

Final Report

1. INTRODUCTION

1.1 Project Overview

This project titled "Visualizing Housing Market Trends: An Analysis of Sale Prices and Features using Tableau" focuses on understanding how different housing attributes like renovations, number of bedrooms/bathrooms, and house age impact sale prices. Using Tableau, the project presents a dynamic, user-friendly dashboard to assist stakeholders in making data-driven decisions in the real estate market.

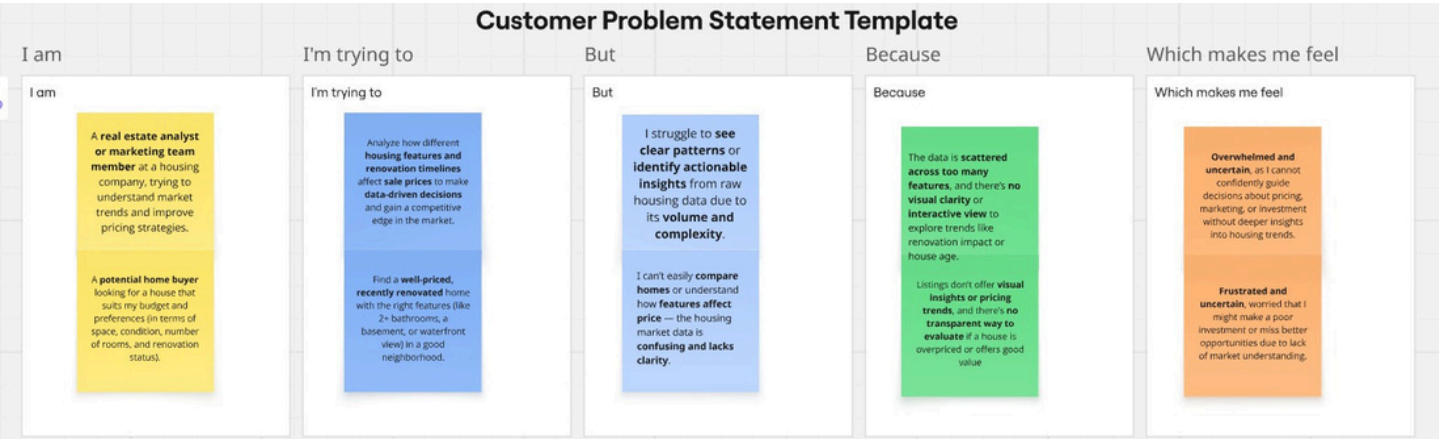
1.2 Purpose

The purpose is to simplify housing data analysis through interactive visualizations, aiding buyers, sellers, and analysts to identify trends, justify pricing, and improve marketing strategies using insights from historical housing data.

2. IDEATION PHASE

2.1 Problem Statement

Real estate analysts and potential homebuyers struggle to interpret raw housing data due to its complexity and lack of visual clarity. The absence of interactive views makes it difficult to evaluate the effect of features like renovation timelines or house age on sale prices. This leads to uncertainty in pricing, marketing, and investment decisions.



2.2 Empathy Map Canvas

Goals & Motivations: Discover housing trends, justify renovation ROI, segment homes, build reports.
Positive Moments: Inspired by visuals, spot patterns, present insights, reuse dashboards.
Negative Moments: Dashboard complexity, chart lag, confusion in KPIs.
Interactions: Login to Tableau, apply filters, export visuals, refer in meetings.
Opportunities: Simplify visuals, improve legends, ensure fast responses.



Empathy map canvas

Use this framework to empathize with a customer, user, or any person who is affected by a team's work. Document and discuss your observations and note your assumptions to gain more empathy for the people you serve.

