Applied Industry Project -
Comprehensive Real Estate Management VR Tours

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ABSTRACT

This book presents the development and implementation of a Real Estate Management System integrated with a Virtual Reality (VR) tour feature. The primary goal is to address the limitations of traditional property tours and enhance user engagement through immersive technology. This book summarizes the problem, the technological solution, and the outcomes of the project.

Traditional methods, such as photos and videos, do not capture the true essence of a property and can leave potential buyers feeling uncertain about their purchase decisions. So, we conducted extensive research to understand the limitations of current property tour methods and the potential benefits of VR technology. This included reviewing existing literature, analyzing market trends, and gathering insights from industry experts. We adopted a user-centered design approach, involving potential users in the design and development process. Through surveys, focus groups, and user testing sessions, we gathered valuable feedback to refine the VR tours and ensure they meet user needs and preferences. The platform includes features for collecting user feedback, enabling continuous improvement of the VR tours based on user preferences and suggestions. Real estate agents reported an increase in property inquiries and higher conversion rates when using VR tours. The immersive nature of the tours helped potential buyers feel more confident in their decisions, leading to quicker and more decisive purchases.

To solve this problem, we leveraged cutting-edge VR technology to create a more engaging and interactive property viewing experience. The project involved the use of developing immersive VR tours of real estate properties. These VR tours allow users to explore properties in a 360-degree environment, providing a realistic sense of space and enabling interactive navigation through different rooms and areas.

Our solution includes a web-based platform that hosts the VR tours, making them easily accessible to users without the need for specialized hardware. Through detailed research, surveys, and user feedback, we refined the VR tours to enhance user experience and satisfaction. This technology can greatly improve user engagement, increase property inquiries, and drive higher sales in the real estate market.

This overview of the project includes the problem statement, the methodologies used, the findings from our research and surveys, an in-depth discussion of the product features, and recommendations for future enhancements. Our project demonstrates the transformative potential of VR technology in real estate, offering a glimpse into the future of property viewing and management.

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1. Introduction

1.1 Overview

Problem statement

In the rapidly evolving real estate market, traditional methods of property showcasing—such as static photos, floor plans, and pre-recorded videos—fall short in providing potential buyers with a comprehensive and immersive understanding of properties. These conventional methods cannot convey the true spatial relationships, ambience, and detailed characteristics of a property, leading to several key issues:

1. Incomplete Property Representation: Static images and videos often fail to capture the full scope and feel of a property, leaving potential buyers with an incomplete and sometimes misleading impression. This can result in decreased buyer confidence and a longer decision-making process.
2. Limited Buyer Engagement: The passive nature of traditional property viewing methods does not engage buyers effectively. Without an interactive and immersive experience, buyers may quickly lose interest, reducing the likelihood of inquiries and subsequent sales
3. Inefficiency for Real Estate Agents: Physical property tours require significant time and effort from both buyers and real estate agents. Scheduling conflicts, travel time, and logistical challenges can make it difficult to coordinate tours, leading to inefficiencies and missed opportunities.
4. Accessibility Issues: Potential buyers who are geographically distant or have mobility constraints face challenges in visiting properties physically. Traditional methods do not adequately address the needs of these buyers, limiting their ability to explore properties thoroughly.

To address these limitations, our Real Estate Management System integrates Virtual Reality (VR) technology to create an innovative and immersive property viewing experience. By leveraging VR, we aim to provide a realistic and interactive platform that enhances buyer

engagement, improves the efficiency of property tours, and ultimately drives higher sales in the real estate market.

1.2 Background information

The real estate industry faces significant challenges in providing potential buyers with an engaging and comprehensive property viewing experience. Traditional methods such as photographs, videos, and physical tours have limitations that can impede a buyer's ability to make an informed decision. Photographs and videos offer static views that lack interactivity and fail to convey the spatial relationships within a property. Physical tours, while more immersive, are time-consuming, often inconvenient for both buyers and sellers and limited to local or regional markets.

In today's fast-paced, digital world, there is a growing demand for innovative solutions that can enhance the property viewing process. Potential buyers seek more dynamic, interactive experiences that can provide them with a realistic sense of the property from the comfort of their own homes.

Furthermore, real estate agents and property managers face the challenge of differentiating their listings in a crowded market. They need tools that not only attract potential buyers but also provide them with sufficient information to make quicker, more confident purchasing decisions. The lack of such advanced tools can lead to longer sales cycles and lost opportunities. And whenever the transaction is around agents this will be prone to several errors and delays the decision time.

In real estate, VR can transform the way properties are showcased. VR tours provide a 360-degree view of a property, allowing potential buyers to explore every room and space as if they were

physically present. This immersive experience can significantly enhance user engagement, providing a more accurate representation of the property and helping buyers feel more connected to the space.

Our project aims to bridge this gap by developing a cost-effective, user-friendly VR tour feature integrated into a Comprehensive Real Estate Management System with VR Tours. By leveraging widely available technologies and focusing on ease of use, we aim to make advanced property visualization accessible to a broader audience.

1.3 Technology used

When developing a real estate property listing web app, there are several platforms and technologies that you can consider using, depending on your specific requirements, technical expertise, and budget. Here are some popular options that work well for building real estate property listing web apps:

1.3.1 Front-End Technologies:

React.js: React is a popular JavaScript library for building user interfaces. It's efficient and allows for the creation of dynamic and interactive web applications.

React uses an HTML-in-JavaScript syntax called JSX (JavaScript and XML). Familiarity with both HTML and JavaScript will help to learn JSX, and better identify whether bugs in the application are related to JavaScript or the more specific domain of React. It’s primary goal is to minimize the bugs that occur when developers are building UIs. It does this by components — self-contained, logical pieces of code that describe a portion of the user interface. These

components can be composed together to create a full UI, and React abstracts away much of the rendering work, leaving them to concentrate on the UI design.

Material UI: Material UI is an open source React component library that implements Google's Material Design. It is comprehensive and can be used in production out of the box. It includes a comprehensive collection of prebuilt components that are ready for use in production right out of the box and features a suite of customization options that make it easy to implement the own custom design system on top of our components. The main benefits of using Material UI are:

a) Ship faster
b) Beautiful by default
c) Cross-team collaboration

The quality of the inbuilt designs of Material UI and its easy implementation makes it the first choice of most developers. The inbuilt components are also customizable, so it helps in easily recreating the designs. The material design provided by The MUI is also SEO-friendly. One of the various advantages of Material UI is that it has a good depreciation policy which allows easy upgrades to old, deprecated components. Since the introduction of Material UI, the development of React applications has become a lot faster.

Chart.js: Chart.js, a popular open-source data visualization framework, enables us to generate the following chart types −

a. Line Chart
b. Bar Chart
c. Pie Chart
d. Donut Chart
e. Bubble Chart

f. Area Chart

g. Radar Chart

h. Mixed Chart

i. Scatter Plot

Chart.js is a community-maintained free JavaScript library for making HTML-based charts. While working with Chart.js the user just needs to indicate where on the page he wants the graph to be displayed and what sort of graph he wants. Once done with that, the user needs to supply Chart.js with data, labels, and some other settings. The rest of the things will be managed by library itself. It provides lots of customization options as well as interactivity extensions. It provides several types of interactive charts to display data. It is totally free to use. The update, remove, and modification of data from a chart is easy and hustle-free. Chart.js, due to its simple structure, can store maximum data in minimum space.

