HOUSING MANAGEMENT SYSTEM WEB SITE WITH AN AI CHATBOT INTEGRATED

Kadodognon Abdoulaye Junior Ouattara. School of Engineering & Technology [SSET] Department of computer science & Applications, Sharda University

Abstract- The advent of technology has introduced balancing change in competitiveness potential for enterprises integrating technological processing in their business, altering the conventional business model. The real estate sector is not an exception to this new phenomenon especially in COTE D'IVOIRE, which influences business processes throughout the sector's supply chain. It could pose a danger to the current industry players who have not adapted to the new business model and, simultaneously, open doors for startups developing innovative, cost-effective, and efficient technology.

Digitalization is defined as the use and integration of digital technologies into various corporate operations (Gartner, 2023).

This study focus on attempting an essay based on finding structure to support the digitalization of the properties in the city of Abidjan real estate. This will help to gain some understanding of the research topics

Through this investigation, the paper aims to provide a comprehensive overview of how real estate business digitalization can be implement to address a specific need and presents a forward-looking perspective on future research directions and technological advancements. The findings underscore the necessity for continuous innovation in real estate realm to address related and contextual challenges in the realm environments

I- INTRODUCTION

A- Background

A housing management system website is an advanced web application based platform designed to streamline the management of housing operations, including property listings, tenant management, maintenance requests, and payment tracking. This system serves both property managers and tenants, providing an intuitive interface to interact with and manage housing-related activities. The integration of an AI Chabot enhances the user experience by offering real-time assistance. The Chabot can respond to inquiries about available properties, handle maintenance requests, and answer billing questions. The AI Chabot reduces the workload of property managers and improves tenant satisfaction by providing instant support.

One of the most pressing concerns in this domain is expressed through two main factors. The first one being a continuous up growing of the percentage of the locale population living under the locale private rental system expanded all over the country. From l'ENV 2015 [] about 1.8 million of the local occupation (family, people living alone, enlarge family, mono-parental family, strict couple without child), are living under rental condition agreement either 30% of the population in COTE D'IVOIRE are living under the rental system. Such a large proportion of the population need a better shelter system, good practices based listening, understanding, and providing. On the the second hand such a large percentage profile open a free large and road for scammer, and fraudulent people with personal interest to infiltrate the system and taking advantage of it through illegitimate position, and role resulting in abuse.

This observation has triggered a significant interest in developing a real estate structure based technology throughout digitalization of the old traditional system, also known as housing based digital management system, which aims to address tenant queries on a more relatable and traceable way. Simultaneously, it connect the tenant and the owners in a more direct and instant way, alleviating, owner

from accommodating a costly third party for the management, also being a potential tool for real estate management

B- Research Question(s)

The adoption of real estate digitalization model in the city of Abidjan raises several critical questions, which are implemented as follow:

- Integration: How can digital technology can be integrated into the pre-existing rental system infrastructures, safely for the both parties, without crashing the market?

- Benefits and Limitations: What are the intrinsic benefits and potential limitations of digitalization in a large rental occupation environments?

- Future Developments: What are the emerging trends and future directions in the development of tools overwhelming a simple computerization process, enabling deeper facilities?

C- Objectives

The search aims to:

1) Identify and analyze supported structucture for Applications

This objective seeks to elucidate the specific applications support and structure to help in the process of establishing a robust system that will support the increasing needs, and the match the actual technological era in which we are, and likely reducing the gap between developed and developing country in some aspect as it's all about resources management.

2) Assess Implementation challenges

This involves a detailed examination of the challenges faced by integrating a new, unfamiliar method in replacement of traditional, manual processing method, through digitalization. These include technical challenges such as the need for robust system reliable enough to do not crash unexpectedly and infrastructural challenges like the cost of implementing all aspect of the real estate management system.

3) Predict Future Technology Shifts

This involves a detailed examination of the challenges faced by integrating a new, unfamiliar method in replacement of traditional, manual processing method, through digitalization. These include technical challenges such as the need for robust system reliable enough to do not crash unexpectedly and infrastructural challenges like the cost of implementing all aspect of the real estate management system

II- LITERATURE REVIEW

Sr. No.	Author Name	Title of study	Key Findings	Limitations
1	Dourish, P., Edwards, W. K., LaMarca, A., Lamping, J., Petersen, K., Salisbury, M., Terry, D. B., & Thornton, J. (2000).	Systems with User-Specific Active Properties	Document properties provide a more flexible and user-centered approach to document management, allowing documents to be organized based on user-defined characteristics	The prototype system is experimental, and its scalability and integration with existing document management systems were not fully tested.