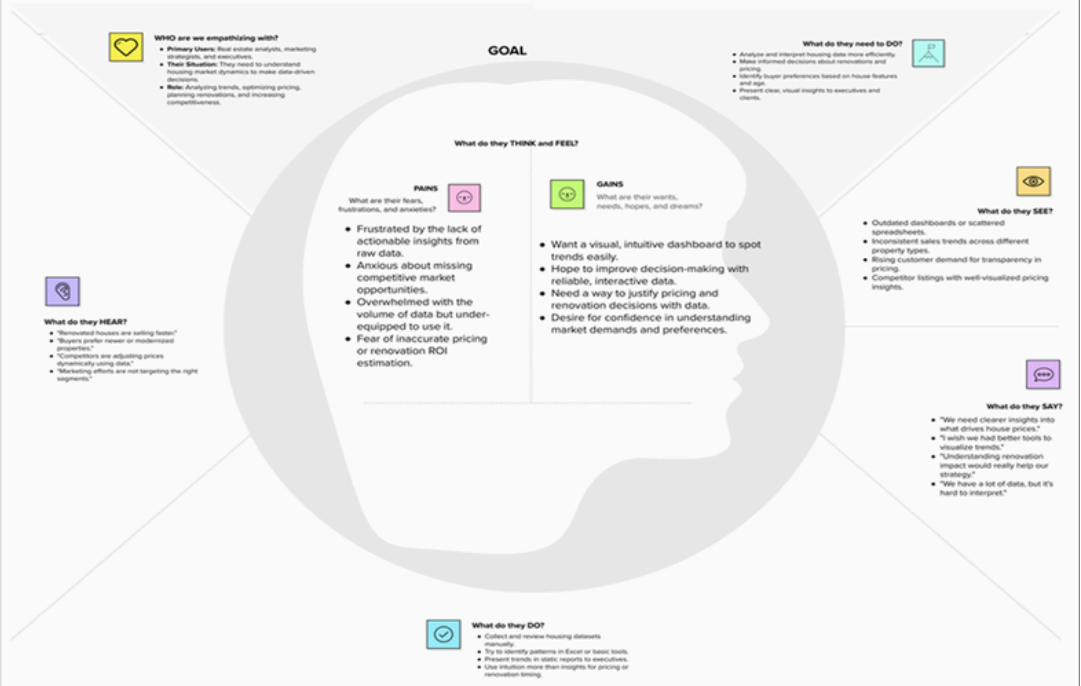
Originally created by Dave Gray at



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Develop shared understanding and empathy

Summarize the data you have gathered related to the people that are impacted by your work. It will help you generate ideas, prioritize features, or discuss decisions.



2.3 Brainstorming

Ideas generated revolved around using Tableau for an interactive dashboard, integrating filters for house features, and comparing renovations and age impacts. The problem was refined through team collaboration, with a solution focusing on accessibility, clarity, and actionable insights.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Customers begin with limited awareness, face difficulty understanding visual tools, and desire actionable insights. By engaging with the dashboard, they explore trends, generate reports, and seek to reuse insights for planning. Long-term engagement can be improved with alerts and continuous updates.

