มหาวิทยาลัยอัสสัมชัญ
ASSUMPTION UNIVERSITY
of THAILAND

VINCENT MARY
SCHOOL of SCIENCE and
TECHNOLOGY

Senior Project Report

Habitat:

University Dormitory Management

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Vincent Mary School of Science and Technology

CS 3200 / ITX 3009 Senior Project 1 (1/2020)

Senior Project Approval

Project title:	Habitat: Dormitory University Management	
Academic Year:	1/2021	
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The Senior Project committee's cooperation between the Department of Computer Science and Information Technology, Vincent Mary School of Science and Technology, Assumption University had approved this Senior Project. The Senior Project in partial fulfilment of the requirement for the degree of Bachelor of Science in Computer Science and Information technology.

Approval Committee:

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Abstract

In university of Thailand, dormitory in campus is the main point when students decide to stay, spend time doing activity in the university on campus to make convenient to the students, especially international students who come to Thailand. The dormitory on campus will be immediately good choice. The students can pay expenses of dormitory while there are some mistakes when calculate the expenses. There are more than one student stays in room, so the expenses should be separated in each student. Almost dormitory applications do not aim to solve this problem and cannot check the detail of expenses.

Habitat is a dormitory of university on campus application built on 2 platforms are an iOS that focuses on expenses in each student, news, and alternative bank payment for students. Another platform is a web application platform for managing system to check any expenses, manage each room in dormitory in each building, and also, petition to collect any problems of students such as some room make too noise, the students can report on the petition feature.

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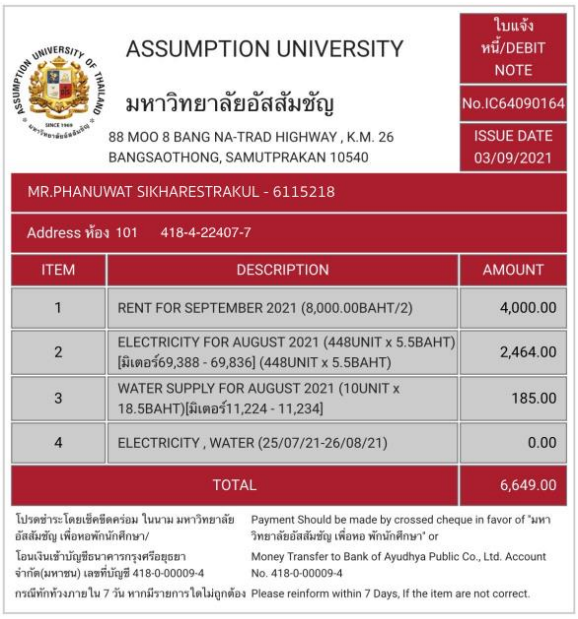
Chapter 1: Introduction

1.1 Problem Statement

Dormitory of Assumption University is one of choices which Assumption University students chose to stay because it is in the university as conveniently come studying in the university. Also, the university has several facilities providing for the students to use. For example, study room, sport centre, library, etc.

There are 3 buildings to manage: King Solomon, King David, and Queen of Sheba. Almost all managers must manage onsite manually which makes them work harder and more paperwork. They sometimes got mistakes to calculate expenses or keep their documents that about bill. They must send tenants bill manually. There are also no data record clearly especially, the record of expenses, number of all rooms in each building, and income statement which the manager should see all of time. An announcement is the last problem because it was tough to inform news to tenants. They always post on Facebook that no one see. It made the tenants miss news in the dormitory. For example, facilities are closed, power cut and others. However, those problems of the dormitory made it difficult to Assumption University students. Sometimes, a billing system automatically deducts money before the students could check bill detail. If there are mistakes, staff will waste the time processing the refund. Figure 1.1 shows the bill on email which staff has adapted in the COVID-19 pandemic.



ASSUMPTION UNIVERSITY

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ใบแจ้งหนี้/DEBIT NOTE

No.IC64090164

ISSUE DATE 03/09/2021

MR.PHANUWAT SIKHARESTRAKUL - 6115218

Address ห้อง 101 418-4-22407-7

ITEM	DESCRIPTION	AMOUNT
1	RENT FOR SEPTEMBER 2021 (8,000.00BAHT/2)	4,000.00
2	ELECTRICITY FOR AUGUST 2021 (448UNIT x 5.5BAHT) [มิเตอร์69,388 - 69,836] (448UNIT x 5.5BAHT)	2,464.00
3	WATER SUPPLY FOR AUGUST 2021 (10UNIT x 18.5BAHT)[มิเตอร์11,224 - 11,234]	185.00
4	ELECTRICITY , WATER (25/07/21-26/08/21)	0.00
TOTAL		6,649.00

โปรดชำระโดยเช็คขีดคร่อม ในนาม มหาวิทยาลัยอัสสัมชัญ เพื่อหอพักนักศึกษา/
โอนเงินเข้าบัญชีธนาคารกรุงศรีอยุธยา จำกัด(มหาชน) เลขที่บัญชี 418-0-00009-4
กรณีหักห้วงภายใน 7 วัน หากมีรายการใดไม่ถูกต้อง

Payment Should be made by crossed cheque in favor of "มหาวิทยาลัยอัสสัมชัญ เพื่อหอ พักนักศึกษา" or
Money Transfer to Bank of Ayudhya Public Co., Ltd. Account No. 418-0-00009-4
Please reinform within 7 Days, If the item are not correct.

Figure 1.1: Student's bill of dormitory

1.2 Motivation

There are many students complain about price, services, and management system of the dormitory on campus. We try to help to solve those problems by developing Habitat project. The staff manages the dormitory manually and uses paper-based system to record or check documents about expenses, room, and students as well and students who stay in dormitory cannot check the bill properly.

Furthermore, we can see those problems and get motivation to solve them for students who live in dormitory in Assumption University. There are several dormitory or hotel management platforms to provide a great experience for management. They do not have a system about separating expenses in each person in room. The tenants can check expenses individually.

1.3 Overview

Those problems are solved by a web application for staff managing the dormitories. There are several features to easily use. It can create buildings, floors, rooms, fees, and set initial meter reading in system for beginning. The system will send them information via email after the tenant is assigned to room.

Calculation all expenses are important to manage renting rooms including rent, electricity, water, and other services prices. The system can automatically calculate the expenses in each person in room with overall of the room. For example, there are 2 people in room that prices are 8,000 THB. So, each person needs to pay is 4,000 THB. The electricity and water price will be calculated with rate per unit are 5.5 THB and 18.5 THB monthly. The calculation of electricity and water price are a formula “Price = (Current Reading – Previous Reading) * (Price / Unit) [1]” and divided by number of students in each room to get any expenses per students. The staff can know what students complain on petition feature such as neighbours got noise too loud or need to repair stuff in the room such as air conditioner, table, chair, etc.

On the other hand, Habitat also has an iOS mobile application that shows the bill for each student. They will get bill in each month on application that they can check any details such as total price, meter readings, and rate of electricity and water. They can pay with QR code on application by bank application.

Students usually have problems in dormitory. For example, some furniture is broken, neighbor made noise at night. They can complain petition to the staff directly on petition feature to note what they have the problems with.

1.4 Scope of the project

Habitat is a dormitory management system based on the expenses of students who stay in the dormitory and the process of calculation each fee such as rent, electricity, water, and other services price each student. For example, if there are 3 students in the room, all expenses will be divided by 3. Furthermore, the system is implemented as a web application and an iOS application for dormitory staff and students respectively.

Chapter 2: Management Systems

Residence hall is a kind of business that has management as a process of planning, decision and organizing. There are managers and staff to manage any resources such as buildings, rooms, tenants, staff, and finance of residence hall to analyse and plan managing them and serve to tenants. There are a number of dormitory platforms including Horganice, Krungthai Dormitory and other applications. These applications help manage room, payment, announcement, etc. However, they cannot add tenants with bed and separate calculate anything expenses to each people. There are no platforms to solve or work with the service style of AU dormitory above.

2.1 Comparison

The existing applications in store are Horganice and Kungthai Dormitory applications that about dormitory management. They can set up buildings, floors, and rooms. They also bill expenses to each room and announce news in applications. They cannot separate the expenses to each person in each room and inform petition on the platform. The Habitat can do what Horganice [2] and Krungthai Dormitory [3] are not able to do.

Table 2.1: Dormitory Management Application Comparison

Contents	**Horganice**	**Krungthai Dormitory**	**Habitat**
Set up building, floors, and rooms	Yes	No	Yes
Initial meters reading	Yes	No	Yes
Room Management	Yes	Yes	Yes
Separate Expenses each person	No	No	Yes
Payment	Yes	Yes	Yes
Announcement	Yes	Yes	Yes
Petition	No	No	Yes

2.2 Process

When the staff manager of dormitory work, there are several steps to do in the process. At the beginning, there are 3 buildings as King Solomon, King David, and Queen of Sheba. The staff will separate the room type already including Standard, Triple, Balcony, and Quadruple. So, each room type has different rent and room size. After that they will record the meter reading of electricity and water in each room before there will let tenants stay in that room. Next, the tenants will come at the countre service centre to select which room type they need and select bed. The staff will assign the tenants in the room which they select in the system. When the staff bill expenses the tenants at the end of the month, the system will cut automatically off on bank account (Krungsri Account, AU branch only). After that the staff will give them the expense detail paper.

Assumption University's dormitory will post news on Facebook page named AU Residence Halls. Most tenants do not see any announcements even there were important such as the temporary power cut. Also, when the tenants have any problems, they must tell the staff at the countre service center only. They track the state of the petitions. The tenants must follow the problems by themselves. Figure 2.1 shows all of room types in the AU dormitory [4].

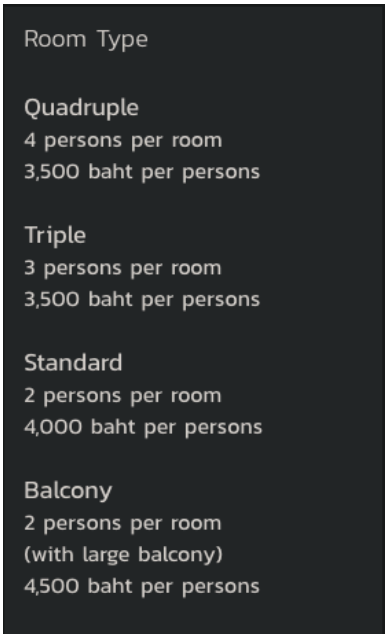

Figure 2.1: Room types of Assumption University dormitory

Chapter 3: Design of The System

3.1 Functional Requirements

3.1.1 Stakeholders

A stakeholder of Assumption University is a party that support organization as University (Owner), Manager, Staff, Finance, and Customer (Tenants/Students). In the beginning, the university as AU dormitory owner to create the building as King Solomon, King David, and Queen of Sheba. In each building, there are approximately 13 floors containing 60 rooms. Moreover, the manager is a person responsible for managing each building. For example, the manager can manage rooms, control, or order staff, cleaner, and security guard. The staff will serve any services in the dormitory to the customers. For instance, customers need to live in room 101, so the staff will assign them to the system. The staff also bill expenses to the customers. In addition, financial department is responsible for finance and co-operate with the bank and check income and expense.

In Habitat project, we provide the features to help all stakeholders to be convenient managing dormitory. These features are managing rooms, setting fees, assigning customers in the room. The staff will record the expenses to the system as well. The staff also views the dashboard to prepare the reports for manager or owner. In the financial department, customers can pay with QR code to Prompt Pay system.

3.1.2 Use Cases

In Habitat project, it explains about management dormitory with process. The room management basically have the number of rooms with status which shows on screen. The billing system will calculate expenses automatically.

For each floor contain rooms, there is a status vertical bar with 3 statuses. There is green color represents available beds, red color represents full or unavailable beds, and grey color represents the rooms have not set room type yet.

The staff will manage room and record billing in each room after they assigned the tenants to the room. In this case, the prices will be divided by number of people in the room. The bill will show to mobile application of user. The Room Management interface shows in Figure 3.1.