	Systems with User-Specific Active Properties. *ACM Transactions on Information Systems*		rather than fixed hierarchical structures Active properties enable the system to not only categorize documents but also control document behavior through executable code, enhancing system responsiveness The combination of static and active properties offers a uniform interface for both managing documents and triggering actions based on user needs (e.g., backup, summarization, or logging access).	The concept of active properties, while powerful, introduces complexity in managing executable code within the system, potentially leading to issues related to security, consistency, or unexpected interactions between properties.
2	Olivia Tiku 2023	Challenges of Building Management Systems Adoption in Trinidad and Tobago	There is a **willingness** to adopt BMS in Trinidad and Tobago, particularly in public schools Key challenges include implementation costs, lack of understanding of the social system, and insufficient skilled labor. **ICT connectivity** and **financial support** are also identified as barriers to successful BMS adoption.	The study is limited by the current lack of BMS adoption in public schools, making it difficult to fully assess the practical impacts of BMS implementation. There may be biases in the data due to the semi-structured interview format, and results may not be fully generalizable to other contexts or regions

3	Irwan Mohammad Ali, Mohd Nasrun Mohd Nawi, Suriani Ngah Abdul Wahab, Mohd Nurfaisal Baharuddin, Aizuddin Masnan 12 march 2023	Facilities Management Digitalisation Model: A Systematic Literature Review"	FM digitalisation is still in its early stages of development. The study identifies FM digitalisation trends from 2010 to 2022. The study proposes a conceptual model that focuses on sustainable FM digitalisation, considering emerging technologies like Building Information Modelling (BIM), IoT, AI, and machine learning. There is a notable rise in the number of publications on FM digitalisation after 2015, with an increasing number of contributions from countries like Italy, Malaysia, and China.	There is a gap in research related to FM digitalisation, particularly in its practical implementation within facilities and real-world environments. Future research could explore the regional differences in FM digitalisation, especially in countries with limited studies on this topic. Further investigation is needed into how specific technologies like AI, IoT, and BIM can transform day-to-day FM practices in sustainable ways
4	Olena Stryzhak, Olena Akhmedova, Olena Sushchenko, and Mariia Pokolodna **2020**	*Industrial Property Management: Sectorial Aspect*	The paper highlights the importance of industrial property in enhancing manufacturing and production efficiency. The study proposes theoretical foundations for organizing a system of industrial property	The research focuses primarily on the context of Ukraine and may not fully address industrial property management practices in other countries. The paper primarily

			management in Ukraine. Industrial property is crucial for creating competitive advantages, fostering innovation, and ensuring economic growth. Comparative Analysis: The research compares various types of industrial property, such as inventions, utility models, industrial designs, trademarks, and trade secrets, along with their legal protection and classification under Ukrainian law. Business Model Development: The authors propose a business model that structures industrial property management processes, aimed at improving the creation and sale of industrial property items, particularly in the mining industry.	provides theoretical insights without direct empirical data on the practical implementation of the proposed system.
5	Brian Mark Shuster 2009	Method and Apparatus for Managing Ownership of Virtual Property	The patent outlines how virtual property can be securely managed by a merchant through a	The patent does not describe the specifics of the security measures in detail, leaving

			centralized system, eliminating the need for consumers to download the property to their own devices, which can help protect the merchant from unauthorized copying. The system allows virtual properties to be transferred, traded, and used, with the merchant retaining control over the property while also enabling a marketplace for virtual goods	open the question of how unauthorized access or copying might still be circumvented despite centralization. The system appears to be designed with a specific type of virtual property in mind (like digital objects in online games), limiting its broader application to other forms of digital assets.
6	Olga Kaganova & Ritu Nayyar-Stone (2000)	Municipal Real Property Asset Management: An Overview of World Experience, Trends and Financial Implications	Asset Management System: An efficient municipal asset management system should focus on maximizing value, ensuring accountability, and using assets to support long-term public needs. Financial Implications: Municipalities often neglect the financial potential of their assets, and there is limited understanding of the assets' market value and liabilities. Asset management practices in municipalities,	Lack of Standardization: There is no universal standard for managing public real estate assets, which limits the ability to compare practices across different municipalities. Focus on Developed Countries: While the study covers municipal asset management globally, much of the literature and examples focus on developed

			especially in developing countries, can significantly improve financial health through better management and strategic decision-making.	countries, with fewer examples from less developed or low-income countries
7	Prof. Nikita Hatwar, Ashwini Patil, Diksha Gondane (2016)	AI BASED CHATBOT	Functionality in Real-World Applications: The chatbot proves to be useful in guiding mall visitors, helping them find shops, checking discounts, and learning movie timings. Improved Efficiency: The chatbot reduces the time users would otherwise spend asking for directions or searching for information manually, making the shopping experience more efficient.	Limited Scope of Knowledge: The chatbot is primarily focused on providing information related to mall navigation and shopping, limiting its general usability for broader applications. Reliance on Training Corpus: While using real conversation data adds emotional content, the chatbot's performance still depends heavily on the quality and extent of the training corpus. It may struggle with novel or unexpected queries.
8	Author(s): Manish Verma	Novel Study on AI-Based Chatbot (ChatGPT)	Improved User Experience: ChatGPT can enhance the user	Limited Capability: ChatGPT is limited in its

