

Biddo: Property Rental Bidding System

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Abstract

In the digital era, where data management is obviously crucial, this project focuses on addressing the operational challenges faced by the case study, a Malaysian real estate agency offering a range of business services through offline and online channel. However, the agency's current manual data recording and storage methods have led to potential inconsistencies and data loss. To tackle these issues, a property rental bidding system called "Biddo" is developed using a structured approach and guided by the Evolutionary Prototyping model. The system stands out as it offers easy registration, property search, and a seamless bidding process for users. The system aims to enhance business operation efficiency and provide a seamless property rental experience through bidding, thereby improving the customer satisfaction. The project's significance lies in its potential to revolutionize the property rental industry, particularly benefiting those with limited on-campus housing options.

1. Introduction

Malaysia's property industry has been an important economic engine over the last 20 years, creating huge areas of investment and opportunity. It is also allowed tens of millions of Malaysians to find their dream homes [1]. Rising property prices in many urban areas are leading to increased demand for more affordable homes in the secondary market. More people are opting for rental properties instead of buying, leading to the growth of the rental market in Malaysia [2]. To address the evolving landscape, this study focuses on Vigor Properties Sdn Bhd, a Kluang-based real estate agency primarily serving walk-in customers. Currently, the case study struggles with manual data management using Spreadsheet in Excel for walk-in customers and WhatsApp for online clients, posing them to high risk of data corruption or loss in spreadsheets due to accidental changes or deletions when accessing by multiple team members.

The identified challenges revolved around manual data recording and storage methods, lack of robust business data validation that can lead to data inconsistencies due to human errors where the agents could key in the business data wrongly and constraints in report generation as Excel has difficulty in generating complex reports that involve high volume of both walk-in and online customer data and property data. Such challenges can lead to difficulty in auditing and trace back the source of all errors that have been made. Thus, a web-based system with database management namely "Biddo: Property Rental Bidding System" is developed to tackle these issues. This system aims to streamline data management, enhance business operational efficiency and introduce a seamless property rental experience through bidding.

Property rental bidding describes a public sale to get a property sold to the highest bidder, it involves a buying and selling process. In Malaysia, there are two ways to bid for a property: online and offline. Due to advancement of technology and Internet, nowadays bidding on an auctioned property is possible through online platform [3]. The primary objective of this project is to design and implement a systematic property rental

bidding system, specifically tailored to address the needs for the case study. This is to streamline and help in managing their daily business operations effectively. Also, this system is developed to accommodate users with different preferences and to tackle the limited on-campus housing accommodations issue faced by the Higher Education students. Biddo is designed for three key users namely bidder, agent and administrator. Administrator is in charge of all the administrative tasks while agent is able to perform properties listing actions whereas bidder may search and bid for their desired rental property.

There are five sections in this paper. Section 1 described the project's background, while Section 2 discussed on the works that are related to it. The methodology used to develop the system is presents in Section 3, and Section 4 provides the results and discussion. Lastly, Section 5 shows the conclusion to summarize the main findings of the study.

2. Related Work

Vigor Properties Sdn Bhd, a Malaysian real estate agency in Kluang, Johor. They provide a full spectrum of business services such as project development consultancy, property selling and renting. Currently, the company has two primary customer channels: offline, with customers walking in to approach the agency directly, and online, through their Facebook page [4]. The company currently employs physical property renting technique at their physical store with window display advertisements and engages in negotiations through Facebook.

At present, each walk-in customer who visits the agency is assigned to an agent for a detailed quotation. The agent records essential customer details, preferences, budget, and other relevant information. Based on this information, agents recommend rental properties aligning with customer's requirements and arrange property viewings. Online customers often seek consultations via the company's Facebook page, engaging in discussions similar to the offline process. However, the company currently employs manual data recording and storage methods using Excel spreadsheets to store walk-in customers data and WhatsApp for online customers data. This method poses risks of potential data corruption, loss, and inconsistencies. Additionally, the lack of support for analysis and report generation makes managing large volumes of customer and property data challenging.

Given the current state of business data management methods in this real estate agency, the company needs to take advantage of the modern digital technologies, which are very much beneficial to business expansion. Thus, a web-based property rental bidding information system is introduced in this project to manage business operations. Apart from that, the introduction of a bidding feature in the proposed web-based system simplifies the property rental process, providing tenants with a hassle-free and time-saving experience for property viewing. This innovative approach not only enables tenants to have the opportunity to bid based on what they can afford, but also contributes to business growth and expansion.

2.1 Web-Based Information System

An information system (IS) is an arrangement of people, data, processes, information presentation, and information technology that interact to support and improve day-to-day operations in a business as well as support the problem-solving and decision-making needs of management [5]. For web-based information system, it is an IS utilizing Web technologies to provide information (data) and functionality (services) to end users through a hypermedia-based presentation or interaction user interface on web enabled devices [6]. This enables the proposed system to be accessed seamlessly through any web browser, enhancing the property renting experience with an online bidding platform. Users can effortlessly enter the system by visiting the website and unlock additional features or actions with proper authentication credentials. The system includes features allowing administrators to manage privileged access tasks, such as authorizing agents, manage agents, delete bidder's account and generate summary sales reports.

Moreover, a web-based information system provides the advantage of real-time information access. Users, including bidders, agents, and administrator, can easily access up-to-date data without device restrictions, ensuring convenient access as long as they have an internet connection and a common browser. Adoption of a web-based information system facilitates real-time information retrieval, enhancing information availability for both the company and its users, ultimately contributing to the project's objectives.

2.2 Comparison with the Existing Systems

Comparative studies were conducted on three existing related system to the proposed system. The first system, EdgeProp [7], is a property website in Malaysia that offers a variety of functions. It is a one stop destination to buy, sell, rent the property, or even bid for desired property. EdgeProp stands out with its filtration feature as it allows users to easily filter out properties that do not meet their criteria, enhancing the user experience by focusing on properties that are of interest to them.

The second system, Mudah.my [8], serves as a Malaysian marketplace where users can sell or find almost anything to everything, including properties for sale, for rent or for auction. Mudah.my, on the other hand, lacks

a direct online bidding feature for properties and requires users to negotiate and contact the agents directly to participate in online bidding.

The third system, AuctionProperty.my [9], is an auction property listings platform in Malaysia diverse properties available for auction, ranging from residential gems to thriving commercial spaces and lucrative industrial assets. Unlike the system studied previously, this system provides the past bidding prices and number of times a property has been bid on. It also provided a loan calculator for users who are looking for a property for sale to calculate a property's value, the loan amount needed, down payment needed, interest rate and the loan term.

In comparison, Biddo has more features and modules compared to the other reviewed existing systems. The most distinctive module is the report generation module, a feature absent in other existing related systems. The proposed system can generate and view the summary sales report, emphasizing the top areas where bidders place their bids. Comparative analysis for this study is important to guide the development of the proposed system, taking inspiration from the strengths of existing system while addressing their limitations, so that the proposed system can emerge as a better system. **Table 1** summarizes the comparison.