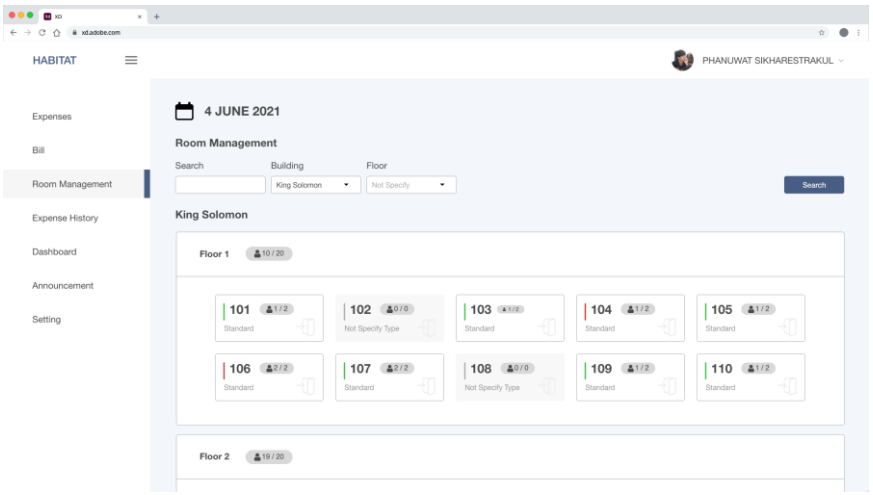

Figure 3.1: Room Management

3.2 Habitat System Design

This part is about the system design and procedures of Habitat project in both front-end and back-end environments. It represents the sequence diagram, process, and workflow in the system and database design to discuss in this part.

3.2.1 Sequence Diagram

In this part, a sequence diagram is showing the object from one point to another point, step by step. The sequence diagram is a sequence of messages between objects which interact with each other. It represents all workflow of the system. It has user, API service, and databases.

In Figure 3.2, there are 4 main elements involved in the interaction. They are students or tenants, staff, backend system or API service, and database in sequence diagram. The element with the longest lifeline is the backend system because almost all elements interact with the

backend system [5]. It represents the process at the beginning to the billing process from staff to tenants. Figure 3.3 shows the lifeline process from payment of tenants to the end of system.

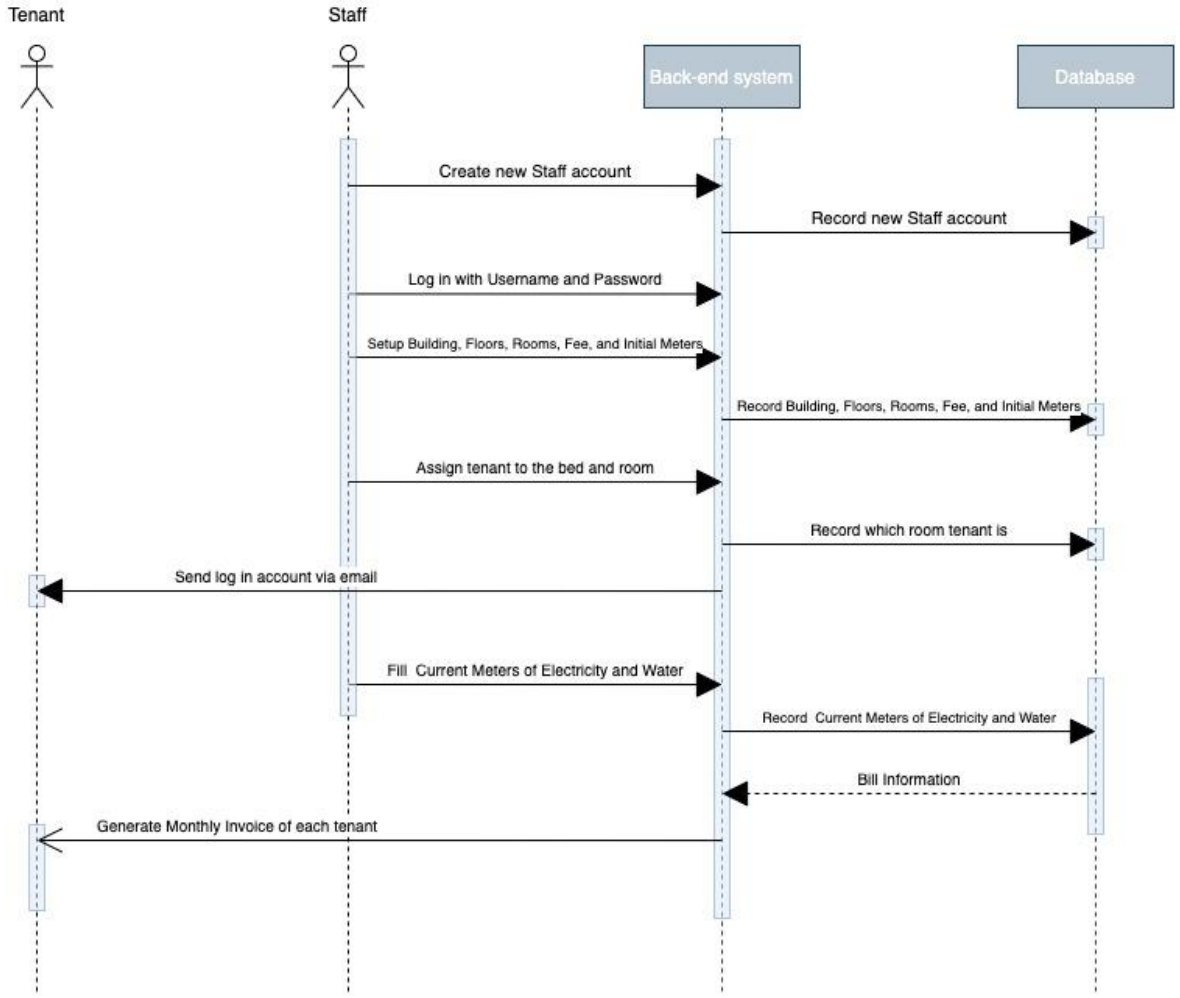

Figure 3.2: (a) Sequence diagram of the beginning to billing to tenant

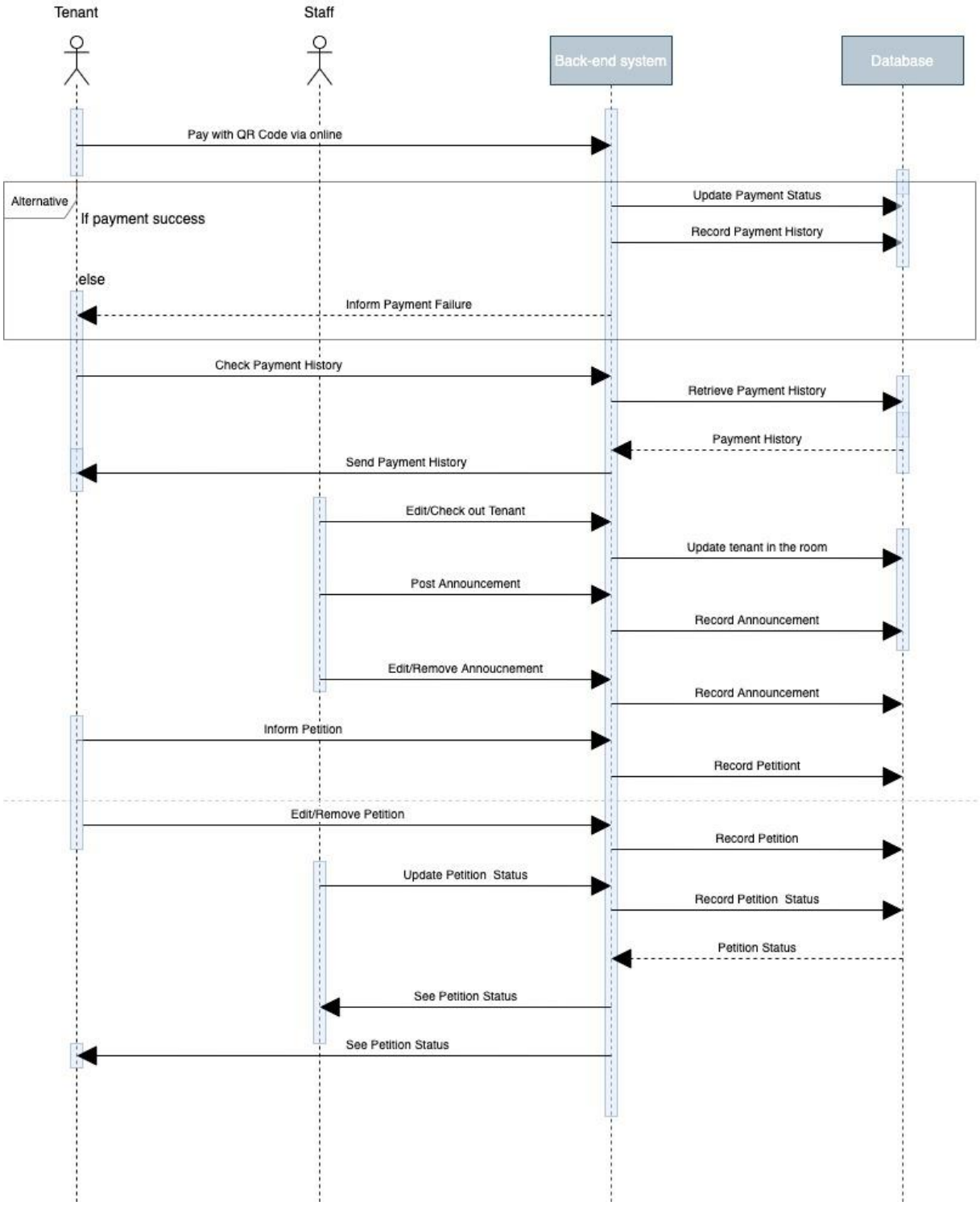

Figure 3.3: (b) Sequence diagram of the payment to finish system

Another long lifeline is followed by staff because they must manage the dormitory, facilities, any services, and take care of the tenants for some time. All the main activities are done by the staff. For example, they can set up the dormitory system, manage rooms, assign tenants to each

room those access control on the database system. By those designs, the staff also make any changes to the data to record on the database.

3.2.2 Staff Workflow

In the staff workflow, Habitat has several features to provide the system for the staff. There are 5 steps to use the web application as set up, expenses, dashboard, announcement, and petition respectively.

Step 1: Set up

a) After fter staff log in to the web application, the staff needs to create a building first because the system does not know what your building name is to manage. The staff must fill with blank to create such as Building Name, Address of the building, and contacts. Figure 3.4 shows the fill to create the building before using the application.

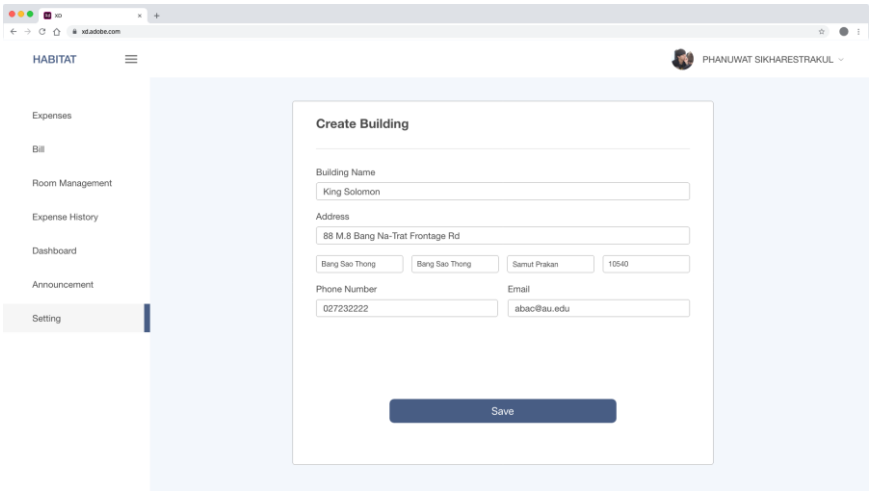

Figure 3.4: Create Building

b) In this step, the staff already have the building. The staff will create floors in the building to set the number of floors. This step is showing to set the floors in the building as Figure 3.5. It is preparing add rooms on each floor.

