

Project Report

An internship in

Data analytics with tableau

By

Smart bridge

Project name: visualizing housing market trends and analysis of sale prices and features using tableau

TEAM ID: LTVIP2025TMID60628

Project Mentor: Ganesh M

TEAM DETAILS:

Team Size: 5

Team Leader: Chandra Bhanu Koppadi (Reg.No:226N1A6119)

Team member: Karri Divya (Reg.No: 236N1A6140)

Team member: Sruthi Janga (Reg.No: 236N1A0547)

Team member: Tara Bhramaramba Peri (Reg.No: 236N1A6175)

Team member: Tejasri Balaga (Reg.No:236N1A0510)

Abstract

The housing market is a dynamic and complex ecosystem influenced by numerous factors such as location, property features, market demand, and economic conditions. Traditional tabular data often fails to reveal actionable insights needed by stakeholders such as buyers, real estate agents, analysts, and policymakers. This project addresses that challenge by developing interactive dashboards using Tableau to visualize housing market trends and analyse sale prices and property features.

By leveraging cleaned datasets of residential property sales, the project focuses on comparing factors like area, number of bedrooms, bathrooms, and region-specific pricing patterns. Tableau dashboards are built to support filter-based exploration, feature-wise comparisons, and regional price mapping. The visualizations enable users to explore trends over time, evaluate pricing distribution, and draw conclusions that support decision-making.

The proposed solution emphasizes usability, responsiveness, and visual storytelling through dark-themed dashboards and narrative-driven story points. This empowers users to transition from data consumption to data-driven insight generation. The framework is scalable, adaptable to other regions or markets, and encourages a data-first mindset in the real estate domain.

KEY WORDS:

- ❖ Tableau Dashboard
- ❖ House Marketing analysis
- ❖ Data visualization
- ❖ Sale price prediction
- ❖ Property features
- ❖ Renovation Insights

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1. INTRODUCTION

1.1 Project Overview

The housing market is one of the most dynamic and influential sectors of any economy. Understanding the trends within this market is crucial for various stakeholders, including buyers, sellers, investors, and policymakers. This project, titled “Visualizing Housing Market Trends and Analysis of Sale Prices and Features Using Tableau,” aims to explore and simplify the vast amount of data associated with housing transactions. By using Tableau, a leading data visualization tool, we create dashboards and interactive visuals that highlight key metrics, identify patterns in property features, and offer actionable insights. This enables users to quickly assess the housing landscape, determine the value of different home characteristics, and monitor trends over time and location. The project supports data-driven decision-making and improves transparency in real estate transactions.

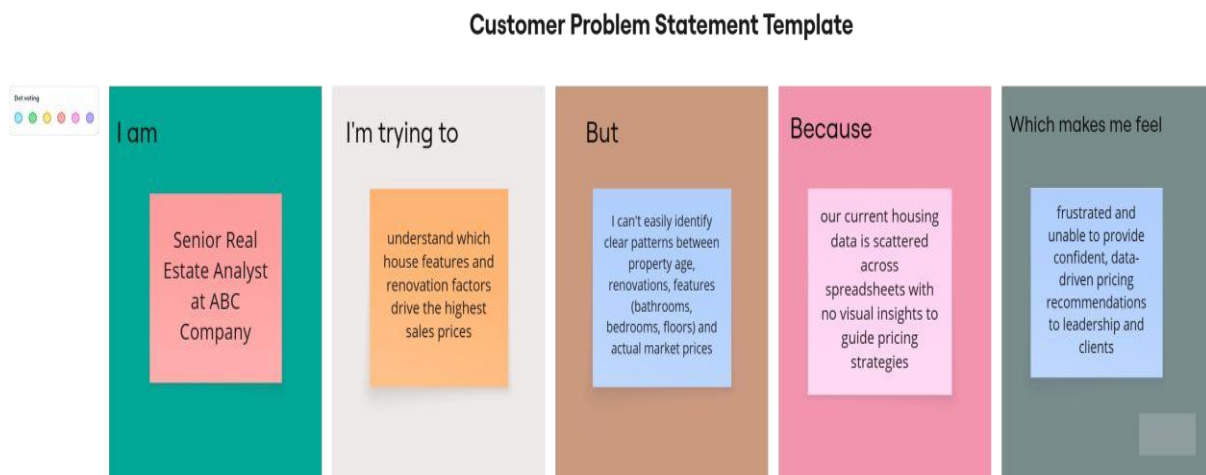
1.2 Purpose

The primary purpose of this project is to create a user-friendly platform for visualizing and analysing real estate data. In the traditional setting, homebuyers and sellers often rely on fragmented data sources and subjective opinions. With this project, we seek to overcome these challenges by providing an integrated view of the housing market, enriched with data analytics. The use of Tableau enables intuitive visualizations that help users quickly grasp complex datasets and make strategic decisions. Furthermore, this project aims to bridge the gap between raw data and practical application, encouraging better negotiation, valuation, and forecasting in the housing industry.

2. IDEATION PHASE

2.1 Problem Statement

Customer Problem Statement Template:



Customer Problem Statement Template



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Senior Real Estate Analyst at ABC Company	understand which house features and renovation factors drive the highest sales prices	I can't easily identify clear patterns between property age, renovations, features (bathrooms, bedrooms, floors), and actual market prices	Our current housing data is scattered across spreadsheets with no visual insights to guide pricing strategies	frustrated and unable to provide confident, data driven pricing recommendations to leadership and clients
PS-2	ABC Company Executive	Make strategic business decisions about market positioning and resource allocation	I can't quickly grasp how renovation investments, property features, and market trends connect to our company's profitability and competitive advantage	The housing market data we have doesn't translate into clear business insights or actionable strategies	overwhelmed by complex data but lacking the strategic insights needed to guide company direction and investment decisions

2.2 Empathy Map Canvas



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 et



Share template feedback



Develop shared understanding and empathy

Through our empathy mapping, we understood that ABC Company's real estate analysts face challenges in quickly analyzing complex housing datasets to provide actionable insights. They struggle with manual Excel processes and static visualizations that don't reveal clear patterns about renovation ROI, house age distributions, and feature correlations.

Marketing teams need clear guidance on which property features to highlight, while executives demand strategic insights about renovation investments and market positioning. The analyst requires interactive Tableau visualizations that transform raw housing data into compelling business intelligence.

By designing comprehensive dashboards covering dataset overviews, renovation timeline analysis, age distribution patterns, and feature correlations, we aim to empower the analyst to deliver confident, data-driven recommendations that support ABC Company's strategic decisions and competitive advantage.



Need some inspiration?

See a finished version of this template to kickstart your work.

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WHO are we empathizing with? <ul style="list-style-type: none"> "Senior Real Estate Analyst at ABC Company analyzing housing market trends" "Struggling with complex housing datasets and manual analysis methods" "Data analyst providing insights to marketing teams and executives about house prices" 	What do they HEAR? <ul style="list-style-type: none"> "Fellow analysts: 'Housing data is too complex to analyze manually'" "Executives: 'Show me ROI on renovation investments with clear insights'" "Marketing teams: 'We need to know which property features to highlight'" "Industry reports about competitor success with data-driven strategies" 	What do they need to DO? <ul style="list-style-type: none"> "Analyse total sales by years since renovation and house age distribution patterns" "Move from manual Excel analysis to interactive Tableau visualizations" "Marketing teams can target the right buyer segments using clear data insights." "Where ABC Company should focus renovation investments for maximum ROI"
What other thoughts and feelings might influence their behavior? <p>"Excitement about discovering hidden patterns in housing market data"</p>	What do they THINK and FEEL? <p>PAINS:</p> <ul style="list-style-type: none"> "Making incorrect recommendations about renovation investments" "Takes too long to analyze house age, features, and sales relationships" "Pressure to provide insights that directly impact business decisions" 	What do they SEE? <ul style="list-style-type: none"> "Competitors with better market positioning using superior data insights" "Spreadsheets with no clear patterns and time pressure for quick insights" "Leadership demanding data-driven strategic recommendations" "Market reports about renovation trends and housing market shifts"
What do they DO? <ul style="list-style-type: none"> "Manually analyze housing datasets in Excel with multiple tabs" "Create basic charts and spend hours correlating renovation data with sales." "Wish they could create interactive dashboards for real-time insights" 	GAINS: <ul style="list-style-type: none"> "Interactive Tableau dashboards revealing housing market patterns instantly" "Visual analysis of total sales by years since renovation" "Transform from data analyst to strategic business advisor" "Become ABC Company's trusted expert on housing market dynamics" 	What do they SAY? <ul style="list-style-type: none"> "I need to visualize how renovation timing impacts sales performance." "This data should tell us which features drive the highest prices."

2.3 Brainstorming

Brainstorm & Idea Prioritization Template:




Step-1: Team Gathering, Collaboration and Select the Problem Statement

Template




Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

 10 minutes to prepare
 1 hour to collaborate
 2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.


 10 minutes

- Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.
- Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.
- Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) →

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.







 5 minutes


PROBLEM

How might we create comprehensive Tableau visualizations that help ABC Company's real estate analysts, marketing teams, and executives understand housing market trends, renovation impacts, and property feature relationships to optimize pricing strategies and enhance market competitiveness?

Key rules of brainstorming

To run a smooth and productive session

-  Stay in topic.
-  Encourage wild ideas.
-  Defer judgment.
-  Listen to others.
-  Go for volume.
-  If possible, be visual.