Table 1 Systems' comparison

System	EdgeProp	Mudah.my	AuctionProperty.my	Biddo
Authentication Module	√	√	X	√
Bidders Information Module	√	√	X	√
Rental Property Details and Listing Module	√	√	√	√
Bidding and Payment Module	√	X	X	√
Agreement Details Module	√	X	X	√
Report Generation Module	X	X	X	√
Google Maps API	√	X	√	√

3. Methodology

Evolutionary Prototyping model is adopted to develop the proposed system. This model is selected for its advantages, including improved system usability, a closer match to users' real needs, improved design quality and reduced development effort as it enables for ongoing improvements and adjustments based on user feedback until it becomes the final product [10]. It is an iterative, trial-and-process that takes place between the developer and the users. It should start with well-understood requirements and new features as proposed by the customer [11]. There are six phases consists in this model namely requirements gathering and analysis, quick design, build a prototype, initial user evaluation, refining prototype then followed with implement product and testing. **Table 2** presents the workflow for the model adopted to develop the proposed system.

Table 2 *System development workflow*

Phase	Task	Output
Requirements Gathering and Analysis	<ul style="list-style-type: none"> Proposed the project Determine the project schedule, activities and output Gather and analyse requirements Literature review on existing system Development of system process model 	<ul style="list-style-type: none"> Project proposal Gantt chart System, user, functional, non-functional requirements Flowchart Context Diagram Data Flow Diagram (DFD)
Quick Design	<ul style="list-style-type: none"> Quick design on system database and user interface 	<ul style="list-style-type: none"> Entity Relationship Diagram (ERD) Database Schema and Data Dictionaries User Interface System Architecture
Build A Prototype	<ul style="list-style-type: none"> Development on first prototype based on the information collected with suitable programming language and webserver 	<ul style="list-style-type: none"> First prototype
Initial User Evaluation	<ul style="list-style-type: none"> Evaluate the first prototype and provide feedback and suggestions 	<ul style="list-style-type: none"> Feedback and suggestions given for refinement
Refining Prototype	<ul style="list-style-type: none"> Iterations occurs between the previous phase with this phase until the prototype is tuned to satisfy the company's requirements based on the feedback and suggestions given 	<ul style="list-style-type: none"> Second Prototype Final Prototype
Implement Product and Testing	<ul style="list-style-type: none"> Implement web-based system Test the developed system for problems identification 	<ul style="list-style-type: none"> Test Cases Test Report

3.1 System Requirements

System requirements capture what is to be implemented by fully describing the software system's functionality, performance, design constraints, and quality attributes [12]. The level of requirements details could be classified into three types which are functional, non-functional and user requirements. Functional requirements are statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations. In some cases, the functional requirements may also explicitly state what the system should not do [13]. **Table 3** summarizes the system's functional requirements.

Table 3 System's functional requirements

Modules	Functions
Authentication	<ul style="list-style-type: none"> The system should allow the bidders to register and login to the system. The system should allow the agents and the administrator to login via ID and password. The system should allow the administrator to authorize the agents to access the system.
Bidders Information	<ul style="list-style-type: none"> The system should allow the bidders to record, update and view their own details. The system should allow the agents and the administrator to view the bidder's details.
Rental Property Details and Listing	<ul style="list-style-type: none"> The system should allow the bidders to browse and view the rental property details. The system should allow the agents to perform rental property listing action and be able to add, update and edit the rental property details.
Bidding and Payment	<ul style="list-style-type: none"> The system should allow the bidders to browse and place bids on their desired rental property. The system should allow the bidders to make payment and view the payment details. The system should allow the agents to view the bidden rental property details.
Agreement Details	<ul style="list-style-type: none"> The system should allow the administrator to view the payment details. The system should allow the bidders to check and sign the tenancy agreement. The system should allow the agents to check the tenancy agreement. The system should allow the administrator to insert all the related details into the tenancy agreement.
Report Generation	<ul style="list-style-type: none"> The system should allow the administrator to generate summary sales report to track business performance.

A system's non-functional requirements are constraints on the services or functions offered by the system [14]. They include timing constraints, constraints on the development process, and constraints imposed by standards. **Table 4** shows the system's non- functional requirements.

Table 4 System's non-functional requirements

Requirements	Descriptions
Performance	<ul style="list-style-type: none"> The system should load the rental property details and any related information within a reasonable time frame. The system should be able to accommodate an increasing number of users and data over time without any issues.
Optional	<ul style="list-style-type: none"> The system should be always usable anytime and anywhere. The system should be able to work on any web browser. The system should be user friendly.
Security	<ul style="list-style-type: none"> The system should securely store and handle user credentials. The system should prevent unauthorized access to all user data, especially payment details and tenancy agreements. The system should provide secure channels to make payment.
Cultural and Political	<ul style="list-style-type: none"> The system should comply with all relevant legal and regulatory requirements.

A system's user requirements are statements of what services the system is expected to provide to system users and the constraints under which it must operate. They are integral to information systems design and are critical to the success of interactive systems [15]. **Table 5** shows the user requirements of the proposed system.

Table 5 System's user requirements

No.	Requirements
1.	Bidders should be able to register and login to the system.
2.	Bidders should be able to record, update and view their own details.
3.	Bidders should be able to browse and view the rental property details.
4.	Bidders should be able to browse and place bid on their desired rental property.
5.	Bidders should be able to make payment and view the payment details.
6.	Bidders should be able to check and sign the tenancy agreement.
7.	Agents should be able to login to the system via their own ID and password.
8.	Agents should be able to view the bidder's details.
9.	Agents should be able to perform rental property listing action.
10.	Agents should be able to add, update and edit the rental property details.
11.	Agents should be able to view the bidden rental property details.
12.	Agents should be able to check the tenancy agreement.
13.	Administrator should be able to login to the system via their own ID and password.
14.	Administrator should be able to authorize the agents to access the system.
15.	Administrator should be able to view the bidder's details.
16.	Administrator should be able to view the payment details made by the bidders.
17.	Administrator should be able to insert all the related details into the tenancy agreement.
18.	Administrator should be able to generate summary sales report.

3.2 System Analysis

Context diagrams present an overview of interaction between the system and its user. It also shows the data input and output to and from its user and system. **Figure 1** shows a context diagram for the proposed system with three external entities namely bidders, agents and administrator.