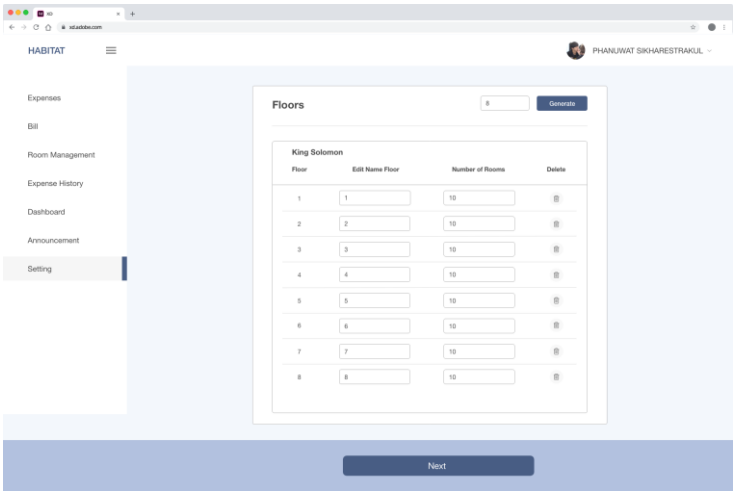

Figure 3.5: Create floors

c) The staff must create rooms to set the rooms on each floor. It is preparing to set the room type to set the rent and room size on the system. Figure 3.6 shows all of the fields to fill the room number on each floor.

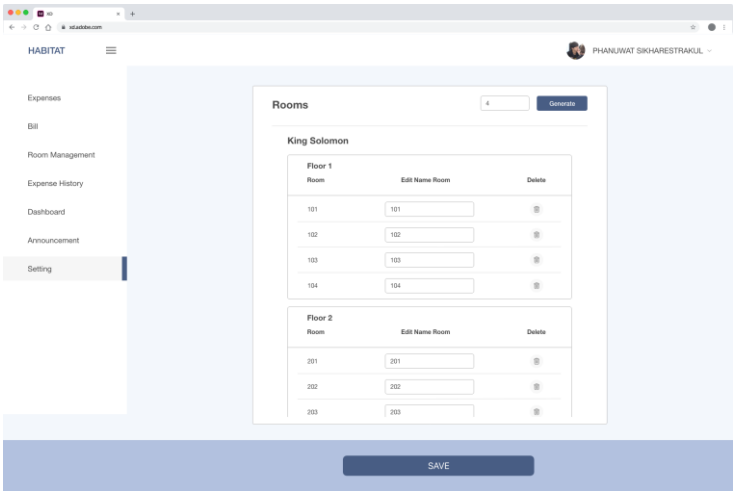

Figure 3.6: Create rooms

d) In Figure 3.7, it is about creating an item of fee types to set the services. The fee type is important for the system to set the services in the dormitory on campus. For instance, electricity and water price per unit, cleaning services, Car parking, etc.

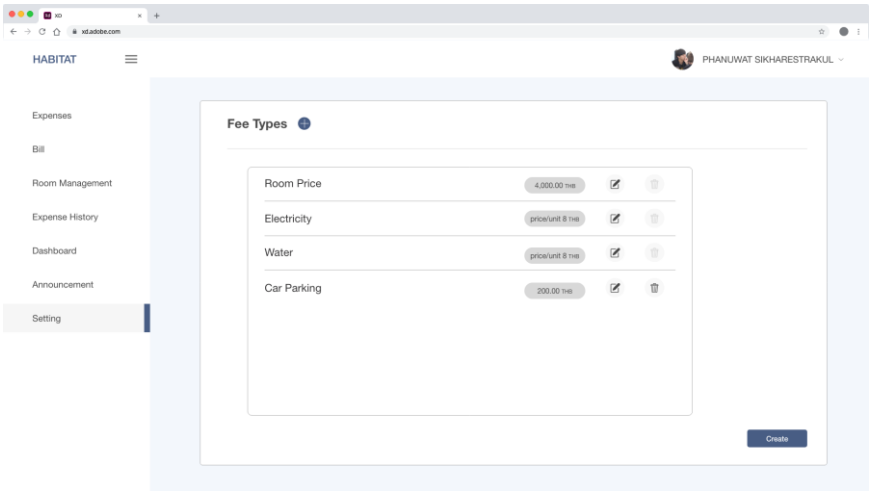

Figure 3.7: Create fee types

e) In this step, it is a step after the staff have already items of fee types. The staff must create fee set to prepare set the service in each room. So, the fee set is a kind of groups the fee types like Figure 3.8.

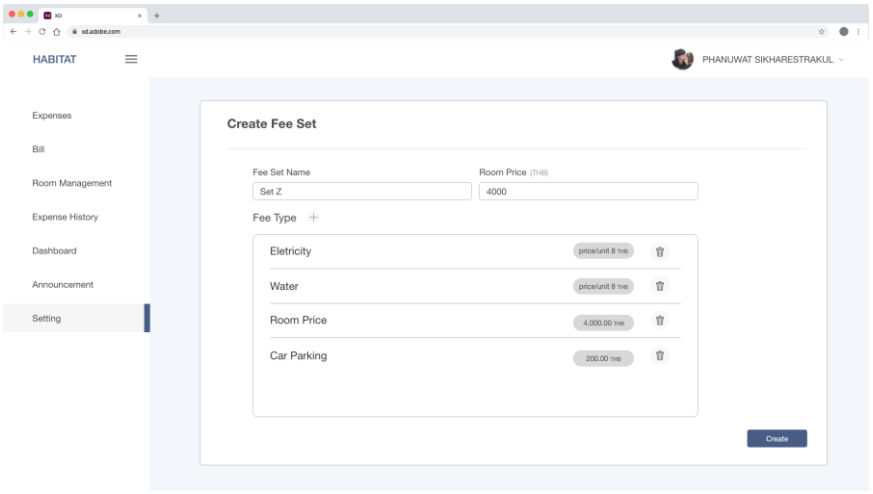

Figure 3.8: Create fee set

f) The staff will assign room type with selecting the fee set in this step. The system will have services, room type name, and number of beds. In Figure 3.9, there are room number on the top to show roomd have already selected. The system will use fee set to calculate expenses with rent, electricity, and water.

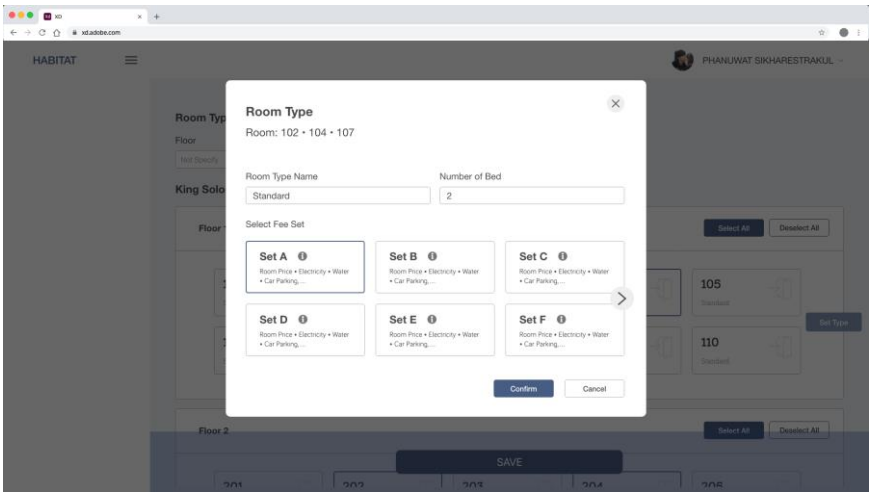

Figure 3.9: Set room types to the rooms

g) The staff will set the bank account with E-Wallet or Prompt Pay for earning money from tenant. This step is an another important field for the payment because the tenants or students need to pay the expenses to the dormitory. They will transfer to the bank account which the staff set at the beginning in Figure 3.10.

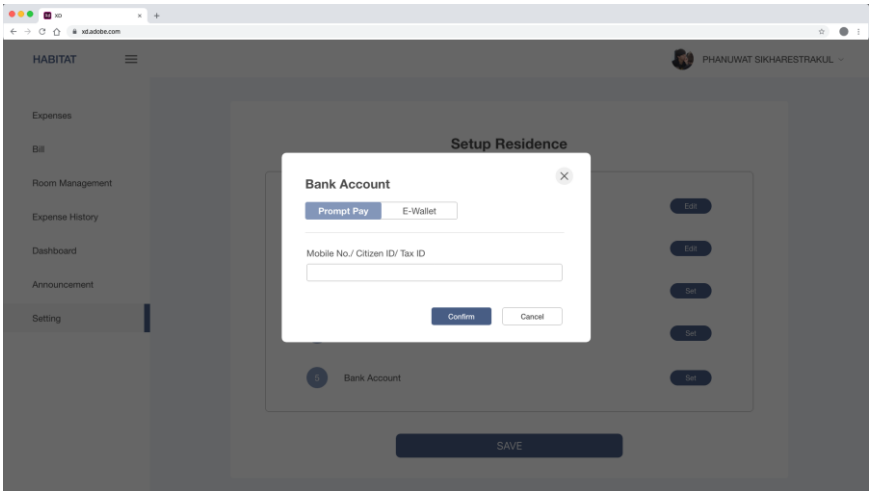

Figure 3.10: Set bank account

h) The building is very new, so the meters reading is new as well. The staff must record the initial meters reading on the system. For example, electricity meter and water meter to be

record the expenses in the first bill in a month. The meter readings of electricity and water will use calculate prices with the formular. Figure 3.11 shows how to fill the meter reading for initialization.

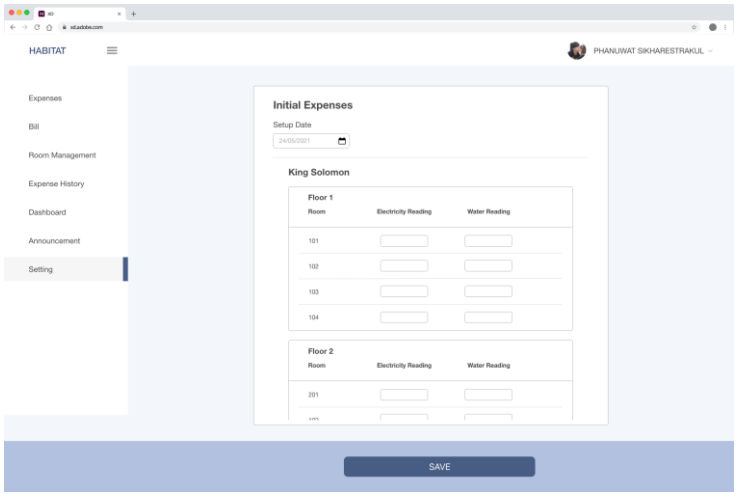

Figure 3.11: Record initial meter reading

i) The staff will use this screen in Figure 3.12 to assign the student to be tenant. After the staff save the information of students, the system will send all necessary information via their email. For example, the room number, username, and password.

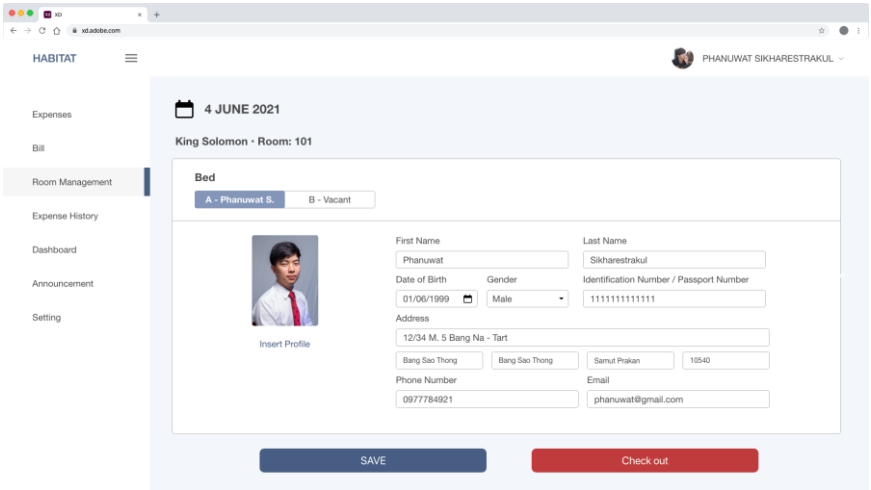

Figure 3.12: Assigning tenant to the room

Step 2: Expenses

j) This step is recording the current meter reading each month when the staff needs to bill the tenant at the end of the month. The prices will calculate on the system of Habitat. The staff just fill Current Date and Current Reading in each meter. Figure 3.13 shows the billing period, previous reading of each room. It is the process of the system will also calculate automatically divide for each person in the room.