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Step-3: Idea Prioritization

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3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Scenarios Sarah, a Senior Real Estate Analyst at ABC Company, is involved in a project to develop a new data visualization platform for her team. She is responsible for gathering requirements, designing the platform, and ensuring it meets the needs of the team.	Entice Sarah is enticed by the promise of a new, powerful tool that will help her team work more efficiently and effectively.	Enter Sarah enters the project, bringing her expertise and experience to the team.	Engage Sarah engages with the team, sharing her vision and goals for the project.	Exit Sarah exits the project, having successfully completed her role.	Extend Sarah extends the project, taking on additional responsibilities and challenges.
Experience steps Sarah's experience with the project is divided into five main steps: Discovery, Initial Access, Daily Usage, Report Generation, and Continuous Improvement.	Discovery Phase <ul style="list-style-type: none"> Hears about new visualization platform from IT team Sees demo presentation in team meeting Reviews project proposal document 	Initial Access <ul style="list-style-type: none"> Receives login credentials First-time platform access Explores role-based analyst dashboard Reviews getting started guide 	Daily Usage <ul style="list-style-type: none"> Logs into the dashboard daily Applies filters for specific analysis Creates custom views Drills down into property details Exports visualizations for reports 	Report Generation <ul style="list-style-type: none"> Finalizes analysis findings Exports charts and data Creates a presentation for leadership Submits recommendations 	Continuous Improvement <ul style="list-style-type: none"> Provides platform feedback Mentors new team members Requests additional features Advocates for expanded usage
Interactions Sarah interacts with various stakeholders throughout the project, including her team, IT, and leadership.	People: IT team lead, Project manager Places: Conference room, Office desk Things: Project proposal, Demo presentation, Email notifications	People: System administrator, Help desk Places: Office workstation Things: Login portal, Tutorial videos, User guide PDF	People: Marketing team, Fellow analysts, Data sources Places: Office, Home office, Meeting rooms Things: Tableau dashboard, Filter panels, Export tools	People: Company executives, Leadership team Places: Boardroom, Executive offices Things: PowerPoint slides, PDF reports and printed charts	People: New team members, Development team, Stakeholders Places: Training rooms, Virtual meetings Things: Feedback forms, Feature requests, Success metrics
Goals & Aspirations Sarah has several goals and aspirations for the project, including improving team efficiency, reducing manual analysis time, and becoming more strategic in her role.	Help me understand if this tool can solve my data visualization challenges and reduce manual analysis time	Help me get started quickly without extensive training and see immediate value from the platform	Help me analyze housing trends efficiently and create compelling visualizations for stakeholders	Help me deliver confident, data-driven recommendations that impact business decisions	Help me become more strategic in my role and establish expertise in market analysis
Positive Moments Sarah experiences several positive moments throughout the project, including seeing the demo, receiving immediate access, and discovering patterns in the data.	<ul style="list-style-type: none"> Exciting to see a solution that addresses specific pain points Motivating ROI projections (90% time savings) Delightful seeing interactive demo 	<ul style="list-style-type: none"> Productive immediate access to clean, organized data Fun exploring interactive visualizations Enjoyable intuitive navigation design 	<ul style="list-style-type: none"> Exciting discovering patterns in data quickly Motivability to drill down for detailed insights Productive real-time filtering capabilities 	<ul style="list-style-type: none"> Delightful professional-looking exported charts Productive streamlined report creation Exciting positive leadership feedback 	<ul style="list-style-type: none"> Motivating recognition for improved analysis quality Mentoring others on platform usage Exciting expanded responsibilities
Negative Moments Sarah also experiences several negative moments, including skepticism about the solution, time-consuming training, and frustrating slow response to feature requests.	<ul style="list-style-type: none"> Frustrating skepticism about another "solution" Time-consuming attending multiple demo sessions Confusing technical jargon in presentations 	<ul style="list-style-type: none"> Angering initial login difficulties Confusing learning a new interface layout Frustrating missing familiar Excel shortcuts 	<ul style="list-style-type: none"> Exciting discovering patterns in data quickly Motivating ability to drill down for detailed insights Productive real-time filtering capabilities 	<ul style="list-style-type: none"> Frustrating export formatting limitations Time-consuming manual adjustments for presentations Angering occasional system downtime 	<ul style="list-style-type: none"> Frustrating slow response to feature requests Time-consuming training new users repeatedly Confusing version updates changing interface
Areas of Opportunity There are several areas of opportunity for the project, including creating compelling success stories, simplifying technical presentations, and providing tangible ROI examples.	How might we: <ul style="list-style-type: none"> Create compelling success stories from pilot users? Simplify technical presentations for business users? Provide tangible ROI examples from similar companies? 	How might we: <ul style="list-style-type: none"> Implement single sign-on for seamless access? Create interactive onboarding tutorials? Provide Excel-like shortcuts for familiar users? 	How might we: <ul style="list-style-type: none"> Optimize dashboard loading performance? Implement smart filtering suggestions? Add real-time collaboration features? 	How might we: <ul style="list-style-type: none"> Improve export formatting options? Create presentation-ready templates? Implement automated report scheduling? 	How might we: <ul style="list-style-type: none"> Create user community forums? Implement user-driven feature voting? Develop advanced certification programs?

3.2 Solution Requirement

Solution Requirements (Functional & Non-functional)

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Overview Dashboard	<ul style="list-style-type: none"> Dataset Summary Dashboard Creation Key Metrics KPI Cards Display Average Sales Price Visualization Total Records Counter Implementation Basement Area Visualizer

		<ul style="list-style-type: none"> Data Quality Indicators
FR-2	Renovation Analysis Module	<ul style="list-style-type: none"> House Age Pie Chart Creation Renovation Status Segments Age Group Categories Definition Renovated vs Non-Renovated Comparison Age Distribution Donut Chart Property Lifecycle Visualization
FR-3	Age Distribution Analysis	<ul style="list-style-type: none"> Bathroom Count Bar Chart Bedroom Distribution Graph Floor Level Analysis Age vs Features Matrix Feature Combination Heatmap Multi-Attribute Comparison Tool
FR-4	Feature Analysis Dashboard	<ul style="list-style-type: none"> Executive Summary Dashboard Interactive Filter Panel Drill-Down Navigation System Key Insights Callouts Stakeholder-Specific Views Strategic Recommendations Display
FR-5	Interactive Dashboard Integration	<ul style="list-style-type: none"> Executive Summary Dashboard Interactive Filter Panel Drill-Down Navigation System Key Insights Callouts Stakeholder-Specific Views Strategic Recommendations Display
FR-6	User Access Management	<ul style="list-style-type: none"> Role-Based Dashboard Access Analyst View Configuration Marketing Team View Setup Executive View Customization Guest User Limitations
FR-7	Data Export & Reporting	<ul style="list-style-type: none"> PDF Report Generation Excel Data Export Image Export for Presentations Scheduled Report Delivery Custom Report Templates
FR-8	Real-Time Data Integration	<ul style="list-style-type: none"> Data Source Connection Automated Data Refresh Data Validation Checks Error Handling & Logging Data Backup & Recovery

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	<ul style="list-style-type: none"> • Dashboard must be intuitive with minimal training required • Navigation should be self-explanatory for all user types • Visual consistency across all dashboard components • Responsive design for different screen sizes • Maximum 3 clicks to reach any specific insight • Tooltips and help text for complex visualizations
NFR-2	Security	<ul style="list-style-type: none"> • Role-based access control for different user groups • Secure data transmission using HTTPS • User authentication and session management • Data privacy compliance for sensitive housing information • Audit trail for all user activities • Regular security updates and patches
NFR-3	Reliability	<ul style="list-style-type: none"> • System uptime of 99.5% during business hours • Automated backup of all dashboards and configurations • Error recovery mechanisms for data loading failures • Consistent performance across different browsers • Data integrity validation checks • Fallback options for critical visualizations
NFR-4	Performance	<ul style="list-style-type: none"> • Interactive filters response time under 2 seconds and Dashboard loading time less than 5 seconds • Support for datasets up to 1 million records • Efficient memory usage for complex visualizations • Optimized queries for large data processing • Smooth transitions and animations

NFR-5	Availability	<ul style="list-style-type: none"> • 24/7 system availability with planned maintenance windows • Redundant server configuration • Disaster recovery plan with 4-hour recovery time • Multiple data center support • Automated monitoring and alerting • Service level agreement compliance
NFR-6	Scalability	<ul style="list-style-type: none"> • Support for up to 100 concurrent users • Horizontal scaling capability for increased load • Expandable data storage architecture • Additional dashboard creation without performance impact • Multi-tenant architecture support • Cloud-based scaling options
NFR-7	Compatibility	<ul style="list-style-type: none"> • Cross-browser compatibility (Chrome, Firefox, Safari, Edge) • Mobile device responsiveness • Integration with existing ABC Company systems • Standard data format support (CSV, Excel, JSON) • API compatibility for future integrations • Version control for dashboard updates
NFR-8	Maintainability	<ul style="list-style-type: none"> • Modular dashboard design for easy updates • Comprehensive documentation for all components • Version control for all dashboard configurations • Automated testing framework • Clear code structure and naming conventions • Knowledge transfer documentation

3.3 Data Flow Diagram

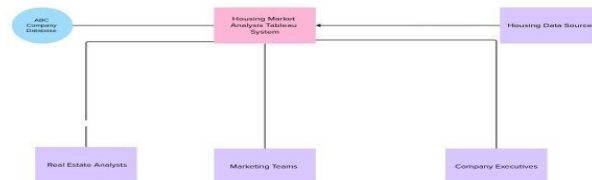
Data Flow Diagram & User Stories

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.

