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Integration of Design Thinking in the Development of a Mobile Application for Property Sales Management

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Abstract

The manual recording process in property sales is still widely used and often leads to issues such as information delays, data inaccuracies, and inefficiencies in unit booking processes. This study aims to design and develop a mobile-based Sales Property Management System as a digital solution to enhance efficiency and data accuracy in property management. The Design Thinking approach was employed as the primary methodology, comprising five stages: Empathize, Define, Ideate, Prototype, and Test. Data were collected through qualitative interviews with property sales personnel, revealing key challenges such as limited access to real-time information and reliance on manual transaction processes. Based on direct user feedback, the system was developed using an Agile approach, with React Native for the mobile interface, ExpressJS and TypeScript for the backend, and AWS cloud services to support system performance and scalability. Testing results indicated that the system successfully accelerated the booking process, streamlined workflows, and reduced dependence on manual methods. These findings demonstrate that the Design Thinking approach is effective in generating user-centered solutions and contributes significantly to the digital transformation of the property industry.

Keywords: Mobile Application, Design Thinking, Property Sales, Digital Transformation, Real-Time Information.

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1. Introduction

Traditional property sales management still heavily relies on manual documentation using paper-based records or spreadsheets [1]. These conventional

practices present several issues, including high error rates, delays in data updates, and limited capabilities in providing real-time information [2]. Studies within small and medium-sized enterprises indicate that manual recording is time-consuming and prone to errors, directly affecting strategic decision-making [3]. For example, in a property company case study, manual reporting took up to two weeks, thereby hindering timely management decisions [4].

As technology continues to evolve rapidly across various industries, the real estate sector is also embracing digital adoption [5]. Digital transformation has emerged as a strategic solution to address operational inefficiencies within this sector [6]. Real estate companies around the globe are integrating digital technologies to enhance operational efficiency while meeting customer expectations for speed, accuracy, and transparency [7]. The real estate industry is at a "critical juncture" for digital revolution to sustain competitiveness [8].

However, most technological implementations in real estate focus primarily on digital marketing strategies, such as 3D modeling or virtual property tours [9]. Meanwhile, integrated solutions specifically designed for real-time sales management—particularly for field agents—are still rarely utilized [10]. This technological gap is critical, given that property sales personnel require fast access to real-time unit availability, status updates, and an efficient reservation process that supports successful sales conversions [11].

To address these challenges, this study proposes the development of a mobile-based Sales Property Management System to streamline the property sales process through real-time and integrated management capabilities [12]. The system is designed using the Design Thinking methodology as its core framework. Through this approach, the research aims to deliver a user-centered solution that significantly enhances the speed, accuracy, and efficiency of sales management, while supporting the broader digital transformation of the real estate industry [13].

2. Methods

2.1 Methodology and Focus

In this study, the Design Thinking approach is applied as the primary methodological framework. Design Thinking was selected due to its effectiveness in supporting human-centered innovation, ensuring that the developed solutions are aligned with user needs and expectations [14]. This approach was originally popularized by Thomas Edison's innovation practices, which emphasized a deep understanding of human behavior before designing a product or service [15]. Edison systematically observed how people used a product, how it was packaged, marketed, sold, and supported—laying the foundation for what would later become

the core principles of Design Thinking, with empathy for the user at the heart of innovation [16].

In the context of this research, the implementation of Design Thinking focuses on understanding the specific needs of property sales personnel in managing property data and streamlining sales processes. The approach consists of five iterative stages: Empathize (gaining deep user insight), Define (clearly articulating user needs and challenges), Ideate (generating creative solutions), Prototype (developing tangible representations of ideas), and Test (validating the solutions with real users) [17].

Table 1. Design Thinking Stages

Stage	Descripstion
Empathize	Understand user needs, challenges, and experiences through observation, interviews, or direct study to gain deep user insights.
Define	Formulate a clear problem statement based on the insights gained during the empathy stage from the user's perspective.
Ideate	Generate alternative solutions based on the user's main challenges, including: (1) providing real-time unit stock information, (2) enabling unit booking through the application, (3) automating data synchronization between sales teams, and (4) developing a mobile-based Sales Property Management System.
Prototype	Design the initial prototype, including interface mock-ups and backend integration.
Test	Conduct usability and functionality tests on both frontend and backend systems to ensure performance meets the defined requirements.

2.2 Empathize

The empathy phase aimed to develop a deep understanding of the needs, challenges, and workflows of property sales personnel. Qualitative data were collected through face-to-face interviews with internal sales representatives at Citraland CPI Makassar on March 7, 2025. The interviews explored topics such as how salespeople track property availability, follow up with customers, and the most common obstacles during sales transactions.

2.3 Define

Based on the findings from the empathy phase, three core problems were identified: the lack of an integrated system for accessing real-time unit stock data, the continued reliance on manual processes for booking and reservations, and inadequate communication and transparency among sales teams, which often results in miscommunication and inefficiencies in the sales workflow.

2.4 Ideate

After identifying the primary user challenges, the researcher proposed several solution alternatives to address these issues: providing real-time unit availability information, enabling booking functionality through the mobile application, implementing automated data synchronization among sales team members, and developing a comprehensive mobile-based Sales Property Management System to streamline and enhance the overall sales process.

2.5 Prototype

This study adopted the Agile model within the Software Development Life Cycle (SDLC) to facilitate rapid iteration of designs. The prototype phase included the development of UI components such as the login page, property summary dashboard, booking form, and an interactive SVG-based map using React Native. Backend services were developed using ExpressJS and TypeScript, with AWS Cloud integration for data storage and distribution.