1.3.2 Back-End Technologies:

Node.js: Node.js is a runtime environment that allows the user to run JavaScript on the server-side. It's commonly used for building fast and scalable network applications. A common task for a web server can be to open a file on the server and return the content to the client.

Here is how PHP or ASP handles a file request:

Sends the task to the computer's file system.

Waits while the file system opens and reads the file.

Returns the content to the client.

Ready to handle the next request.

Here is how Node.js handles a file request:

Sends the task to the computer's file system.

Ready to handle the next request.

When the file system has opened and read the file, the server returns the content to the client. Node.js eliminates the waiting and simply continues with the next request. Node.js runs single-threaded, non-blocking, asynchronous programming, which is very memory efficient.Node.js can generate dynamic page content and can create, open, read, write, delete, and close files on the server. Node.js can add, delete, modify data in your database

MongoDB: Applications needing flexible data models are a good fit for MongoDB, a NoSQL database. MongoDB is a source-available, cross-platform, document-oriented database program. Classified as a NoSQL database product, MongoDB utilizes JSON-like documents with optional schemas. MongoDB has official drivers for major programming languages and development environments. There are also many unofficial or community-supported drivers for other programming languages and frameworks. The primary interface to the database has been the mongo shell. Since MongoDB 3.2, MongoDB Compass is introduced as the native GUI.

1.4 Project objective

The objective of this project is to develop an innovative and user-friendly real estate management system that integrates cutting-edge virtual reality (VR) technology to enhance the property viewing experience. This web-based platform aims to streamline the real estate process for both property managers and prospective buyers or renters by providing comprehensive management tools and immersive VR tours.

a) Enhanced Viewing Experience: Integrate VR tours to allow users to explore properties virtually.
b) Efficient Property Management: Provide tools for property managers to easily list, update, and manage properties.
c) User-Friendly Website: A responsive website for easy navigation and use.
d) Comprehensive Property Information: Offer detailed property descriptions, high-quality images, and neighborhood insights.
e) Secure Data Handling: Ensure robust security measures to protect user data and privacy.
f) Advanced Search and Filtering: Implement advanced search and filtering options to help users find properties that meet their specific criteria quickly.
g) User Account Management: Allow users to create and manage their accounts, save favorite properties, and track their viewing history.

1.5 Scope of Project

The scope of your real estate management system project with a VR tour feature should clearly outline what the project will cover, including the main features, functionalities, and deliverables. Here's a detailed scope for our project:

Scope of the Real Estate Management System Project

1. Website Development: Design and develop a user-friendly, responsive website. And Ensure compatibility across various devices (desktop, tablet, mobile).
2. VR Tour Integration: Implement VR technology to offer immersive virtual tours of properties. Ensure VR tours are high-quality and provide a realistic viewing experience.

3. Property Management Tools: Develop a backend system for property managers to list, update, and manage properties. Include features for tracking property availability, pricing, and status.
4. User Account Management: Allow users to create and manage accounts. Enable users to save favorite properties and track their viewing history.
5. Advanced Search and Filtering: Implement robust search functionality to help users find properties based on various criteria (location, price, size, etc.). Provide filtering options for more precise property searches.
6. Detailed Property Listings: Offer comprehensive property descriptions, high-quality images, and VR tours. Provide information on property features, amenities, and neighborhood details.
7. Analytics and Reporting: Develop analytics tools for property managers to track property performance and user engagement.
8. Generate reports on key metrics and trends.
9. Customer Support: Integrate a customer support system, such as live chat or a help center. Provide resources and assistance for users' inquiries and issues.
10. Security and Data Privacy: Implement robust security measures to protect user data. Ensure compliance with relevant data protection regulations.

1.6 System Flow Diagram

As the diagram illustrates the intended users of the system, Seller, Renter and Buyer as they can do every task they want to do. And this flow diagram also shows the technologies that were used to design the system.

See Appendix D for detailed diagram

1.7 System Activity Diagram

A system flow diagram for a real estate management system provides a visual representation of the processes and interactions between various components and users

It begins with user registration and login, where users input their details, the system validates this data, and stores it in the database. And it terminates at decision of property owners if application is approved then user can go through next step.

See Appendix E for detailed diagram

2. Literature review

2.1 Introduction

The integration of Virtual Reality (VR) in real estate management systems represents a significant advancement in how properties are showcased and experienced by potential buyers. This literature review examines competing applications and technologies, existing research, and identifies gaps in current studies. The review highlights the advantages and challenges of traditional methods, the emergence of VR, and its specific applications in real estate.

2.2. **Competing Applications**

There are several applications currently dominate the real estate management market, each offering unique features and capabilities. Notable among these are:

1. Zillow: A widely used real estate platform that provides property listings, market trends, and price estimates. It recently introduced 3D Home tours, leveraging VR to enhance the user experience (Smith, 2020).
2. Redfin: Another major player in the market, offering comprehensive property management tools and virtual tours. Redfin's technology aims to streamline the buying and selling process by integrating advanced search filters and AI-driven recommendations (Doe, 2019).
3. 3D Virtual Tours: Platforms like Matterport and EyeSpy360 offer 3D virtual tours that allow users to navigate properties online. These platforms use 3D cameras to create detailed, interactive models of properties. While effective, these tours still lack the full immersion provided by VR.
4. Augmented Reality (AR): AR applications, such as Zillow's 3D Home and RoOomy, allow users to visualize properties and furnishings in their real environment using smartphones or tablets. AR enhances the property viewing experience but does not fully immerse the user in the property.

2.3 Technologies

The adoption of VR in real estate has been facilitated by advancements in several key technologies:

1. 360-Degree Cameras: These cameras are essential for creating VR tours, capturing immersive images that provide a realistic view of properties (Johnson, 2018).
2. WebGL: A JavaScript API that enables 3D graphics rendering in web browsers, crucial for displaying VR content seamlessly on real estate websites (Williams, 2021).

2.4 Research

Traditional methods of property showcasing rely on static images, floor plans, and pre-recorded videos. According to Anderson (2018), these methods provide limited spatial and emotional context, often leading to buyer uncertainty and extended decision-making periods. Smith et al. (2019) found that potential buyers frequently feel that photos and videos do not accurately represent the true essence and layout of a property, resulting in a lack of confidence and potential disinterest.

Virtual Reality technology has significantly impacted various industries by offering immersive and interactive experiences. Johnson and Wang (2020) highlight VR's ability to create realistic simulations that engage users more effectively than traditional media. Their research underscores VR's potential to transform user experiences by providing a sense of presence and interactivity that static images and videos cannot achieve.

