

Problem Statement (How Might We…):

How might we design Tableau dashboards that uncover and clearly communicate key factors affecting house sale prices and trends across features like renovation, age, bedrooms, bathrooms, and floors?

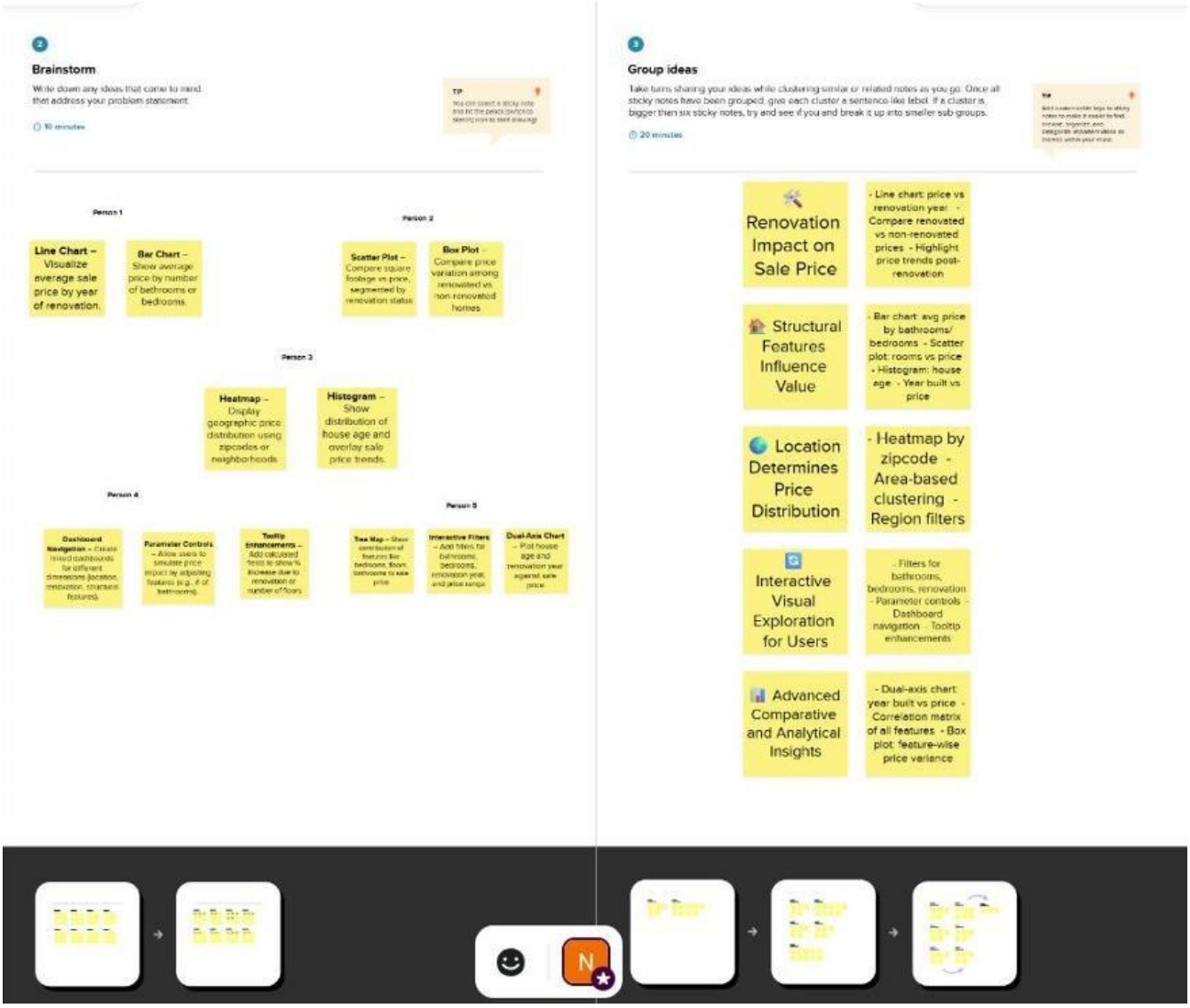


Step-2: Brainstorm, Idea Listing and Grouping:

Ideas List: -

Show average sale price over years since renovation - Correlate number of bathrooms with price - Cluster house age with number of floors - Heatmap of price distribution by zip code - Use filters for bedrooms/floors/bathrooms - Show trend lines by year built - Bar chart: average price by number of bedrooms - Compare renovated vs non-renovated price growth **Grouped Clusters:**

Cluster Theme	Idea
Renovation Impact	Show average price over years since renovation, compare renovated vs not
House Age & Structural Features	Cluster house age with floors, show trend lines by year built
Bathrooms/Bedrooms Impact	Correlate bathroom counts, average price by bedrooms
Location-based Price Analysis	Heatmap by zip code, regional filters
Dashboard Interactivity	Filters, dropdowns, slicers



Step-3: Idea Prioritization

Idea Cluster	Feasibility	Importance	Final Priority
Renovation Impact	High	High	Top Priority
House Age &Structural Features	Medium	High	Priority 2
Bathrooms/Bedrooms Impact	High	Medium	Priority 3
Location-based Price Analysis	Medium	Medium	Optional/ Future Enhancement
Dashboard Interactivity	High	High	Essential – include in all dashboards

