

Letter of Transmittal

13/10/2018

Catherine Goard
University of Wollongong
Northfields Avenue
Keiraville, NSW 2500

Dear Catherine Goard,

We are submitting the proposal for a new property management system. The included report documents and supports the implementation of a unified, modern system that would bring benefit to property investors, property managers and tenants.

Questions related to this proposal should be directed towards the writers and researchers of this document. We wish for this report to meet your expectations.

Sincerely,

Mashfique Alam, Gustavo Borromeo, Vignesh Lakshmanan, Blake Rogan and Lei Zhang



DESTINY PROPERTY MANAGEMENT

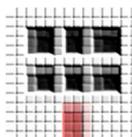
A modern take on real-estate
property

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1. Executive Summary

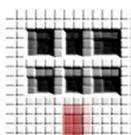
The aim of this report is to detail the implementation of blockchain technology and the Internet of Things into property management.

- This document highlights issues that users are facing when interacting with other users and includes potential solutions for these issues.
- The primary users include, property investors, property managers and tenants.
- The secondary users include the government, Amazon and utility companies.
- The government and tenants have moderate interest in this implementation while the property investors, property managers, amazon and utility companies have high interests in the success of the project.
- The government, property investors and property managers will have high influence over the features to be included in this project. Amazon, tenants and utility companies will have moderate influence over the project.
- The system research interview and surveys were conducted to increase stakeholder interest and add important features to the project.
- The requirements section contains requests created by the users.
- The user persona describes the potential users involved in property management.

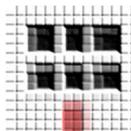


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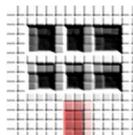
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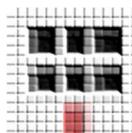


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4. Introduction

4.1. Issues

Results in recently conducted surveys have shown little change in property management in the past few decades. Tenants often have a layer of separation from the property owner when a property manager is present. The primary goal of a property manager is to ensure both the tenant and landlord are satisfied. This is typically performed by ensuring areas such as utility usage, billing, property care and security are all maintained. These primary stakeholders hold various documents including the utility bills, lease agreement and title to the land.

Titles of land and rental agreements in the majority of countries are still hardcopies. This poses a flaw where property can be falsely transferred through forgery of the title.

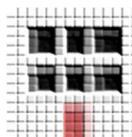
Manual management of utility bills and rental payments by the property manager is a repetitive and time-consuming process. A property manager would be able to manage extra properties if this was to become more efficient.

4.2. Solution

In recent years, blockchain and the Internet of Things have been increasing in popularity. Blockchain can be a great tool for preventing fraudulent alterations in past documents such as titles of land whilst still maintaining transparency as public records. Each new update to the decentralised system must be approved by specified servers/nodes that have previous hashed data making virtually impossible to create a fraudulent transaction. The IoT is a suite of technologies connecting devices and locations for instant data analysis in an intuitive manner.

The addition of the Internet of Things has already greatly impacted convenience and security. Amazon's shipping service allows packages to be delivered inside a home when Remote locking of doors ensure valuables can be kept safe even when away. Smart remote camera systems can actively report foreign movement to the appropriate contacts, whether it be the tenant, property manager, landlord or even the police. Utility companies would be able to set up internet-based electricity, water, and gas meter readers for automatic billing. Combining these features into a single package would decrease the load on property managers.

Property owners, property managers and tenants would greatly benefit from a new system. Convenience, security and a flowing user interface that meet user expectations are improvements over any current system on the market.



5. Business Domain

5.1. Current Systems

5.1.1. Blockchain

Blockchain currently exists primarily in cryptocurrency. Its anonymity, transparency and security are all desirable traits for investors. In the hopes to prevent forgery of land titles, the Swedish Land Registry “Lantmäteriet” is currently the global leader in trialling the implementation of blockchain. With multiple successful trial periods involving major stakeholders such as banks, Svensk Fastighetsförmedling (online real estate search portal) and ChromaWay (blockchain start-up), their tests have proven to be successful. They were able to securely transfer titles online using the blockchain technology. Consultancy firm Kairos Future claims the new system would reduce paperwork, speed up transactions and reduce fraud, thus saving over one hundred million euros per year.