	2023	Impacts on the Traditional Library Management	experience by answering simple queries and directing users to more detailed information, saving time and increasing library efficiency. Personalized Recommendations: The AI can analyze users' reading habits and make personalized suggestions for books, articles, and other resources User Engagement: The chatbot can be used to engage users in library events, programs, and activities, increasing participation	ability to handle complex or nuanced queries, which can lead to user frustration. Lack of Empathy: Being an AI, ChatGPT lacks the human touch and may not effectively address emotional nuances in user interactions.
9	Takuma Okuda, Sanae Shoda 2018	AI-based Chatbot Service for Financial Industry	The introduction of chatbots can significantly improve the efficiency of customer support and sales processes in the financial industry. The PoC at Sony Bank demonstrated that chatbots could streamline support services, especially for existing users of financial products, improving both customer satisfaction and	The study's scope is limited to the case of Sony Bank, which may not be representative of all financial institutions or markets. The paper primarily focuses on the technical features of the chatbot platform (FRAP) rather than detailed empirical data

			operational efficiency. Fujitsu's FRAP system offers customization options such as script editing, thesaurus generation, and user stream tracking, which can enhance service quality.	on its effectiveness cross various financial sectors
10	Christoper Colli, Claire Hayworth, Illana Melzer, Jessica Robey **August 2018**	Understanding and Quantifying Rental Markets in Africa: Côte d'Ivoire Report	Approximately 1.8 million Ivorian households (30%) rent their homes, with higher rental rates in urban areas, particularly in Abidjan (78% of households). The majority of rental housing is in shared living arrangements, like "communal courtyards," and 46% of rental homes in urban areas are one-room dwellings. Many renters face overcrowding, with 26% of urban renters living in overcrowded conditions. Rental prices in urban areas vary widely, with most rents under $50	Data on the regulatory environment governing the rental market in Côte d'Ivoire is scarce. There are significant gaps in understanding the role of various market players such as developers, financiers, real estate agents, and property managers. Limited information is available on property owners' financial sources, management models, and rental yields. More data is needed to assess tenants'

			USD, though Abidjan residents pay more. There is limited access to amenities like WCs and running water, especially outside Abidjan.	accessibility, housing choices, and aspirations.

III- RESEARCH METHOLOGY

A- Research Design

-Sequential Exploratory Design method**:**

This paper Research methodology has been based on local deployment since all the information used to produce this paper have been fetch and build locally pointing a specific local narrow market.

Related documentation provided in the references has been collected from platform like google scholar and related platform, providing a global overview on various implemented work allowing us to explore various prototyping idea and methodology on a pretty large palette of documentation profiles.

Coding implementation follow the same path, almost by pattern recognition, based on a large files repository various methodology approach have been analysed for providing robust web application with user friendly interface. At the end of our documentation two implementation process based has been highlighted.

-PERN: which stand for Postgresql, Espress, React, Node js.

-MERN: which stand for Mongoose Express React and Node js.

B- Data Collection

Qualitative Phase:

- Expert Interviews: online informal semi-structured interview conducted with local major stockholder in the domain, has help in fetching basic requirement for the SRS document for the product to be implemented succefully to match contextual and very specific needs. Lack of contextual data is facing due to the precarious development which is only recently addressed low quality statistics can be reveal only push the local market knowledge to experienced local actor in the realm out which we interviewed

- Technical Requirements:

Front-End: javascript (React)

Back-End: Node.js with Express, Prisma.

Database: PostgreSQL

Payment Gateway Integration: Stripe, PayPal, or similar

Hosting: local hosting for now

Security: SSL encryption, data validation, and protection against SQL injection and XSS