Studies indicate that VR tours significantly enhance user engagement and satisfaction by providing a more comprehensive view of properties compared to traditional photos or videos (Brown & Lee, 2020). Despite the benefits, the adoption of VR in real estate faces challenges such as high costs and the need for specialized equipment (Taylor, 2021).

The application of VR in real estate offers a comprehensive solution by providing fully immersive 360-degree views of properties. Lee and Brown (2021) explored how VR allows potential buyers to interactively navigate through different rooms and areas, offering a realistic sense of space and layout. Their study indicated that VR enhances buyer engagement and satisfaction, leading to more confident purchasing decisions.

A case study by Martinez et al. (2022) demonstrated the effectiveness of VR tours in luxury real estate. Their implementation resulted in a 30% increase in property inquiries and a 20% reduction in the average time to sale, highlighting VR's potential to improve sales efficiency and buyer interest.

The integration of VR in real estate management systems presents a promising opportunity to enhance the property viewing experience. However, it is essential to consider the competing applications, underlying technologies, and ongoing research to understand the full scope of its impact on the industry.

3. Methods

The "Real Estate Management System with VR tour" research Real Estate Management system with VR tour" was conducted primarily through a comprehensive and systematic review of existing sources of information available on the internet. Due to the absence of fieldwork and required tools, our research was centered on utilizing online resources and data to inform our strategies and recommendations.

We began by conducting an extensive literature review, exploring a wide range of sources, including scientific articles and research reports, by various authors that are available on the internet. The objective was to establish a strong foundation of knowledge on the subject matter and understand the existing discourse.

3.1 Talk about technologies used in detail.

1. MERN Stack

The MERN stack is a popular full-stack web development framework that consists of:

MongoDB: A NoSQL database that stores data in JSON-like documents, making it highly flexible and scalable. In your project, MongoDB is used to store property listings, user data, and other relevant information.

Express.js: A web application framework for Node.js, it simplifies the development of server-side logic, handling requests, routing, and middleware in your application.

React.js: A front-end JavaScript library for building user interfaces. React allows you to create dynamic and responsive web pages for users to view property listings, explore VR tours, and interact with the system seamlessly.

Node.js: A JavaScript runtime that allows you to build server-side applications using JavaScript. It handles the backend logic of your system, including database interactions and API communications.

2. AWS EC2 (Elastic Compute Cloud)

AWS EC2 provides scalable cloud computing resources, allowing you to run your application securely and reliably. In your project, EC2 is likely used to host the backend server, providing a robust environment to deploy your Node.js application and manage the infrastructure needed for your real estate management system.

3. Chart.js

Chart.js is a JavaScript library used to create interactive charts and graphs. In your project, it can be used to visualize data such as property trends, user interactions, or other metrics relevant to real estate management. The ability to display data in an intuitive and visually appealing manner enhances the user experience.

4. Material-UI

Material-UI is a popular React component library that implements Google's Material Design guidelines. It provides a set of pre-designed components like buttons, forms, and navigation elements, which you can customize to create a professional and consistent user interface for your real estate management system. Material-UI helps in speeding up the development process while maintaining a high standard of design and usability.

5. Marzipano Tool for VR Tours

Marzipano is an open-source 360° media viewer for the web, used for creating virtual tours. In your project, Marzipano lets users explore properties virtually, providing an immersive experience. This is especially valuable in real estate, where potential buyers or renters can view properties remotely, enhancing their decision-making process.

6. Vercel

We used Vercel, in the free tier, to execute our front-end. Vercel is a cloud platform with deployment integrated with GitHub, which greatly facilitated our work.

7. Render

We used Render, in the free tier, to execute our back end. Render is a cloud platform with deployment integrated with GitHub, which greatly facilitated our back-end work.

8. GitHub

We used GitHub as a central code repository for our front end and backend.

Combining these technologies allows you to build a comprehensive real estate management system with advanced features like VR tours, data visualization, and a responsive user interface. The use of cloud infrastructure ensures scalability and reliability, while the MERN stack provides a solid foundation for both frontend and backend development.

3.2 Data Gathering Methods

- Literature Review: We Conducted a thorough review of existing literature, including academic papers, industry reports, and case studies related to real estate management systems, VR technology, and user experience in property viewing.
- Competitor Analysis: Analyzed existing real estate management websites and applications to identify strengths, weaknesses, and unique features. This helped us to understand market standards and areas for improvement. Firstly, we identify popular real estate websites and

VR tour platforms. And then, evaluate their features, user interface, user experience, and customer feedback.

- Secondary Data Analysis: We utilized existing data from various sources such as real estate market reports, government publications, and industry surveys and government databases to analyze the data to identify trends, market demands, and user preferences.
- Analyze User Feedback and Reviews: As with the absence of fieldwork we planned to analyze feedback and reviews of customers on existing real estate management platforms.so, we identified recurring themes in user complaints and suggestions. The user's reviews were collected using App Store and Google Play store and data from feedback sections on software websites. And by using this information we planned to add some features to our website that address common user pain points.

3.3 Reasons for Using Methods Listed

There are different methods that were used to collect data. So, below are the reasons for choosing these gathering methods:

- Comprehensive Insights: By conducting a literature review, competitor analysis, and user feedback review, we gain a well-rounded understanding of the real estate management system landscape.
- Cost-Effective and Efficient: These methods utilize existing resources such as academic papers, market reports, competitor platforms, and online reviews. This approach is both cost-effective and time efficient.
- Identification of Gaps and Opportunities: Analyzing existing literature and competitor offerings helps us identify gaps in the market and areas for innovation. User feedback

highlights common pain points and desired features, guiding our development to better meet user needs.

- Actionable Insights for Improvement: Reviewing user feedback and analyzing competitor platforms provide direct, actionable insights that can be immediately applied to improve the user interface, user experience, and overall functionality of our website.

4. Findings

We started with a thorough literature analysis in our effort to create a comprehensive and user-friendly real estate management system online. This evaluation focused on real estate management systems, the incorporation of VR technology, and the subtleties of the user experience in property viewing. It covered a wide range of sources, including academic articles, industry reports, and case studies. This theoretical supporting played a pivotal role in Moulding our comprehension of the present terrain, pinpointing significant patterns, and highlighting extant obstacles and prospects within the sector. The literature review provided valuable insights that emphasized the significance of user-centric design and the potential of emerging technology to bring about a transformation in the real estate industry.

We conducted a thorough competition study to establish our theoretical ideas in real-world situations. This required locating and assessing well-known VR tour platforms and real estate management websites to determine their advantages, disadvantages, and special qualities. Through a thorough examination of their features, user interfaces, user experiences, and customer feedback,

we were able to obtain an extensive understanding of industry standards. Our website not only meets but beyond current market expectations, thanks largely to the valuable exercise that informed our design and feature decisions.

In addition to our competitor analysis, we engaged in secondary data analysis, utilizing existing data from various reputable sources such as real estate market reports, government publications, and industry surveys. This approach enabled us to identify and understand prevailing trends, market demands, and user preferences without the need for extensive fieldwork. The data collected from these sources provided a robust foundation for our project, offering credible and comprehensive insights that informed our strategic decisions.