<div>Scenario: [Existing experience through a product or service]</div>	<div>Entice</div> <div>How does someone become aware of this service?</div>	<div>Enter</div> <div>What do people experience as they begin the process?</div>	<div>Engage</div> <div>In the core moments in the process, what happens?</div>	<div>Exit</div> <div>What do people typically experience as the process finishes?</div>	<div>Extend</div> <div>What happens after the experience is over?</div>
<div>Experience steps</div> <div>What does the person (or people) at the center of this scenario typically experience in each step?</div>	<div>Don't know how data visualization can help program/renovation strategies</div> <div>Limited awareness of how data visualization benefits housing interests</div> <div>Unclear value proposition of Tableau dashboards</div>	<div>Difficulty navigating complex dashboards</div> <div>Unclear how to apply filters like renovation year or house age</div>	<div>Hard to compare multiple features at once (e.g., bathrooms + floors)</div> <div>Unclear chart legends or KPI meanings</div> <div>Inconsistent data format confuses users</div> <div>Slow response from filters with large data sets</div>	<div>No clear way to summarize or share insights</div> <div>Confused about exporting visualizations</div>	<div>No trend notifications or updates</div> <div>Insights are not automatically refreshed</div> <div>No long-term tracking of decisions made</div>
<div>Interactions</div> <div>What interactions do they have at each step along the way?</div> <div> <ul style="list-style-type: none"> People: Who do they see or talk to? Places: Where are they? Things: What digital touchpoints or physical objects do they use? </div>	<div>Watch internal demo or case study</div> <div>Hear about it in a team meeting</div> <div>Receive email about the dashboard</div>	<div>Logs into Tableau for the first time</div> <div>Clicks through KPIs and graphs</div>	<div>Applies filters across features</div> <div>Interacts with histograms, pie charts, grouped bars</div> <div>Compares renovated vs. non-renovated houses</div>	<div>Downloads charts to PDF or Excel</div> <div>Takes screenshots for meeting</div>	<div>Requests dashboard updates</div> <div>Schedules follow-up usage</div> <div>Refers back to visualizations in future meetings</div>
<div>Goals & motivations</div> <div>At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")</div>	<div>Find accurate housing trends</div> <div>Justify renovation investment</div> <div>Improve pricing strategies</div>	<div>Understand dataset dimensions (e.g., house age, sales price)</div> <div>Use visuals for decision-making</div>	<div>Identify key sales drivers</div> <div>Segment houses by features and performance</div> <div>Detect renovation ROI patterns</div>	<div>Build compelling reports</div> <div>Present insights to leadership</div>	<div>Track the impact of implemented changes</div> <div>Set benchmarks for future pricing</div> <div>Make data a continuous part of the workflow</div>
<div>Positive moments</div> <div>What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?</div>	<div>Inspired by visual storytelling in housing data</div> <div>Gets interested through success stories</div> <div>Excited by potential insights</div>	<div>Quickly grasps sales trends</div> <div>Finds intuitive KPIs</div>	<div>Spots clear sales-impacting patterns</div> <div>Customizes dashboard views effectively</div> <div>Gets real-time feedback from filters</div>	<div>Confidently exports & presents results</div> <div>Saves time by avoiding manual analysis</div>	<div>Uses dashboard for future planning</div> <div>Sees improvement in business outcomes</div> <div>Recommends it to others</div>
<div>Negative moments</div> <div>What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?</div>	<div>Doesn't see need for advanced tools</div> <div>Thinks dashboard is too complex</div> <div>Doubts data reliability</div>	<div>Overwhelmed by filter options</div> <div>Can't interpret certain charts</div>	<div>Charts lag with large data</div> <div>Filters give unexpected results</div> <div>KPIs unclear or inconsistent</div>	<div>Forget to save/export data</div> <div>Difficulty generating final reports</div>	<div>Insights not reused</div> <div>No way to get alerts</div> <div>Don't trust dashboard data</div>
<div>Areas of opportunity</div> <div>What might we make each step better? What ideas do we have? What have others suggested?</div>	<div>Doesn't see need for advanced tools</div> <div>Thinks dashboard is too complex</div> <div>Doubts data reliability</div>	<div>Overwhelmed by filter options</div> <div>Can't interpret certain charts</div>	<div>Charts lag with large data</div> <div>Filters give unexpected results</div> <div>KPIs unclear or inconsistent</div>	<div>Forget to save/export data</div> <div>Difficulty generating final reports</div>	<div>Insights not reused</div> <div>No way to get alerts</div> <div>Don't trust dashboard data</div>