5.1.2. Internet of Things

The Internet of Things has been exponentially growing in both commercial and residential real estate markets. It adds the benefit of monitoring various system statuses. The most common IoT integration in residential homes is smart remote surveillance monitoring. IoT in commercial buildings is much more common with entire system status monitoring becoming an increasing standard. Figure 1 is a diagram displaying various IoT commercial integrations.

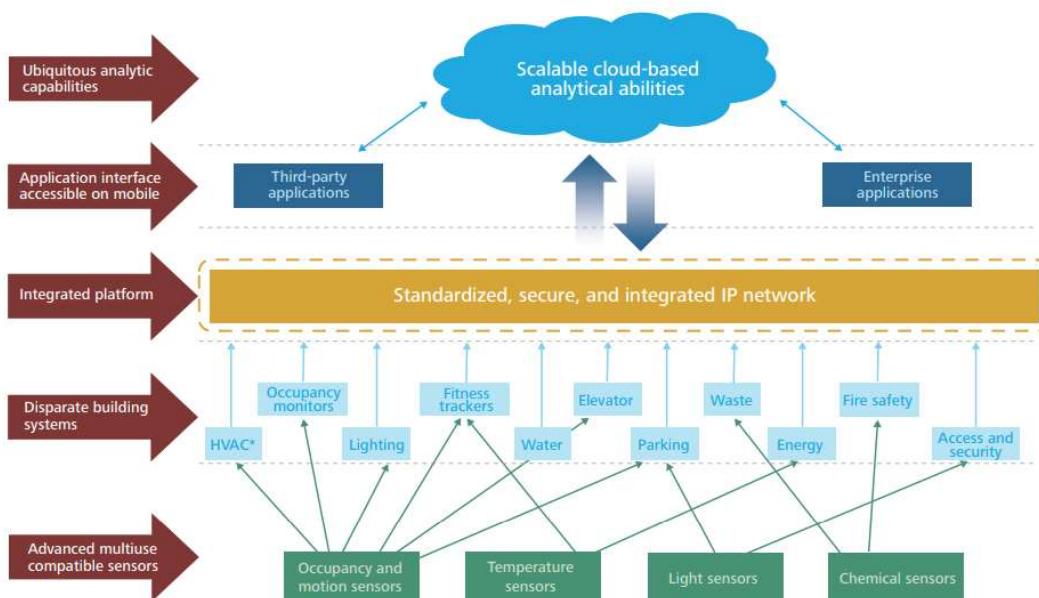
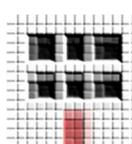


Figure 1 SOURCE: JIM YOUNG, “BIOT—BUILDING INTERNET OF THINGS™,” REALCOMM, JANUARY 23, 2014; DELOITTE CENTER FOR FINANCIAL SERVICES ANALYSIS. (Kejriwal & Mahajan, 2016)



6. Stakeholder analysis

6.1. Primary users

6.1.1. Rental property investor/owners/landlords

The investor's goal when purchasing a rental property is to receive a positive financial return. They would receive most benefit from a fast and secure transaction system powered by blockchain and maintenance of the property through the Internet of Things. This group of users has high interest and moderate influence in this project.

6.1.2. Property managers/agent

A property manager is responsible for satisfactorily maintaining the lease on a property. Their involvement usually involves locating a tenant, responding to reports created by the tenant and maintaining utility bills on behalf of the property investor. A system with increased efficiency for dealing with these will decrease the amount of time spent managing each property. This will allow the property manager to manage a larger number of properties in the same amount of time. This group of users has high interest and moderate influence in this project.

6.1.3. Tenants/Leasee

A tenant is the customer to the property investor and manager. Depending on the rental agreement, they could be responsible for paying for their utilities. Having an automated system to monitor the property and do these tasks for them is of high interest. This group of users has high interest and moderate influence in this project.

6.2. Secondary users

6.2.1. Utility companies

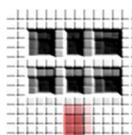
Utility companies provide the tenant with water, electricity and gas. Allowing for automatic payments would decrease the number of late or missed payments. However, some profit greatly on late payment fees and this can possibly decrease their profits. They would have high interest and high influence as their system would have to adopt to the IoT standard.