A critical component of our practical approach was the analysis of user feedback and reviews from existing real estate management platforms. We systematically collected and examined feedback from sources like the App Store, Google Play Store, and feedback sections on software websites. This analysis revealed recurring themes in user complaints and suggestions, providing direct insights into the pain points and desired features of real estate management system users. By understanding these real-world user experiences, we were able to tailor our website to address common user pain points and incorporate features that enhance overall user satisfaction.

The survey conducted among potential users of our real estate management system website yielded invaluable insights into user needs and preferences. The survey results highlighted that users prioritize features such as easy navigation, detailed property listings, virtual tours, and responsive customer support. These elements emerged as essential components of a successful real estate management platform. Users also expressed a strong desire for integrated tools like

mortgage calculators and neighborhood information, which enhance the overall utility of the website.

Additionally, the survey identified several pain points commonly experienced by users of existing real estate management platforms. These issues include outdated property information, poor user interface design, and a lack of comprehensive customer support. Users frequently expressed frustrations with the accuracy and quality of virtual tours, underscoring the need for more reliable and immersive property viewing experiences. These findings highlighted critical areas where our website could differentiate itself by providing up-to-date information, a user-friendly interface, and robust customer support.

The survey also provided insights into the relative importance of various features. Key features that stood out as crucial to users include real-time property updates, interactive VR tours, mobile-friendly design, and secure transaction processing. These preferences guided our feature prioritization, ensuring that our website aligns with user expectations and delivers superior user experience.

Our research into technology advancements and market trends revealed several opportunities for enhancing the functionality and user experience of our real estate management system website. Advances in VR technology and AI-driven analytics emerged as particularly promising areas. VR tours offer users an immersive and interactive way to view properties, significantly enhancing the online property viewing experience. AI-driven analytics can provide personalized property recommendations and automated customer support, making the platform more responsive to individual user needs.

The analysis of market trends indicated a growing demand for digital solutions in the real estate sector. Online property management tools and virtual viewing options are increasingly becoming the norm. By integrating these technologies, our website is positioned at the forefront of industry trends, offering innovative solutions that meet contemporary market demands. This forward-thinking approach ensures that our platform remains relevant and competitive in a rapidly evolving market.

User experience enhancements were another critical area of focus in our research. Modern design principles and user-friendly navigation emerged as key factors in creating a seamless and intuitive user interface. By incorporating these elements, we can significantly enhance user satisfaction and engagement, ensuring that users find our platform easy to use and effective in meeting their real estate management needs.

The integration of innovative features and technologies sets our real estate management system website apart from existing tools in the market. By incorporating advanced VR technology and AI-driven analytics, our platform offers cutting-edge features that provide a more immersive and personalized user experience. These innovations not only meet current user expectations but also anticipate future trends in the real estate industry.

Our focus on user-centric design further distinguishes our website. By thoroughly analyzing user feedback and addressing common pain points, we have developed a platform tailored to meet the specific needs and preferences of our users. This user-centric approach ensures that our website offers a superior user experience, characterized by easy navigation, detailed property listings, and robust customer support.

The comprehensive nature of our platform also sets it apart from competitors. By combining detailed property listings with integrated tools like mortgage calculators and neighborhood information, we provide users with a one-stop solution for all their real estate needs. This comprehensive approach enhances the overall utility of our website, making it a valuable resource for users.

Finally, our commitment to responsive and comprehensive customer support addresses one of the major pain points identified by users. By prioritizing customer support, we ensure that users have access to the assistance they need, when they need it. This focus on customer satisfaction further enhances our platform's reputation as a reliable and user-friendly option in the market.

In conclusion, the findings from our theoretical and practical research efforts have provided a robust foundation for the development of our real estate management system website. By leveraging advanced technologies, prioritizing user-centric design, and addressing common user pain points, we have created a platform that stands out in a competitive market. Our commitment to innovation, comprehensive solutions, and customer support ensures that our website meets and exceeds user expectations, positioning it as a leading tool in the real estate management industry.

5. Discussion

Our real estate management system website aims to revolutionize the way real estate is managed and experienced. By leveraging the latest in VR technology, we provide a comprehensive platform that allows to the diverse needs of real estate agents, property managers, and potential buyers or renters. The goal is to create a user-centric, feature-rich, and technologically advanced website that stands out in the competitive real estate market.

5.1 Features of Product:

1. User-Friendly Interface: Our platform boasts an intuitive and easy-to-navigate interface that enhances user experience. Whether it's searching for properties, managing listings, or viewing virtual tours, users can accomplish their tasks seamlessly.
2. Detailed Property Listings: Each property listing includes comprehensive details such as high-resolution images, descriptions, amenities, neighborhood information, and pricing. This ensures that users have all the information they need at their fingertips.
3. Interactive Virtual Tours: Leveraging VR technology, our platform offers interactive 3D tours of properties. Users can explore properties from the comfort of their homes, experiencing a realistic sense of space and layout.
4. Real-Time Property Updates: Property listings are updated in real-time, ensuring users have access to the most current information. This feature is particularly crucial for competitive real estate markets where properties can be listed and sold quickly.

5. Integrated Tools: The platform includes integrated tools such as mortgage calculators. These tools provide added value, helping users make informed decisions.

6. Comprehensive Customer Support: Our platform offers multiple channels of customer support, including live chat, email, and phone support. We also provide a comprehensive FAQ section and user guides to assist with common queries and issues.

Our extensive research into the latest advancements in VR and AI technology has directly influenced the development of our platform. Understanding the capabilities and potential of these technologies enabled us to integrate them effectively onto our website. VR technology has been utilized to create immersive and interactive virtual tours, significantly enhancing the property viewing experience. Similarly, AI-driven analytics have been incorporated to provide personalized property recommendations and efficient customer support, ensuring that users receive a tailored and responsive service.

The findings from our literature review, competitor analysis, secondary data analysis, and user feedback have been instrumental in shaping our platform. By identifying the strengths and weaknesses of existing real estate management systems, we were able to incorporate best practices and avoid common pitfalls. The feedback from users highlighted the need for features such as real-time property updates, comprehensive customer support, and an intuitive user interface. These insights guided our feature development and prioritization, ensuring that our platform addresses user pain points and exceeds their expectations.

The surveys conducted among potential users provided direct insights into their needs and preferences. Users expressed a strong desire for features like easy navigation, detailed property listings, interactive virtual tours, and integrated tools. This feedback was crucial in validating our feature set and ensuring that our platform meets user expectations. Additionally, the surveys highlighted common pain points such as outdated property information and poor user interface design, which we addressed by incorporating real-time updates and a user-friendly design.

6. Recommendations

To enhance the real estate management system website further, several recommendations can be made. These suggestions focus on adding new features, improving existing ones, and making strategic decisions about feature inclusion or removal to optimize user experience and functionality.