Version Control: Git/GitHub

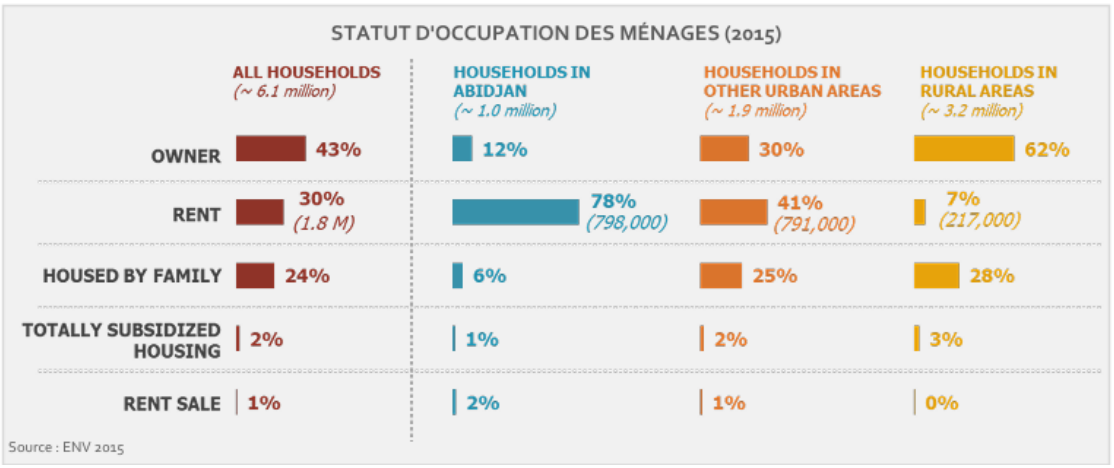

Fig1-occpation status

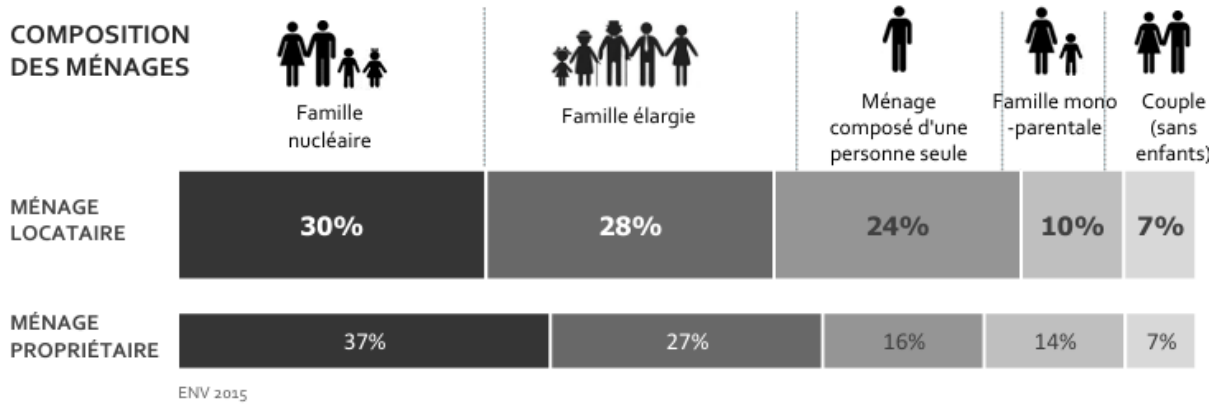

Fig2-occupation composition

C- Data Analysis

Qualitative Data Analysis:

- Thematic Analysis: This analysis focus on extracting detailed regarding the benefic, and strategical aspect important for adopting of digitalization in the realm of real estate management.

- Case Study Analysis: Evaluation of documented implementations of real estate management system

User Registration & Authentication	User Registration & Authentication Tenant registration with personal details (name, email, phone number, etc.) Property owner/administrator registration Secure login/logout functionality Role-based access control (tenant, property owner, admin)
Property Listings & Details	Property owners can add, update, and remove property listings Display property details like rent amount, amenities, size,

	and availability Search functionality (by location, rent price, size, etc.) Property images and floor plans
Tenant Management	Tenants can apply for rental properties Track application status and approval/rejection Rent payment tracking (due dates, payment history)
Payment System Integration	Allow tenants to make payments online Payment history and invoices accessible to tenants and property owners Rent reminders and late fee management Payment methods integration (credit/debit cards, bank transfers, etc.)
Maintenance Requests	Tenants can submit maintenance requests with details and images Property owners or admins can assign work orders to contractors or maintenance staff Track the status of requests (pending, in progress, completed) Maintenance history
Communication Portal	In-app messaging system between tenants and property owners/admins Notifications and alerts (payment reminders, maintenance updates, new listings, etc.) Communication logs for transparency
Reporting & Analytics	Property owners can generate reports on occupancy rates, rental income, and payment history Maintenance cost analysis Tenant performance reports (e.g., timely payments, request history)
Admin Panel	Admin can manage users, properties, payments, and maintenance requests Generate and view system-wide reports Manage user roles and permissions Oversee platform-wide activities Mobile-Friendly Interface Responsive design for easy use on mobile devices
Friendly web application	Fully responsive design to ensure usability across devices (desktops, tablets, mobile browsers)

Interface	Smooth user experience with intuitive navigation and clear layout

Table2- qualitative data analysis table

Rationale for the Methodology

This methodology is designed to provide a comprehensive understanding of how the real estate system can be built to impact effectively by its robustness and completeness, representing both tenants and owners parties. The Sequential Exploratory Design method approach ensures that the study remains flexible and responsive to emerging data, providing a robust framework for exploring a rapidly evolving field. This approach not only aids owners in managing their properties but also provide support tenant to easily keep a track of their request and related, ensuring that the findings are well-supported and actionable.

IV- EXPECTED RESULTS

Provide a responsive and robust web application capable to serve both tenant parties and ownership:

Uncontestably no one can deny the impact of digitalization in any business in terms of competitiveness. For this reason, it is more than need to

Speed and Efficiency: expected system is theatrically supposed to robust and tangible through non-specific requirement specification with rate limit to avoid overflowing based on restful backend API and intuitive react interface implemented with PERN