6.2.2. Council/Government

The local council and government currently hold records for the land titles and would have high interest and influence in the blockchain technology. They would also have moderate interest in the IoT where information on security, fire safety and other building aspects can be easily collated into a database for monitoring.

6.2.3. Amazon Key and Echo

Amazon's IoT smart lock allows authorised remote unlocking of the front door for parcel delivery and Echo for controlling other IoT enabled devices.



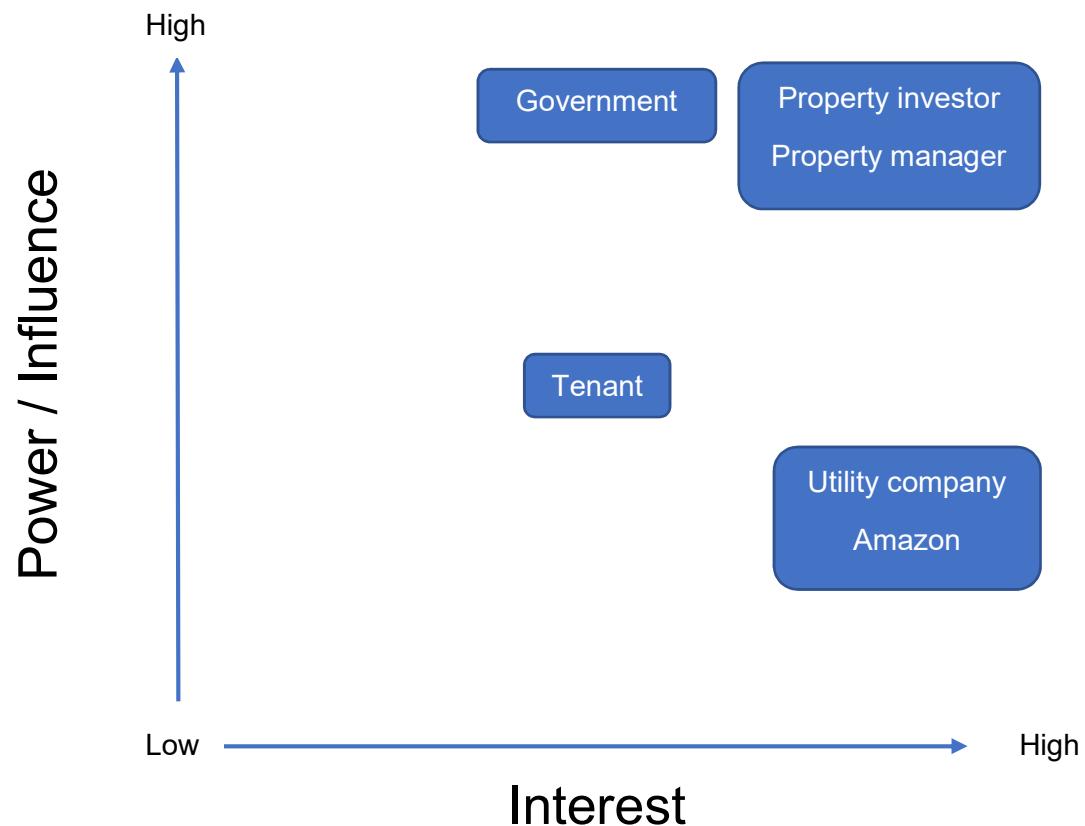
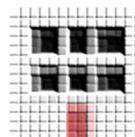


Figure 2 Stakeholder diagram of power, influence and interest



7. System Research

In order to successfully meet the demands of the primary and secondary users of the blockchain technology and Internet of Things implementation, direct contact must be made with the users. This has been performed

7.1. Interview

An interview was used to gather information from the local council as a detailed response was required from the small dataset

7.1.1. Local council

Question 1. What are your goals and requirements for this project?

Answer 1. We wish to have a simple management system where valuable documents such as public property titles and lease agreements can be securely viewed without alteration. The property resident, emergency services and insurance companies should be able to be automatically alerted in the event of an emergency such as flooding or fire.

Question 2. What do you personally consider a success for this project?

Answer 2. We consider the project a success when the deliverables are completed within the allocated budget.