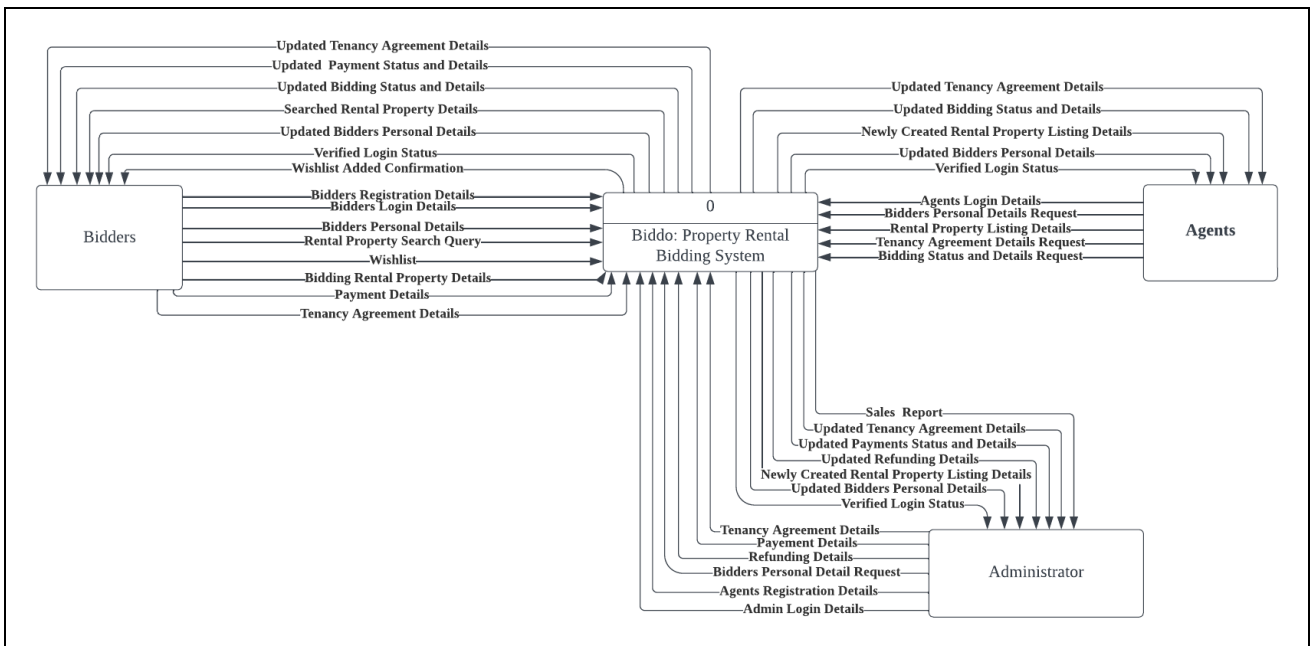


Fig. 1 Context Diagram

Data Flow Diagram (DFD) level 0 is the decomposition of the system process shown in the context diagram. It is a graphical representation of the flow of data or input from an entity through a process, which then generates output either to another entity or stored in data storage. **Figure 2** shows the DFD level 0 of the proposed system.

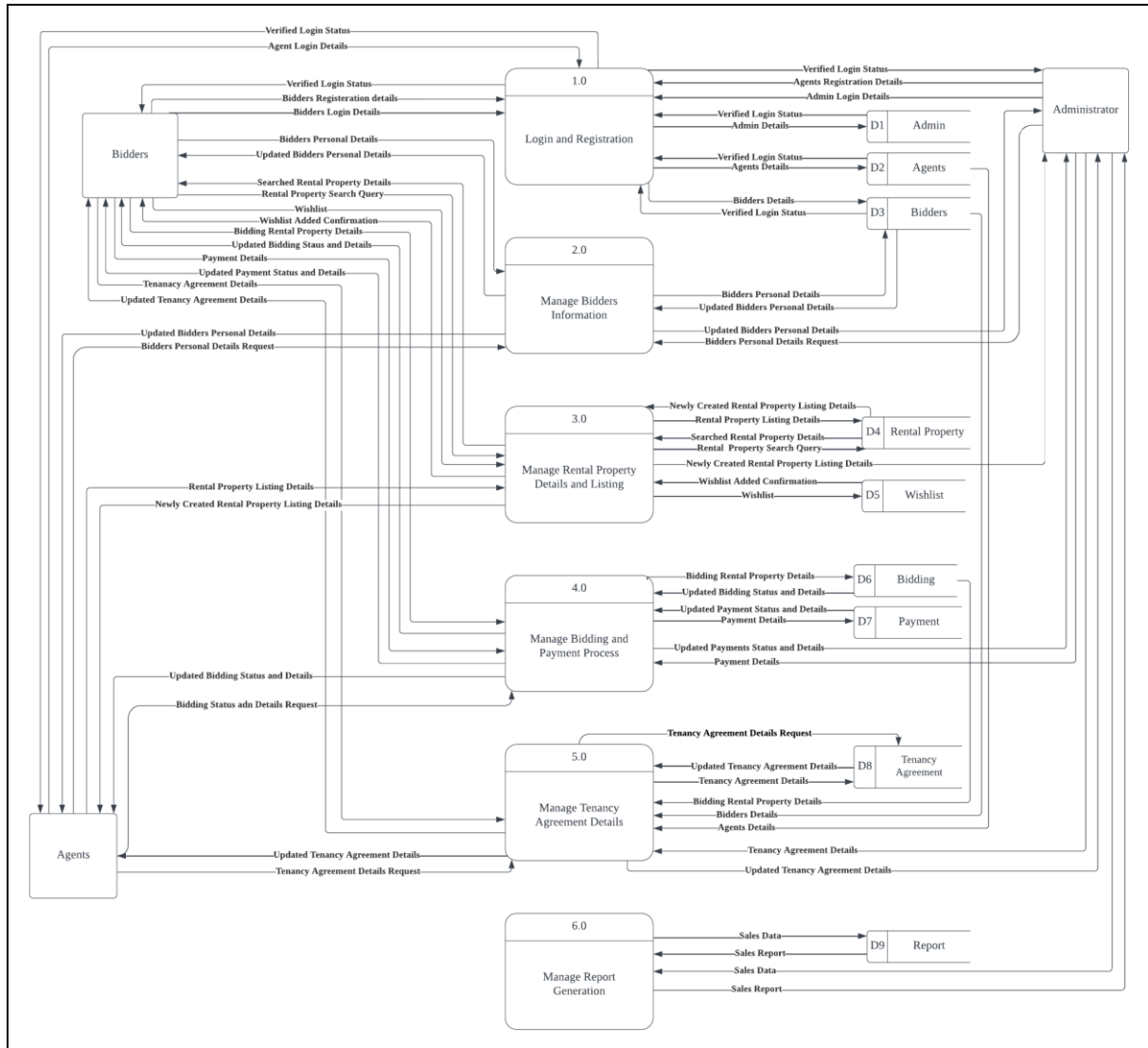


Fig. 2 DFD Level 0

Entity Relationship Diagram (ERD) is a diagram which depicts data in terms of the entities and relationships described by the data. They store data in tables while every table consists of records and every record consists of fields [16]. ERD of the proposed system which comprised of 13 entities is depicted in **Figure 3**.