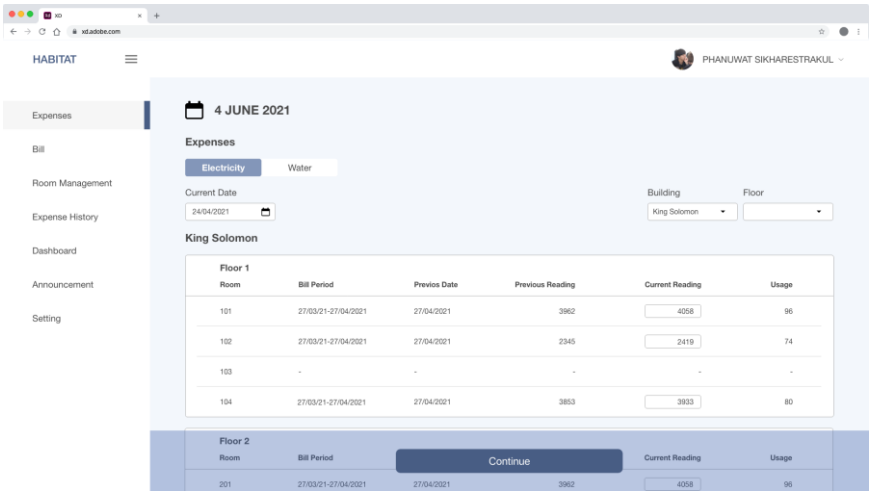

Figure 3.13: Record current meters reading

k) After the staff full fill the current reading, the staff must double check the prices on Verified Expenses in Figure 3.14. The staff will confirm to send billing to each tenant if they press submit button. The payment issue is very dangerous because if the expenses are mistake meaning that the system is not reliable. The tenants or students will not unsatisfied the system.

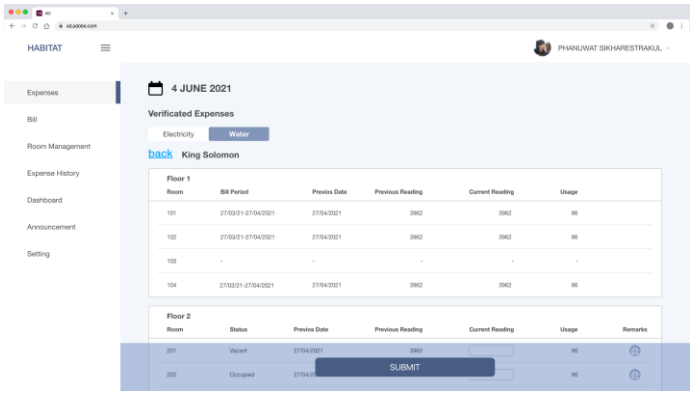

Figure 3.14: Verify month bill

l) The staff can check the status of each tenant on the Bill feature like as Figure 3.15. The staff can follow each person who did not pay yet because they can debt collection with those who do not pay the expenses.

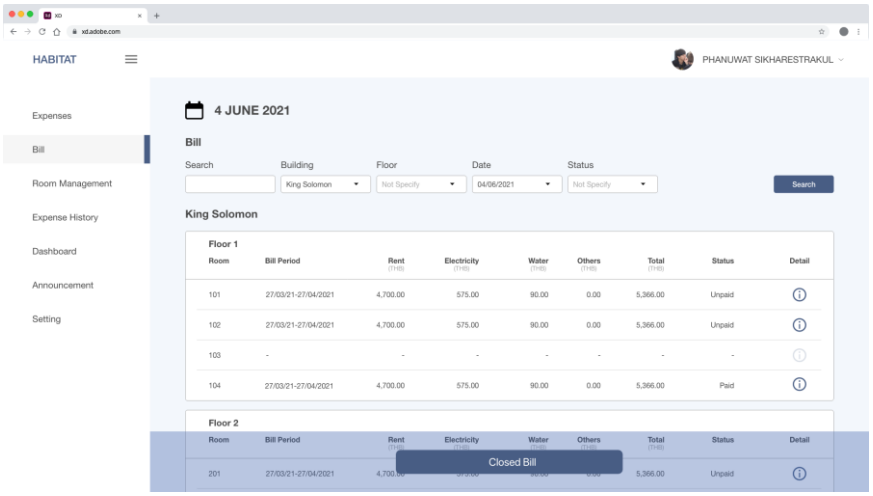

Figure 3.15: Show bill record

Step 3: Dashboard

m) In Figure 3.16, the staff can view the chart and the number of vacancies on the dashboard. This step is necessary when the staff needs feedback to report to the owner of the university dormitory. Furthermore, it can be referencing the trend to improve any services or promote to have more tenants.

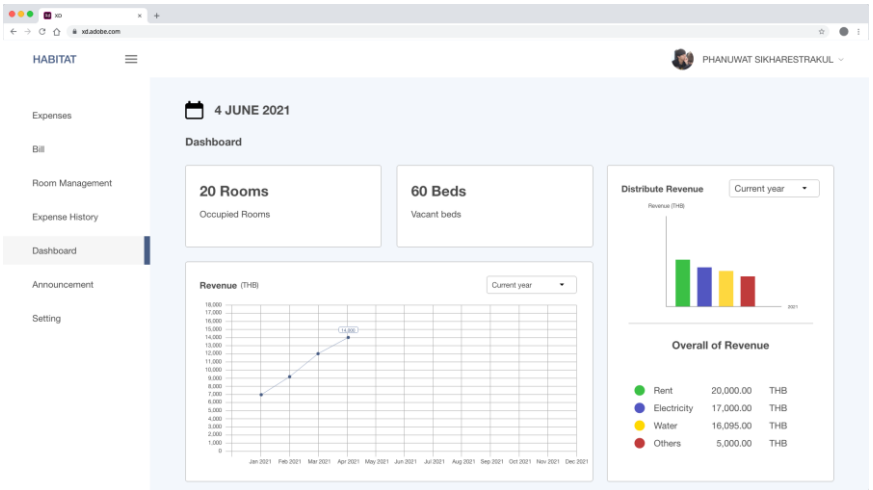

Figure 3.16: View chart and number of vacant

Step 4: Announcement

n) In the present, the announcement is significant to get news. Figure 3.17 shows how to create the announcement on the application. From the old system, the staff must post on the Facebook page that some students cannot see the post. It made the students miss the important news such as power cut, practicing escaping the fire, and others.

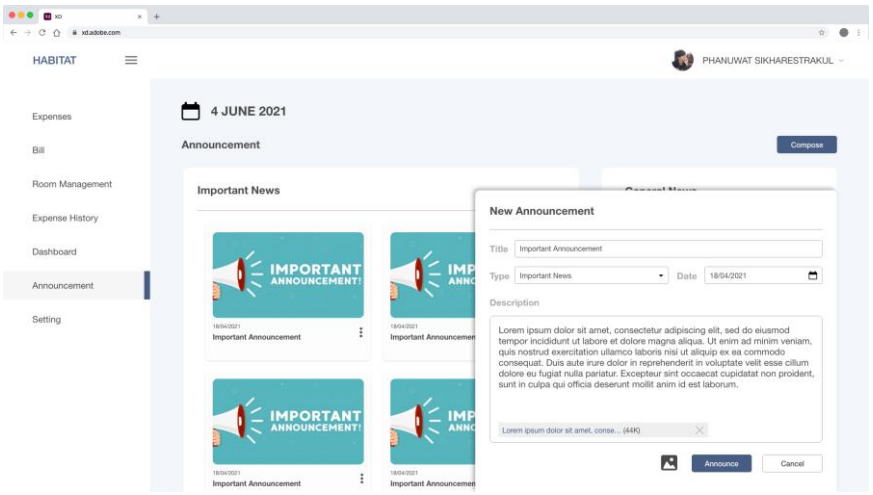

Figure 3.17: Create announcement

o) In Figure 3.18, the screen shows the announcement list to make clearly managing the announcements. The inside of each announcement item is announcement detail. The staff and users can comment to make the community and give the opinion on the content as figure 3.19. In addition, the staff can also delete comment in Figure 3.20. Figure 3.21 is shows how to delete the post announcement. Therefore, the staff can manage everything on announcement feature as posting, commenting on post, deleting the comments and posts.

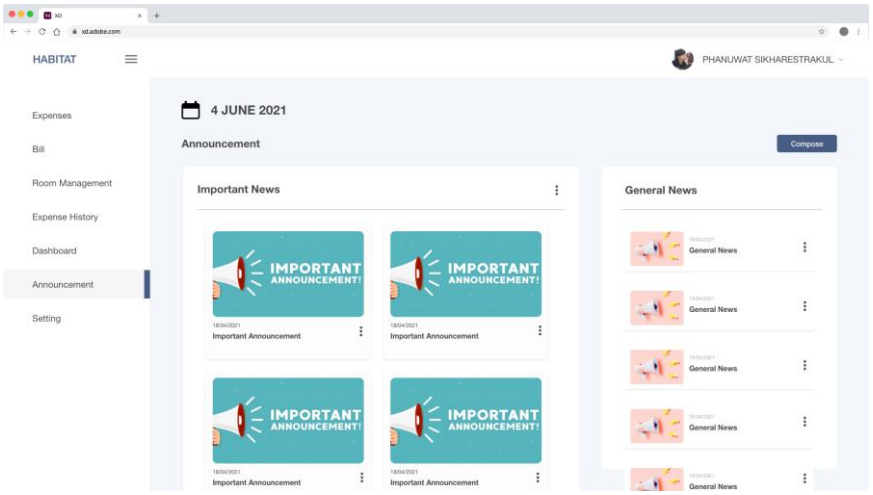

Figure 3.18: Announcement list

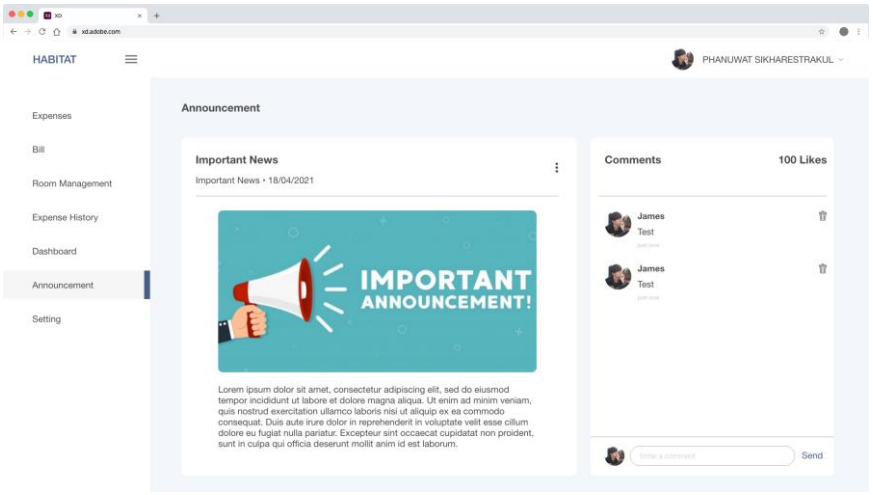

Figure 3.19: View announcement detail and comment

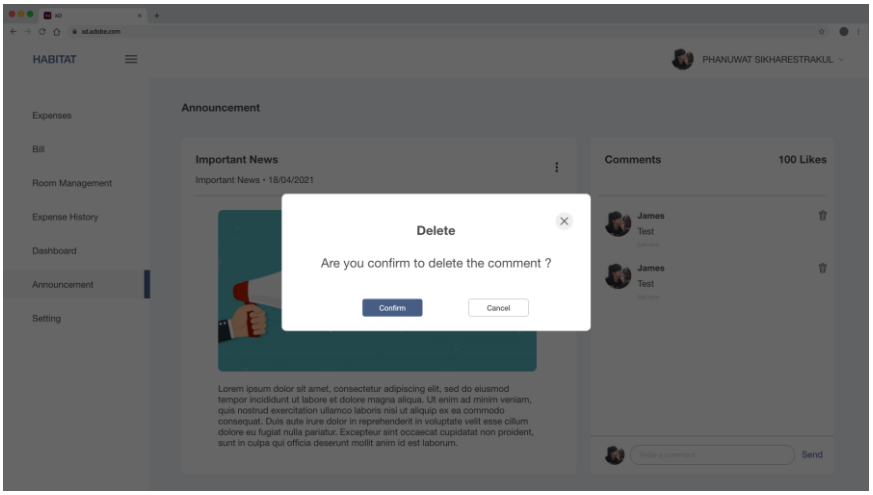

Figure 3.20: Delete comment

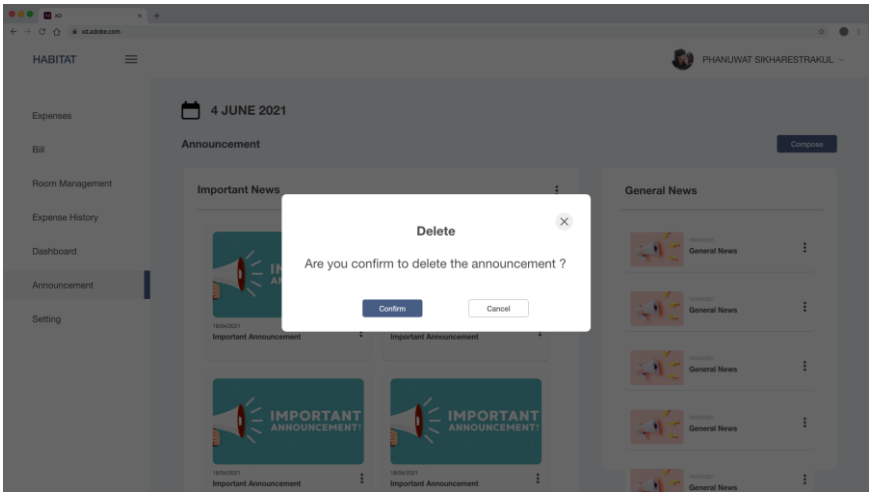

Figure 3.21: Delete announcement

Step 5: Petition

p) This is the last step as the petition, the staff can manage the petitions with the petition list in Figure 3.22. When they click on each item, they can see the detail from the student clearly with a picture for the decision to solve or not seem like as Figure 3.23. Figure 3.24 shows the management of the petition list that can solve and delete with the list at once. They can delete the petition by delete icon in the petition detail in Figure 3.25.