Question 3. Why are you interested in this project?

Answer 3. We believe this is the best pathway towards the future of property management.

7.2. Survey

A survey was used to conduct research with the public. The ease of distribution allowed us to retrieve valuable data from a large population with minimal effort.

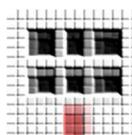
7.2.1. Property owner

Question 1. On a scale of 1-10, how comfortable are you with the idea of your land titles being secured online with blockchain? If below 5, explain.

Result 1. Those who were least comfortable (1-3) said they were uninformed about how blockchain works. The average answer: 7

Question 2. On a scale of 1-10, how comfortable are you with enabling IoT devices throughout your household? What would you change?

Result 2. The owners were very positive with the idea of turning their properties into smart properties at a comfortability rating of 9. They especially liked the idea of remote security and utility monitoring. Those with low ratings were sceptical about the security of the cameras, where intruders could also possibly monitor the cameras and plan their raid.



7.2.2. Property manager

Question 1. What features would create efficiency in your work cycle?

Result 1. The most time-consuming parts of a property managers' duties involve processing utility bills and sorting through lease agreements. If these can be made more efficient, it would decrease work load and allow management of more properties.

Question 2. Can you re-order this list of features from highest to lowest priority/interest and provide a rating from 1-10? Blockchain property titles/lease agreements, IoT security cameras, IoT utility tracking, IoT automatic utility billing

Result 2. Most answers had different lists of priority. When the averages are taken, automatic utility tracking proved to be the highest priority while the rest shared the same average score.

7.2.3. Tenants

Question 1. What features would you be most interested in?

Result 1. The consensus was that residential tenants are most interested in automatic billing with prior alerts for both their utilities and lease payments. Other high interests were IoT remote surveillance to monitor the property and remote door locking in the event that the doors were left unlocked after leaving the property. Commercial properties were more interested in the live utility usage to bring down their operational cost.

7.2.4. Utility

Question 1. What are the advantages of introducing IoT devices throughout commercial and residential properties?

Result 1. Utility companies were most excited about payments not being missed by an automated system. Currently their highest losses are from non-payment

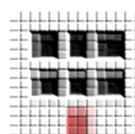
Question 2. What are your concerns with introducing IoT devices throughout commercial and residential properties?

Result 2. Profits could possibly decrease with the elimination of late payment fees and decreased utility usage since tenants become more aware of their usage.

7.2.5. Amazon

Question 1. How would you contribute to residential IoT?

Result 2: Implementation of Amazon Key will allow parcels to be safely delivered inside a home when there is no one to accept it. Amazon Echo is an Alexa enabled device capable of controlling IoT enabled devices such as the air conditioning unit, refrigerator and lightbulbs.



8. Scenario[s] / Persona[s]

8.1. Personas

8.1.1. Property Investor

The property investors' main goal is to turn a profit at the end of each lease term. Investors can have different terms when dealing with a contract. Having the tenant pay for their own utilities can simplify their payments.

8.1.2. Tenant

The tenant signs a contract to be able to utilize the investors' property. Tenants often have different requirements and usually converse with the property manager who is hired by the investor.

8.1.3. Property Manager

The property manager coordinates between the investors' requests and tenants' requests. Once these are considered, the management of utilities, billing and other extra features such as IoT implementation can be commenced.

8.1.4. Council

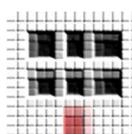
The council approves renovations, alterations to land ownership and may oversee lease agreements.

8.1.5. Utility companies

Utility companies provide the tenant with essential services such as water, electricity and gas. Investors either pay for these utilities or allow the tenant to pay for them, reducing load on the property manager.

8.1.6. Amazon

Amazon is a company that provides easy access to IoT enabled devices such as Amazon Key and Echo.



8.2. Scenarios

8.2.1. Scenario A

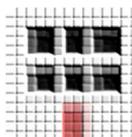
The following scenario is based on the functional aspect of this service.

Jack approached Destiny Property Management. He came to know that DPM uses smart contracts in the blockchain technology to serve as an intermediate between the leasee and the owner. Blockchain technology is a secure network in which fraud is unlikely to occur. This is because every transaction in the blockchain is verified by millions of nodes present all over the world. Moreover, transparency of the property documents is maintained between the end to end users. This made Jack confident of his decision to rent with DPM.