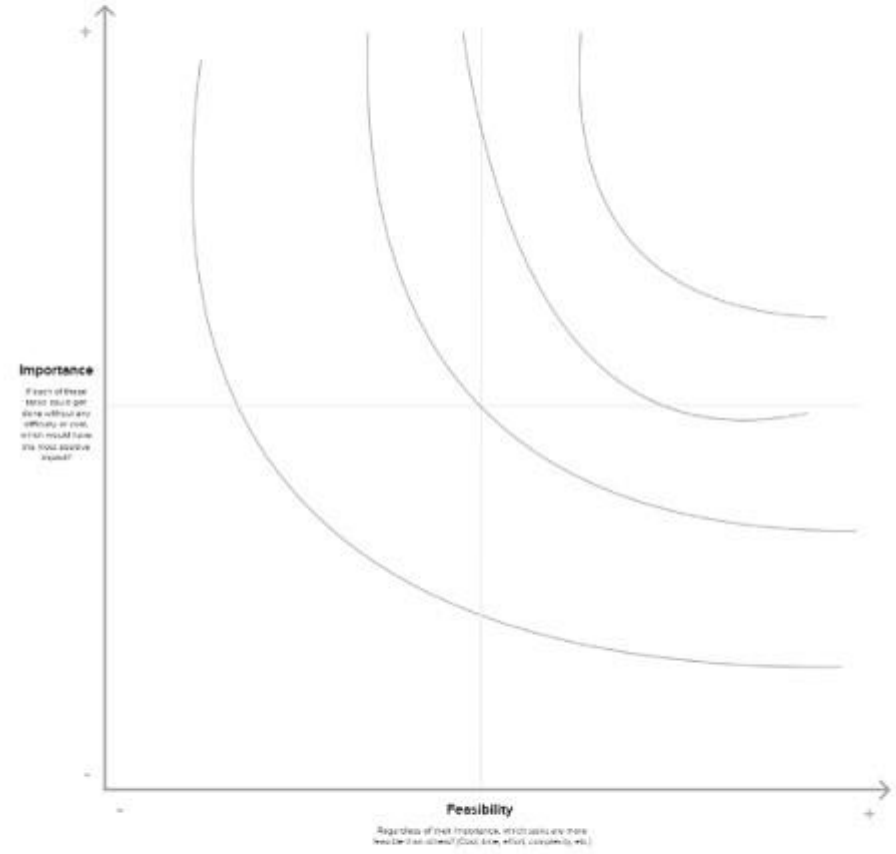
4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

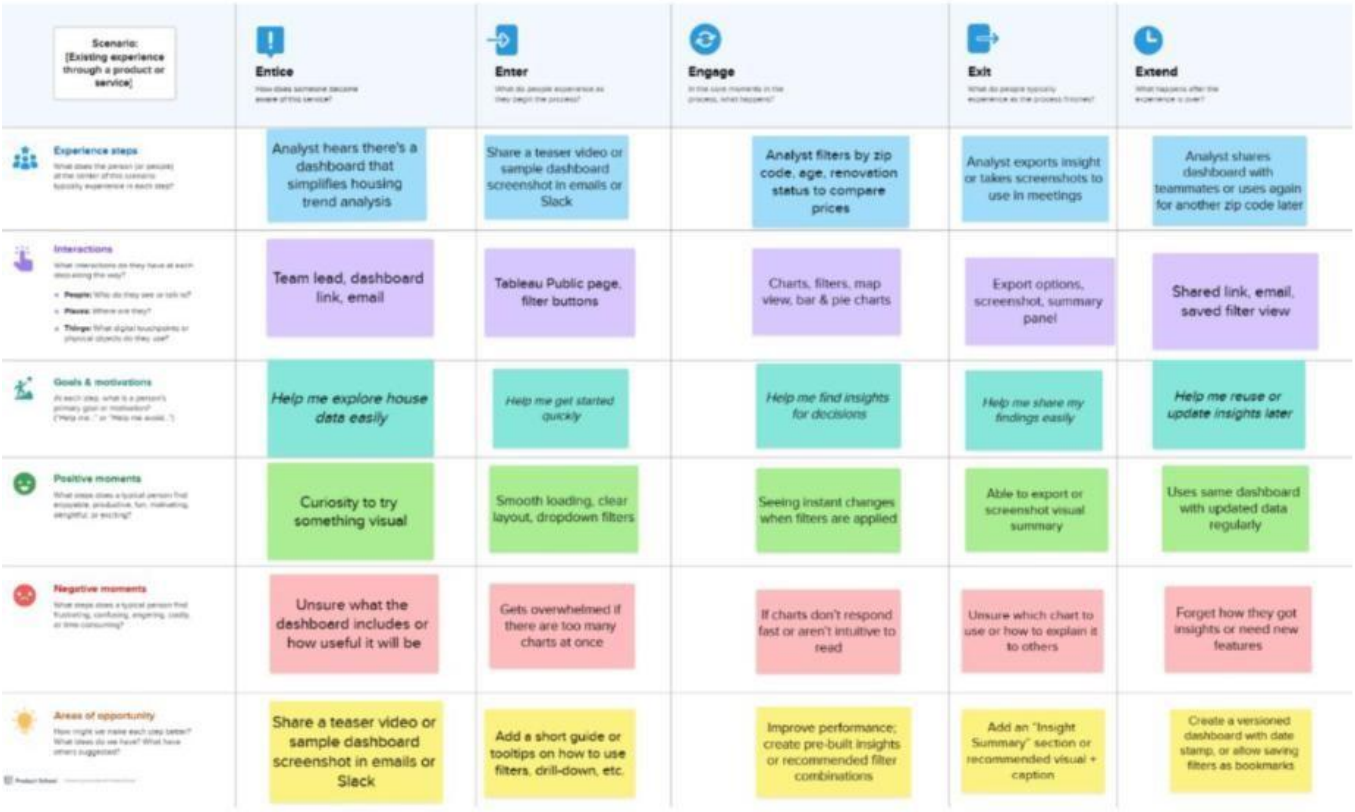
20 minutes

TIP



3 REQUIREMENT ANALYSIS

3.1 Customer Journey map



3.2 Solution Requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR 1	Data Upload	Upload CSV/Excel of housing market data
FR 2	Data Cleaning	Remove missing or inconsistent values
FR 3	Feature Engineering	Add derived metrics (e.g., price/sq. ft)
FR 4	Interactive Visualization	Filter data by region, price range, features
FR 5	Trend Analysis	Time-based trends in housing prices
FR 6	Data Export	Export selected visual insights to image/PDF

Non-Functional Requirements:

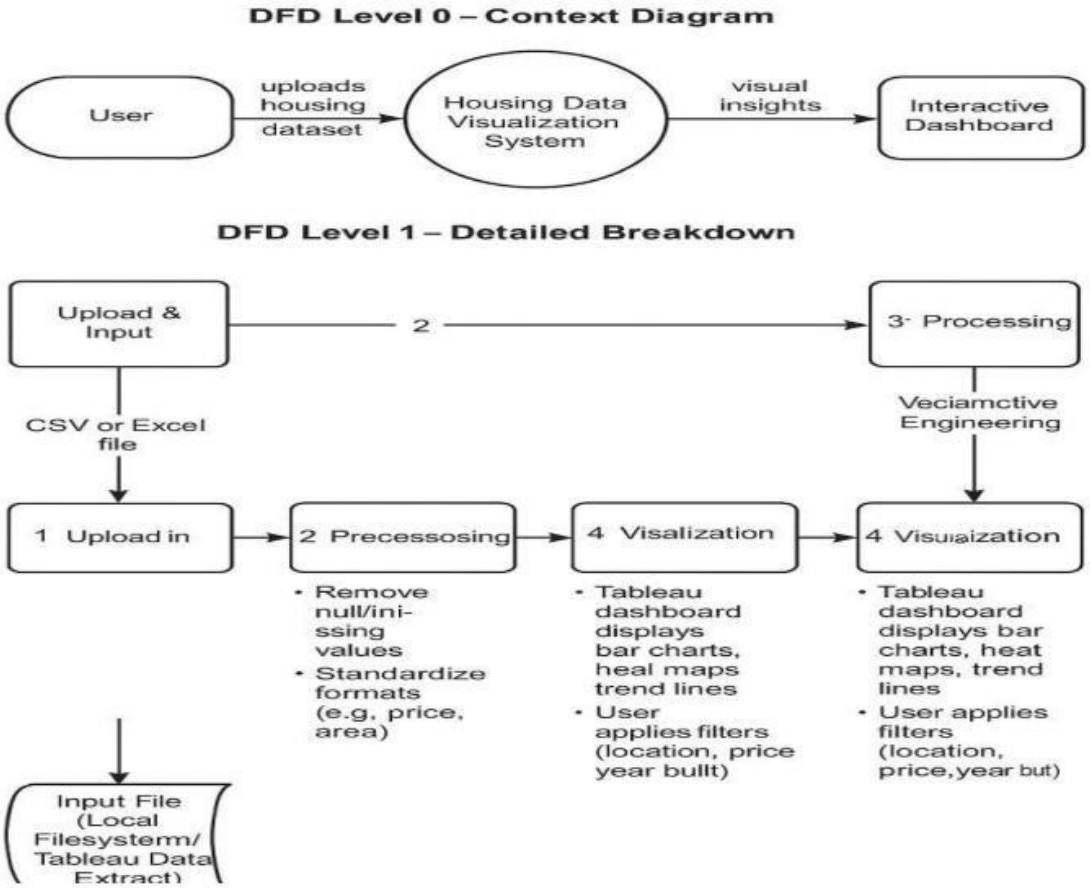
Following are the non-functional requirements of the proposed solution.

NFR NO	Non-Functional Requirement	Description
NFR 1	Usability	The dashboard must be intuitive and simple to use for non-technical users
NFR 2	Security	Local-only access; data not shared externally; no login needed.
NFR 3	Reliability	Should handle file errors and missing data gracefully.
NFR 4	Performance	Should render visualizations for medium datasets (~10,000 records) quickly
NFR 5	Availability	Works offline on local Tableau Desktop software
NFR 6	Scalability	Suitable for scaling up to slightly larger datasets if needed in future

3.3 Data Flow Diagram:

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



DFD Level 0 - Project Overview

- User uploads the housing dataset (CSV/Excel)
- Preprocessing Module (Python) cleans and transforms the data
- Feature Engineering Module adds derived attributes (e.g., price/sq. ft)
- Visualization Layer (Tableau Dashboard) displays trends and insights
- User views or exports filtered insights

DFD Level 1- Detailed Process

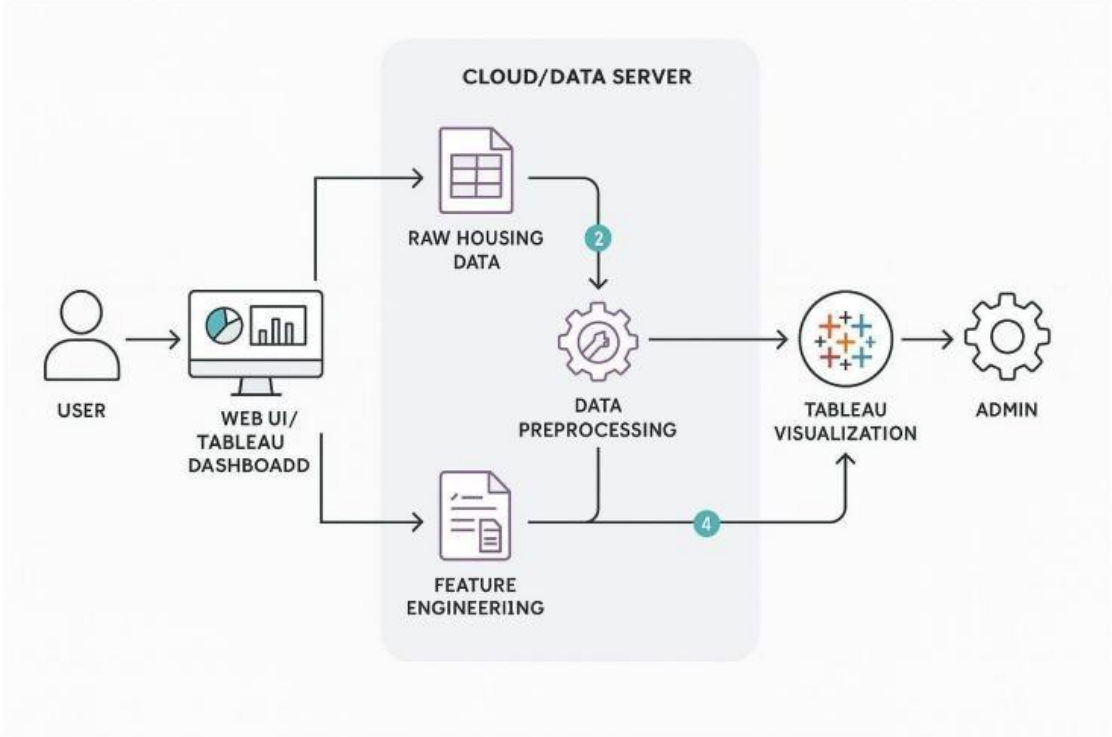
- Data Upload → File Validation → Missing Value Handling
- Data Transformation → Unit Normalization → Column Derivations
- Dashboard → Filters by Region, Price, Bedrooms, etc. → Displays Graphs and Charts