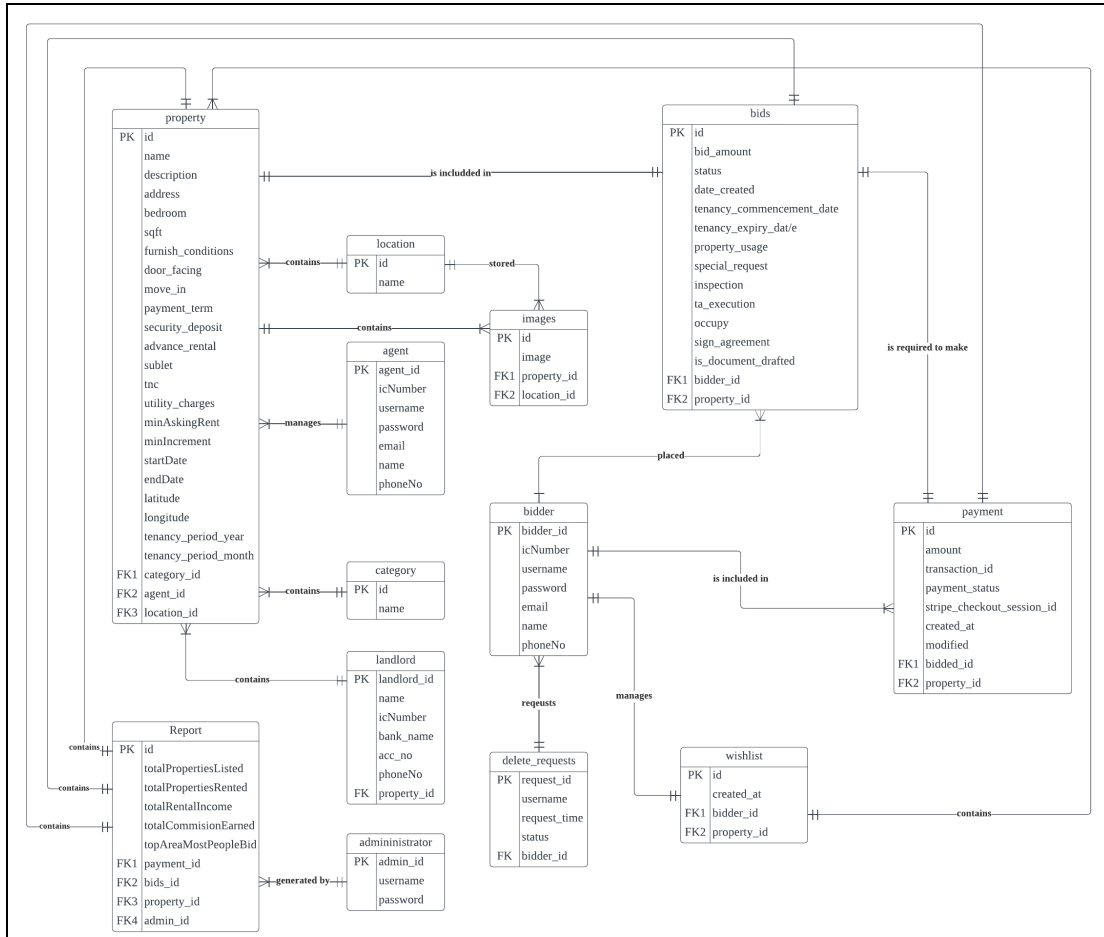


Fig. 3 ERD

As shown in Figure 4, the flowchart shows the process on three main users gain access to the system.

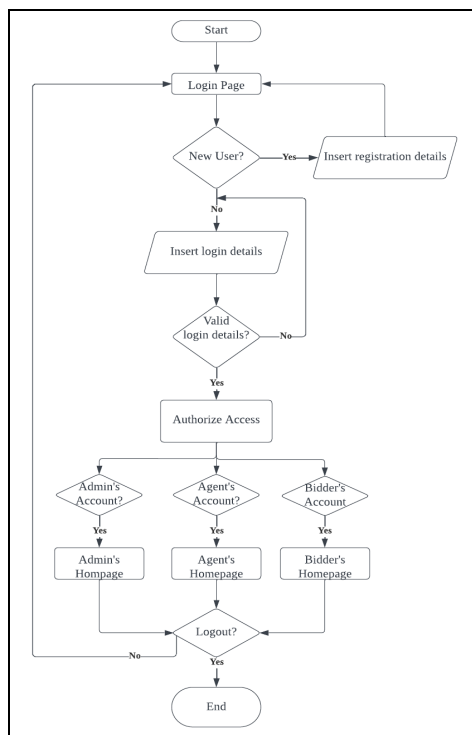


Fig. 4 Flowchart of users to gain access to the system

Figure 5 illustrates the flowchart for administrator to perform administrative tasks.

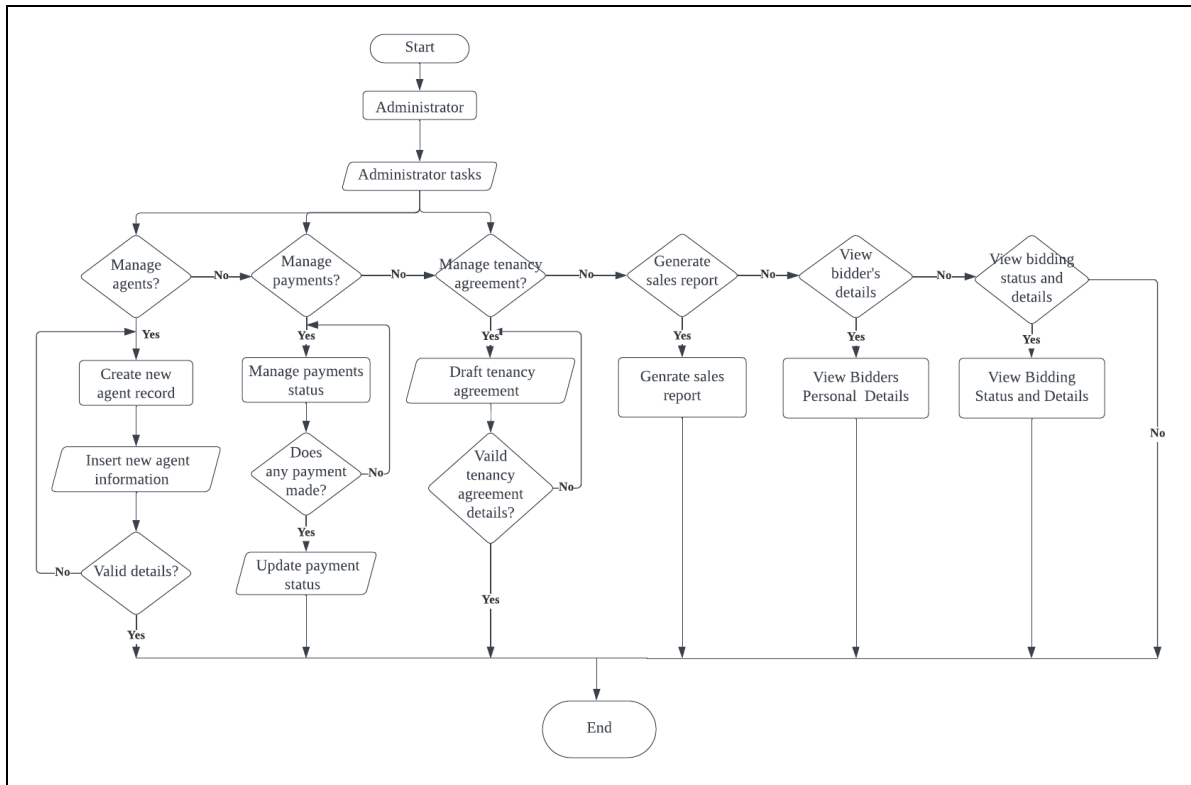


Fig. 5 Flowchart for Administrator

Figure 6 depicts the flowchart for agents to run their duty while Figure 7 presents the flowchart for bidder to perform user's activity.