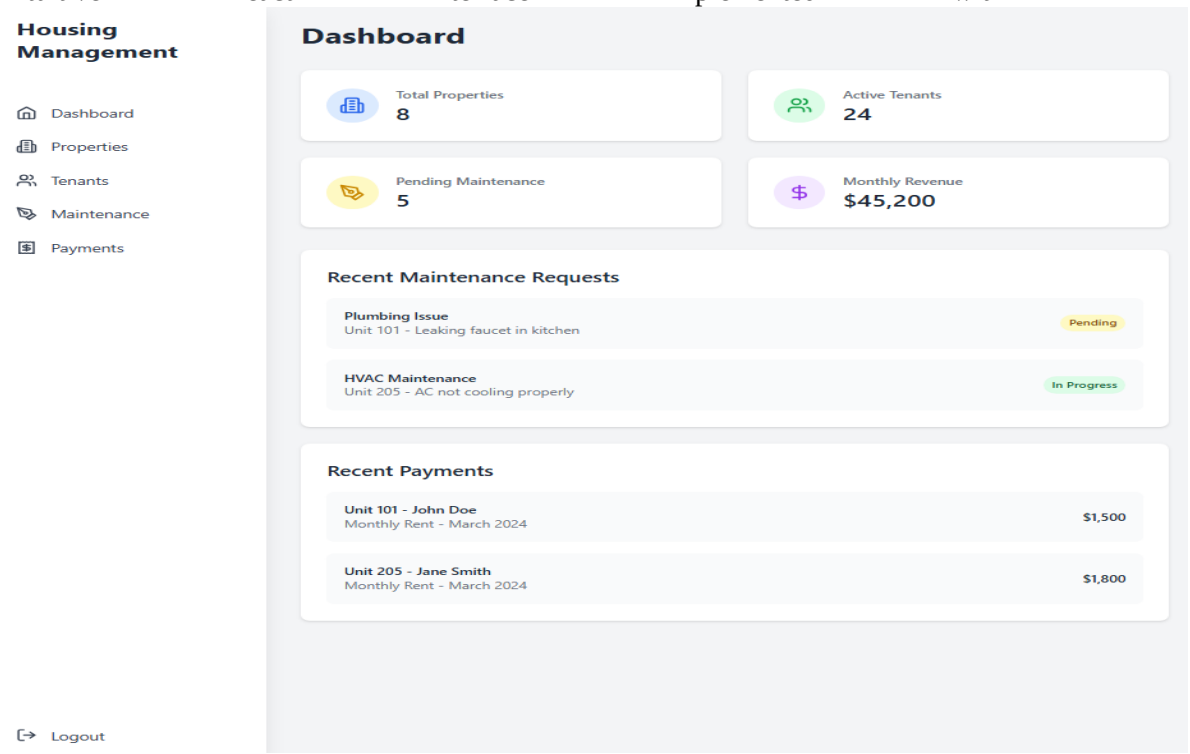

Fig3- dashboard page.