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority / Release
Data Analyst / Student	Data Upload	USN-1	As a user, I can upload a housing dataset in CSV/Excel format	Dataset successfully uploaded and ready for processing	High / Sprint-1
Data Analyst / Student	Data Preprocessing	USN-2	As a user, I can clean data and remove missing entries	Data cleaned with no missing/null values	High / Sprint-1
Data Analyst / Student	Feature Engineering	USN-3	As a user, I can create new metrics like price per sqft, age of house	Derived fields are generated correctly	High / Sprint-1
End User / Viewer	Visualization Filtering	USN-4	As a user, I can filter housing data by location, price, or bedroom count	Filters apply correctly on dashboard	High / Sprint-2
End User / Viewer	Trend Analysis	USN-5	As a user, I can view charts showing sale price trends over time	Charts show monthly/yearly price trends	High / Sprint-2
End User / Viewer	Export Data	USN-6	As a user, I can export filtered visualizations as images or PDFs	Export works and saves in selected format	Medium / Sprint-3

3.4 Technology Stack:



Technical Architecture:

This project leverages data visualization to analyze housing market trends such as sale prices and housing features using Tableau. It focuses on visual exploration rather than complex machine learning or cloud-native deployments. The architecture is primarily local with support from lightweight scripting and desktop-based tools.

Architecture Diagram Summary:

• User Interface (Tableau Dashboard)- Users interact with visualizations.

• Data Source (Local File Storage) - CSV or Excel files used as input.

• Preprocessing (Python)- Data is cleaned and structured using pandas.

• Feature Engineering (Python or Tableau Prep)- Additional insights generated.

• Visualization Layer (Tableau Desktop / Public) - Interactive dashboards built and published.

• Infrastructure - Local machine for development and deployment.

Table-1: Components & Technologies:

S. No	Component	Description	Technology Used
1	User Interface	Dashboard interface for user interaction	Tableau Public / Tableau Desktop
2	Application Logic-1	Preprocessing logic for housing data	Python (Pandas, NumPy)
3	Application Logic-2	Feature engineering and transformations	Tableau Prep / Python
4	Application Logic-3	Not Used	Not used

5	Database	Raw data storage (optional, using files)	Not used / CSV
6	Cloud Database	Not used in this project	Not used
7	File Storage	For storing CSV/Excel input files	Local Filesystem
8	External API-1	Not used	Not used
9	External API-2	Not used	Not used
10	Machine Learning Model	Not used	Not used
11	Infrastructure	System where the application runs	Local Desktop (Windows/Mac)

Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1	Open-Source Frameworks	Data preprocessing and manipulation	Python (Pandas, NumPy)
2	Security Implementations	No user authentication or cloud data access in current version	Not Applicable
3	Scalable Architecture	Not designed for cloud scale or multiple users	Not Applicable
4	Availability	Local system availability only	Tableau Desktop on personal system
5	Performance	Handles small to medium datasets, processed locally using efficient libraries	Python (Pandas), Tableau Optimizations