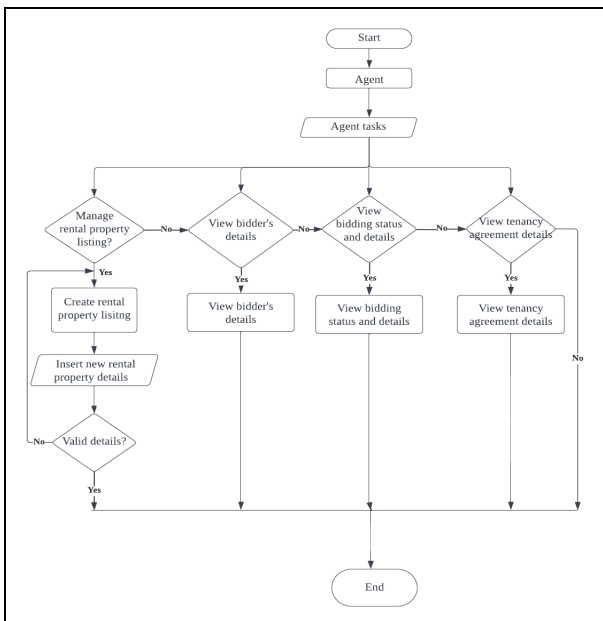


Fig. 6 Flowchart for Agent

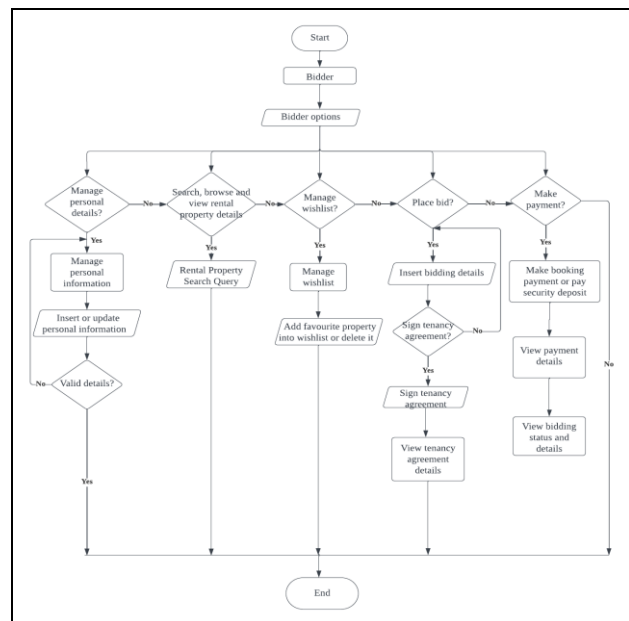


Fig. 7 Flowchart for Bidder

3.3 System Design

System architecture represents the conceptual model of a system together with models derived from it that represent (1) different viewpoints defined as views on top of the conceptual model, (2) facets or concerns of the system in dependence on the scope and abstraction level of various stakeholders, (3) restrictions for the

deployment of the system and description of the quality warranties of the system, and (4) embeddings into other systems [17]. **Figure 8** shows the system architecture of the proposed system.

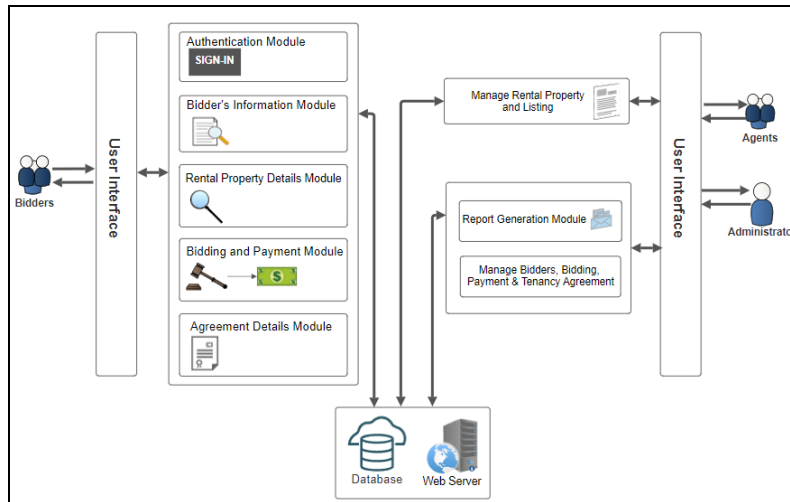


Fig. 8 System Architecture

The relational schema for the proposed system are listed as follows:

- i. administrator (admin_id, username, password)
- ii. agent (agent_id, icNumber, username, password, email, name, phoneNo)
- iii. bidder (bidder_id, icNumber, username, password, email, name, phoneNo)
- iv. property (id, name, description, address, bedroom, bathroom, sqft, furnish_considents, door_facing, move_in, payment_term, security_deposit, advance_rental, sublet, tnc, utility_charges, minAskingRent, minIncrement, startDate, endDate, latitude, longitude, tenancy_period_year, tenancy-period_month, category_id, agent_id, location_id)
- v. location (id, name)
- vi. category (id, name)
- vii. images (id, image, property_id, location_id)
- viii. delete_requests (request_id, username, request_time, status, bidder_id)
- ix. wishlist (id, created_at, bidder_id, property_id)
- x. bids (id, bid_amount, status, tenancy_commencement_date, tenancy_expiry_data, property_usage, special_request, inspection, ta_execution, occupy, sign_agreement, is_document_drafted, bidder_id, property_id)
- xi. landlord (landlord_id, name, icNumber, bank_name, acc_no, phoneNo, property_id)
- xii. payment (id, amount, transaction_id, payment_status, stripe_checkout_session_id, created_at, modified, bidder_id, property_id)
- xiii. report (id, totalPropertiesListed, totalPropertiesRented, totalRentalIncome, totalCommisionEarned, topAreaMostPeopleBid)

The system user interface has been designed and is shown in **Figures 9-16**.

The login interface for a bidder is titled 'Login'. It features a 'Username/email*' field with a placeholder 'Enter your username/ email', a 'Password*' field with a placeholder 'Enter your password', and a 'Forgot password?' link. Below these fields is a 'LOGIN' button and a link for 'New user? Create account'.

(a)

The login interface for an agent or administrator is titled 'Agent/ Admin Login'. It features a 'Username/email*' field with a placeholder 'Enter your username/ email', a 'Password*' field with a placeholder 'Enter your password', and a 'Forgot password?' link. Below these fields is an 'Access Level*' dropdown menu and a 'LOGIN' button.