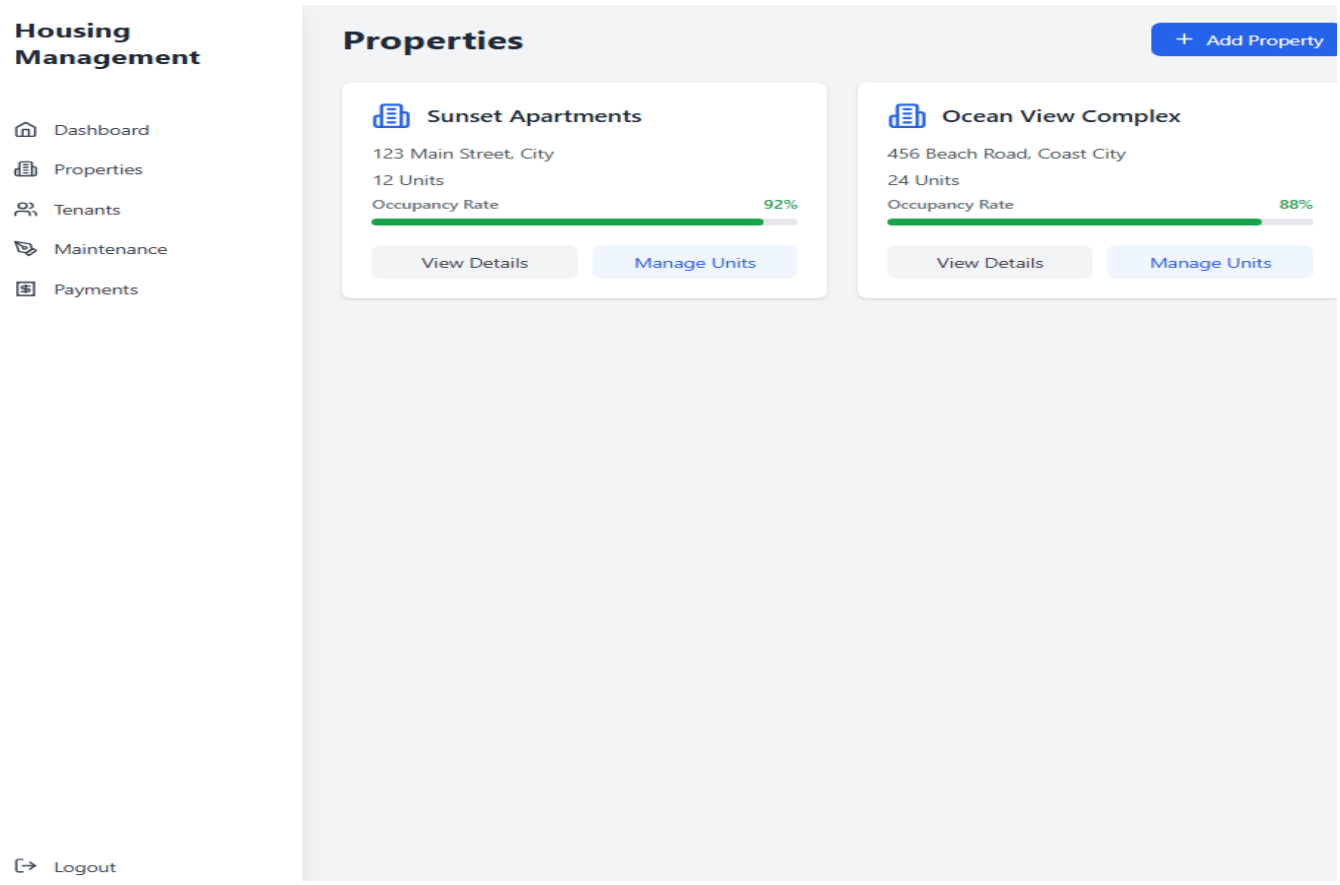

Fig-4-property view

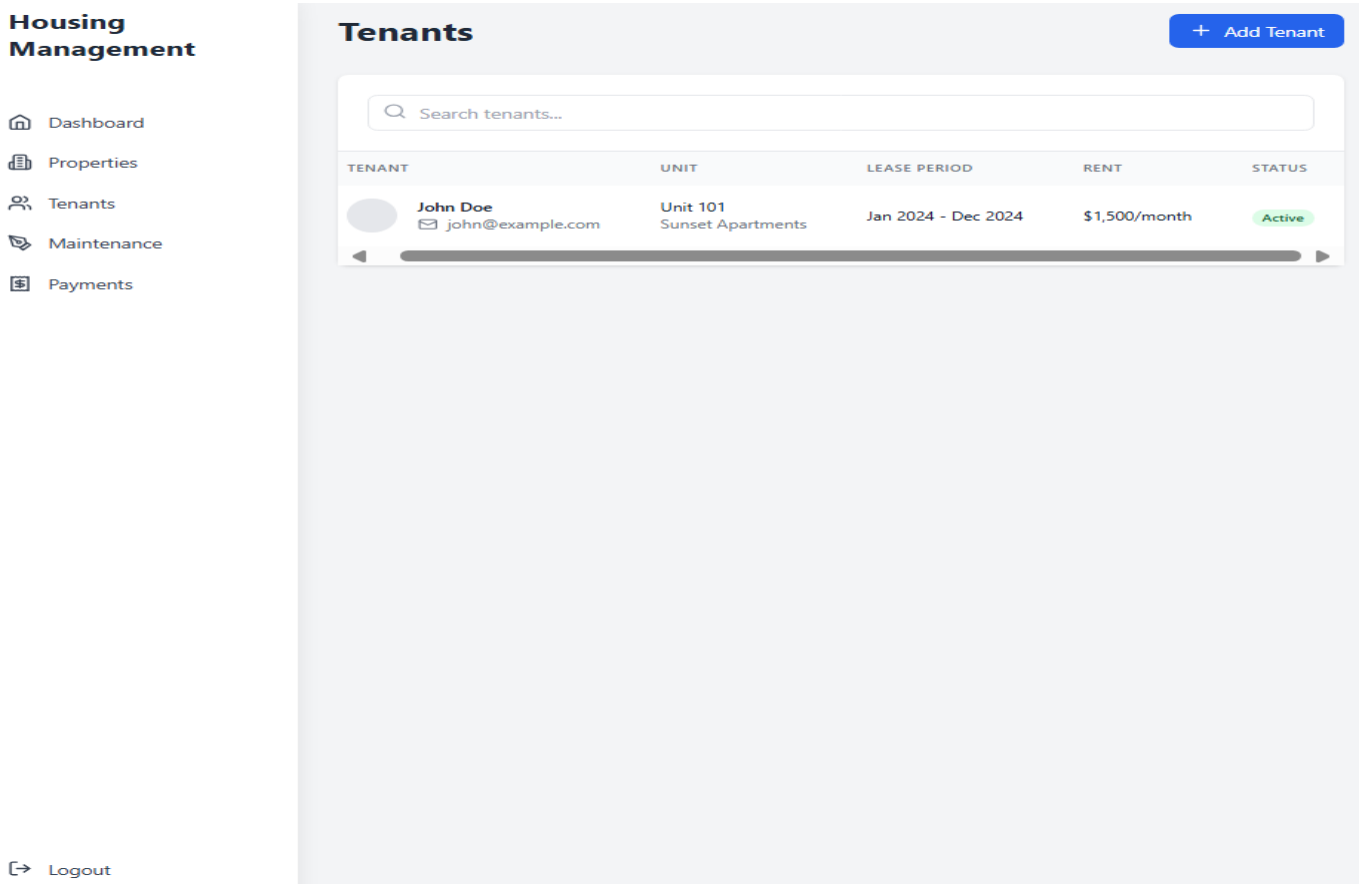