See an example

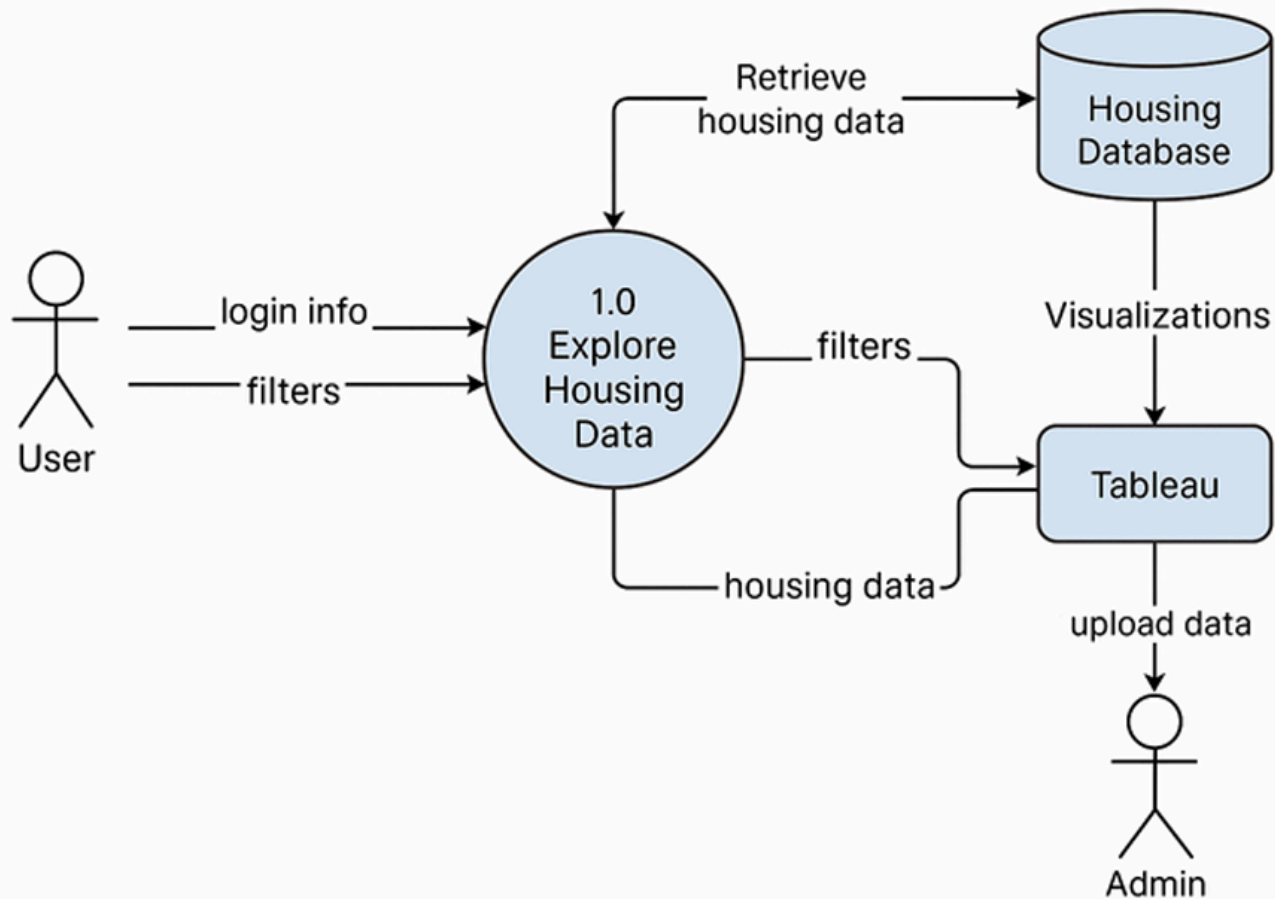
3.2 Solution Requirement

Functional Requirements:- Load housing data from Excel/CSV- Filter data by features (house age, renovations, etc.)- Generate diverse visualizations- Enable interactive dashboard elements Non-functional Requirements:- Usability: Easy-to-use Tableau interface- Security: Restricted access- Reliability: Works under different data loads- Performance: Loads in 2–3 seconds- Scalability & Availability

3.3 Data Flow Diagram

Data enters from Excel → Cleaned and filtered in Tableau Prep → Visualized in Tableau → Published on Tableau Public.

DFD Level 0



3.4 Technology Stack

Data Source: Microsoft Excel Cleaning & Aggregation: Excel / Tableau Prep Visualization Engine: Tableau Desktop / Public User Interaction: Filters, Parameters Geo-Mapping: Tableau Maps Documentation: Google Docs, Word Presentation: PowerPoint / Canva

TECHNOLOGY STACK

Component	Description	Technology
Data Source	Source of transformed	Microsoft Excel (.xlsx)
Data Cleaning	Preprocess data (remove missing	Excel / Tableau Prep
Data Aggregation	Group and summarize data	Tableau (Calculated
Visualization Engine	Generate visual charts like	Tableau Desktop / Tableau Public
User Interaction Layer	Add filters, dropdowns,	Tableau Filters & Parameters
Geo-Mapping	Show houses on map based on	Tableau Map Visualization
Hosting & Sharing	Publish dashboards for	Tableau Public
Documentation	Record brainstorming,	Google Docs / Microsoft Word
Presentation Layer	Display final output to stakeholders and evaluators	Microsoft PowerPoint / Canva

4. PROJECT DESIGN

4.1 Problem-Solution Fit

Real estate professionals face difficulty analyzing complex datasets. The Tableau dashboard allows them to uncover patterns, make better pricing decisions, and track housing trends. Before: manual and unclear analysis. After: confident decision-making with clear insights.