4 PROJECT DESIGN

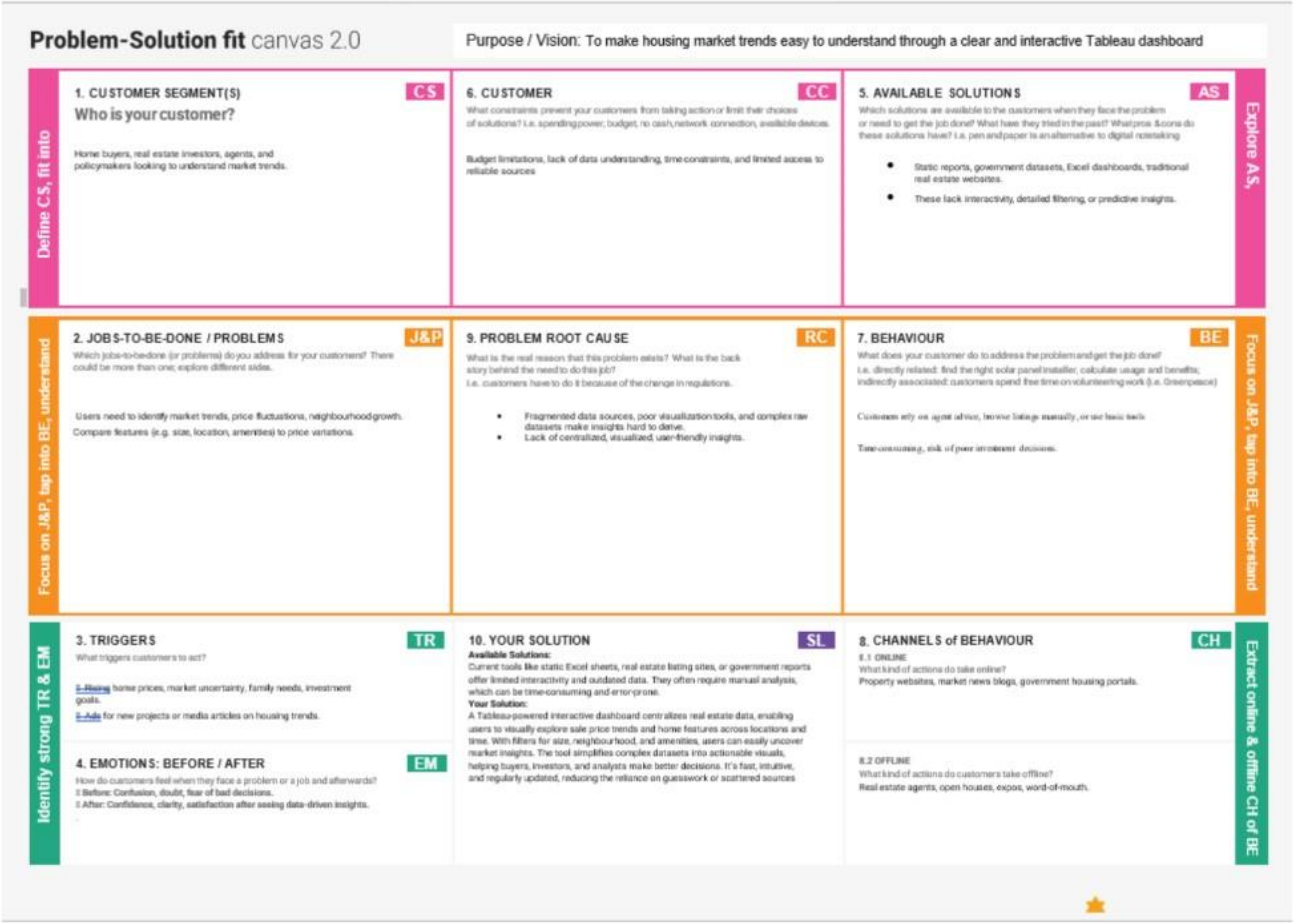
4.1 PROBLEM FIT SOLUTION

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why

Purpose:

- ❑ Solve complex problems in a way that fits the state of your customers.
- ❑ Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.
- ❑ Sharpen your communication and marketing strategy with the right triggers and messaging.
- ❑ Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.
- ❑ **Understand the existing situation in order to improve it for your target group.**

Template:



4.2 Proposed Fit Solution:

Project team shall fill the following information in the proposed solution template.

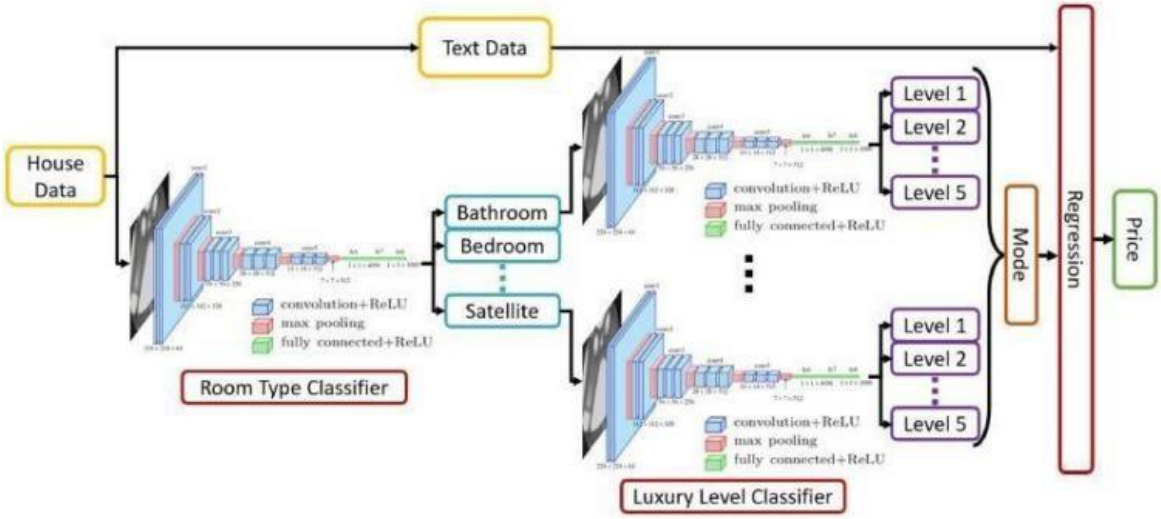
S. No	Parameter	Description
1.	Problem Statement (Problem to be solved)	Understanding and identifying trends in housing market data can be challenging due to the volume and variety of factors such as location, property features, and time. Users lack an intuitive way to interpret how these factors influence housing prices.
2.	Idea / Solution description	This project proposes a data-driven approach using Tableau to visualize housing market trends. The system will enable users to upload datasets, process and clean data using Python, and explore trends through interactive dashboards. This helps users gain insights into pricing patterns, feature impact, and location-based analytics.
3.	Novelty / Uniqueness	The solution uniquely combines data preprocessing in Python with the powerful visual exploration capabilities of Tableau. It offers a no-code experience to users who want to explore complex datasets through simple filters and charts.
4.	Social Impact / Customer Satisfaction	The solution can benefit homebuyers, real estate analysts, and developers by providing transparent and accessible housing market information. It promotes informed decision-making and enhances customer confidence.
5.	Business Model (Revenue Model)	This solution can be offered as a freemium Tableau dashboard tool with optional customization services for real estate firms. Revenue can be generated through consulting, dashboard tailoring, or training packages.
6.	Scalability of the Solution	The system is designed to handle moderately large datasets and can be scaled to integrate APIs for live data or support larger data infrastructure with cloud-based Tableau solutions in the future.

4.3 Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:



5 PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story points	Priority	Team Members
Sprint-1	Data Collection	USN-1	As a user, I can upload a housing dataset in CSV/Excel format	3	High	Nallapu Umamaheswar Reddy
Sprint-1	Data Loading	USN-2	As a user, I can load the dataset into Tableau	2	High	Nallapu Umamaheswar Reddy
Sprint-2	Data Cleaning	USN-3	As a user, I can clean data and remove missing entries	3	High	Nallapu Umamaheswar Reddy.
Sprint-2	Categorical Handling	USN-4	As a user, I can preprocess categorical fields appropriately	3	High	R. Simhadri, K. Swetha
Sprint-3	Dashboard Design	USN-5	As a user, I can view visual summaries of pricing trends	2	High	Naga Sravya. A, P. Keerthi Reddy.
Sprint-3	Feature-based Filtering	USN 6	As a user, I can filter dashboards by price, bedrooms, location, etc.	2	High	Nallapu Umamaheswar Reddy, K. Swetha
Sprint-4	Dashboard Exporting	USN 7	As a user, I can export visuals to images or PDFs	2	High	R. Simhadri, Naga Sravya. A
Sprint-4	Tableau Public Publishing	USN 8	As a user, I can publish dashboards to Tableau Public	1	High	P. Keerthi Reddy, K. Swetha

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date	Story Points Completed (as on planned date)	Sprint Release Date (Actual)
Sprint-1	5	2 Days	22 June 2025	23 June 2025	5	21 June 2025
Sprint-2	5	2 Days	22 June 2025	23 June 2025	5	23 June 2025
Sprint-3	5	2 Days	24 June 2025	25 June 2025	5	25 June 2025
Sprint-4	5	1 Day	26 June 2025	26 June 2025	5	26 June 2025
Sprint-5	5	1 Day	27 June 2025	27 June 2025	5	27 June 2025

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

Average velocity=5+5+5+5+5/2+2+2+1+1=25/8=3.12 Story points/day (rounded) Final

average team velocity=3.1 points / day

Burndown Chart

A burndown chart visually represents the remaining work versus time.