2.5 Test

Testing was conducted internally in two stages. The Unit Test phase involved using Jest to verify that each UI component met the functional specifications. The second stage involved API testing using Postman to validate the accuracy and integrity of backend data management.

3.Results and Discussion

3.1 System Design

The system design results indicate that the architecture developed by the researcher adopts a client–server model based on REST API, separating the frontend and backend components to ensure ease of parallel development and support for system scalability.The database structure is designed using Amazon RDS (MySQL) to manage key entities, including Users (sales and admin), Properties (housing projects), Units (inventory per project), Transactions (unit bookings), and Media (property-related documents/images).

The implementation utilizes Prisma ORM to efficiently handle relationships between entities. For example, one property can have multiple units, each unit can be booked by only one active transaction, and every transaction may include supporting documents stored in Amazon S3. Furthermore, integration with Amazon CloudFront is applied for media content delivery to ensure low latency, enabling

rapid access to property images and documents by both sales personnel and administrators. This cloud-based approach supports high availability and flexibility, allowing seamless scalability as the number of users grows.

3.2 Mobile Interface

The mobile interface is designed to be responsive and user-experience-oriented, following the principles of human-centered design within the Design Thinking framework. The mobile application is developed using React Native to support Android devices. Several key user interfaces have been implemented:

Login Page – Equipped with JWT-based authentication to ensure secure access to user data.

Figure 1. Login Page

Sales Dashboard – Displays a summary of property status, recent sales activities, and provides quick access to the booking feature.

Figure 2. Sales Dashboard

Booking Form – Enables sales agents to reserve units by filling in customer details, selecting available units, and uploading supporting documents directly via the application.

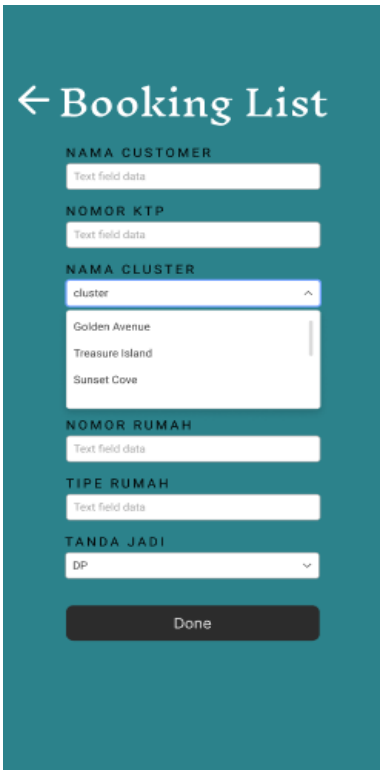

Figure 3. Booking Form

Interactive Map Page – Utilizes an SVG-based map to display housing project locations visually and with zoom capabilities, allowing sales personnel to provide clients with a clearer spatial understanding.

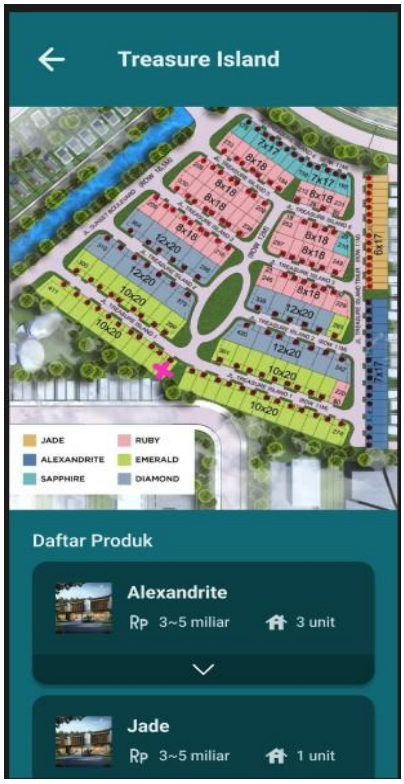

Figure 4. Interactive Map Page

3.3 Discussion

The findings of this study demonstrate that the application of Design Thinking is effective in producing solutions that are aligned with user needs (user-centered). During the Empathize phase, in-depth interviews successfully uncovered real-world issues, particularly delays in accessing unit stock data and inefficient manual booking processes. These issues were accurately translated during the Define phase, ensuring that the solutions developed were highly relevant to the sales team's needs.

The prototype, developed and tested using the Agile Scrum approach, effectively supported iterative design based on user feedback, aligning with the principles of iterative development in digital innovation. The integration of cloud technologies—namely AWS RDS, S3, and CloudFront—provided significant added value, particularly in terms of scalability and content delivery speed. This study shows that the system significantly improved the booking process, reduced reliance on manual tools such as WhatsApp and Google Drive, and enhanced the accuracy of sales transaction reporting.

4. Conclusion

This study successfully designed and implemented a mobile-based Sales Property Management System using a Design Thinking approach focused on user

needs. By applying the five Design Thinking phases—Empathize, Define, Ideate, Prototype, and Test—the research identified key challenges faced by property sales agents, including limited real-time access to unit stock, inefficient booking processes, and lack of transparent communication. The system, developed with React Native, ExpressJS, and AWS services (RDS, S3, CloudFront), significantly improved speed, accuracy, and efficiency compared to manual methods. While the current implementation demonstrates practical contributions to digital transformation in the property industry, future work should expand testing scope, incorporate predictive analytics, support multi-platform integration, and address data privacy compliance to further enhance system functionality and strategic value.

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