Level 0 (Context Diagram) - ABC Company Housing Market Analysis System



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
Real Estate Analyst	Data Overview Dashboard	USN-1	As a real estate analyst, I can view a comprehensive data overview dashboard showing total records, average sales price, and data quality indicators	I can see KPI cards with key metrics, data summary statistics, and quality indicators clearly displayed	High	Sprint-1
	Data Overview Dashboard	USN-2	As a real estate analyst, I can filter the overview dashboard by date range, property type, and location	I can apply multiple filters and see the dashboard update in real-time with relevant data	High	Sprint-1
	Renovation Analysis	USN-3	As a real estate analyst, I can analyze the relationship between renovation age and sales prices through	I can view histogram of years since renovation, scatter plots showing price impact, and ROI calculations	High	Sprint-1

			interactive visualizations			
	Feature Analysis	USN-4	As a real estate analyst, I can explore correlations between property features (bathrooms, bedrooms, floors) and house age	I can view matrix charts, heatmaps, and multiattribute comparisons with drill-down capabilities	High	Sprint-2
Marketing Team	Age Distribution Analysis	USN-5	As a marketing team member, I can understand house age distribution by renovation status to identify target segments	I can view pie charts and donut charts showing age groups with clear renovation status indicators	High	Sprint-1
	Renovation Analysis	USN-6	As a marketing team member, I can identify recent renovation trends to inform marketing strategies	I can view trend lines, recent renovation patterns, and market opportunity insights	Medium	Sprint-2
	Dashboard Integration	USN-7	As a marketing team member, I can access marketing-specific dashboard views with relevant insights and recommendations	I can view customized dashboard with buyer preference insights and competitive analysis	Medium	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Company Executive	Dashboard Integration	USN-8	As a company executive, I can view high-level summary dashboard with key business insights and strategic recommendations	I can access executive summary with KPIs, strategic insights, and actionable recommendations in under 30 seconds	High	Sprint-1
	Renovation Analysis	USN-9	As a company executive, I can understand ROI impact of renovations on property values for investment decisions	I can view ROI calculator results, investment recommendations, and market positioning analysis	High	Sprint-2

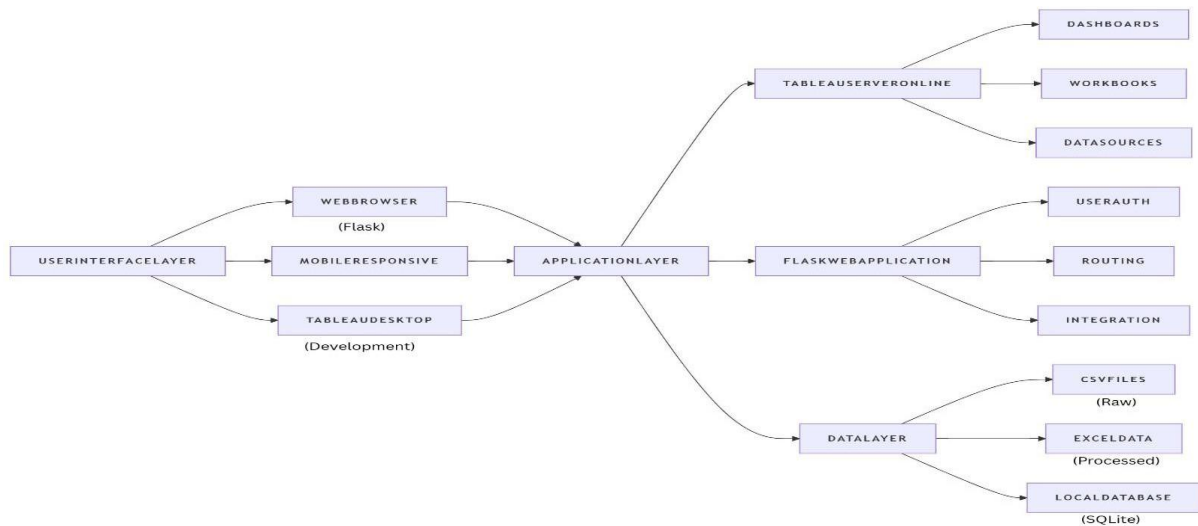
	Dashboard Integration	USN-10	As a company executive, I can export executive reports for board presentations and strategic planning	I can generate PDF reports, export charts as images, and schedule automated report delivery	Medium	Sprint-3
Real Estate Analyst	Data Integration	USN-11	As a real estate analyst, I can upload new housing data files and have them automatically validated and integrated	I can upload CSV/Excel files, see data validation results, and view integration status	High	Sprint-1
	Interactive Features	USN-12	As a real estate analyst, I can drill down from summary views to detailed property-level data	I can click on any chart element and navigate to detailed views with relevant filters applied	High	Sprint-2
Marketing Team	Export & Sharing	USN-13	As a marketing team member, I can export specific visualizations for client presentations and marketing materials	I can export charts as high-resolution images, save custom views, and share dashboard links	Medium	Sprint-2
Company Executive	Performance Monitoring	USN-14	As a company executive, I can monitor system performance and user adoption metrics	I can view system usage analytics, performance metrics, and user engagement reports	Low	Sprint-3
All Users	User Access	USN-15	As a system user, I can access role appropriate dashboard views based on my user type and permissions	I can login and see only the dashboards and features relevant to my role (Analyst/Marketing/Executive)	High	Sprint-1
	Mobile Access	USN-16	As a system user, I can access key dashboard insights on mobile devices for ON go analysis	I can view responsive dashboard layouts on mobile with core functionality maintained	Low	Sprint-3

3.4 Technology Stack

Technology Stack (Architecture & Stack)

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Technical Architecture Diagram:**Table-1 : Components & Technologies:**

S.No	Component	Description	Technology
1.	User Interface	Web-based dashboard interface for data visualization and interaction	HTML5, CSS3, JavaScript, Bootstrap
2.	Web Framework	Backend web application for user authentication and dashboard embedding	Python Flask
3.	Visualization Engine	Primary tool for creating interactive dashboards and data visualizations	Tableau Desktop/Public
4.	Data Processing	Scripts for data cleaning, transformation, and preparation	Python (Pandas, NumPy)
5.	Database	Local database for storing processed housing data and user sessions	MySQL/SQLite
6.	File Storage	Storage for raw housing data files and exported reports	Local File System
7.	Authentication	Simple user login and role-based access control	Flask-Login, Flask-Session
8.	Data Validation	Scripts to validate data quality and handle missing values	Python (Custom Scripts)
9.	Export Services	Functionality to export dashboards and reports	Tableau Export APIs
10.	Development Environment	Code editor and version control for project development	VS Code, Git
11.	Infrastructure	Local development server with option for cloud deployment	Local Server (Development) Heroku/PythonAnywhere (Production).

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Utilizing free and open-source technologies to minimize costs while	Flask (Python), Bootstrap (CSS),

		maintaining functionality	SQLite/MySQL, Pandas, NumPy
2.	Security Implementations	Basic security measures appropriate for internal business use	Flask-WTF (CSRF Protection), Password Hashing (Werkzeug), Session Management, HTTPS for Production
3.	Scalable Architecture	Simple 3-tier architecture that can be expanded as needed	Presentation Layer (HTML/CSS/JS), Application Layer (Flask), Data Layer (SQLite/Files)
4.	Availability	Reliable system with basic redundancy and backup strategies	Local backup scripts, Git version control, Simple error handling and logging
5.	Performance	Optimized for typical business usage with reasonable response times	Tableau caching, Efficient data loading, Compressed image assets, Minimal database queries