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Who is your customer? i.e. working parents of 0-5 y.o. kids 1.Real estate analysts 2.Marketing teams 3.Strategic decision-makers (executives, managers)	6. CUSTOMER CONSTRAINTS CC What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. Limited technical knowledge in data visualization tools Budget or time constraints Incomplete or inconsistent data	5. AVAILABLE SOLUTIONS AS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking. Manual Excel-based reports Market prediction blogs and real estate portals Traditional consulting services	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS J&P Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides. 1.Understand what factors influence housing prices 2.Identify trends related to renovations, house age, and property features 3.Strategize pricing and marketing based on data	9. PROBLEM ROOT CAUSE RC What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. Lack of visualized insights from available housing data Raw data is hard to interpret No integration of factors like renovation, age, and features into one view	7. BEHAVIOUR BE What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) Attempt to analyze Excel reports manually Depend on outdated reports or intuition Look at competitors or public listings for trends	
	3. TRIGGERS TR What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. Difficulty in understanding complex housing data Market fluctuations and uncertainty in pricing trends Competitors using data analytics for better decisions 4. EMOTIONS: BEFORE / AFTER EM How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. Before: Confused, uncertain, overwhelmed by raw data After: Confident, clear insights, empowered to make strategic decisions	10. YOUR SOLUTION SL If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. A set of Tableau dashboards visualizing key patterns in housing data Scenarios include sales by renovation years, house age distributions and structural features Helps stakeholders identify actionable insights to improve pricing and market targeting	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7 Tableau dashboards Housing analytics websites Company intranet tools 8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. Team meetings Market reports Internal presentations	

4.2 Proposed Solution

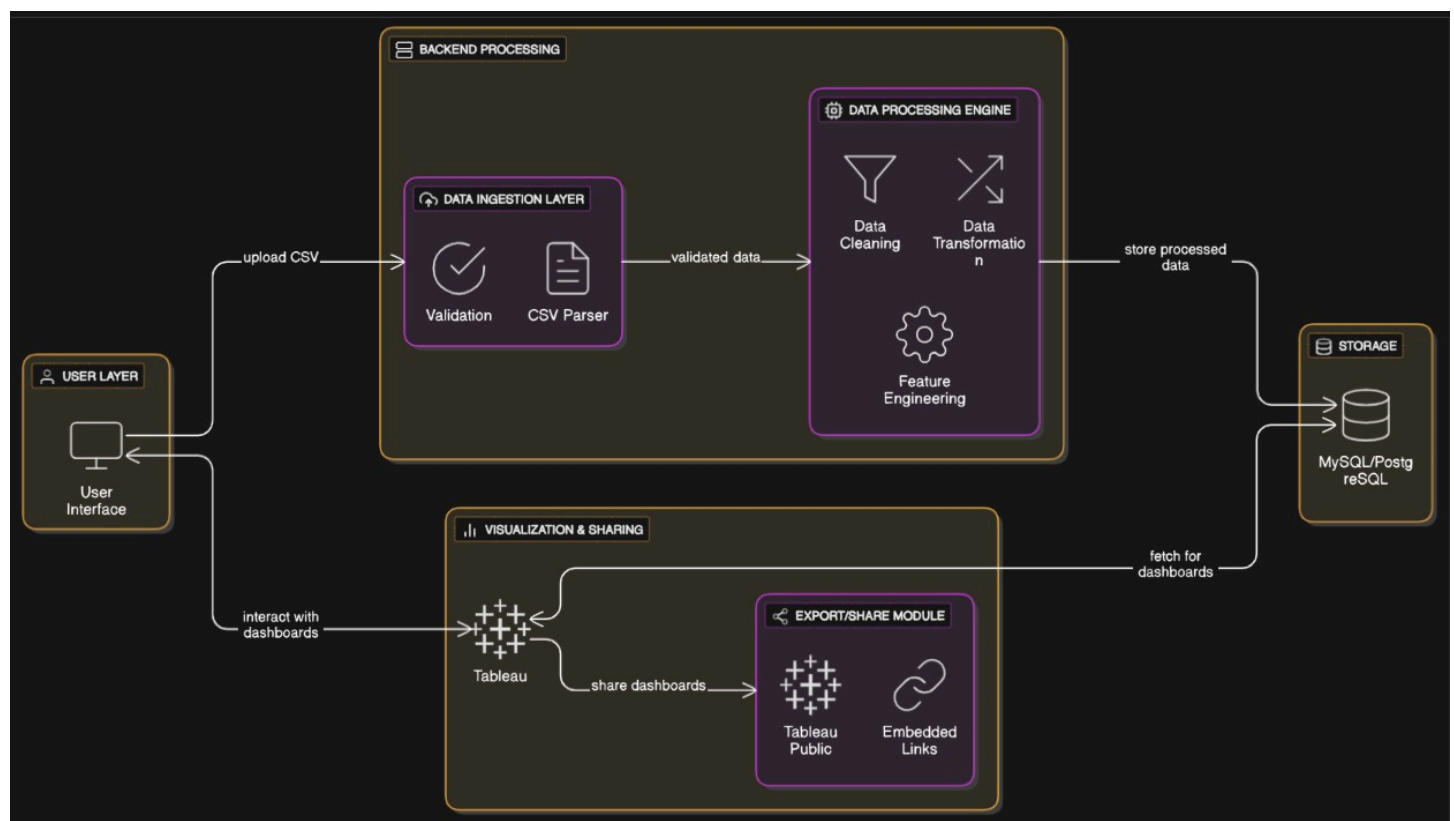
An interactive Tableau dashboard integrating sale price, renovation status, and structural features like bedrooms/bathrooms.