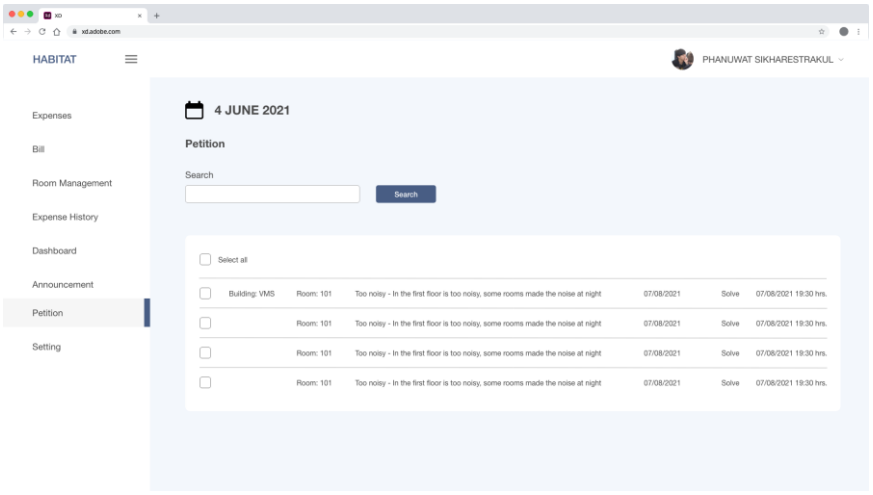

Figure 3.22: Petition list

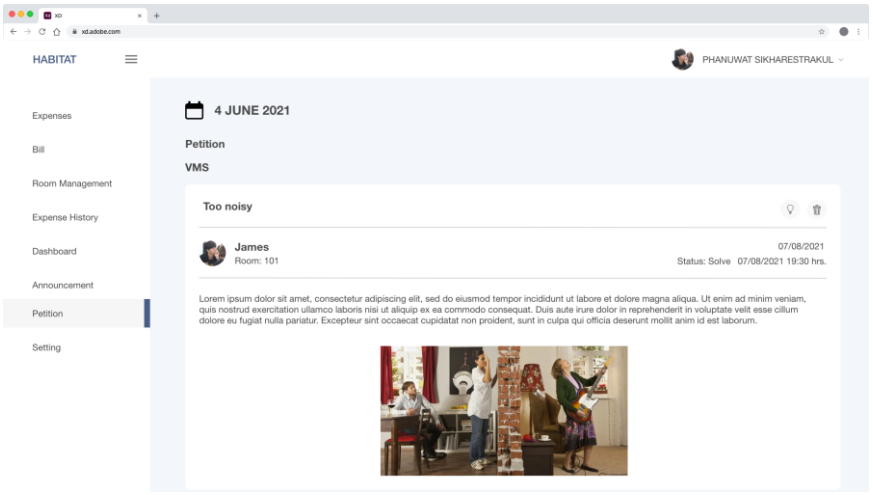

Figure 3.23: Petition detail

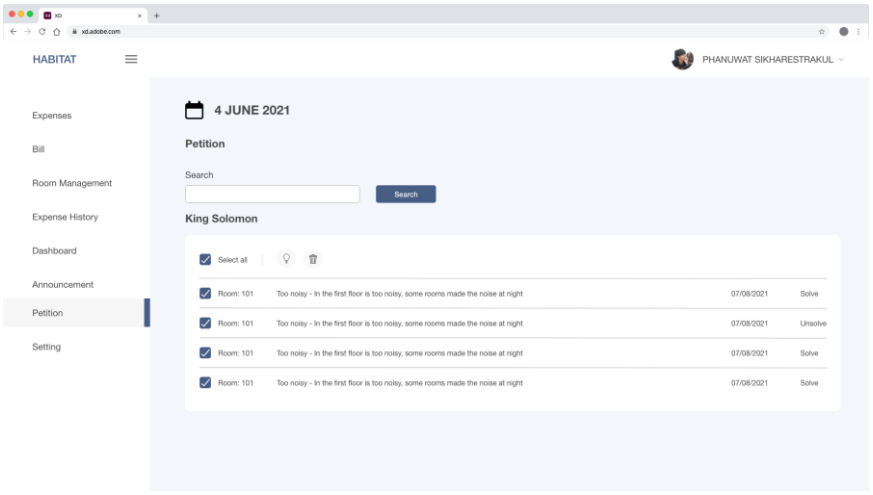

Figure 3.24: Solving the petition from staff

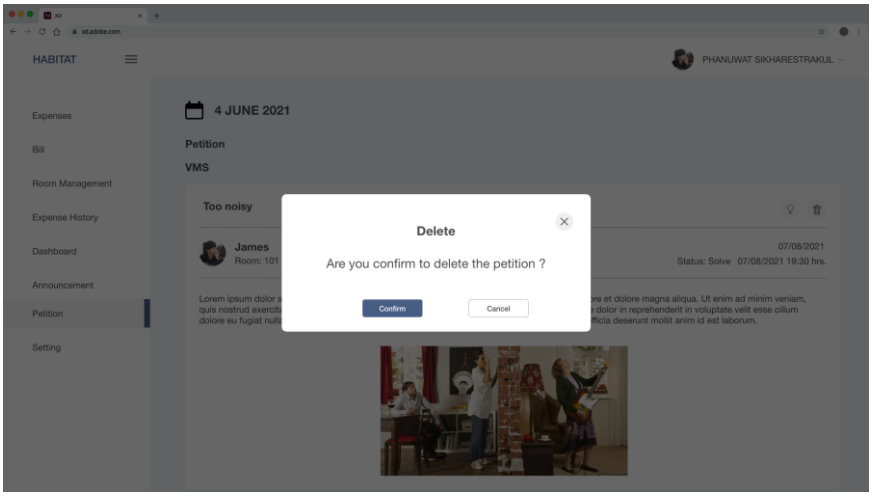

Figure 3.25: Delete petition

3.2.3 Student Workflow

In the student workflow, Habitat also provides the system for the tenant with 3 steps for mobile application. They are payment, announcement, and petition. These steps will make dormitory life is better because they are convenient and easy to use.

Step 1: Payment

a) The important step of the mobile, the student can view the bill list like in Figure 3.26 with the status as Paid/Unpaid. In addition, user can click on the billing item to see the detail for checking accuracy of the expenses in Figure 3.27. If they got the mistake

expense, they could contact staff to double-check on web application again like Figure 3.15. They will pay by using bank application to scan the QR code which is shown in Figure 3.28.

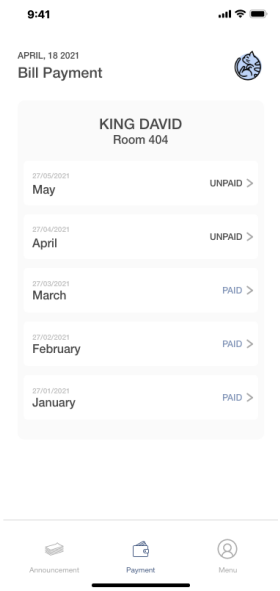

Figure 3.26: Bill list

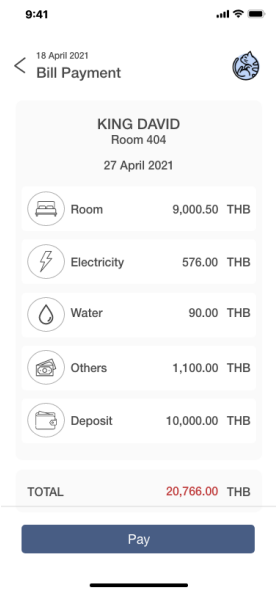

Figure 3.27: Bill detail

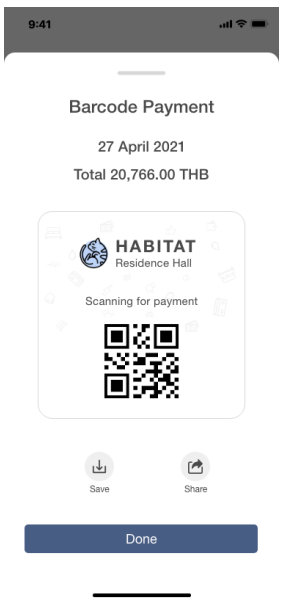

Figure 3.28: Pay expenses with QR code

Step 2: Announcement

b) In Figure 3.29, it is the announcement list that shows the announcements from staff. Observably, it shows with the first button at the bottom navigation that would be the first screen of the mobile application. The students will be able to see new announcements immediately. The staff can see the detail of the announcement with the comment on that post. If they can comment on the announcement, they also delete their comments. The last one is a comment list and showing how to comment. When they need to delete, they just slide their comment to the left side.

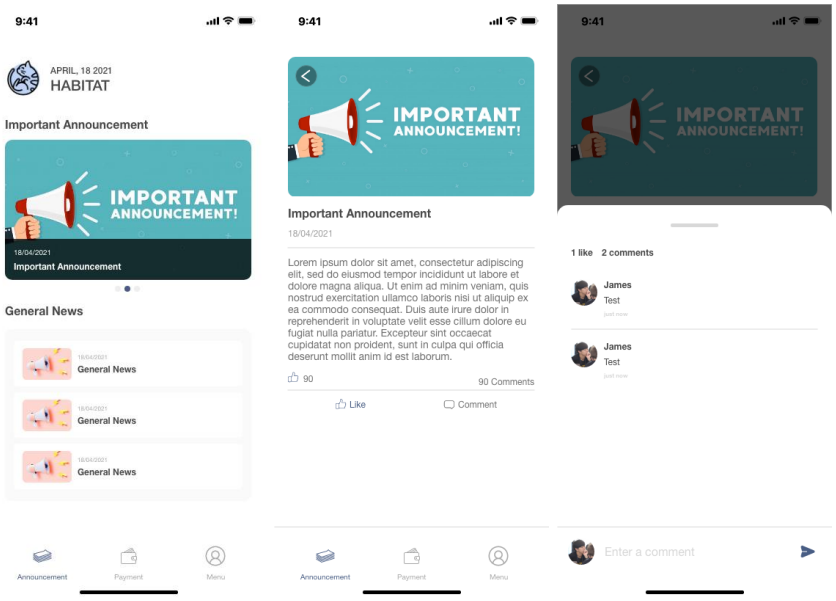

Figure 3.29: Announcement feature, announcement list, detail, and comment from left to right

Step 3: Petition

c) The petition is an interesting feature that almost all other dormitory applications don't have. Figure 3.30 shows the student can inform the petition by themselves to the staff directly. For example, there is a neighbor who made a noise at night. The staff will get the petition from Figure 3.24. The student can also see the petition detail to check the petition properly with the picture like in Figure 3.31. When they need to delete the petition, it is the same way when the delete announcement is sliding the item to the left-hand side.