Fig5-tenant view

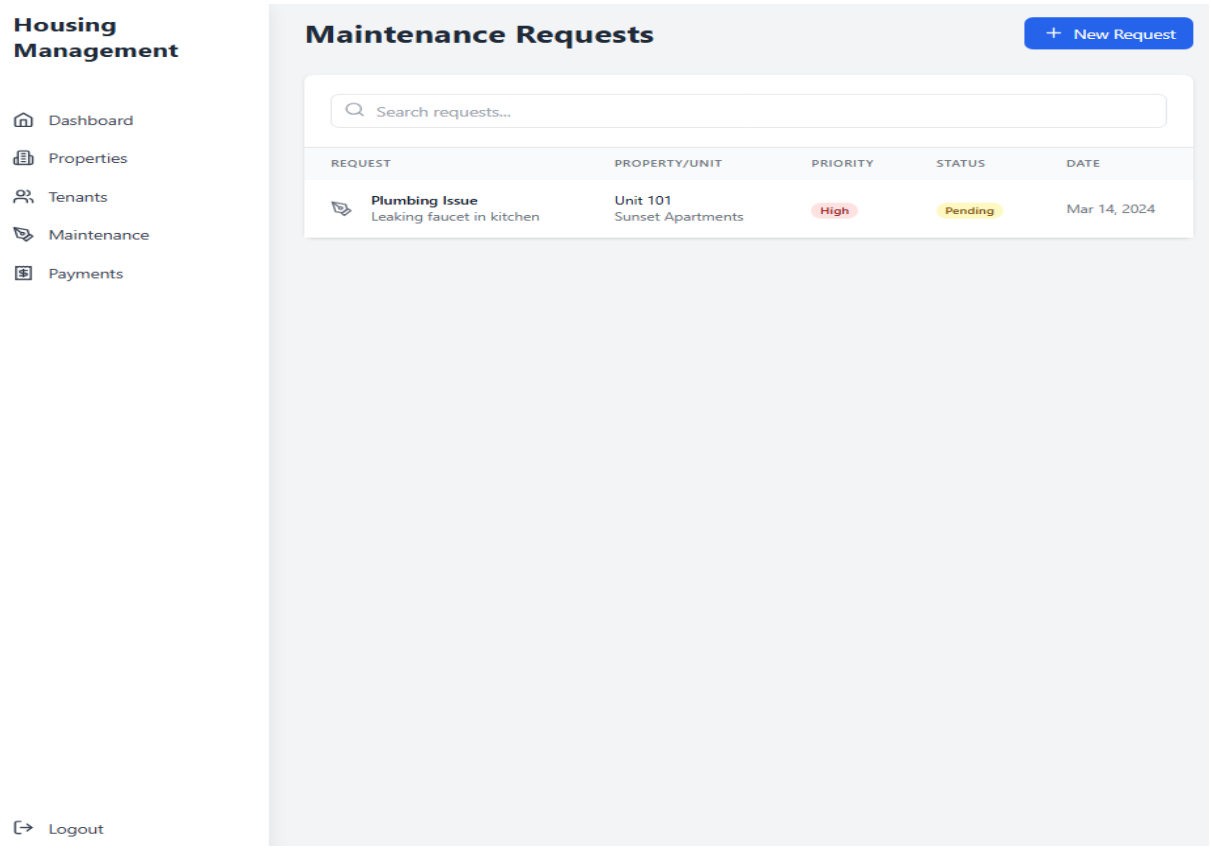

Fig6- maintenance view.