8.2.2. Scenario B

The following scenario is based on the functional aspect of this service.

The property manager also showed Jack a few properties which uses Internet of Things. A property with IoT can constantly monitor buildings and their surroundings, to learn and automatically control temperature, humidity, air quality and lighting levels. As well as providing real time security information.



9. Requirements

For the project to be considered successful the following user stories and additional dependencies must be met to a satisfactory level. In this instance a satisfactory level means that a user is able to achieve the goals set out in the user stories and that the additional dependencies are completed.

9.1. User Stories

9.1.1. Rental property investor/owners/landlords

As a rental property investor/owner/landlord I want to track client rental agreements so that I know who is where and when.

As a rental property investor/owner/landlord I want to know the utility usage of each tenant so that accurate rental fees can be determined.

As a rental property investor/owner/landlord I want to know which properties are performing well and which ones are not so that an informed decision can be made to sell a property or perform renovations, etc on an underperforming property.

9.1.2. Property managers/agent

As a property manager I want to ensure that tenants are aware of their contract conditions and the owner is aware of who is on their properties.

As a property manager I want to be aware of rental prices so that I can inform potential tenants and ensure that current tenants are paying the correct amount

9.1.3. Tenants/Lessee

As a tenant I want to know the terms of my contract so that I am aware of what I can and cannot do, along with how long my lease period is.

As a tenant I want to know that my property is secure for the duration of my lease so that I feel safe.

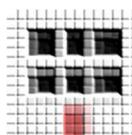
As a tenant I want to know my utility usage so that I can reduce the cost of my rent.

9.1.4. Utility companies

As utility company we want to easily monitor utility usage so that we can correctly bill the client.

9.1.5. Council/Government

As government body we want to easily monitor rental agreements to ensure that there are no fraudulent practices.



9.1.6. Amazon Delivery Service

As a member of ADS, we want to be able to easily deliver package to ensure an efficient delivery service.

9.2. Dependencies

Dependencies include a strong reliable interaction and communication protocol between the utility companies and the system, amazon delivery service.

The implemented system must also be relatively cheap to run, and service. It must also be efficient to use.

9.2.1. Platform

The system must be available to a wide range of devices, screen sizes, and user abilities. As such our system will be developed using the latest web technologies that can support a wide variety of devices such as traditional web browsers and contemporary mobile web browsers and mobile applications.

9.2.2. User

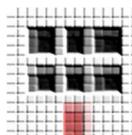
It must be easy for a new user to interact with the system and be easily accessible to a wide user base. This will be achieved through strong accessibility support and the transition into a WCAG2.0 Level AAA, and through continued user feedback and accessibility research implementing a system that supports an even larger audience.

9.2.3. Maintenance

The system must be cheap and easy to maintain. This can be achieved by decoupling and modularising the system to reduce the amount of strain on the system. Making it easy to perform scheduled maintenance on smaller areas of the system instead of shutting the whole system down.

9.2.4. Functional

The system must be able to perform a range of tasks quickly and efficiently. This system will be using **FURPS+** model to describe and analyse all requirements. The system will be tested in aspect of functionality, usability, reliability, performance and supportability until it meets all requirements.