It offers real-time filtering and storytelling to explain trends and improve decision-making. Novelty: No-code dashboard with multiple integrated views.

Social Impact: Informed buyers and sellers, improved pricing transparency. Business Model: SaaS, consulting services, dashboard subscriptions. Scalability: Expandable to include more cities, features, KPIs.

4.3 Solution Architecture

Architecture includes components like:- Data ingestion from Excel- Preprocessing and transformation in Tableau- Visualization and interaction layers- Hosting and sharing via Tableau Public



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Sprint 1:- Data Collection (2 points)

Data Cleaning (3 points)

Feature Engineering (2 points)

Sprint 2:- Visualizations (5 points)

Dashboard Design (3 points)

Filters and Interactivity (3 points)

Story Narration (2 points)

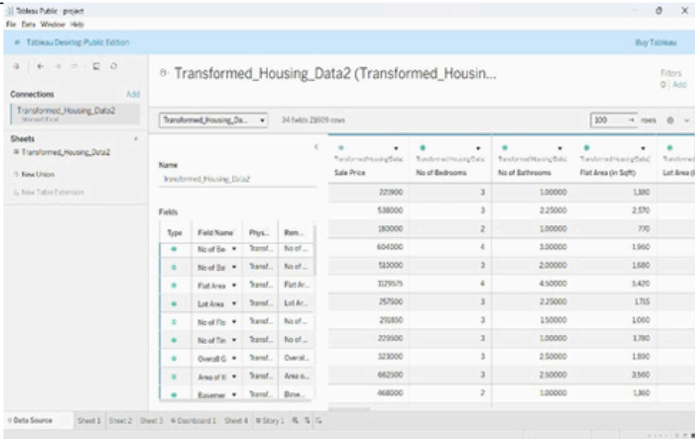
Publishing Dashboard (3 points)

Velocity: 12 points per sprint

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- Data cleaned, missing values removed, and categorical variables encoded- Filters applied on Sale Year, Location, Bedrooms, Sale Condition- Visuals included: Avg Price by Zip, Price per Sq Ft, Renovation Age- Total of 4 visualizations with 3 story captions