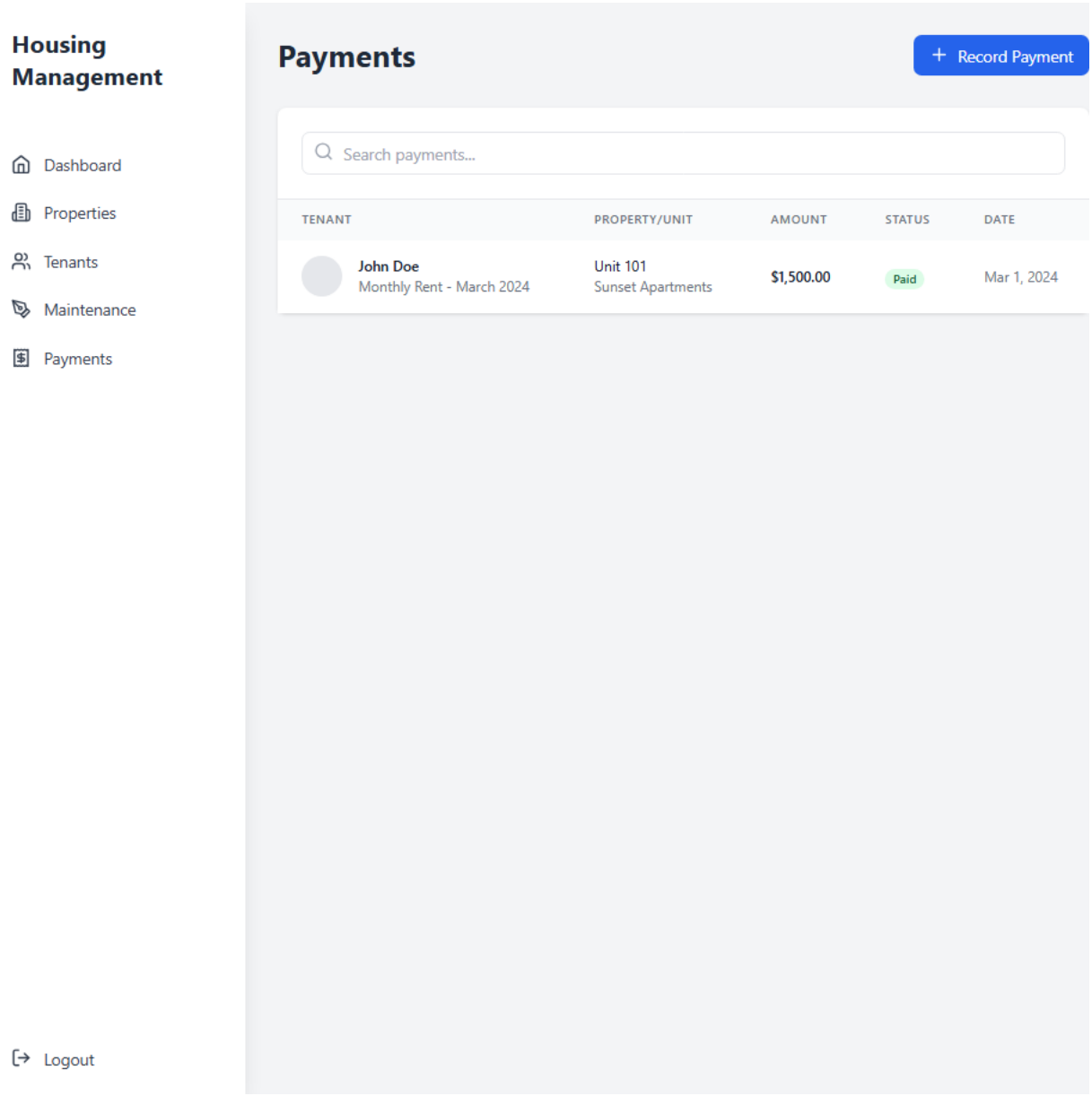

Fig7-payment view

Challenges and Barriers:.

- Integration Complexity: the integration complexity remain mitigate based on the popular adoption of the system by the population with can be define only when the the final product will be deployed and available for public usage. For now only experimental prototype is running and is is still in development process.
- Future Prospects and Expectations:
- Long-term Investment: A long-term investment in the realm of IoT for smart-home equipment and functionality is planned, awaiting for more sponsor for the practical achievement, and market analysis.

Case Study and qualitative Analysis:

The case studies provided concrete examples of software requirement specification for building a complete system addressing every party in an efficient and reliable way since a log of each token triggered is saved and kept on the server side.

V- DISCUSSION

Integration Challenges: the integration complexity reaming mitigate based on the popular adoption of the system by the population with can be define only when the the final product will be deployed and available for public usage. For now only experimental prototype is running and is is still in development process

Cost and Accessibility:

The final product is supposed to be free of use, on open source based to allowing contribution free accessibility to all the actor of the chain from the promotor to tenant passing by the manager and the properties owners

Security vs. Practicality:

Infinitely scalable based on the personal aspiration and business requirement. The system is secure with basic implementation like ARCJET preventing the server from crashing due to rate limit, and DDOS. Protection against database injection is provided too

Theoretical and Practical Contributions

This study contributes to the theoretical understanding of methodology for developing such a system but also to be aware of the shortfall and value added of such a structure in the economy. The findings suggest that stakeholders should consider the setup of an awareness propaganda on the subject of the adoption strategies, resulting in swapping from the traditional method to the digitalization of the rental system

VI- CONCLUSION

A- Summary

This research explored the potential of integrating digitalize structure system in real estate realm in the city of Abidjan, and its impact on the cost effiency and social wellness. The qualitative analyses conducted highlight the key component to rightly address the market based on an enumerated major component to keep it easy and to implement and understand, representing the both the both parties in a fair and efficient and qualitative way.

B- Significance

The findings of this study are significant as they offer a direct template to implement innovation based on deja-vu, in the cost efficiency is optimally at its peak since its an open source project aimed to encapsulate the relative up growing needs for a better understanding and cost efficiently address them throughout a dual perspective web application based providing support simultaneously for tenants and properties owner. Integrating IT in the real estate realm would most certainly offer facilities to active actor of the realm block chain

Recommendations

Based on the findings and the discussions presented, the following recommendations are made to facilitate the advancement and adoption of the said system:

Collaboration across Sectors:

Strengthening partnerships with major local actor can accelerate the development and deployment of the system. These collaborations can pool resources, share knowledge, and drive innovations that are necessary for overcoming the existing barriers to adoption

VII- REFERENCES

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