(b)

Fig. 9 Login Interface (a) For Bidder; (b) For Agent and Administrator



Fig. 10 Registration Interface for Bidder

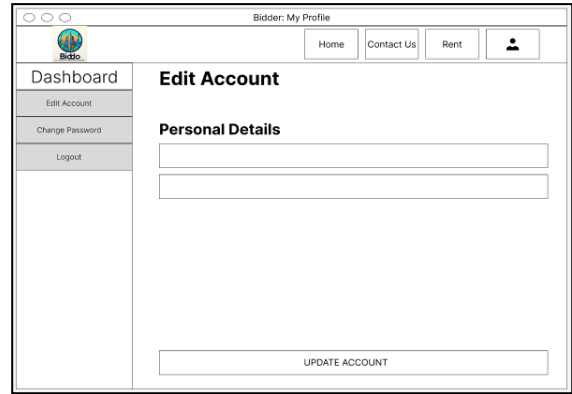


Fig.11 Edit Personal Details Interface (Bidder)

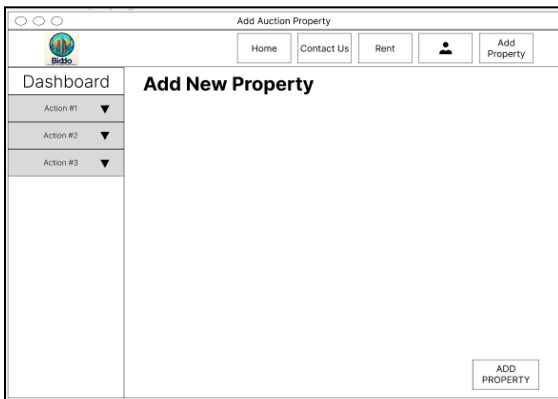


Fig. 12 Add New Property Interface (Agent)

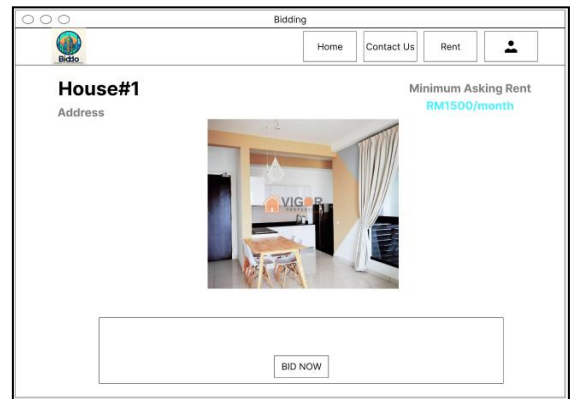


Fig. 13 Bidding Interface (Bidder)

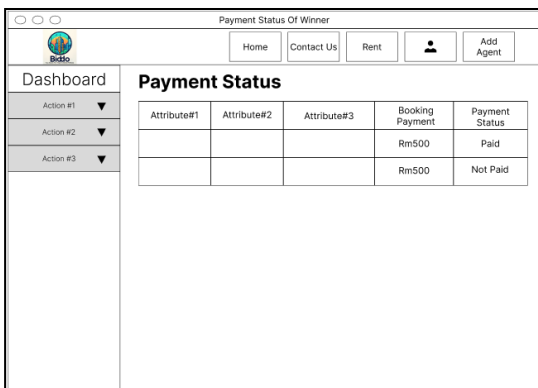


Fig. 14 View Payment Status Interface (Admin)

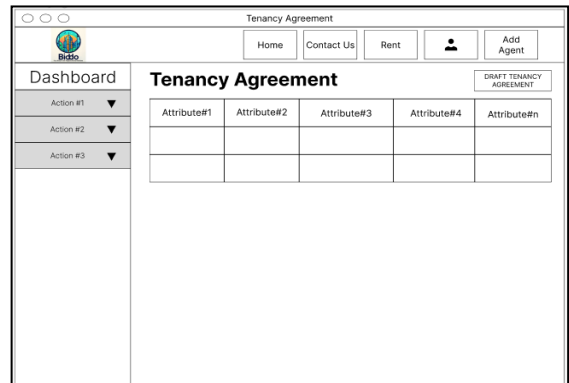


Fig. 15 Manage Tenancy Agreement Interface (Admin)

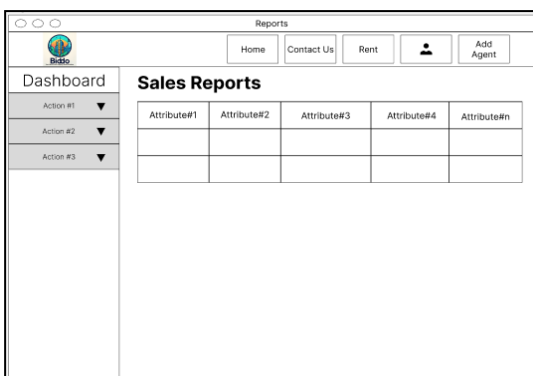


Fig. 16 Generate Sales Report Interface (Admin)

4. Result and Discussion

The proposed system, which comprises six functional modules, has undergone a series of implementations and thorough testing to ensure its functionality, reliability, and user-friendliness.

4.1 Authentication Module

Figure 17 shows the user interface of the account registration for bidder.

Malaysian Identity Card Number*:
Enter IC No without dash(-)

Username*:

Password*:

Must contain at least one number and one uppercase and lowercase letter, and between 6 to 15 characters.

Email*:

Name*:

Phone Number*:

[Register](#)

[Already have an account? Login](#)

Fig. 17 Bidder's Account Registration Interface

Figure 17 shows the registration form for bidder to insert their details. By clicking on the “Register” button, the user-input details will be inserted into the database. A registration successfully alert message will pop out to notify the bidder.

4.2 Bidders Information Module

Figure 18 shows the user interface for bidder to update their personal details.

BIDDO HOME ABOUT US PROPERTY CONTACT yumer01

Edit Personal Details

My Profile

- [Edit Personal Details](#)
- [Change Password](#)
- [Delete Account](#)
- [Logout](#)

Email:

Phone Number*:

[Update Account](#)

Fig. 18 Update Bidder Personal Details Interface

Figure 18 shows that bidder can update their email and phone number if needed by filling in the necessary field and clicking on the update account button.

4.3 Rental Property Details and Listing Module

Figure 19 shows the interface for property listing action perform by agent.

The screenshot shows a web form for listing a property. The form includes the following fields:

- Property Title: [Text input field]
- Property Address: [Text input field]
- Property Location: [Dropdown menu with 'Select Property Location' text]
- Property Type: [Dropdown menu with 'Select Property Type' text]
- Property Bedroom: [Text input field]
- Property Bathroom: [Text input field]
- Property Sqft: [Text input field]

 The form is set against a light green background with a city skyline image at the top.

Fig. 19 Property Listing Action Performed By Agent Interface

Figure 19 shows the property listing action performed by agent where agent can fill in the property’s details.

Figure 20 displays the interface for viewing the property details.

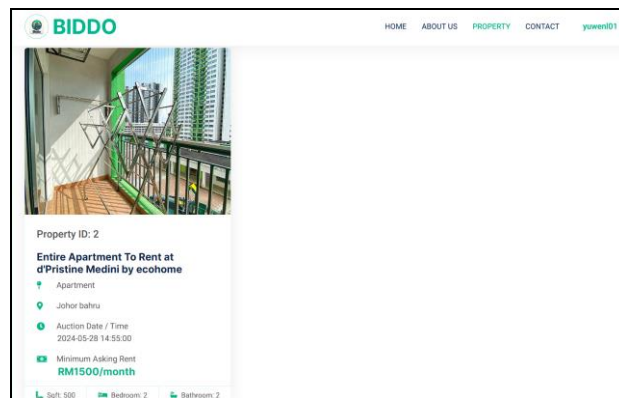


Fig. 20 Viewing the Property Details Interface

4.4 Bidding and Payment Module

Figure 21 shows the interface of the active bidding session.