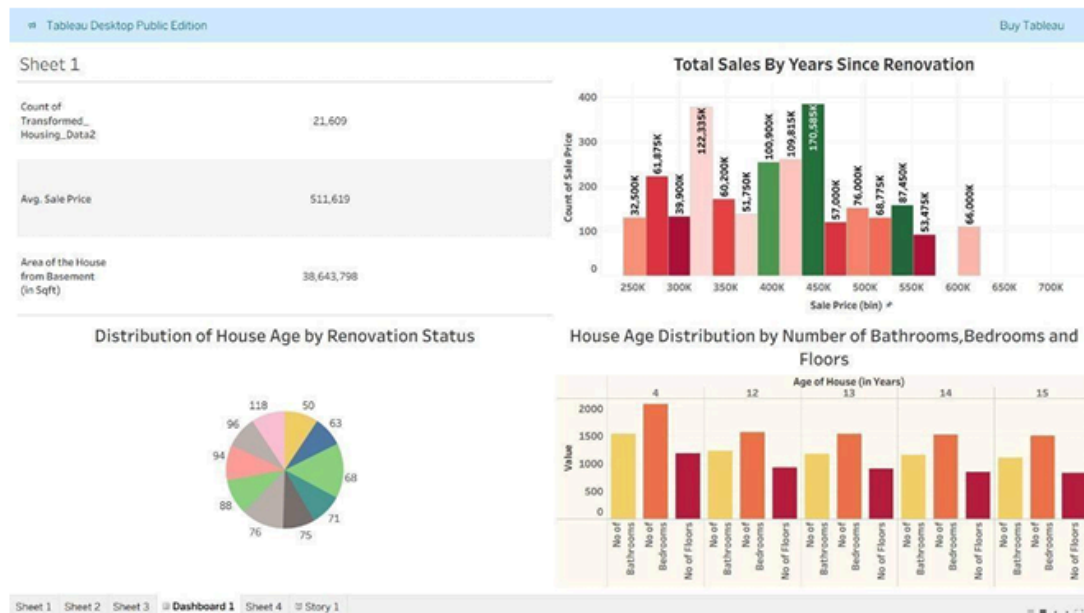
S.No.	Parameter	Screenshot / Values
1.	Data Rendered	
2.	Data Preprocessing	Data cleaned for null values, removed outliers, encoded categorical variables.
3.	Utilization of Filters	Filters applied on Sale Year, Location, Bedrooms, and Sale Condition.
4.	Calculation fields Used	- Average Price by Zip Code - Price per Sq Ft - Renovation Age
5.	Dashboard design	No. of Visualizations / Graphs: 4 Includes bar charts, pie charts, and histograms.
6	Story Design	No. of Visualizations / Graphs: 3 Structured narrative on housing price trends, regional differences, and feature correlations.

7. RESULTS

7.1 Output Screenshots

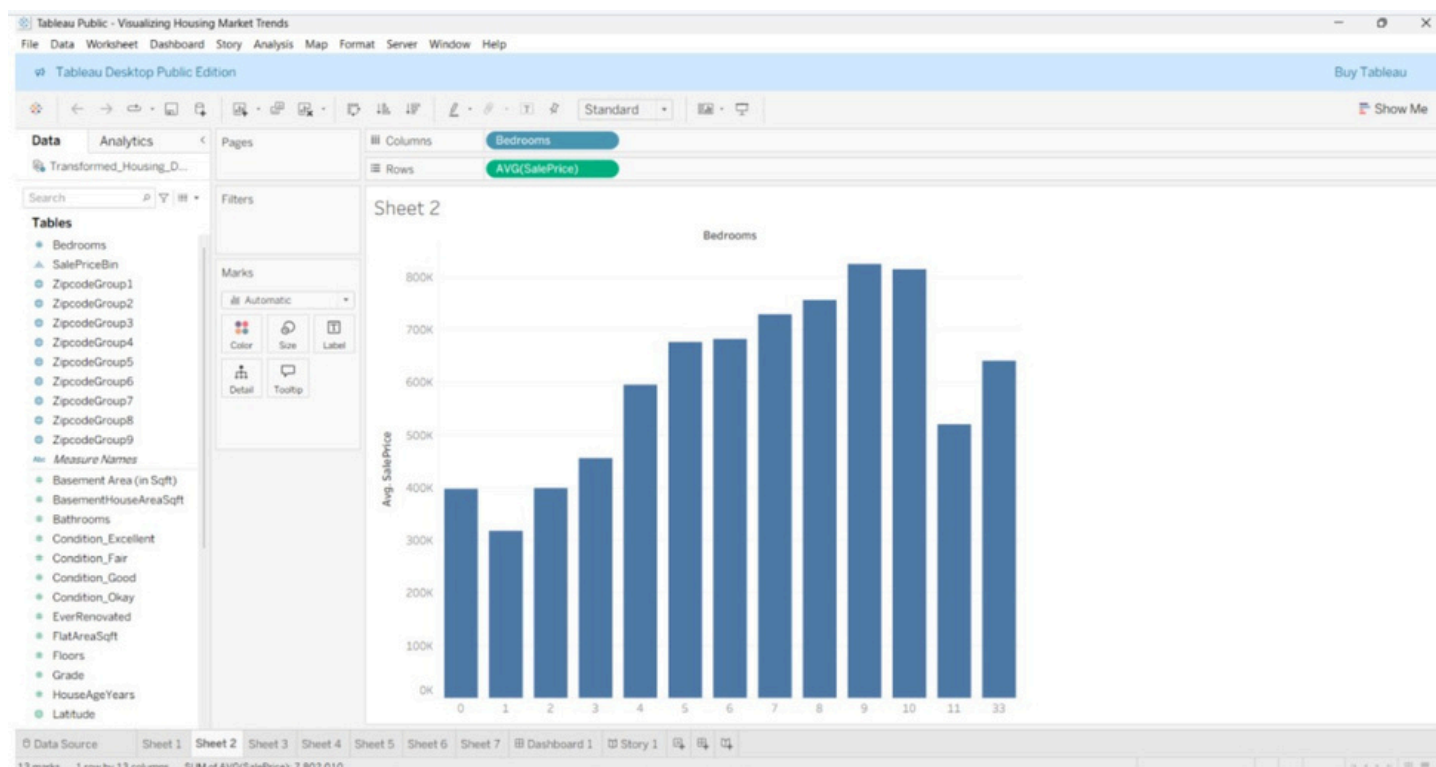
Screenshots to be attached showing dashboard features such as bar, pie, map, and histogram charts.