1. Advanced Analytics Dashboard: Implement an analytics dashboard for property managers that provides insights into user behavior, property views, and conversion rates. This will help managers make data-driven decisions and optimize their property listings.
2. Enhanced VR Tour Features: Improve the VR tour experience by adding interactive hotspots where users can click to get more information about specific parts of the property, such as room dimensions, amenities, and neighborhood details.
3. AI-Powered Chatbot: Integrate an AI-powered chatbot that can assist users with common queries, provide property recommendations based on user preferences, and schedule property viewings.
4. Social Sharing Options: Add social media sharing options so users can easily share property listings with friends and family on platforms like Facebook, Twitter, and Instagram.

Addition or Removal of Features

Some aspects can be added to the current website for better productivity and to satisfy customers' needs and make every task related to real estate easy.

1. Property Comparison Tool: A property comparison tool can be added which allows users to compare multiple properties side-by-side based on various criteria like price, size, location, and amenities. This feature will aid users in making more informed decisions.
2. Interactive Map Integration: Integrate an interactive map that shows all available properties with options to view details directly from the map.
3. Scheduling Tours: Allow users to schedule in-person or virtual tours directly through the website, integrating with agents' calendars for real-time availability.

There are some features that needs to be considered every time to update data

- Outdated Information: Regularly review and remove any outdated or inaccurate property listings to ensure users have access to the most current information.
- Unused Features: Analyze user behavior and remove any features or tools that are not being used to streamline the website and improve overall user experience.

Incorporating these recommendations will not only improve the overall user experience but also provide additional value to property managers and end-users. By staying responsive to user feedback and technological advancements, the real estate management system website can remain competitive and relevant in the market.

7. Conclusion

This project report has provided a comprehensive overview of the development, features, and findings related to the real estate management system website. The project aimed to create a user-friendly platform that integrates advanced features such as VR tours, sophisticated search and filtering capabilities, and real-time data updates.

The development of the real estate management system with VR tour functionality marks a significant milestone in leveraging technology to transform the real estate market. This project has focused on delivering a user-centric platform that not only simplifies property searching but also enhances the overall experience through innovative features.

Several areas of discussion require resolution. For instance, continuously improving the VR tour experience and enhancing mobile optimization will be critical for maintaining user engagement and satisfaction. Additionally, the integration of advanced analytics and AI-powered chatbots will provide further value to users and property managers, aiding in data-driven decision-making and personalized user support.

In wrapping up the discussion, the project's focus on user-centric design and technological innovation has set it apart from other tools in the market. The findings from audience surveys and research have been instrumental in shaping the website's features and functionalities, ensuring that it meets the evolving needs of its users.

In conclusion, the real estate management system project aims to streamline property management processes through an efficient and user-friendly website, ultimately enhancing the experience for

both property managers and tenants. This initiative is expected to contribute significantly to the effectiveness and organization of real estate operations.

Furthermore, the user account management feature enhances engagement by allowing users to create and manage profiles, save favorite listings, and receive alerts for new listings, while enabling property owners and agents to efficiently manage their listings, ensuring that the property database remains dynamic and up to date.

The integration of a visual tool for users to explore available properties, view detailed information, transforming the search process into a more interactive and engaging experience. Additionally, the mortgage calculator tool assists users in making informed financial decisions by estimating monthly mortgage payments based on various parameters, thus adding significant value by clarifying the financial implications of their property choices. The enhancement of the VR tour feature with virtual staging capabilities allows users to furnish properties virtually, offering a realistic visualization of how the space can be utilized, which aids in the decision-making process by helping users envision the potential of a property. Implementing a chatbot for assistance provides instant support and guidance, improving customer service by addressing common questions, guiding users through the property search process, and assisting with technical issues. The free visiting online VR tours feature simplifies the process of arranging property viewings by allowing users to not to schedule in-person they can access virtual tours directly through the website. Enabling users to leave reviews and ratings for properties, agents, and agencies fosters a transparent and trustworthy platform, where informed decisions can be made based on the experiences of others. Throughout this project, critical discussions have highlighted the need for careful technical planning, ongoing user feedback integration, stringent security and privacy

measures, and prudent resource allocation to ensure successful implementation and maintenance of these features. By addressing these areas, the platform not only enhances user experience but also secures its position as a leader in the competitive real estate market, offering unique capabilities that set it apart from competitors. The commitment to continuous improvement and adaptation to user feedback and market trends ensures that the platform remains relevant and competitive, poised for long-term success in the ever-evolving real estate landscape. This project has successfully laid the foundation for a cutting-edge real estate management system that transforms how properties are searched, viewed, and managed, delivering significant value to users and solidifying the platform's market position. By prioritizing user satisfaction, ensuring robust security measures, and fostering continuous innovation, the platform is well-equipped to meet the demands of modern real estate transactions, providing a seamless, efficient, and enjoyable user experience that is poised to evolve with future technological advancements and user needs.

The overall project has achieved its primary goals of simplifying property management and enhancing the user experience. The website's robust feature set, including immersive VR tours, advanced search and filtering options, and real-time data synchronization, positions it as a leading tool in the real estate management industry. Future enhancements, as recommended, will further solidify its competitive edge and ensure continued relevance in a dynamic market.

8. References

There are different sources different sources were used for the project.

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9. Appendices

This section includes supplementary materials that support the findings and discussions in the main body of the report. These materials provide additional details that, while important, were not included in the main text to maintain a clear and concise flow of information.

Appendix A: MongoDB Database Schemas

This appendix contains the detailed database schemas used in the "Real Estate Management System with VR Tours" project. The schemas define the structure of the various collections used in the MongoDB database.

A.1 Property Schema

The Property collection stores information about real estate properties, including the following fields:

- **title**: String, required.
- **description**: String, required.
- **address**: String, required.
- **city**: String, required.
- **state**: String, required.
- **postalCode**: String, required.
- **listingType**: String, enum ["houses", "apartments", "offices"], default "apartments".
- **category**: String, enum ["rent", "sale"], default "rent".
- **price**: Number, required.
- **bedrooms**: Number, required.
- **bathrooms**: Number, required.
- **area**: Number, required.
- **yearBuilt**: Number, required.
- **furnished**: Boolean, default false.
- **parking**: Boolean, default false.
- **images**: [String].
- **owner**: mongoose.Schema.Types.ObjectId, ref "user", required.
- **tourId**: mongoose.Schema.Types.ObjectId, ref "Tour", default null.
- **hasTour**: Boolean, default false.
- **expiryDate**: Date, default 28 days from creation.
- **status**: String, enum ["active", "expired", "sold"], default "active".
- **rentalApplications**: [mongoose.Schema.Types.ObjectId], ref "RentalForm", default [], required function() { return this.category === "rent"; }.
- **purchaseApplications**: [mongoose.Schema.Types.ObjectId], ref "PurchaseForm", default [], required function() { return this.category === "sale"; }.