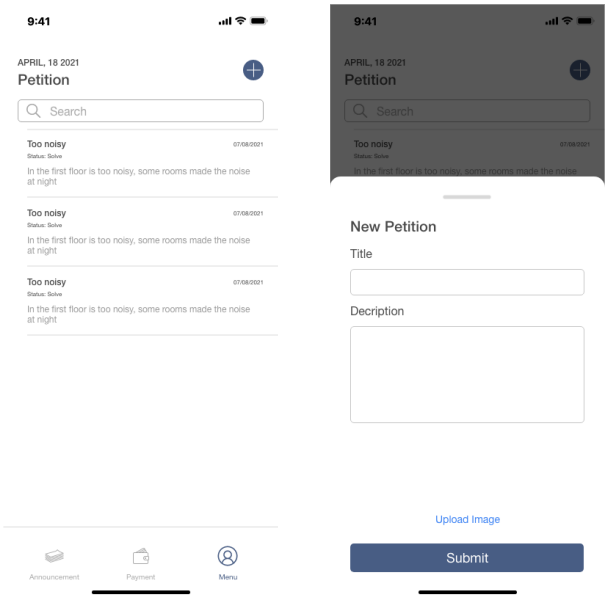

Figure 3.30: Inform petition to the staff

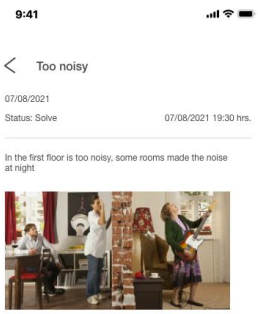

Figure 3.31: Petition detail

3.2.3 System Diagram

Habitat is a management application that has 2 parts as user and staff. There is a flow which IT system as front-end and back-end. To begin with the staff part, the staff of dormitory use web

application to set up system, create building, floors, rooms, manage rooms. Then, the service received the request of what staff would like to do on the application. The service will record the data on the database. Whereas the staff needs to see anything on the screen, the database will return all data requested. The service will render to all data displaying.

On the other hand, the user part has a process as same as the staff part. The process is a user uses the mobile application. The user can check bills, history payment, payment method, and send a petition to the staff. The user will send any requests to the service, and then the service will receive a request to find out the data from the database. The database also returns the data to display on the mobile application. However, the data of staff and users come from the same database and the same API service. It is different functions from any requests from them [6]. Figure 3.32 shows the system diagram of Habitat to see the flow of the system.

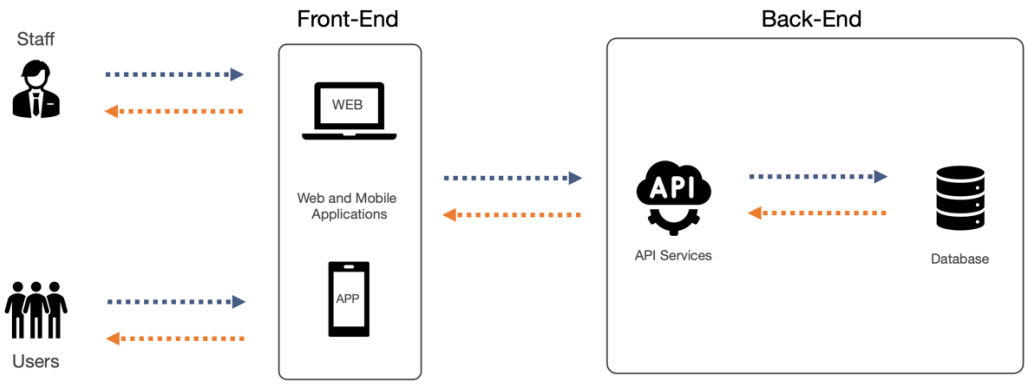

Figure 3.32: System diagram of Habitat

3.2.4 Habitat Functionalities

The project, Habitat is built on web and iOS platforms. The application is developed by React framework 17.0.2 version and HTML 5 using Visual Studio for staff part. Swift 5.0 programming language using Xcode 13.0 for user part. There are several functionalities provided on the application. To begin with the functionalities.

a) Set up

The set up function is a creation initial system before start using the program. Mainly, initial creation of course is creating building, floors, and rooms to prescribe number of floors and rooms in the building. To set initial meters reading of electricity and water in

each room to prepare calculate electricity and water prices when there are tenants are assigned in the room. Figure 3.33 shows the set up menu.

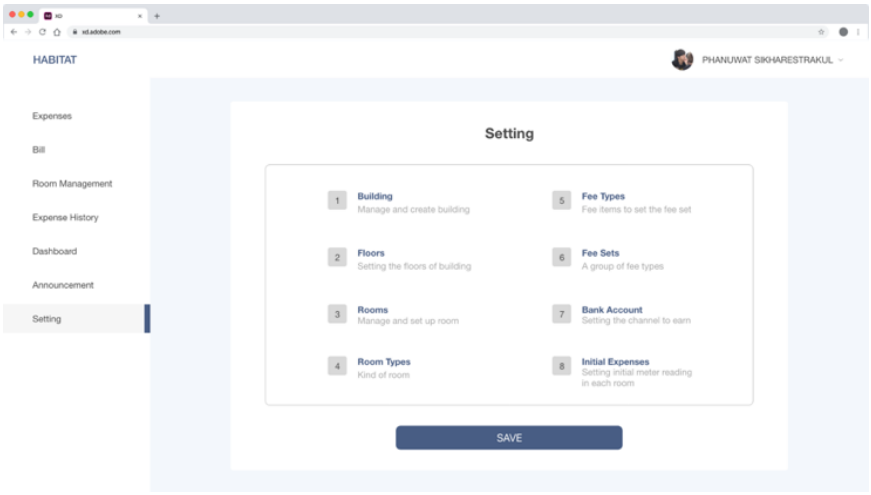

Figure 3.33: Set up feature of Habitat

b) Expenses

The expenses feature is a core of this project because of the main objective as expense management including calculate the expenses in each person in the room that the staff set any services, prices already and fill the current meter reading of electricity and water in each room only. The system will automatically calculate the expenses to each person who in that room. After bill expenses to the tenants, there is verified expenses for double checking before submitting the expenses to the tenants due to the money issue is important. If there is a problem about the money, it would be critical to each part as staff, tenant, and back system. Figure 3.34 shows the recording meter reading.

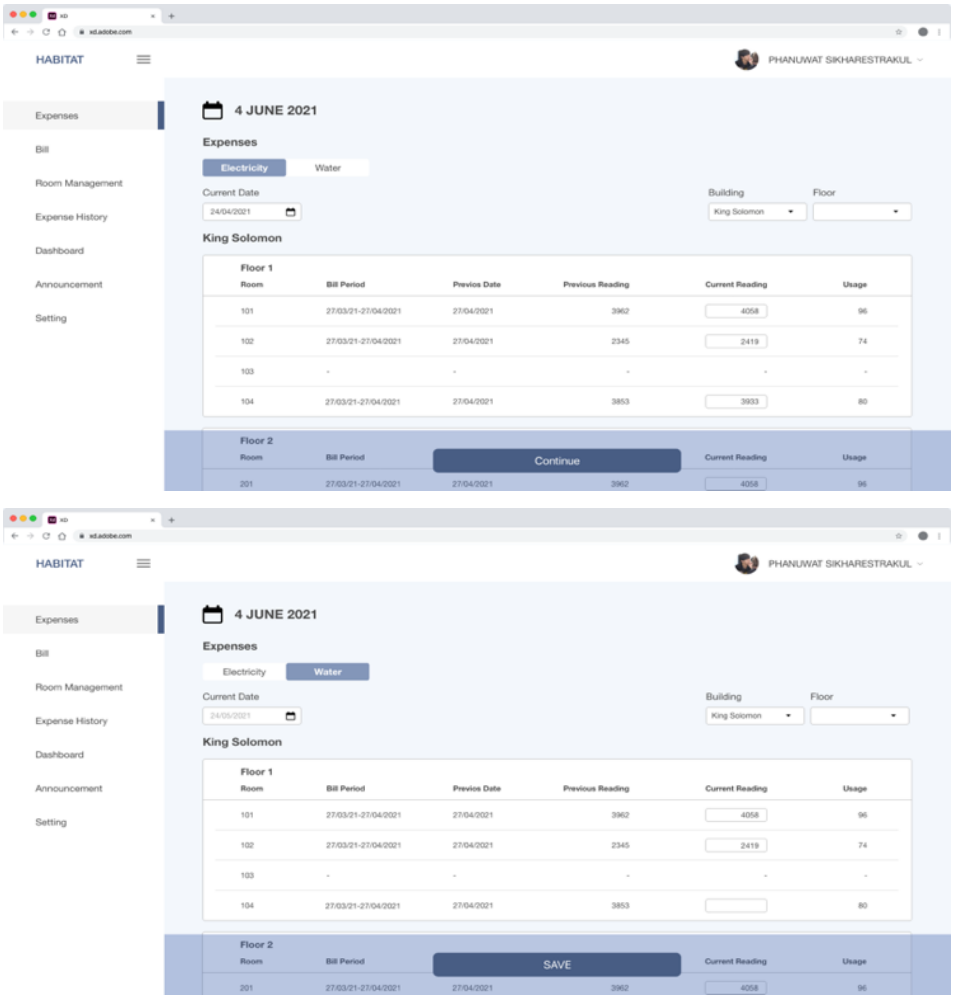

Figure 3.34: Recording electricity and water meter reading

c) Bill

When do the staff need to check the tenants' status in each room. The bill function can help to track status of tenants who pay the rent or not with the status "Paid/Unpaid". Also, statement detail how much tenant hold money including rent, electricity and water prices, total other prices and other detail and total price in each person. On the user part, the tenant can check the payment and detail on mobile and they can pay with QR code to the bank. The tenant can pay back from previous month. Figure 3.35 shows the bill on web application.

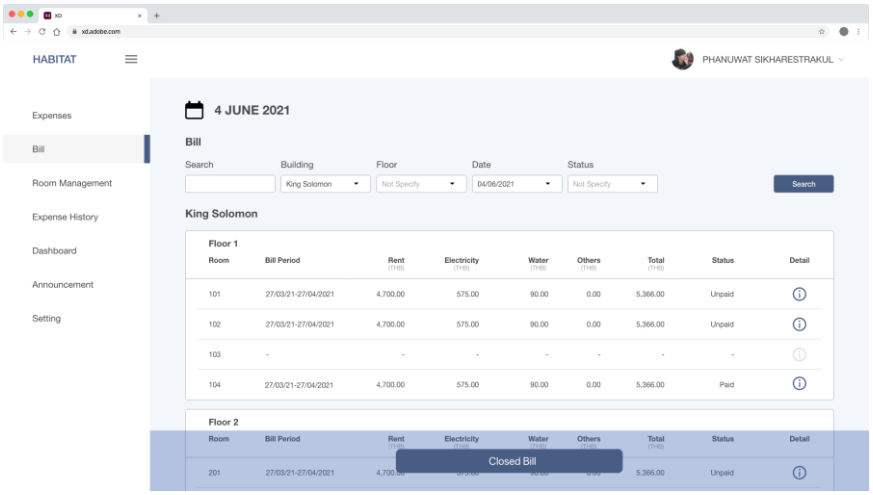

Figure 3.35: Bill feature of Habitat

d) Room Management

Room Management feature is managing the room in each floor. The staff can assign the tenants on this feature, so they have to select bed name first, then fill first name, last name, date of birth, gender, identification number or passport number, address and the contact as email and phone number. The email and phone number that the tenant gave the staff can use them to log in mobile application. Furthermore, the system will map the bed name and the tenant together that can check who in which room and who has how much debt they have. Figure 3.36 shows Room Management feature to manage the rooms in each floor.