You can manually plot this based on the dates and story point progression above using tools like Excel or Google Sheets**.**

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Model Performance Testing

Project team shall fill the following information in model performance testing template:

S. No	Parameter	Screenshot / Values
1	Data Rendered	Housing dataset with columns: Saleprice, Bedrooms, Bathrooms, YearBuilt, YearRenovated, etc.
2	Data Preprocessing	Cleaned missing values, derived fields: HouseAge, IsRenovated, YearsSinceRenovation
3	Utilization of Filters	Filters used: Year Built, Renovation Status, Bedrooms, Bathrooms, Sale Price Range
4	Calculation fields Used	HouseAge = 2025 - YearBuilt; IsRenovated = IF YearRenovated > 0 THEN "Yes" ELSE "No"
5	Dashboard design	No of Visualizations / Graphs - 4 (KPI Overview, Sales by Renovation, Pie Chart by Age & Renovation, Grouped Bar by Features)
6	Story Design	No of Visualizations / Graphs - 4 (Organized into interactive dashboard layout)

7. RESULTS

7.1 Output Screenshots

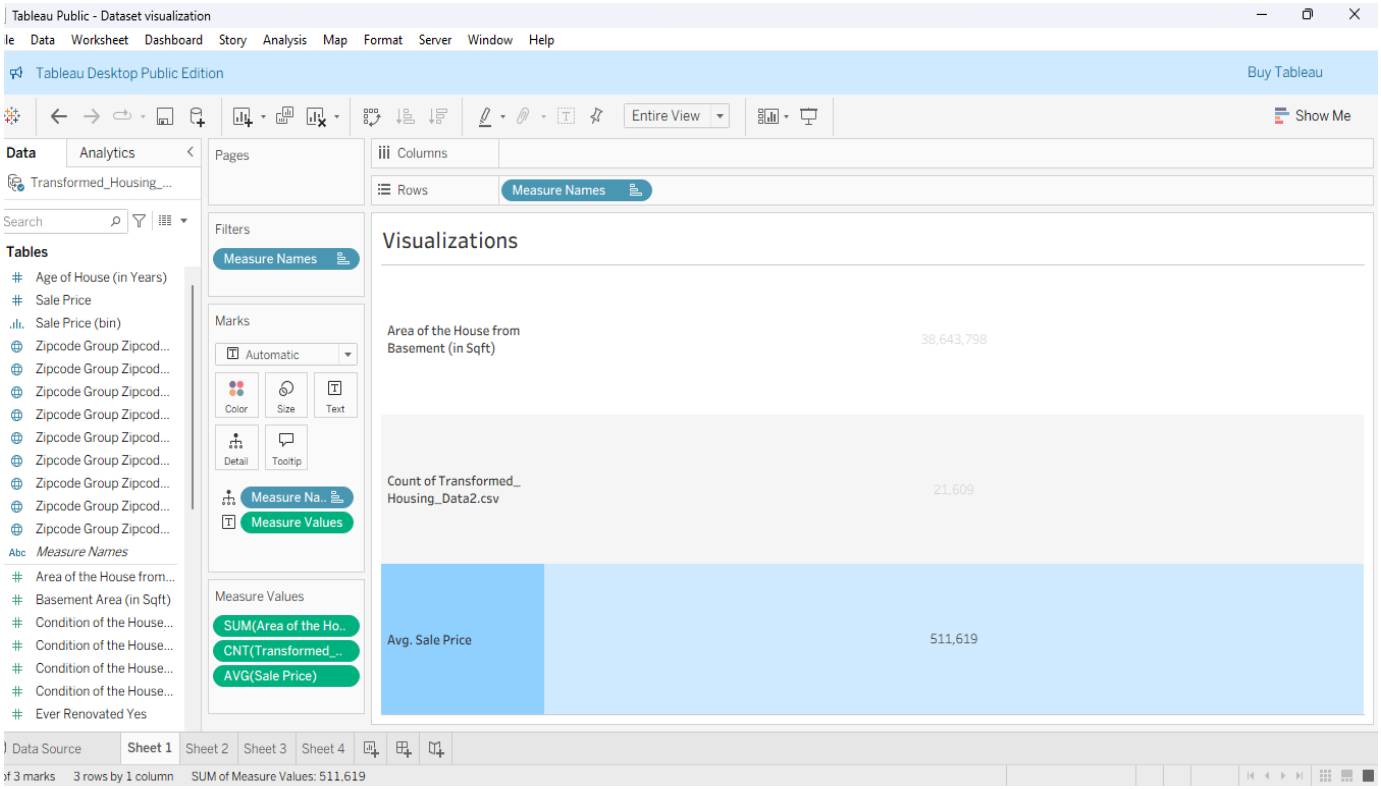


Fig 1: Overall Housing Data Overview.