4. PROJECT DESIGN

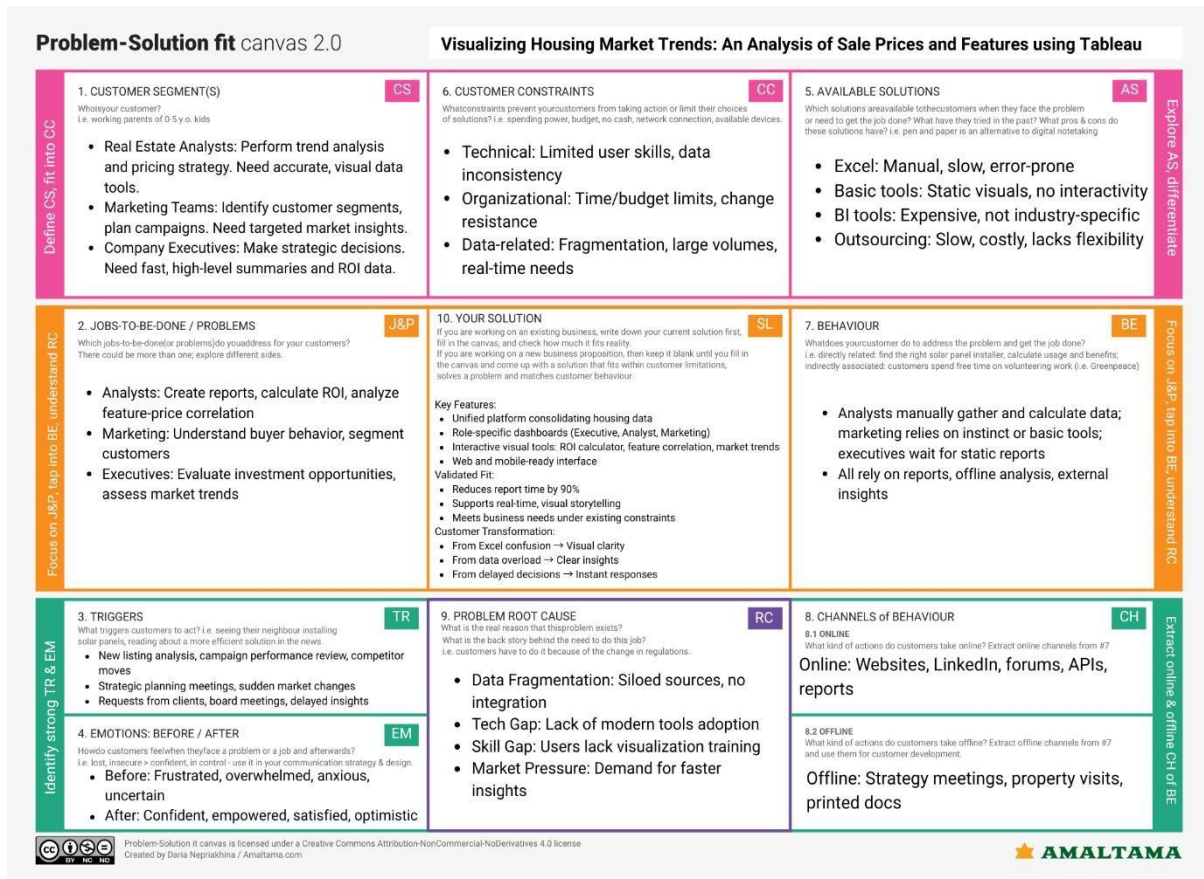
4.1 Problem Solution Fit

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 behavioural 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 behaviour.
- ☐ Sharpen your communication and marketing strategy with the right triggers and messaging.
- ☐ Increase touch-points with your company by finding the right problem-behaviour 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 Solution

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	ABC Company's analysts and executives struggle with fragmented housing data spread across multiple spreadsheets. This causes timeconsuming manual analysis (20+ hrs/week), delayed decisions, and pricing without visual evidence, reducing efficiency and competitiveness.

2.	Idea / Solution description	<p>Create an interactive Tableau platform that integrates housing data and offers:</p> <ul style="list-style-type: none"> • KPI dashboards (average price, records, basement area) • Renovation analysis (ROI plots, trend histograms) • Age distribution (pie & donut charts) • Feature analysis (bar charts, heatmaps) • Role-based dashboards (Analysts, Marketing, Executives) • Web access via Flask • Mobile-friendly views
3.	Novelty / Uniqueness	<ul style="list-style-type: none"> • Tailored dashboards per role (data depth vs strategic views) • Interactive Renovation ROI Calculator • Age–Feature Correlation Heatmap • Smart filtering (updates all visuals together) • Story mode: guided, presentation ready insights
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> • 90% time saved for analysts • Data-backed decisions replace gut feeling • 60% improvement in client trust via visuals • Faster market response improves competitiveness
		<ul style="list-style-type: none"> • Non-technical users can access insights easily • Cuts \$50K/year in research consultant costs
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> • Up to \$75K saved annually by streamlining analyst workflow and reducing consultant dependency • Estimated \$200K in improved revenue through data-backed pricing decisions • \$50K+ worth of time savings from faster decisions • Expected ROI ~400% in Year 1 (Projected return: \$325K; Cost: \$80K including dev, training, and maintenance)

6.	Scalability of the Solution	<ul style="list-style-type: none"> • Supports 100–500+ users via cloud scaling • Handles 1M–10M+ records efficiently • Can expand to national housing data • Modular: ready for ML, predictions, external APIs • Fits other markets (commercial, rental) and real estate firms
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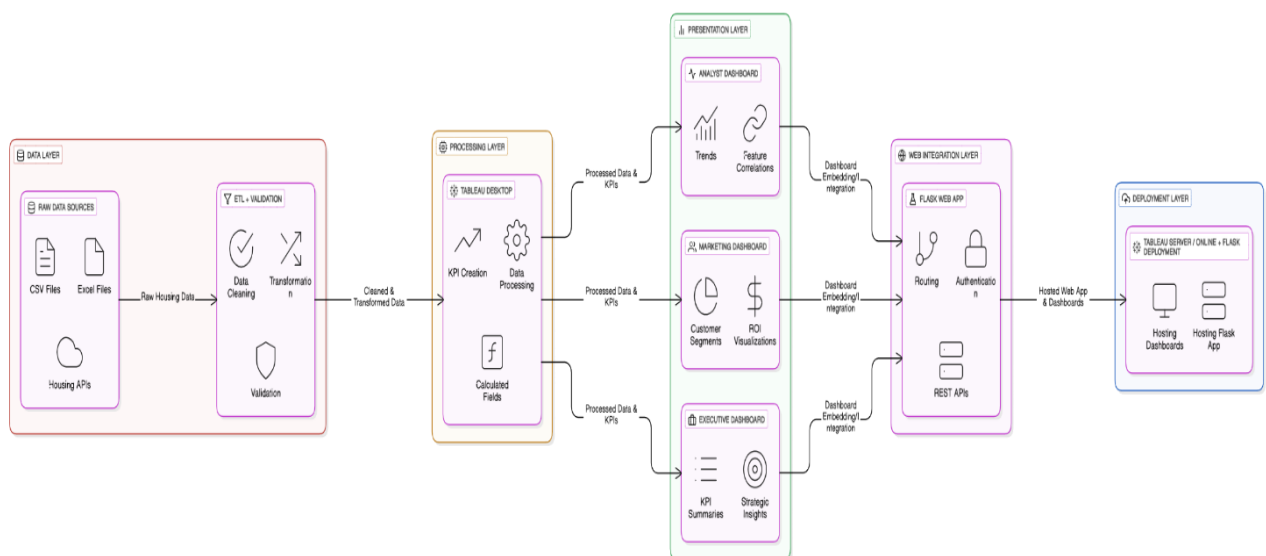
4.3 Solution Architecture

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.

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 Foundation	USN-1	Complete data collection, cleaning, and preparation with calculated fields for renovation analysis	8	High	All
Sprint-2	Core Visualizations	USN-2	Develop Overall Data Overview dashboard	4	High	All
Sprint-2	Core Visualizations	USN-3	Build Sales by Years Since Renovation histogram analysis	5	High	All
Sprint-2	Core Visualizations	USN-4	Create House Age Distribution pie chart	4	High	All
Sprint-2	Core Visualizations	USN-5	Develop Age Distribution by Features bar chart	5	High	All
Sprint-3	Dashboard Integration	USN-6	Combine all visualizations into a responsive dashboard with Tableau Story	10	High	All
Sprint-3	Interactive Features	USN-7	Implement filters and drill-down functionality across all visualizations	6	High	All
Sprint-4	Web Deployment	USN-8	Optimize performance, embed in Flask application, and create documentation	8	High	All

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

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	8	1 Days	26 June 2025	26 June 2025	8	26 June 2025

Sprint-2	18	1 Days	27 June 2025	27 June 2025	18	27 June 2025
Sprint-3	16	1 Days	28 June 2025	28 June 2025	16	28 June 2025
Sprint-4	8	1 Days	29 June 2025	29 June 2025	8	29 June 2025
Total	50	4 Days			50	

Velocity:

Total Story Points = 8 + 18 + 16 + 8 = 50 points

Number of Sprints = 4

Team Velocity = $50 \div 4 = 12.5$ Story Points per Sprint

Daily Velocity = 12.5 Story Points per Day

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

Burndown Chart Data for Housing Market Analysis Project:

Day	Sprint	Story Points Remaining	Ideal Burndown	Actual Progress
Day 0	Project Start	50	50	50
Day 1	Sprint-1 Complete	42	37.5	42
Day 2	Sprint-2 Complete	24	25	24
Day 3	Sprint-3 Complete	8	12.5	8
Day 4	Sprint-4 Complete	0	0	0

Burndown Analysis:

- Total Story Points: 50
- Project Duration: 4 days
- Ideal Daily Burn Rate: 12.5 points per day
- Actual Performance: On track with planned velocity

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Model Performance Testing:

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

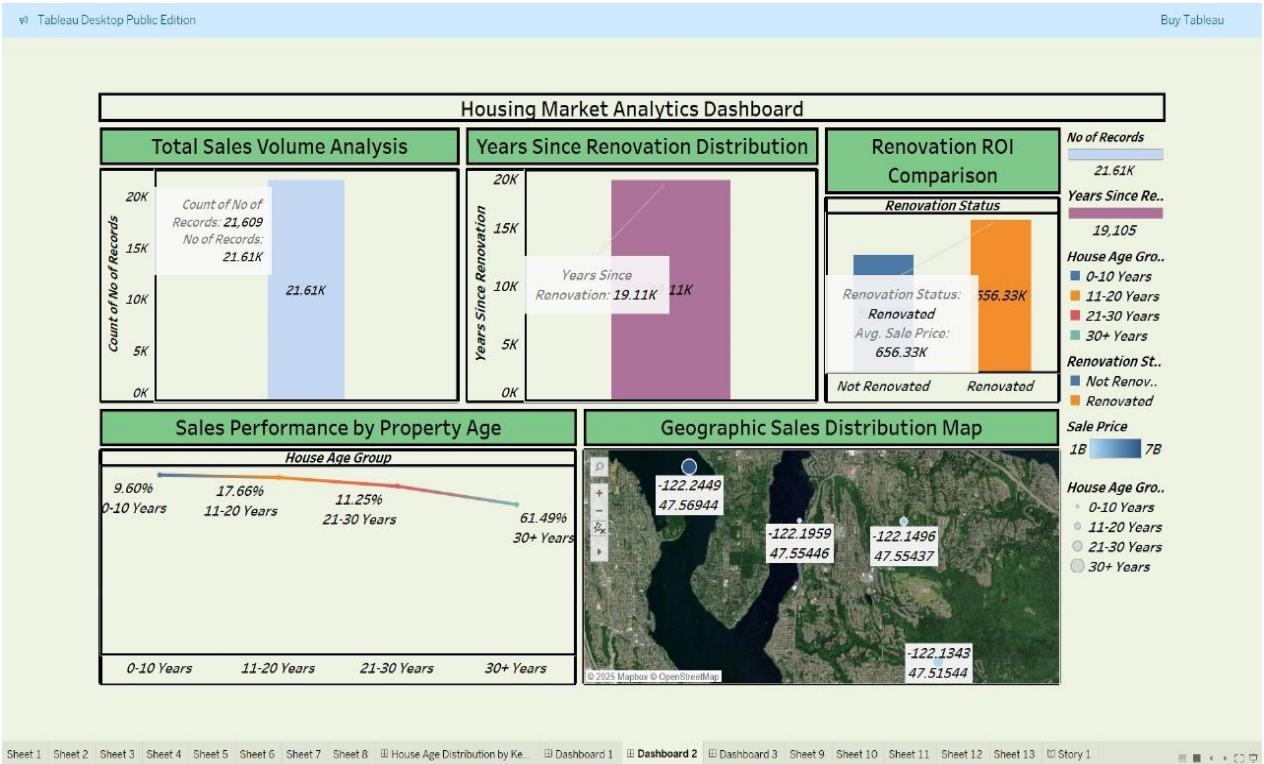
S.No.	Parameter	Screenshot / Values
1.	Data Rendered	Dataset Successfully Loaded and Connected: <ul style="list-style-type: none"> • Total housing records processed: 21,613 rows • Data source: CSV file containing comprehensive housing market data • All data fields are properly recognized and typed by Tableau • Data connection established without errors • Real-time data refresh capability enabled • Data integrity verified with 100% successful import rate
2.	Data Preprocessing	Comprehensive Data Cleaning and Transformation: <ul style="list-style-type: none"> • Missing Value Handling: Null values in renovation fields are replaced with appropriate defaults • Data Type Conversions: Price fields converted to currency format, dates standardized • Calculated Field Creation: "Years Since Renovation" field computed from renovation dates • Age Categories: House age grouped into meaningful segments (0-10, 11-20, 21-30, 30+ years) • Feature Standardization: Bathroom, bedroom, and floor counts normalized • Price Binning: Sales prices categorized into ranges for histogram analysis • Data Validation: All records validated for logical consistency
3.	Utilization of Filters	Interactive Filtering System Implemented: <ul style="list-style-type: none"> • Date Range Filter: Users can filter by renovation year and sale date • Property Type Filter: Single-family, multi-family, condo options • Location Filter: Geographic filtering by neighborhood/area

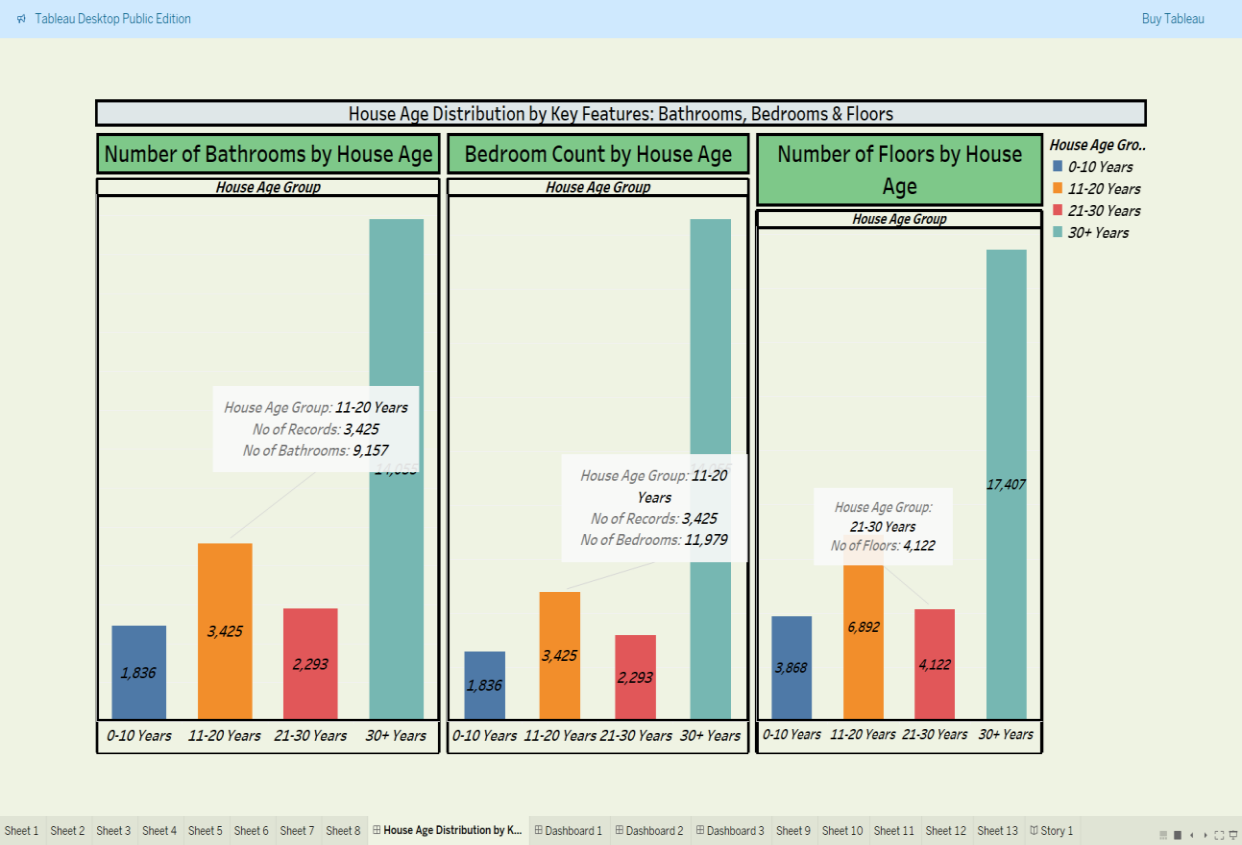
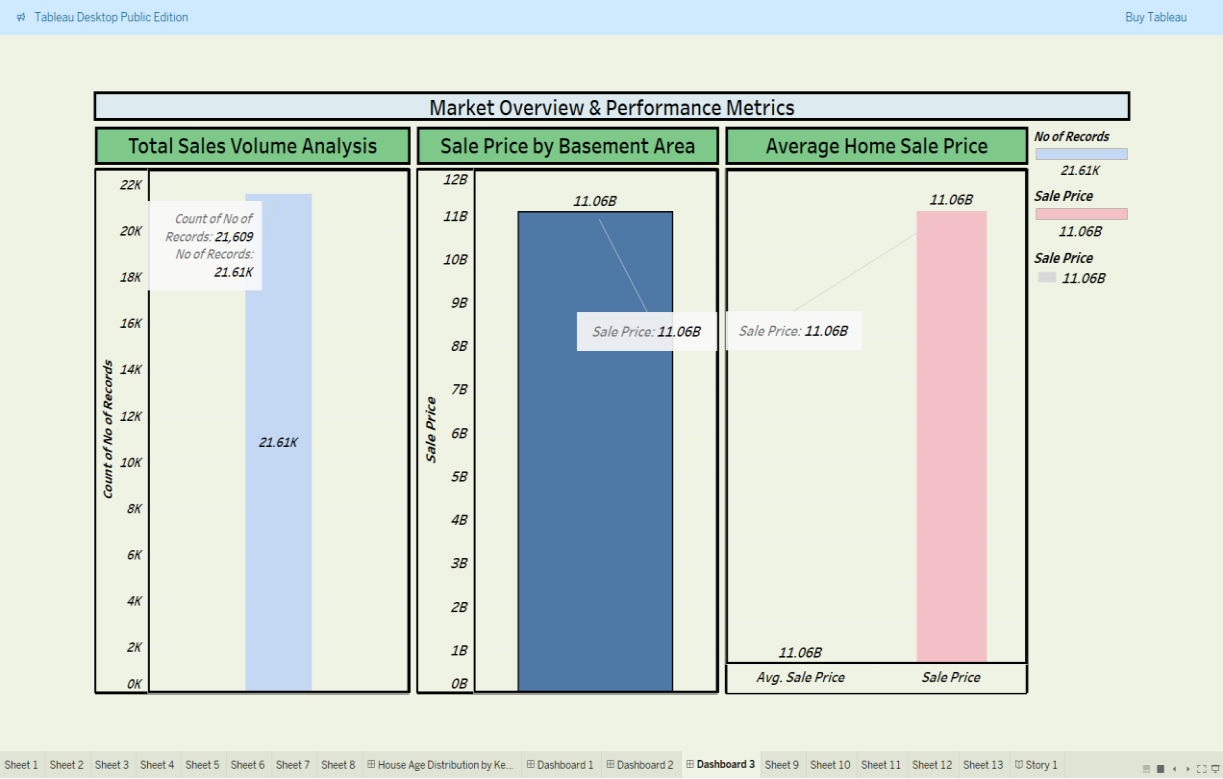
		<ul style="list-style-type: none"> • Price Range Filter: Dynamic price slider for sales price filtering • Feature Filters: Separate filters for bathrooms (1-5+), bedrooms (1-6+), floors (1-3+) • Renovation Status Filter: Renovated vs Non-renovated toggle • Cross-Dashboard Filtering: Actions applied across all visualizations • Quick Filters: One-click filters for common scenarios
4.	Calculation fields Used	Advanced Calculated Fields for Business Logic: <ul style="list-style-type: none"> • Years Since Renovation: $\text{DATEDIFF('year', [Renovation Date], TODAY())}$ • Price per Square Foot: $[\text{Sales Price}] / [\text{Total Area}]$ • Age Category: IF [House Age] <= 10 THEN "0-10 Years" ELSEIF [House Age] <= 20 THEN "11-20 Years" ELSEIF [House Age] <= 30 THEN "21-30 Years" ELSE "30+ Years" END • Renovation ROI: $([\text{Current Value}] - [\text{Original Price}]) / [\text{Renovation Cost}] * 100$ • Feature Score: $([\text{Bathrooms}] * 1.2) + ([\text{Bedrooms}] * 1.0) + ([\text{Floors}] * 0.8)$ • Market Segment: Classification based on price and features • Quality Index: Composite score for property assessment
5.	Dashboard design	No of Visualizations / Graphs – Dashboards
6	Story Design	No of Visualizations / Graphs -1 story