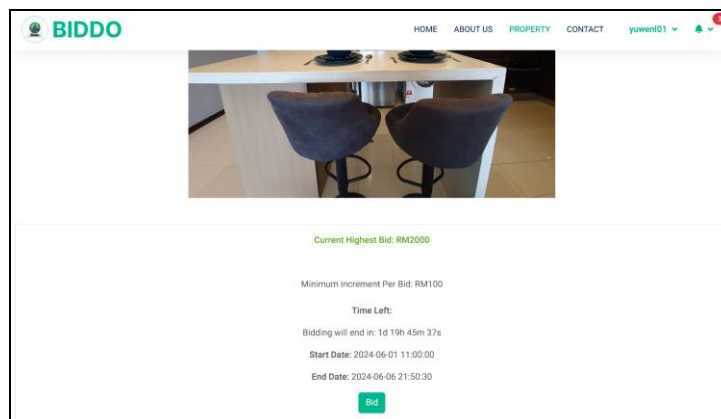


Fig. 21 Active Bidding Session Interface

Figure 22 displays the payment gateway interface.

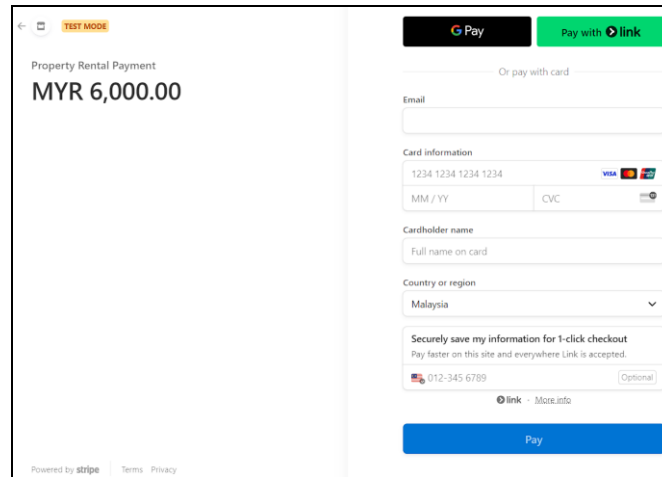


Fig. 22 Payment Gateway Interface

Figure 22 shows the interface of the payment gateway. The total amount including the bid amount, security deposit, utility deposit and advance rental is displayed on screen. Bidder needs to fill in the mandatory details to make the payment order successfully.

4.5 Agreement Details Module

Figure 23 presents the interface of the drafted tenancy agreement.



Fig. 23 Draf Tenancy Agreement Code Snippet

Figure 23 shows the drafted tenancy agreement on screen. Then, bidder must click on the button with “I have read and understand the tenancy agreement” text on it at the bottom of the page. Lastly, bidder will be prompt to signature capture to finish up the signing of tenancy agreement contract.

4.6 Report Generation Module

Figure 24 shows the interface of the report generated.

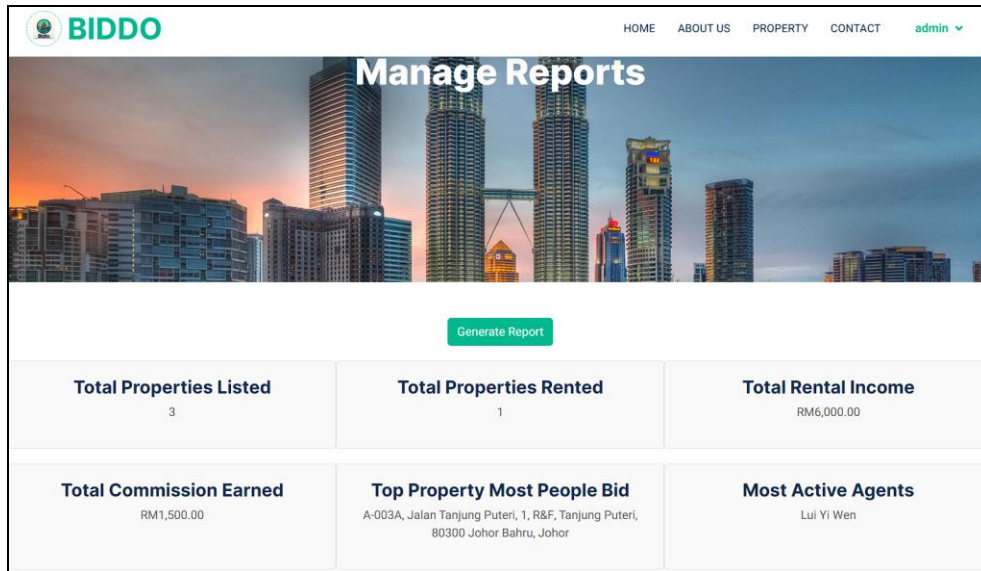


Fig. 24 Report Generation Interface

Figure 24 shows the interface of the report generated by the administrator. Administrator can use the report to track the business performance.

4.7 Testing Result

After the proposed system has undergone a series of implementations, the system underwent the functionality testing using test case and a User Acceptance Testing (UAT) form. **Tables 6 to 11** show the six test cases that have been carried out for each module. These test cases were designed to evaluate a specific function of the module, ensuring that all aspects of the system were thoroughly examined. This is to help identify any bugs or issues that could impact the system’s performance or user experience.

Table 6 Test case for Authentication Module

Module: Authentication				
Test Case ID	Description	Expected Result	Actual	Pass/Fail
A1-1	To check whether administrator can register for an agent’s account	Administrator should be able to create an account for agent	Administrator has successfully created an account for agent	Pass
A1-2	To check whether a bidder can register and login to the system or not	Bidder should be able to register an account and login into the system	Bidder has successfully created an account and logged into the system	Pass
A1-3	To check whether the administrator and agent can be login to the system or not	Both privilege users should be able to login to the system	Both privilege users successfully login to the system	Pass
A1-4	To check whether a bidder can request to forgot password or not	Bidder should be able to request forgot password at login page	Bidder has successfully reset the password	Pass
A1-5	To check whether the system will restrict login whenever a wrong credential is entered	The system should restrict login when an incorrect credentials has been entered	The system restricted the login when an incorrect or no credentials has been entered	Pass

Table 7 Test case for Customer Information Module

Module: Customer Information				
Test Case ID	Description	Expected Result	Actual	Pass/Fail
C2-1	To check whether the bidder's personal details can be view or update or not	Bidder should be able to view or update their personal details	Bidder has successfully view or update their personal details	Pass
C2-2	To check whether a bidder can request for account deletion or not	Bidder should be able to request for account deletion	Bidder has successfully deleted their account after the request has been reviewed and take action upon it	Pass
C2-3	To check whether the system will restrict the actions mentioned above whenever a wrong credential is entered	The system should restrict the actions requested when an incorrect credentials has been entered	The system did restrict the actions requested when an incorrect or no credentials has been entered	Pass