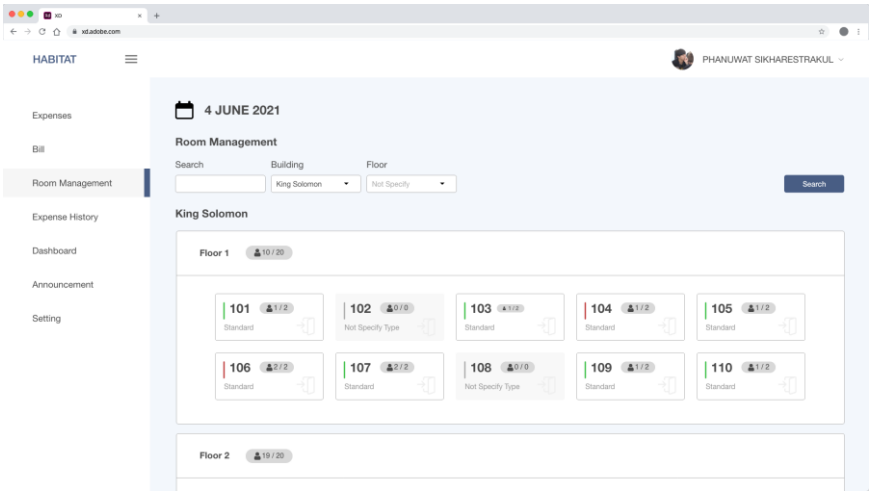

Figure 3.36: Room Management feature of Habitat

e) Expense History

The staff can check history on expense history to record and write the report to inform manager of the dormitory easily and using for improving the dormitory better because the human learn and improve by the past. Figure 3.37 shows Expense History screen to show the history that the staff have done.

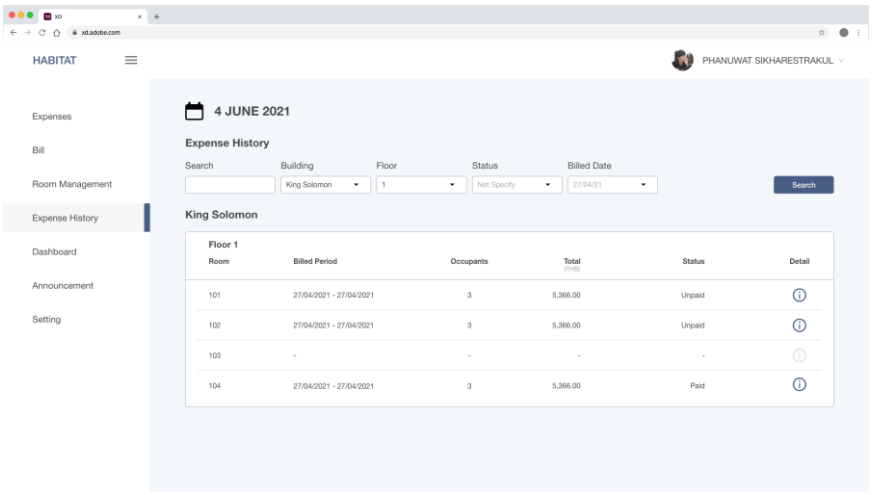

Figure 3.37: Expense History feature of Habitat

f) Dashboard

In the present, the data virtualisation is important to represent the data in the graph and chart to understand easily because the people can see increase or decrease the line graph or height of the chart to compare in each month. They got profit or loss in each month. Figure 3.38 shows Dashboard to render the charts as line graph and bar.

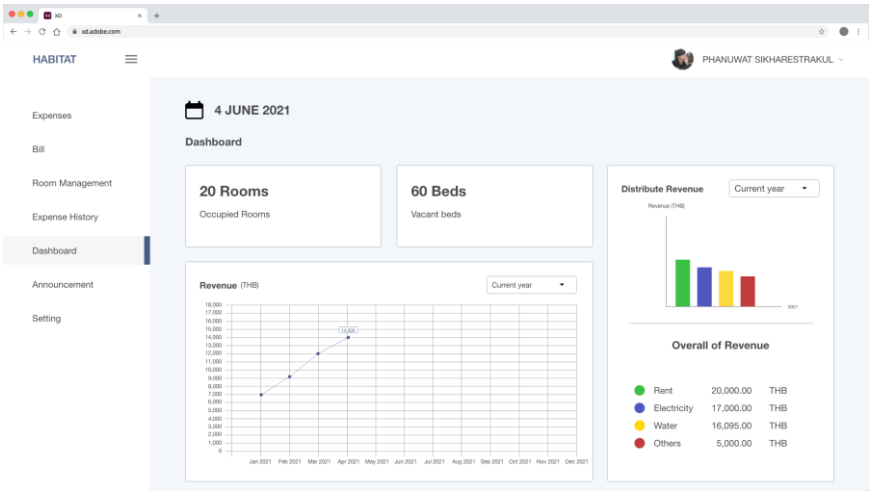

Figure 3.38: Dashboard feature of Habitat

g) Announcement

From the problem, the staff mostly post the announcements on Facebook page as AU Residence Halls. The most tenants cannot see the announcements because they might not subscribe or like the page. They will miss important news. The announcement feature to help showing the important news and the general news to separate the level of news from the dormitory as important news and general news. Figure 3.39 shows Announcement feature to show announcement list.

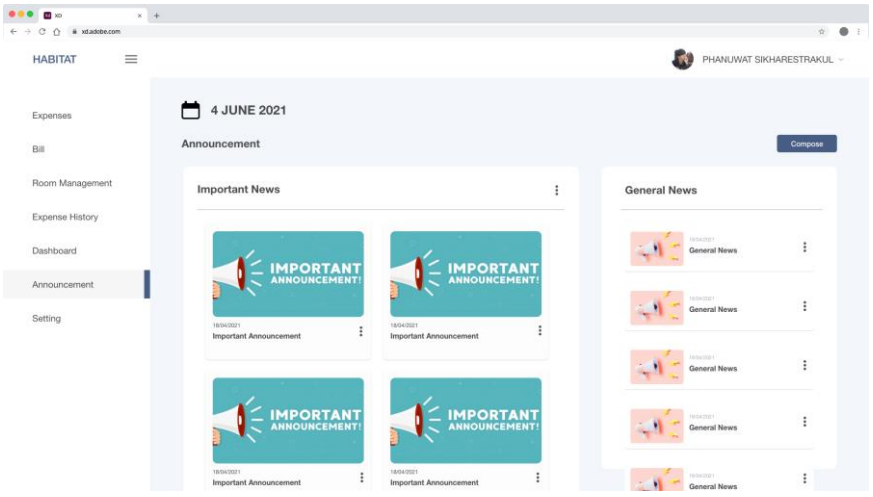

Figure 3.39: Announcement feature of Habitat

h) Petition

Normally, when tenants have any problems, they will tell staff at countre service centre and follow the problems by themselves. For convenient of the tenants in petition, Habitat provide and solve that petition problem. Petition feature, the user can send the petition to staff directly and there is status that can track, the staff have solved or not. The staff will know immediately when user send the petition on the system. They can solve from the petition which user sent. Figure 3.40 shows the Petition feature on web application.

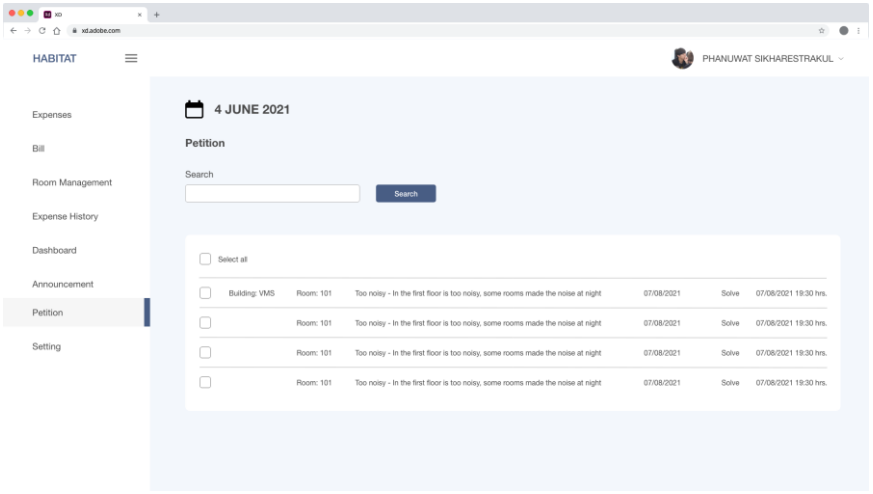

Figure 3.40: Petition feature of Habitat

3.3 Habitat UX/UI Design

The design User Experience and User Interface (UX/UI) has several theories to make the UX/UI is the standard in the world. To begin with, UX is the process design based on the experience of the user to interact with the application. It gives a great experience to make the user feel satisfied to continue using the application again and again. The UX copied the human behavior to adapt using the application. For example, the horizontal motion when the user fill the pin code wrong, it is copied from the oscillating head of the human. A scroll view is adopted from binoculars that can see views around of the environment.

On the other hand, the User Interface (UI) is a design making the look of the application more beautiful like a human wears clothes. Moreover, the UI design of the Habitat project has used the theory as Gestalt Principle that the group of visual perception principles. The Habitat is using proximity, similarity, symmetry, and closure concepts to make the UI of Habitat is

looking good, friendly, clean, and minimal. The minimal style mostly makes the user feel comfy using the application, easy to use, not messy. In each Gestalt Principle concept which used on Habitat is meaningful to impact and communicate to the users [7].

3.3.1 Proximity

The proximity is a group of elements arrange in place in each part. This concept can help to group the elements to separate the views properly. For example, an announcement list in Habitat. There are 2 news types as important news and general news at the left and right respectively. The important news is outstanding more than general news because it is what the user should see at first. Another thing is all of the news orders with the current date posted. The user will see the last post with the theory reading as the user will read from left to right and top to bottom. Figure 3.41 shows the proximity concept.

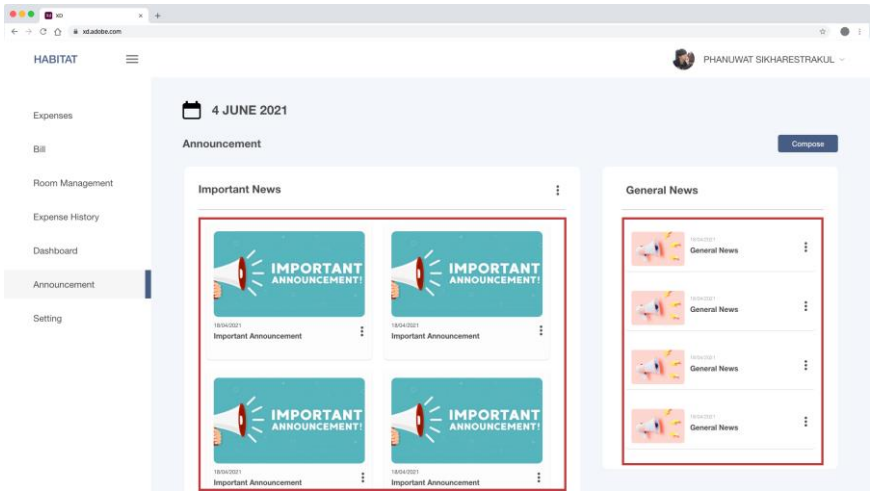

Figure 3.41: Announcement list with proximity concept

3.3.2 Similarity

The similarity is the sharing shape view or visual characteristics to provide the views has related to other views of items in each element. For example, Figure 3.42 is showing the Room Type feature on the web application is using with the similarity concept because the color, sizing, and shape is similar but making different meaning. In Figure 3.42, there are 2 types of items as the blue border and grey border. The blue border items are selected items, but the grey border items are unselected items. Observably, the similarity grouped the items to see the meaning of each item even the sizing, the shape is the same.

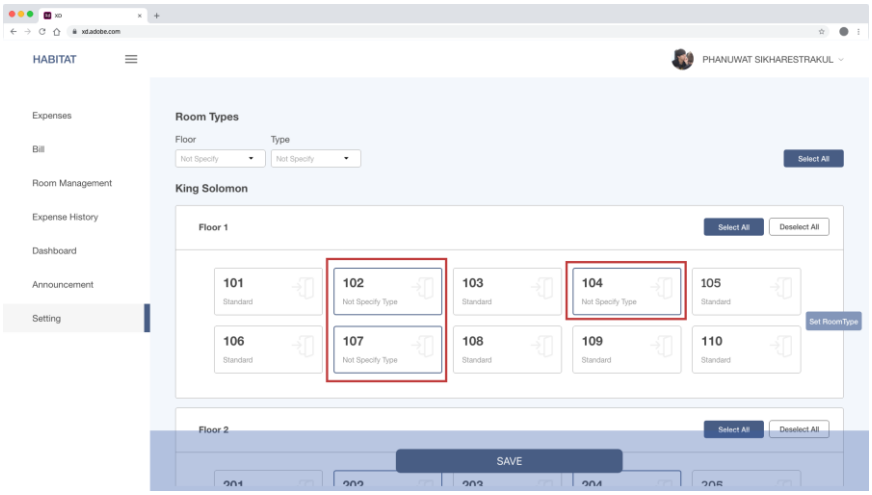

Figure 3.42: Room Type with similarity concept

3.3.3 Symmetry

The symmetry is the element that tends to belong together as margin of left and right, sizing and the position are the same because it seems like the mirror when the mirror reflects the object in the mirror. Everything is the same components. Figure 3.43 shows the symmetry concept with the items of building. If we will the card view at the background to behalf, the 2 items of the buildings will properly adjoin together.