Dashboard:



Story:





8. ADVANTAGES & DISADVANTAGES

Advantages:-

1. Interactive and user-friendly- No coding required- Quick insights and visual trends- Suitable for non-tech users
2. Converts complex housing datasets into easy-to-understand dashboards using charts, maps, and filters.
3. Enables buyers, sellers, and investors to make informed decisions based on location, time, and property features.

Disadvantages:-

1. Depends on Tableau availability- Limited external customization- Filters may slow down on large datasets
2. Tableau is excellent for visual analysis, but not ideal for complex statistical modeling (e.g., regression analysis, predictive forecasting).
3. Tableau Public may experience lag when working with very large datasets unless optimized.

9. CONCLUSION

- 1.The project demonstrates how visual analytics empower real estate decision-making. Tableau transforms raw data into a comprehensible and interactive tool, helping stakeholders take strategic actions with confidence.
- 2.The project successfully transformed raw housing data into interactive dashboards that reveal key trends, such as seasonal pricing fluctuations, feature-driven price impacts, and regional disparities in home values. Through visual tools like time-series charts, scatter plots, and geographic heat maps, the solution supports intuitive exploration of the market and addresses the information gap faced by non-technical stakeholders.
- 3.Despite limitations such as dependency on data quality and some analytical constraints, the project highlights the clear advantage of combining data storytelling with interactive visual analytics. It lays the groundwork for future enhancements such as real-time data integration, predictive modeling, or embedding within a broader property advisory platform.

10. FUTURE SCOPE


1. Add real-time data integration from housing platforms- Expand KPIs to include eco-ratings or walk scores- Extend coverage across more regions- Incorporate predictive models for pricing trends
2. Predictive Analytics & Forecasting • Enhance Tableau with external tools (like Python, R, or machine learning APIs) to forecast future housing prices based on historical trends, inflation, and economic indicators. • Helps users anticipate market movements and prepare investment strategies.
3. Advanced Feature Correlation • Add multivariate analysis to examine how combinations of features (e.g., square footage + location + age) influence prices. • Use heatmaps, bubble charts, and regression overlays for deeper insights.
4. Voice and AI Chat Integration • Integrate voice-enabled filters or AI chatbots to help users explore insights using natural language (e.g., “Show me areas with the highest price growth in 2024”).

11. APPENDIX

Dataset Link: <https://www.kaggle.com/datasets/rituparnaghosh18/transformed-housing-data-2>

Demo Video:  Demo video.mp4

GitHub / Project Demo Link:

 GitHub - Rishmitha08/Visualizing-Housing-Market-Trends-An-Analysis-of-Sale-Prices-and-Features-using-Tab...