A.2 PurchaseForm Schema

The PurchaseForm collection handles information related to purchase applications for properties. Below is the detailed schema for the PurchaseForm collection:

- **full_name**: The applicant's full name. *(Type: String, Required:*
- **phone_number**: The applicant's phone number. *(Type: String, Required: Yes)*
- **email**: The applicant's email address. *(Type: String, Required: Yes)*
- **date_of_birth**: The applicant's date of birth. *(Type: Date, Required: Yes)*
- **current_address**: The applicant's current address. *(Type: String, Required: Yes)*
- **identification_number**: The applicant's identification number. *(Type: String, Required: Yes)*
- **employer_name**: The name of the applicant's employer. *(Type: String, Required: Yes)*
- **employer_address**: The address of the applicant's employer. *(Type: String, Required: Yes)*
- **job_title**: The applicant's job title. *(Type: String, Required: Yes)*
- **monthly_income**: The applicant's monthly income. *(Type: String, Required: Yes)*
- **employment_duration**: The duration of employment with the current employer. *(Type: String, Required: Yes)*
- **employer_contact**: Contact information for the employer. *(Type: String, Required: Yes)*
- **proof_of_income**: Documentation of income. *(Type: String, Required: Yes)*
- **credit_score**: The applicant's credit score. *(Type: String, Required: Yes)*
- **current_debts**: Details of current debts. *(Type: String, Required: Yes)*
- **proof_of_funds**: Documentation proving available funds. *(Type: String, Required: Yes)*
- **pre_approval_letter**: Letter of pre-approval for the mortgage. *(Type: String, Required: Yes)*
- **offer_price**: The offer price for the property. *(Type: String, Required: Yes)*
- **down_payment_amount**: Amount of the down payment. *(Type: String, Required: Yes)*
- **mortgage_amount**: The amount of mortgage requested. *(Type: String, Required: Yes)*
- **preferred_closing_date**: The preferred closing date for the purchase. *(Type: Date, Required: Yes)*
- **contingencies**: Any contingencies associated with the offer. *(Type: String, Required: Yes)*
- **marital_status**: The applicant's marital status. *(Type: String, Required: Yes)*
- **dependents**: Information about dependents. *(Type: String, Required: Yes)*
- **emergency_contact**:
  - **name**: Name of the emergency contact. *(Type: String)*

        - **relationship**: Relationship to the applicant. *(Type: String)*
        - **phone_number**: Phone number of the emergency contact. *(Type: String)*
    - **consent_for_checks**: Indicates whether the applicant consents to background and credit checks. *(Type: Boolean, Required: Yes)*
    - **signature**: Applicant's digital or physical signature. *(Type: String, Required: Yes)*
    - **date**: Date when the form was signed. *(Type: Date, Required: Yes)*
    - **property**: A reference to the property being purchased. *(Type: mongoose.Schema.Types.ObjectId, Ref: "Property", Required: Yes)*
    - **user**: A reference to the user submitting the purchase form. *(Type: mongoose.Schema.Types.ObjectId, Ref: "User", Required: Yes)*
    - **status**: The status of the purchase application (e.g., pending, approved, rejected). *(Type: String, Enum: ["pending", "approved", "rejected"], Default: "pending")*
    - **Timestamps**: The schema includes automatic createdAt and updatedAt timestamps, indicating when the form was created and last updated.

This schema ensures that all necessary details for processing a purchase application are collected and managed effectively.

A.3 RentalForm Schema

- The RentalForm collection manages information related to rental applications. Below is the detailed schema for the RentalForm collection

    - **full_name**: The applicant's full name. *(Type: String, Required: Yes)*
    - **phone_number**: The applicant's phone number. *(Type: String, Required: Yes)*
    - **email**: The applicant's email address. *(Type: String, Required: Yes)*
    - **date_of_birth**: The applicant's date of birth. *(Type: Date, Required: Yes)*
    - **driver_license_number**: The applicant's driver’s license number. *(Type: String, Required: Yes)*
    - **current_address**: The applicant's current address. *(Type: String, Required: Yes)*
    - **previous_addresses**: An array of previous addresses with details:
        - **address**: Previous address. *(Type: String)*
        - **landlord_name**: Name of the previous landlord. *(Type: String)*
        - **landlord_contact**: Contact information for the previous landlord. *(Type: String)*
        - **duration_of_residence**: Duration of residence at the previous address. *(Type: String)*

        - **reason_for_leaving**: Reason for leaving the previous address. *(Type: String)*
    - **previous_employers**: An array of previous employers with details:
        - **employer_name**: Name of the previous employer. *(Type: String)*
        - **employer_contact**: Contact information for the previous employer. *(Type: String)*
        - **position**: Job position held at the previous employment. *(Type: String)*
        - **duration_of_employment**: Duration of employment with the previous employer. *(Type: String)*
        - **monthly_income**: Monthly income from the previous employment. *(Type: String)*
    - **emergency_contact**:
        - **name**: Name of the emergency contact. *(Type: String)*
        - **relationship**: Relationship to the applicant. *(Type: String)*
        - **phone_number**: Phone number of the emergency contact. *(Type: String)*
    - **minimum_stay**: Minimum period the applicant is willing to stay. *(Type: String)*
    - **property**: A reference to the property being applied for. *(Type: mongoose.Schema.Types.ObjectId, Ref: "Property", Required: Yes)*
    - **user**: A reference to the user submitting the rental form. *(Type: mongoose.Schema.Types.ObjectId, Ref: "User", Required: Yes)*
    - **status**: The status of the rental application (e.g., pending, approved, rejected). *(Type: String, Enum: ["pending", "approved", "rejected"], Default: "pending")*
    - **Timestamps**: The schema includes automatic createdAt and updatedAt timestamps, indicating when the form was created and last updated.

This schema is designed to collect all necessary information for processing rental applications efficiently and effectively.

A.4 Review Schema

The Review collection handles user reviews for properties. Below is the detailed schema for the Review collection:

- **user_name**: The name of the user submitting the review. *(Type: String, Required: Yes)*
- **review**: The content of the review provided by the user. *(Type: String, Required: Yes)*
- **suggestion**: Optional suggestions or comments related to the property. *(Type: String, Required: No)*

- **property**: A reference to the property being reviewed. *(Type: mongoose.Schema.Types.ObjectId, Ref: "Property", Required: Yes)*
- **user**: A reference to the user who submitted the review. *(Type: mongoose.Schema.Types.ObjectId, Ref: "User", Required: Yes)*
- **Timestamps**: The schema includes automatic createdAt and updatedAt timestamps, indicating when the review was created and last updated.

This schema ensures that reviews are associated with both the property being reviewed and the user who submitted the review, facilitating efficient management and retrieval of feedback.

A.5 Tour Schema

The Tour collection stores information about virtual tours associated with properties. Below is the detailed schema for the Tour collection:

- **name**: The name of the tour. *(Type: String, Optional)*
- **description**: A description of the tour. *(Type: String, Optional)*
- **s3FileUrl**: The URL of the uploaded tour file on Amazon S3. *(Type: String, Optional)*
- **createdAt**: The date and time when the tour was created. *(Type: Date, Default: Date.now)*
- **Timestamps**: The schema includes a createdAt field with a default value set to the current date and time when the tour is created.