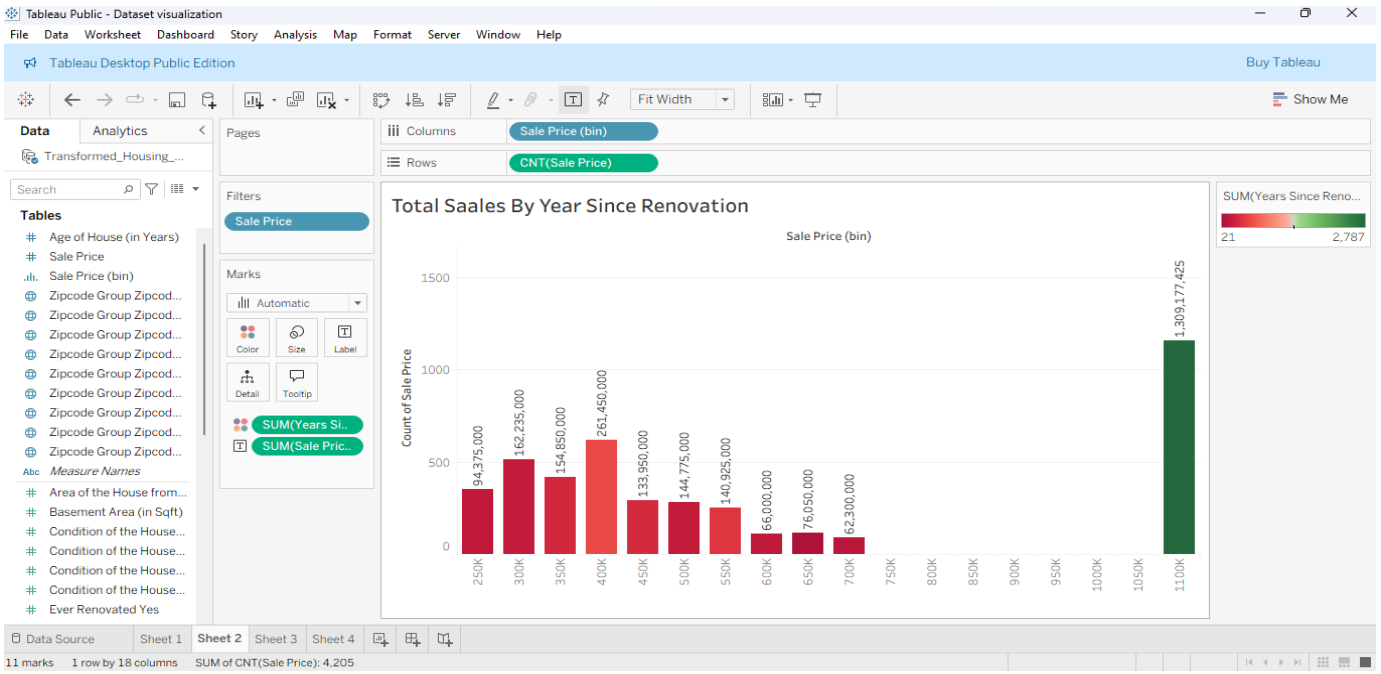


Fig 2: Total Sales by Years Since Renovation

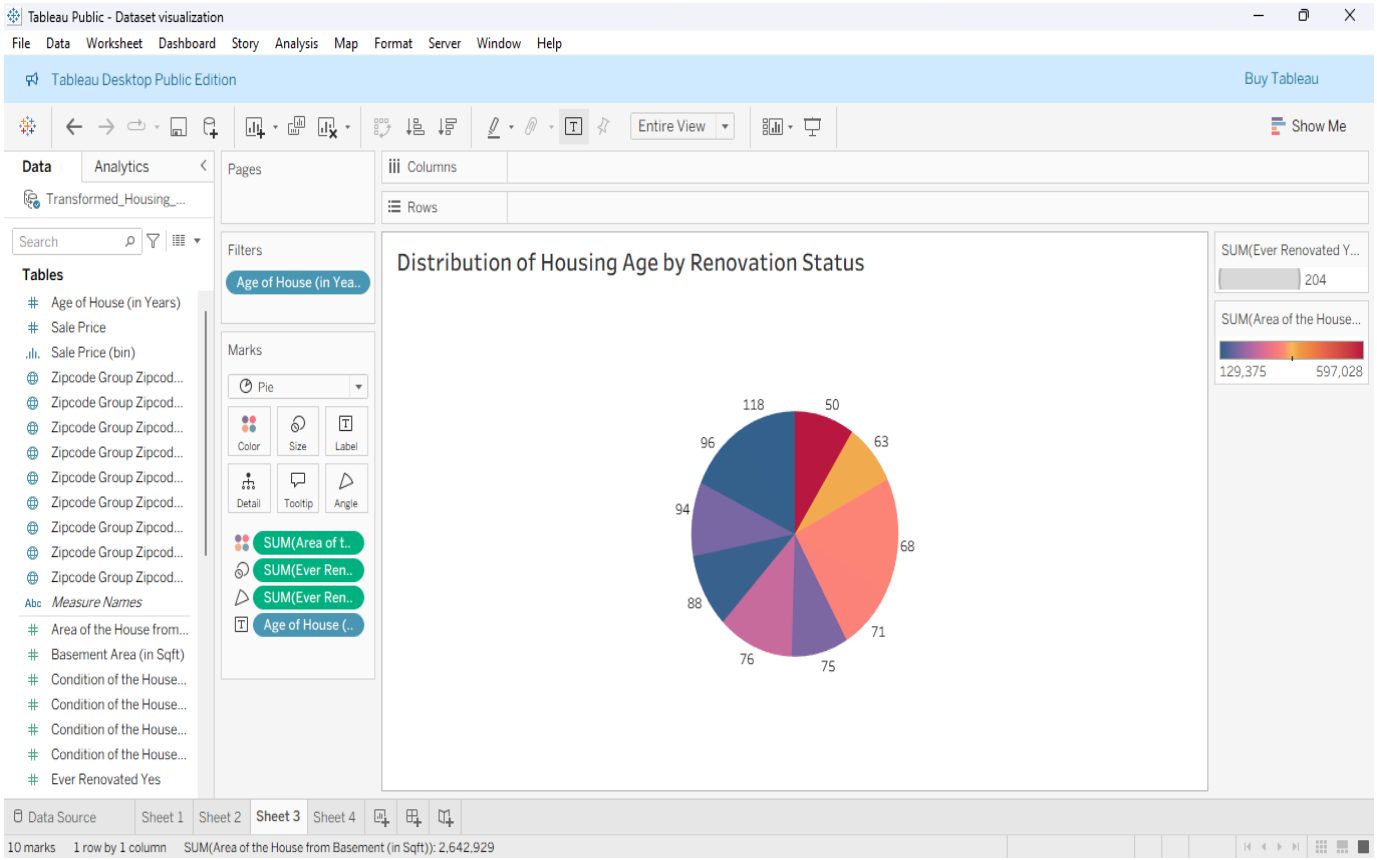


Fig 3 Distribution of House Age by Renovation Status

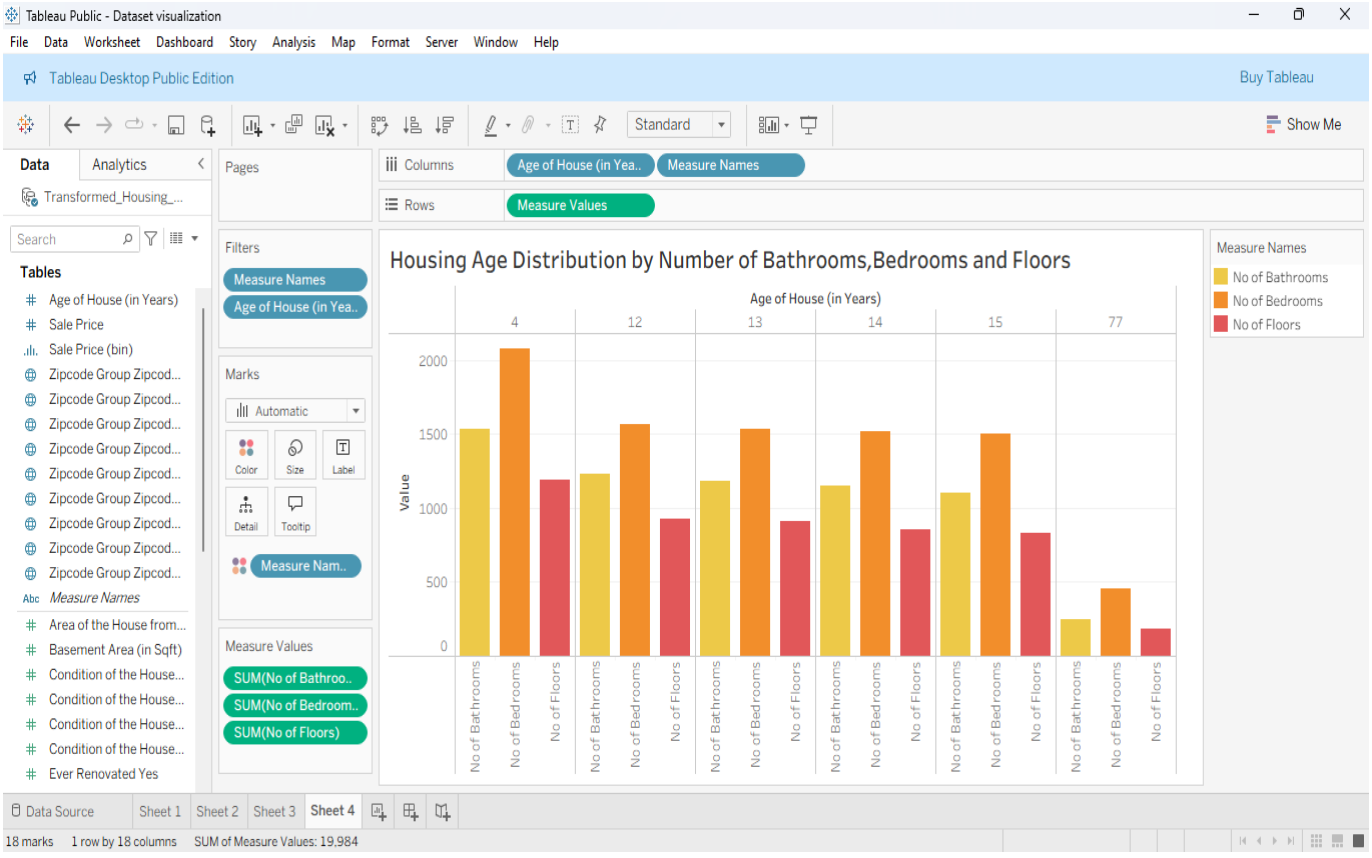


Fig 4 - House Age Distribution by Number of Bathrooms, Bedrooms, and Floors

8. Advantages & Disadvantages:

8.1 Advantages

1. Easy to Understand – Visual dashboards make complex housing data easier for non-technical users to interpret.
2. Quick Insights – Users can instantly spot trends and patterns using filters, maps, and charts.
3. Better Decision-Making – Buyers and sellers can make informed decisions based on data-driven insights.
4. Customizable Views – Tableau allows interactive filtering by location, time, or property features.
5. Professional Appeal – Useful for real estate professionals and analysts for presentations or reports.

Disadvantages

1. Data Quality Issues – Incomplete or outdated data can affect accuracy.
2. Tool Limitation – Tableau requires a learning curve and may have limited free version features.
3. Performance Concerns – Large datasets may slow down dashboard responsiveness.
4. Dependence on Visualization – Users may rely on visuals without understanding deeper statistical relationships.
5. Access Restrictions – Not everyone may have access to Tableau software or licenses.

9. CONCLUSION