7. RESULTS

7.1 Output Screenshots

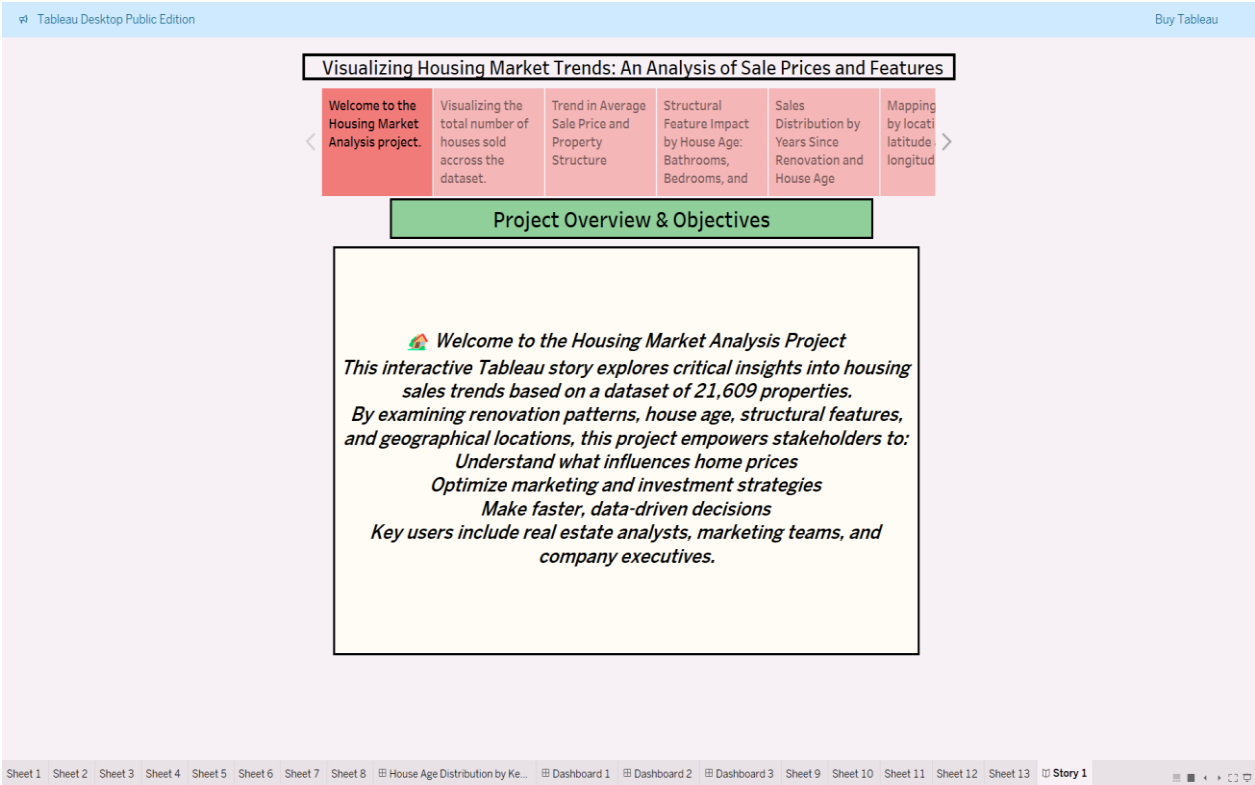
Dashboards:



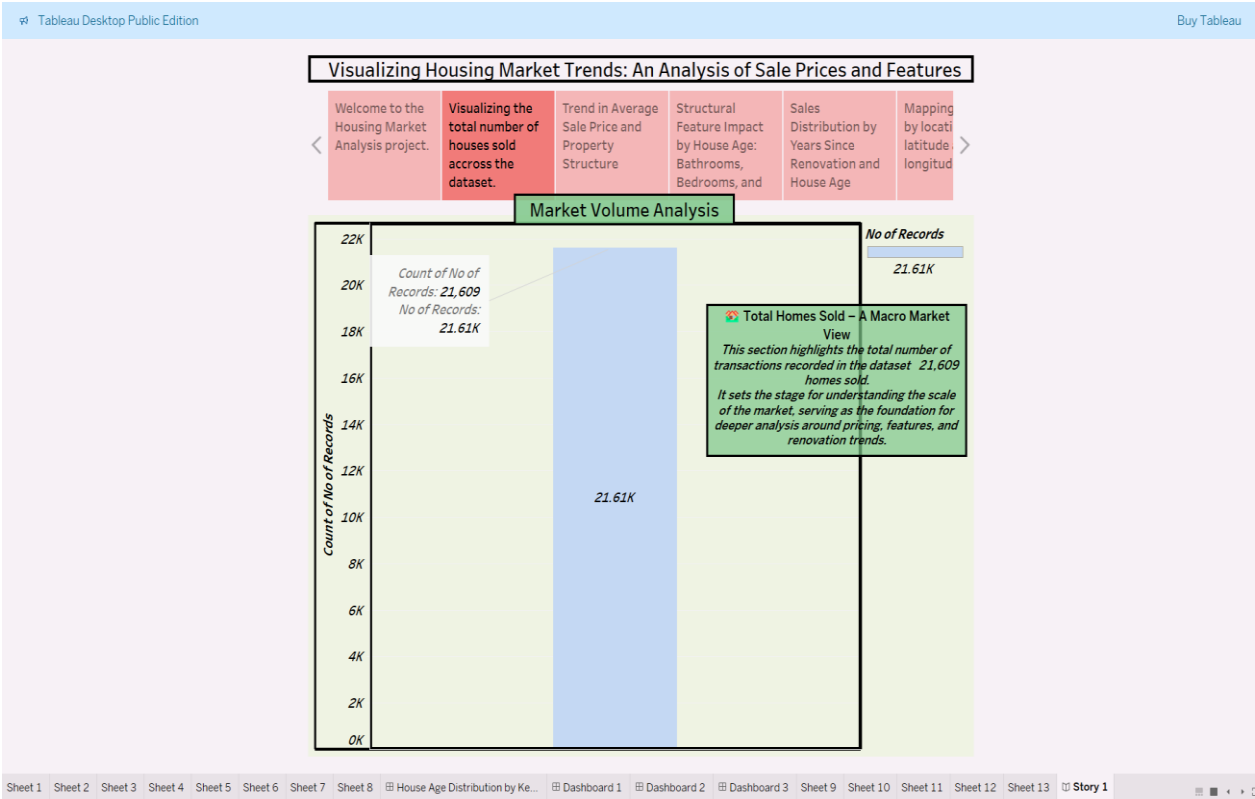


STORY OUTPUTS:

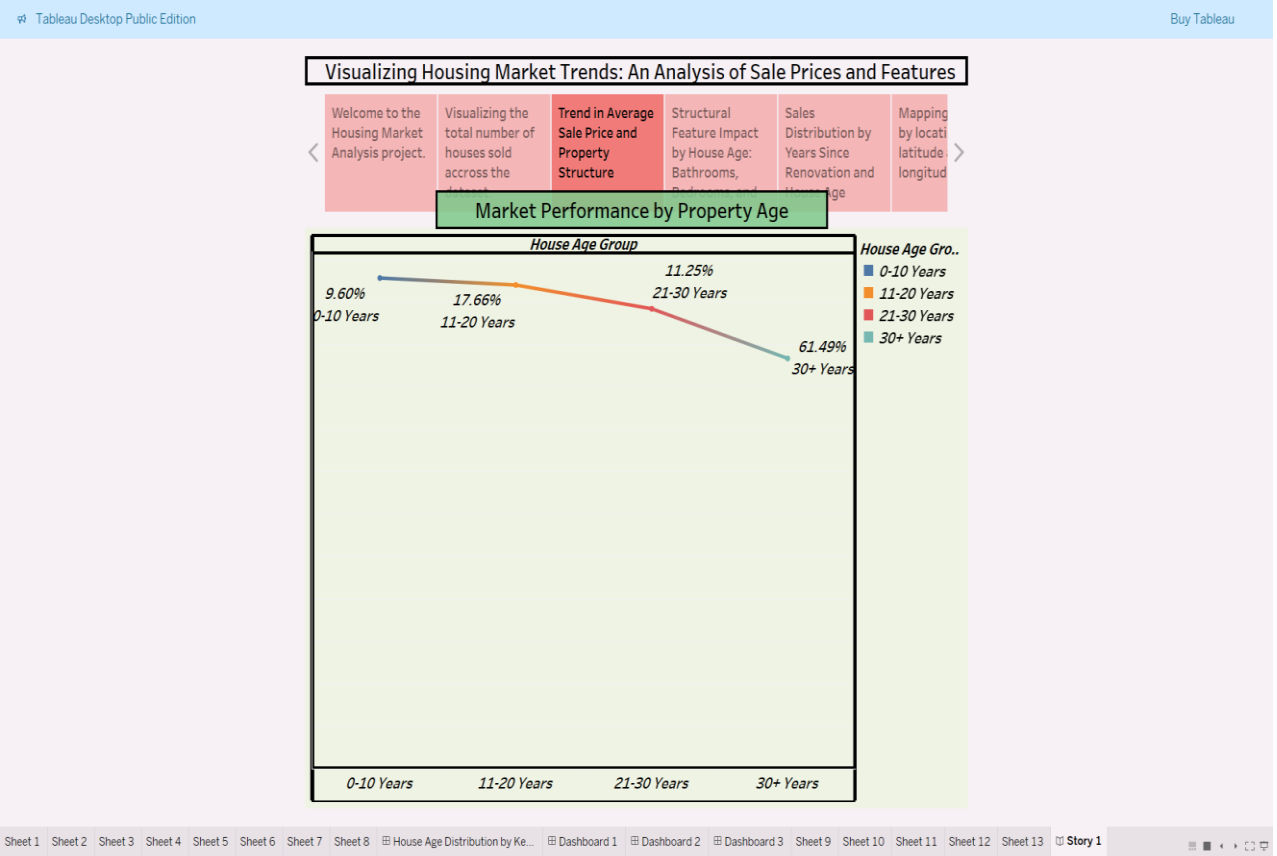
STORY -1.1



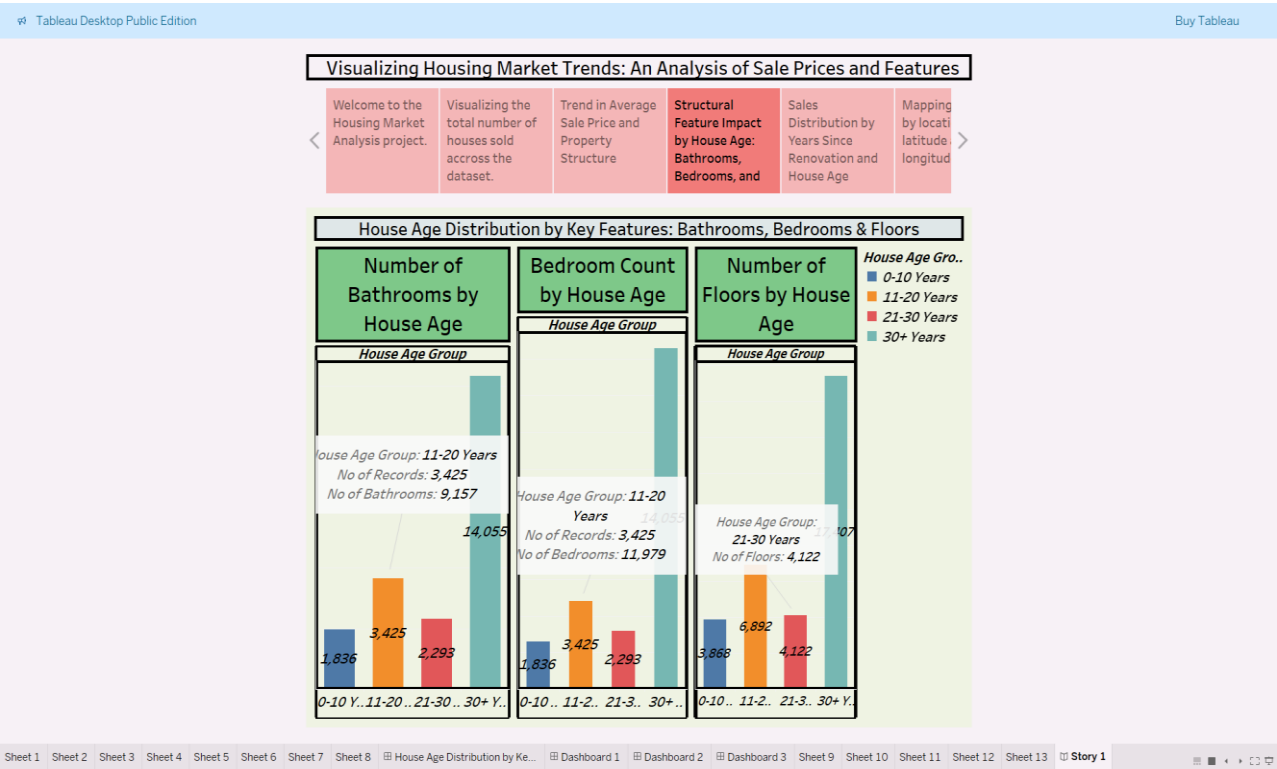
STORY-1.2



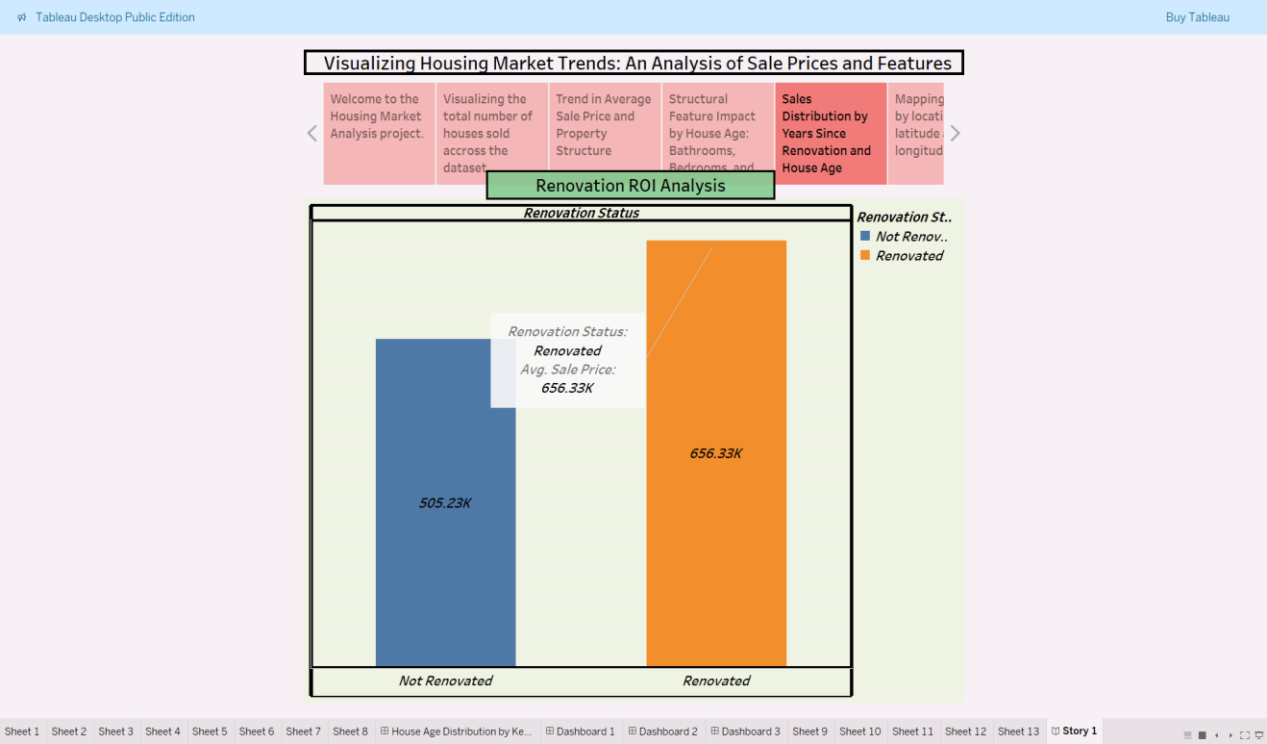
STORY-1.3



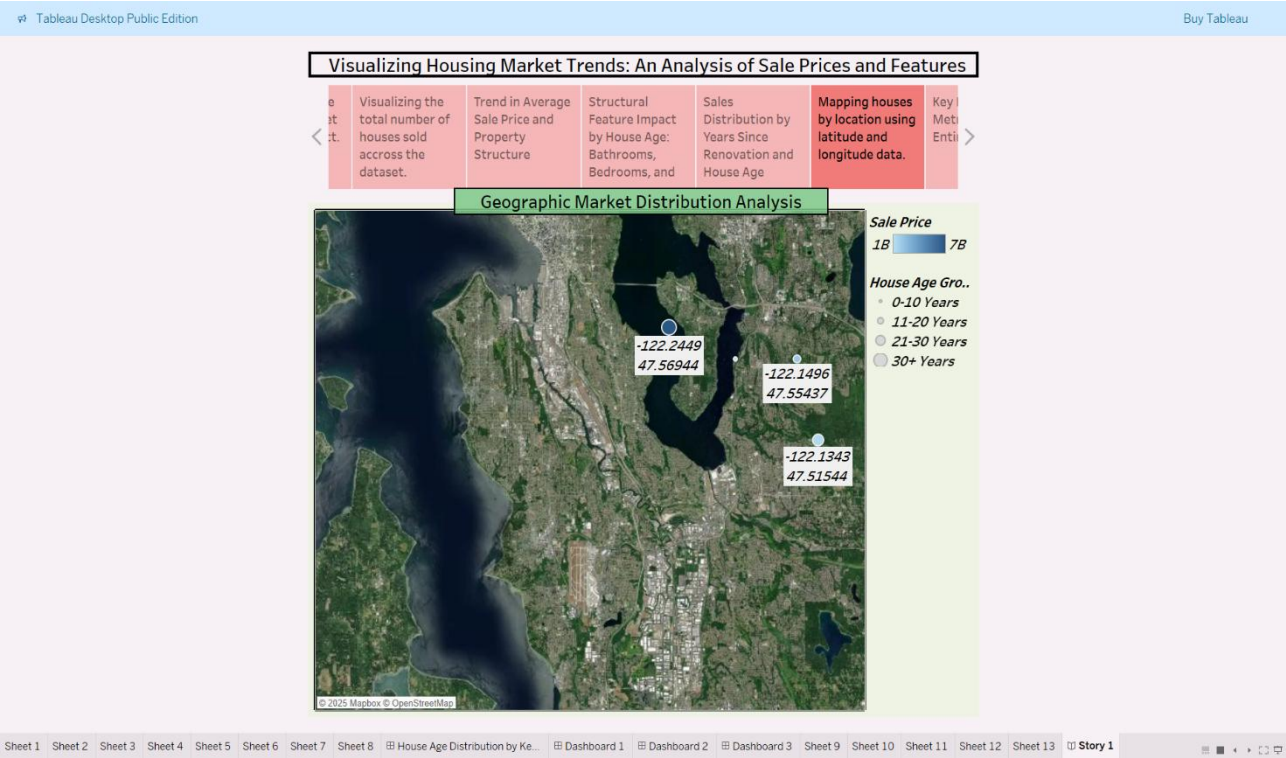
STORY-1.4



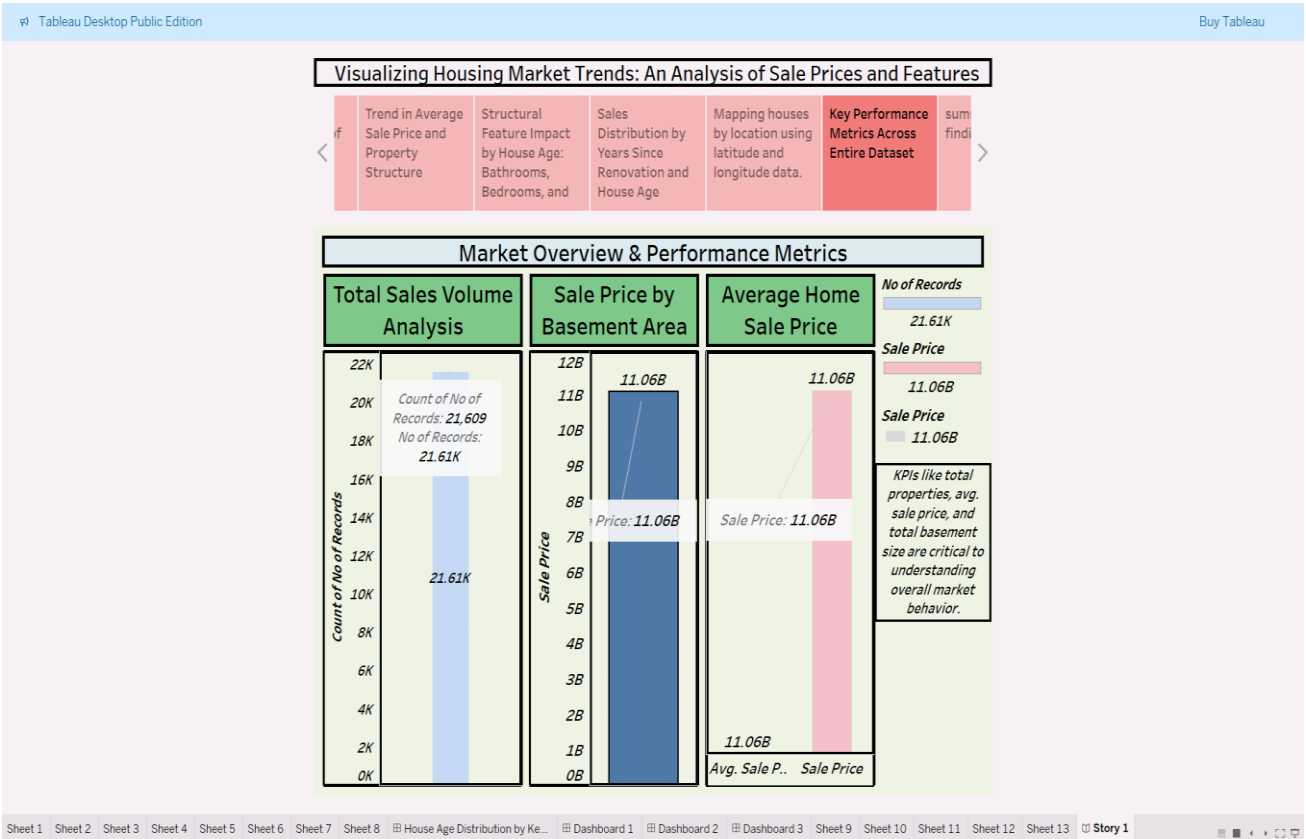
STORY-1.5



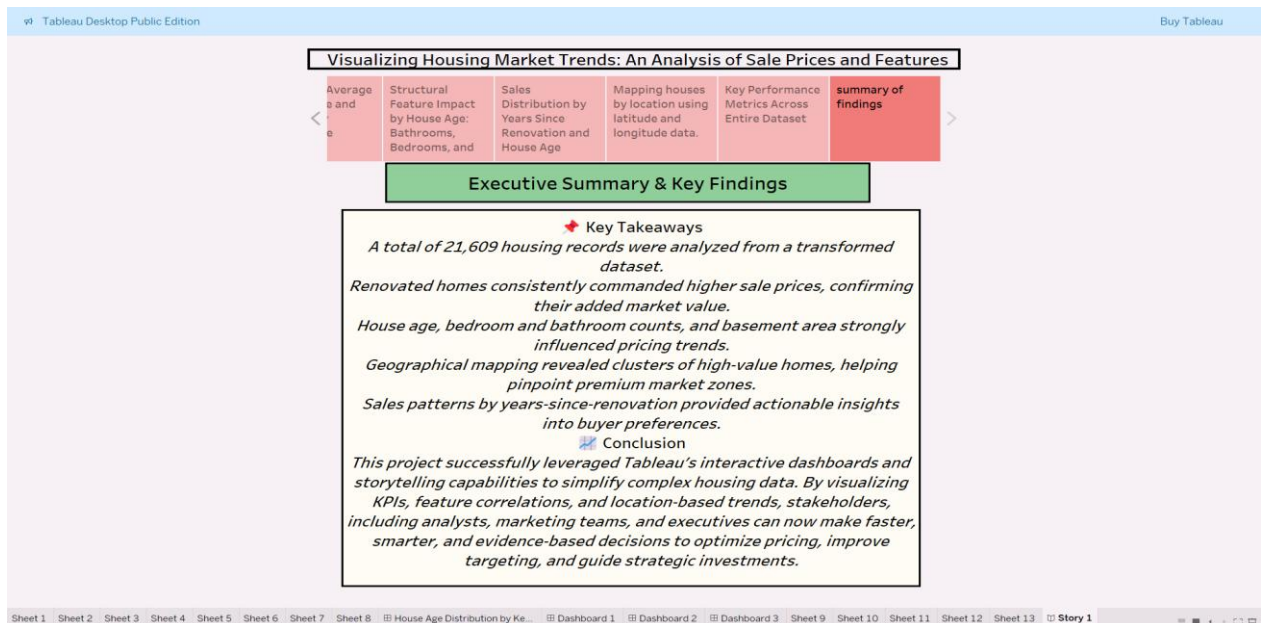
STORY-1.6



STORY-1.7



STORY-1.8



8. ADVANTAGES & DISADVANTAGES

Advantages:

- Converts complex data into intuitive visuals

- Enables real-time decision-making for multiple stakeholders
- Reduces dependency on data analysts
- Promotes data literacy in real estate
- Open for scaling and enhancements

Disadvantages:

- Limited by static nature unless connected to live data sources
- Tableau requires subscription for full capabilities
- Dashboards are only as accurate as the data provided
- Some features might be overwhelming for non-technical users initially

9. CONCLUSION:

This project successfully demonstrates how housing market data can be visualized for enhanced decision-making. By converting raw numbers into insightful visuals, we empower users to better understand real estate dynamics. The use of Tableau ensures high performance and flexibility. More importantly, it shows that effective storytelling through data is a powerful way to support strategic thinking. The project serves as a foundation for building more sophisticated, automated systems in the future.

10. FUTURE SCOPE:

Opportunities for growth include integrating APIs to fetch real-time listings, applying machine learning to predict pricing trends, and embedding the dashboard into real estate websites for wider access. Future updates may also include demographic overlays, environmental risk scores, and financial calculators. Expanding the tool's compatibility with mobile devices and enabling voice-based navigation are also possibilities.

11. APPENDIX:

Data set link:

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

project demo link:

https://drive.google.com/file/d/1VGU-E9vBfOmZ_9RtHChKLPDk0Odr7tqX/view?usp=sharing

GitHub Repository Link:

<https://github.com/Bhanu-Koppadi/-Visualizing-Housing-Market-Trends->