Table 8 Test case for Rental Property Details and Listing Module

Module: Rental Property Details and Listing				
Test Case ID	Description	Expected Result	Actual	Pass/Fail
R3-1	To check whether a bidder is able to browse and view the properties details	Bidder should be able to view and browse the properties details	Bidder has successfully view and browse all the properties details.	Pass
R3-2	To check whether an agent is allowed to perform property listing action and capable to edit it afterwards	Agent should be able to list the property and edit it afterwards	Agent has successfully listed the property and able to edit the listed property details	Pass
R3-3	To check whether the system will restrict the actions mentioned above whenever a wrong information is entered	The system should restrict the actions requested when an incorrect information has been entered	The system did restrict the actions requested when an incorrect or no information has entered	Pass

Table 9 Test case for Bidding and Payment Module

Module: Bidding and Payment				
Test Case ID	Description	Expected Result	Actual	Pass/Fail
B4-1	To check whether the bidder can browse and place bid on property	Bidder should be able to browse and place bid on desired property	Bidder can browse and place bid on desired property successfully	Pass
B4-2	To check whether bidder is allowed to make payment and view the payment details afterwards	Bidder should be able to make payment and view the payment details afterwards if won the bid	Bidder can make payment and view the payment details later successfully if won the bid	Pass
B4-3	To check whether agent is allowed to view the rental property bid history	Agent should be able to view the rental property bid history	Agent can view the rental property bid history successfully	Pass
B4-4	To check whether administrator is allowed to view the payment details	Administrator should be able to view the payment details	Administrator can view the payment details successfully	Pass
B4-5	To check whether the system will restrict the actions mentioned above whenever a wrong information is entered	The system should restrict the actions requested when an incorrect information has been entered	The system did restrict the actions requested when an incorrect or no information has been entered	Pass


Table 10 Test case for Agreement Details Module

Module: Agreement Details				
Test Case ID	Description	Expected Result	Actual	Pass/Fail
TA5-1	To check whether the bidder can review and sign the drafted tenancy agreement	Bidder should be able to review and sign the drafted tenancy agreement	Bidder can review and sign the drafted tenancy agreement successfully	Pass
TA5-2	To check whether agent is allowed to view the tenancy agreement	Agent should be able to view the signed tenancy agreement	Agent can view the signed tenancy agreement successfully	Pass
TA5-3	To verify whether the administrator can draft the tenancy agreement if there is highest bidder who won the bid	Administrator should be able to draft the tenancy agreement if there is highest bidder who won the bid	Administrator can draft the tenancy agreement if there is highest bidder who won the bid successfully	Pass

Table 11 Test case for Report Generation Module

Module: Report Generation				
Test Case ID	Description	Expected Result	Actual	Pass/Fail
RG6-1	To check whether the administrator can generate the sale report	Administrator should be able to generate the sales report	Administrator can generate the sales report successfully	Pass

Following the functionality testing, the system was subjected to User Acceptance Testing (UAT) using a form depicted in **Figure 25**.



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Biddo: Property Rental Bidding System

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****Note:** This System Testing Form is prepared to get user feedback on the system to know the extent of the system's functionality. This form has one (1) section only namely Section A.

Please fill in the scale from 1 to 5 in the relevant evaluation box.

Section A:

1	Strongly Dissatisfy
2	Dissatisfy
3	Average
4	Satisfy
5	Strongly Satisfy

No	Item	Evaluation Scale from 1-5
SYSTEM FUNCTIONALITY		
1.	User can register and login to the system.	5
2.	User can request forgotten password and reset the password.	5
3.	User can view or update their personal details.	5
4.	User can request for account deletion.	5
5.	User can search property by entering specific keyword or filter by the location and the property type in the search bar.	5
6.	User can add property to his/her Wishlist and be able to delete it as needed.	5
7.	User can browse and place bid on desired property.	5
8.	User can view the property details.	5
9.	User can view the current bid price and the remaining time for an active bidding session.	5
10.	User can view the bid status/history during an active bidding session or after the bidding session has ended.	5
11.	User can review the drafted tenancy agreement before signing it.	5
12.	User can download the signed tenancy agreement as PDF file.	5
13.	User can make payment after the tenancy agreement is signed.	4
14.	User can view the payment status of the transactions made.	5
15.	User can review the bid history to keep track of past bidding activities.	5
USER-FRIEDNLY SYSTEM		
1.	It is easy to use and user-friendly.	4
2.	I can use it without written instructions.	4
3.	I do not notice any inconsistencies as I use it.	4
4.	I would find the system useful in my job.	3
OVERALL SYSTEM EVALUATION		
1.	The interface design of the system is user-friendly and intuitive.	4
2.	The navigation of the system is efficient and straightforward.	4
3.	The system maintains good readability, with clear fonts and appropriate colour contrast.	4

Comments / Suggestions: Overall, the system performs well. However, in the real word of property rental, there are always unexpected factors that can arise when closing a deal face to face with clients.

Tester Name: Tan MayMay (Manager of the Vigor Properties Kluang Agency)

Date: 6th June 2024

Fig. 25 UAT Form

Figure 25 shows the UAT form that was constructed using a combination of several questionnaires. These include the Perceived Usefulness and Ease of Use [17], Perceived Usefulness [18] and Ease of Use and USE Questionnaire: Usefulness, Satisfaction, and Ease of use [19]. The UAT form was designed to gather feedback on the system's functionality, user-friendliness and the overall system evaluation by asking the tester to rate various aspects on a scale from 1 to 5, with 1 being strongly dissatisfied and 5 being strongly satisfied.

5. Conclusion

In conclusion, the proposed system with database significantly enhances operation efficiency for the company given the high volume of customer and property data that the company handles by streamlining the process of recording and retrieving customer information. It mitigates the risk of data corruption in spreadsheets, improves data management, ensures accuracy by reducing human error and time spent on manual data entry. Then, the sales summary report generated can ease the process for auditing.

However, there are some limitations that may impact the proposed system's effectiveness and usability. First and foremost, the payment gateway is currently acting as a dummy and has not undergone the necessary document verification process. This means that the system is not fully operational for handling actual financial transactions. Apart from that, the system may still be vulnerable to security threats such as hacking or data breaches, posing risks to user data security as the system now lacks a series of robust security measures. Plus, the complexity of rental processes within the system may pose challenges for users unfamiliar with the platform, potentially leading to usability issues.

To address the limitations mentioned above, several future improvements can be considered. Firstly, completing the necessary document verification process for the payment gateway is crucial. This step would enable the system to transition from its current dummy status to a fully operational platform capable of handling real financial transactions securely. Then, enhancing security measures to mitigate potential risks such as hacking or data breaches by implementing robust encryption protocols. Lastly, simplifying rental processes and refining the user interface for users who are unfamiliar with the platform. Overall, the project has successfully developed a system that can serve as an example of how to effectively manage business data and enhance customer satisfaction by offering a hassle-free property rental experience for the company or similar business in the field.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

*The authors confirm contribution to the paper as follows: **study conception and design:** Lui Yi Wen, Suhaila Mohd Yasin; **data collection:** Lui Yi Wen; **analysis and interpretation of results:** : Lui Yi Wen Z; **draft manuscript preparation:** : Lui Yi Wen. All authors reviewed the results and approved the final version of the manuscript.*

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