This project successfully demonstrates how interactive data visualization can simplify complex real estate data and make housing market trends more accessible. By using Tableau, we analyzed key property features that impact sale prices and revealed patterns across time and location. The dashboards offer clear, actionable insights for homebuyers, sellers, and market analysts. Overall, the solution enhances understanding, supports smarter decision-making, and bridges the gap between raw housing data and meaningful interpretation.

10. Future scope

- Incorporate Real-Time Data – Integrate APIs or live data feeds to provide up-to-date market trends and price changes.
- Predictive Analytics – Apply machine learning models to forecast future housing prices based on current trends.
- Expand to Rental Market – Include rental listings and trends to serve a broader audience.
- Mobile-Friendly Dashboards – Optimize dashboards for mobile users to increase accessibility.
- User Personalization – Allow users to customize views based on preferences like location, budget, or property type.
- Integration with External Tools – Connect Tableau dashboards with platforms like CRM or real estate listing sites for seamless workflow.

11. APPENDIX

11.1 Dataset

Visualizing Housing Market Trends An Analysis of Sale Prices and Features using Tableau

https://www.kaggle.com/datasets/rituparnaghosh18/transformed-housing-data-2

11.2 GitHub:

https://github.com/PRAVALU/Visualizing-Housing-Market-Trends-An-Analysisof-Sale-Prices-and-Features-using-Tableau-