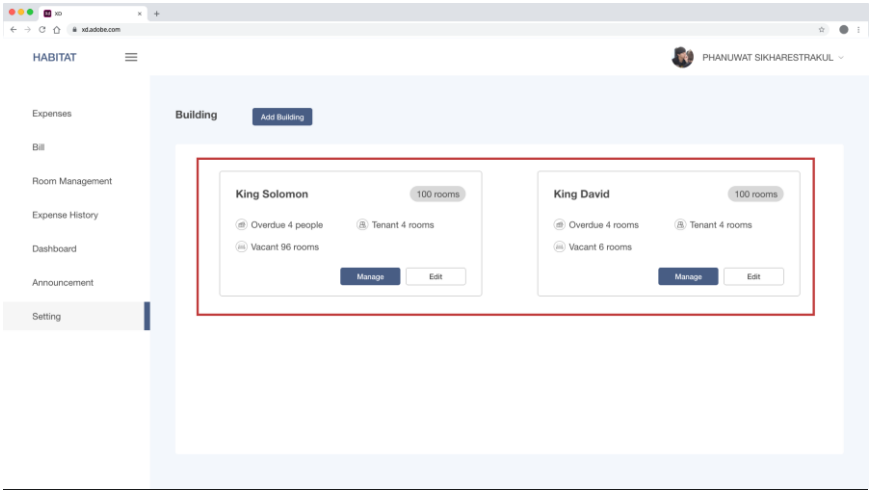

Figure 3.43: Building items with the symmetry concept

3.3.4 Closure

The closure is a different concept from the others because it is a group of elements that incomplete shape, but the user can know what it is. It is like the human's brain will imagine and draw the incomplete shape to be complete in their mind. Figure 4.44 shows the closure concept with the line graph and bar chart. Observably, these charts are incomplete and not connected shapes together, but the user can know where the scale of each point is in the line graph and bar chart. In addition, the charts also have white space making the user read the chart clearly.

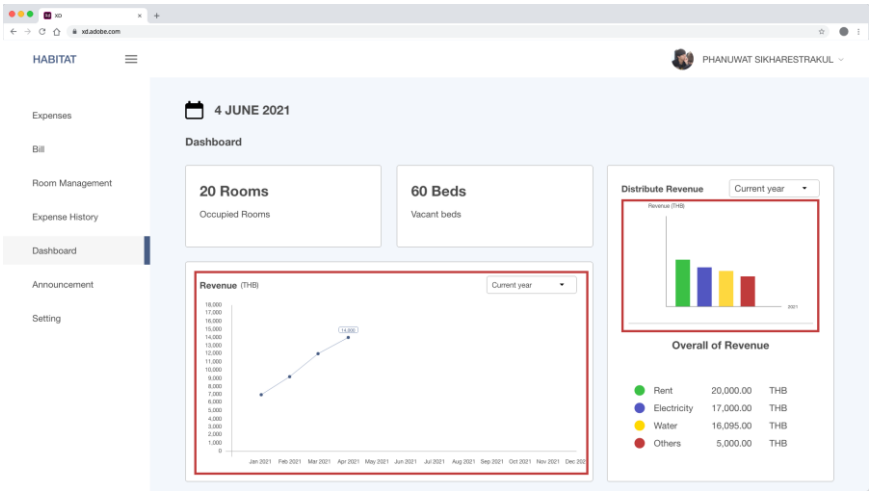

Figure 3.44: The chart tends with the closure concept

3.4 Habitat Database

In the Habitat database, there are 14 main entities to be the Habitat project. The first entity is Building, this entity is the information of all buildings which staff will manage in the organization including `building_name` and the bank account as `e_wallet` or prompt-pay for earning the income from tenants that transfer. The second is Floor entity and Room entity to set the number of floors in each building and set the number of rooms in each floors respectively. Next, `Fee_Set_Type` entity has 2 entities that combined as `Fee_Set` and Fee Type to set the Fee items on `Fee_Type` then grouping the many fee types to be fee set and set room price on `Fee_Set` entity. While `Room_Type` entity to set the type of room as sizing and number of beds to link with the system which room has what type. For example, Standard type has 2 beds, Triple type has 3 beds, etc. Bed entity can set the tenant to be what bed in each room. Furthermore, User entity represents the information of tenants including name, birthdate,

etc. Moreover, there is Staff entity to manage and control everything in building and set the standard information as Building, Floors, Rooms, Fee Types, Fee Set, etc. The staff will manage and control the Announcement and Petition that there are `Post_Announcement`, and Petition entities to post any news and record news on `Post_Announcement` entity. In addition, the user will inform any problems and record on Petition entity. They have title, description, and date mainly. The important transactions for expenses. For staff part, `RentingTransaction` entity which represents about the record any expenses including the meters reading of electricity and water including prices as electricity, water, any services, and total prices to send the payment information to user with the last entity. The last entity is the `UserRentingTransaction` entity to show the payment of user and date [8]. The relational schema of main system as Figure 3.45.

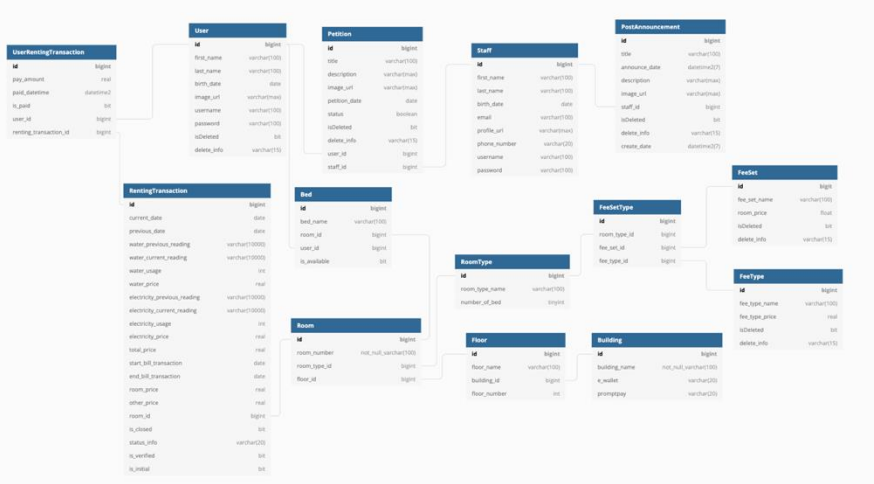

Figure 3.45: Relational schema of main system

3.4.1 `RentingTransaction` Entity

In `RentingTransaction` Entity, this entity shows the data of all expenses that record by staff including `current_date`, `previous_date`, `water_previous_reading`, `water_current_reading`, `electricity_previous_reading`, `water_usage`, `water_price`, `electricity_usage`, `electricity_price`, `other_price`, `total_price`, `electricity_current_reading`, `start_bill_transaction`, and `end_bill_transactrion`. Besides, `is_closed` attribute indicates if the bill transaction is not closed, meaning the someone do not pay expenses yet. It is for checking the history as well. After the staff record it, the transaction will record on the database and calculate

the expenses to each tenant in each room automatically. The relational schema of `RentingTransacrtion` Entity is shown in Figure 3.46.

Figure 3.46: `RentingTransaction` Entity

3.4.2 `PostAnnouncement` Entity

In the present, the news is important including important news or general news. The people cannot reach the new news of the university because almost all teenagers are not interested to discover the news. They like to play the game and watch movies or cartoons. So, the staff will post announcements or called “News” to the application as the record on `PostAnnouncement` entity including title, date, description, image. The staff can delete announcements with `isDeleted` attribute. The setting the announcement type with `Type` entity and `Comment` entity in each announcement. The comment will record who comments on the messages on `Comment` entity. Also, `Like` entity is an entity to set `Like` on announcements for the user. Figure 3.47 shows the schema of `PostAnnouncement` Entity.

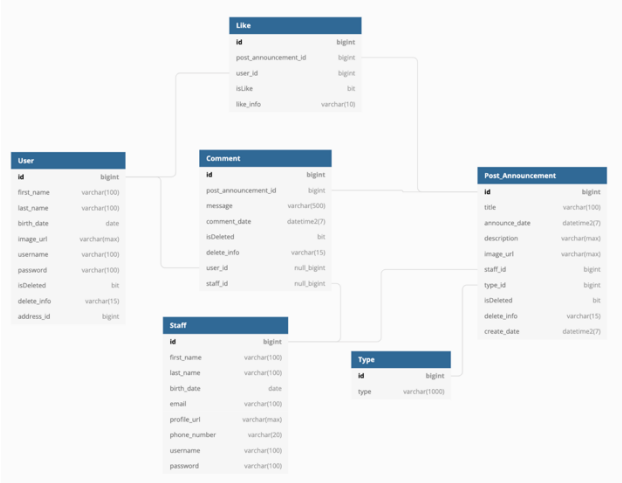

Figure 3.47: `PostAnnouncement` Enitity

3.4.3 `Petition` Entity

Problems can happen all of the time. For example, neighbors make loud, furniture is broken, and whatever courses to have the problems. `Petition` Entity represents to record any problems of tenants including title, description, image to be evidence, date. The tenants will send this information to the staff directly on the system. Furthermore, the staff will control solving system with status attribute to be solved or unsolved. Thus, the Habitat application will facilitate the tenants to inform the problems and track the status of the system. Figure 3.48 shows the `Petition` Entity.

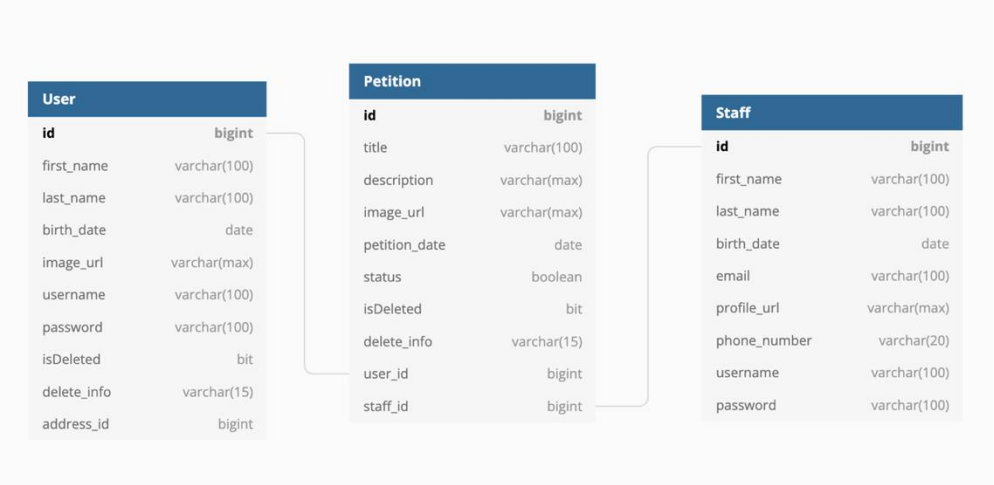

Figure 3.48: `Petition` Entity

Chapter 4: Conclusion

Habitat is the dormitory management system for Assumption University dormitory. This project has 2 parts which are the staff part on web application and the student/tenant part on iOS application. This application provides usability for management and payment experience. Moreover, the management system has process to separate the expenses for each person in the same room. Each person will get expenses from the rent, and any other services. Staff also can set up, create, edit, and delete to manage the dormitory in the system. For student, they can check and pay their expenses. The part of web application is important in the project that make different among other dormitory/hotel management applications.

As comparison among the other dormitory/hotel managements in Chapter 2, there are some features which Habitat improved from those applications. It is unique and different from others that is suitable with Assumption University's dormitory system. According to each feature in the application, it can solve the problems on users in both sides. The system will calculate expenses by person in room. Tenants can inform any problems to staff in the dormitory with petition. Therefore, Habitat system could make improving the user experience and new experiences on user to make lives better.

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