This schema allows for the storage and retrieval of information related to virtual tours, including metadata and the location of the tour files.

A.6 Users Schema

The User collection manages information about users within the system. Below is the detailed schema for the User collection:

- **firstname**: The first name of the user. *(Type: String, Required: Yes)*
- **lastname**: The last name of the user. *(Type: String, Required: Yes)*
- **email**: The user's email address. *(Type: String, Required: Yes, Unique: Yes)*
- **password**: The user's password (hashed). *(Type: String, Required: Yes)*
- **phone**: The user's phone number. *(Type: String, Optional)*
- **address**: The user's address. *(Type: String, Optional)*

- **city**: The city where the user resides. *(Type: String, Optional)*
- **state**: The state where the user resides. *(Type: String, Optional)*
- **zipCode**: The postal code of the user's residence. *(Type: String, Optional)*
- **profilePicture**: URL or path to the user's profile picture. *(Type: String, Optional)*
- **userType**: The type of user (e.g., buyer, seller, agent). *(Type: String, Enum: ["buyer", "seller", "agent"], Required: Yes)*
- **preferredContactMethod**: The preferred method for contacting the user (e.g., email, phone). *(Type: String, Enum: ["email", "phone"], Required: Yes)*
- **receiveNewsletter**: Indicates whether the user wants to receive newsletters. *(Type: Boolean, Default: false)*
- **Timestamps**: This schema does not include automatic timestamp fields (createdAt, updatedAt).

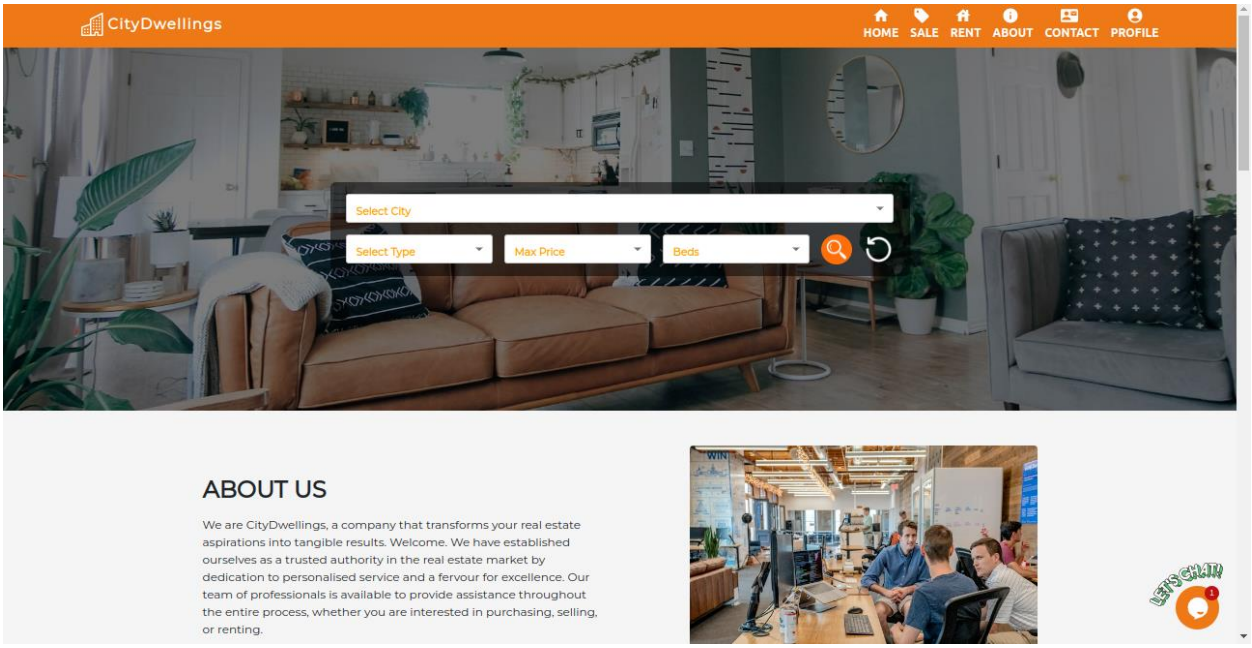
This schema supports the management of user accounts, including essential personal details, contact preferences, and account type.

Appendix B: Project End-Product

The "Comprehensive Real Estate Management System with VR Tours" is a comprehensive web application designed to streamline the property management process and enhance the user experience through immersive virtual reality technology. The end product serves as an integrated platform where users can explore, manage, and interact with real estate listings in a dynamic and engaging manner.

To learn more about our project, please visit our product website:

https://city-dwellings-app.vercel.app/

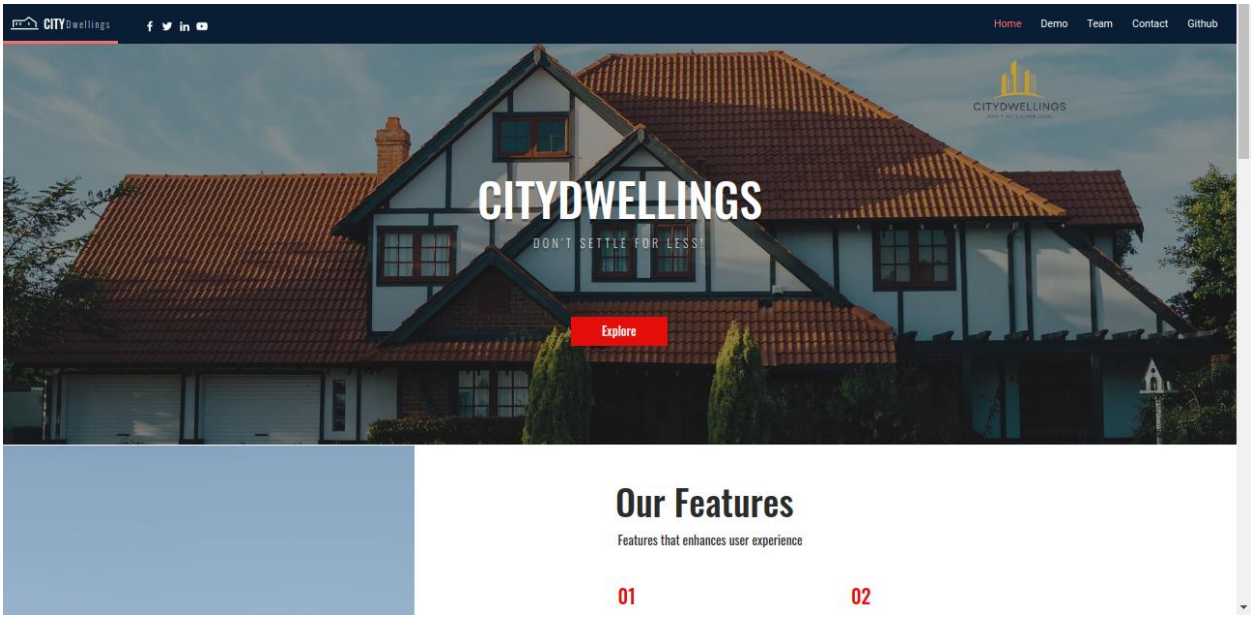


Appendix C: Portfolio Website

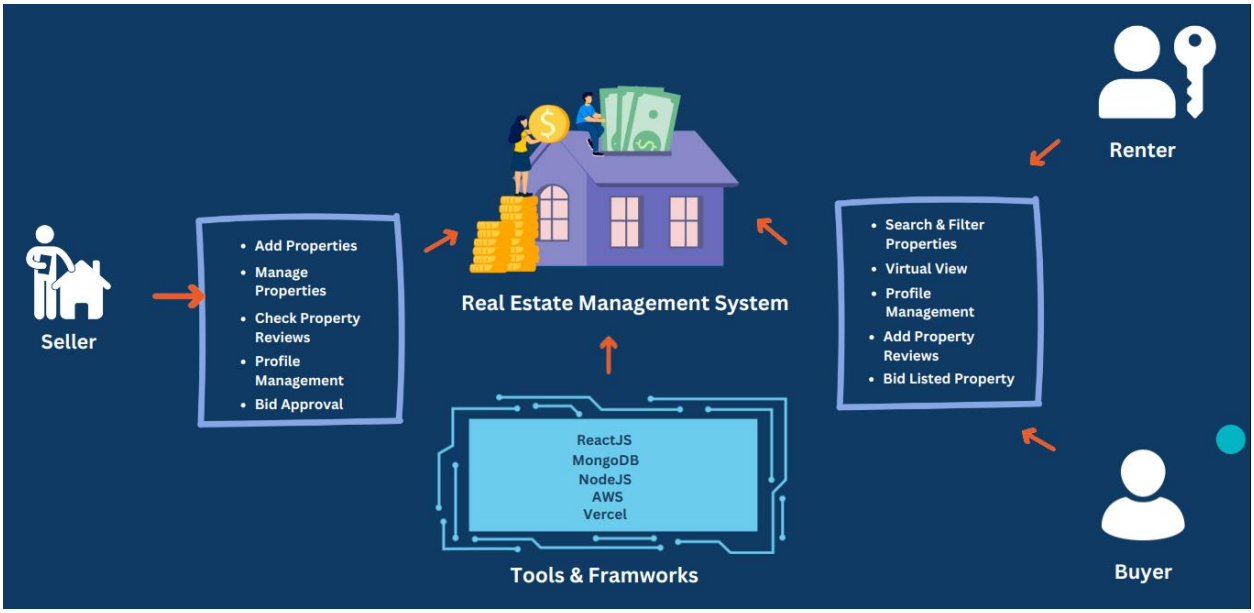
This appendix provides an overview of the Portfolio Website, a dedicated online platform showcasing the "Comprehensive Real Estate Management System with VR Tours" project. The Portfolio Website serves as a comprehensive and visually appealing presentation of the project's features, technologies, and outcomes

To learn more about our product, please visit our portfolio website:

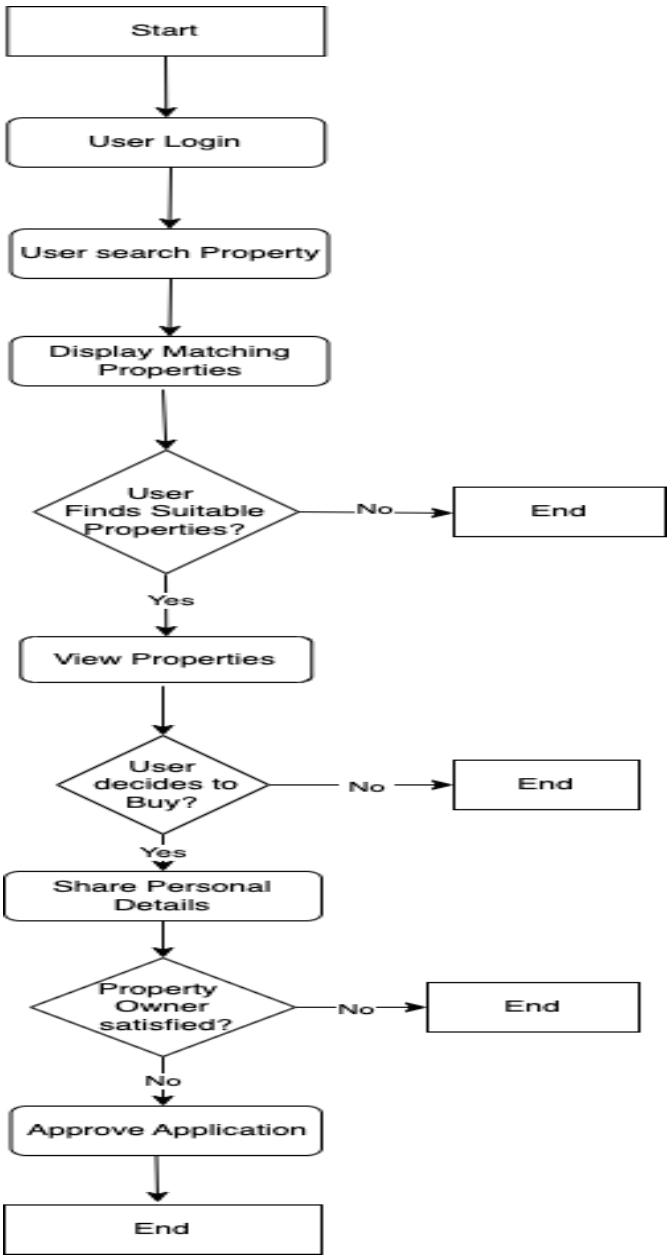
https://binarysolutions006.wixsite.com/citydwellings



Appendix D: System Flow Diagram



Appendix E: System Activity Diagram



10.Report Sign-Off

We, the undersigned, have reviewed and approved the project report titled "Comprehensive Real Estate Management System with VR Tours" We confirm that the report meets the required standards and is ready for submission.

"Overall, the report provides a clear and detailed overview of the Real Estate Management System. It accurately reflects the project's objectives and outcomes, and it offers valuable insights into the system's capabilities and potential impact. I am confident that this report will serve as a valuable resource for the successful implementation and management of the system."

Project Title: Comprehensive Real Estate Management System with VR Tour

Date: August 6th, 2024

Prepared By: Team – A7

Sign-Off Confirmation

By signing this form, you confirm that you have reviewed and approve the content of the project report.

Name	Title	Signature	Date
Meet Chothani	Project Manager	*Meet*	August 6th, 2024
Anupartap Rana	DB Administrator	*Anupartap*	August 6th, 2024
Rohan Sharma	Developer	*Rohan*	August 6th, 2024
Kulwinder Kaur	Data Analyst	*Kulwinder*	August 6th, 2024
Parminder Kaur	QA Tester	*Parminder*	August 6th, 2024
Sukhvir Kaur	QA Tester	*Sukhvir*	August 6th, 2024