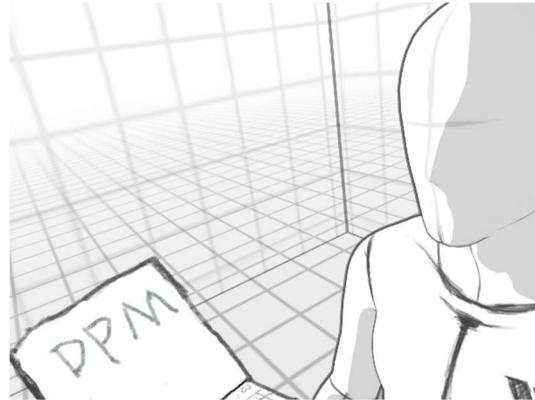


10. Storyboard

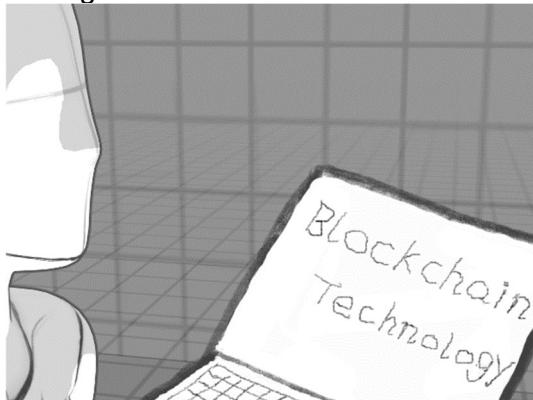
10.1. Use Case



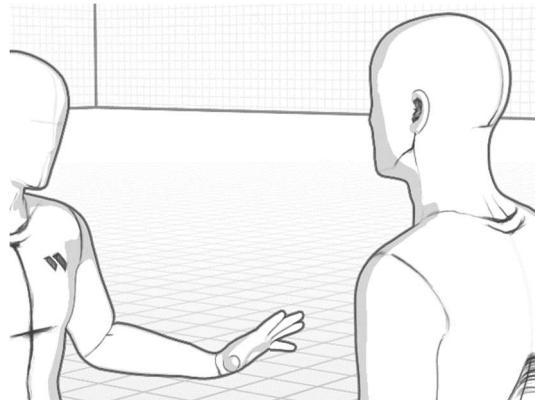
Jack had some properties to be leased and managed.



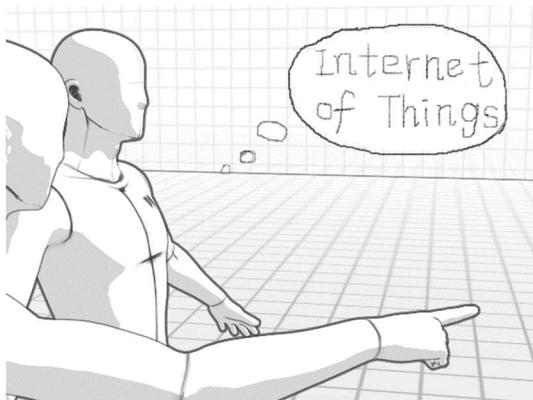
Jack searched for DPM on the internet



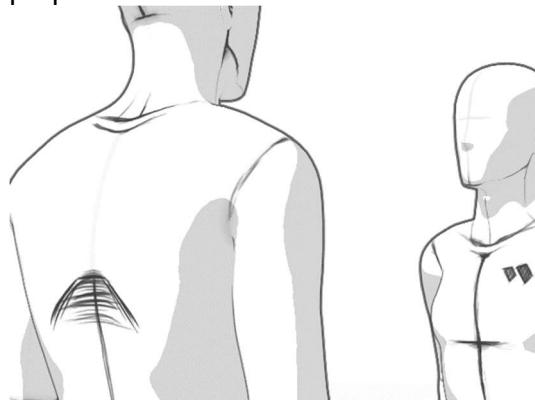
He learned that DPM uses blockchain technology for smart contracts to serve as an intermediary between the leasee and the owner



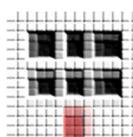
After that he made an appointment with DPM to get more details on how he could integrate their services into his existing properties

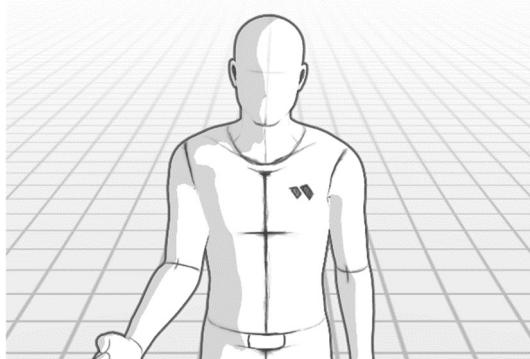


The property manager showed him a few properties already using the system



The property manager told jack a property with IoT can learn and automatically control temperature, humidity, air quality and lighting levels. As well as providing real time security information





This made jack confident of his decision to manage all his properties through DPM

Figure 3 storyboard outlining why a user will want to interact with the system.

10.2. User Interaction

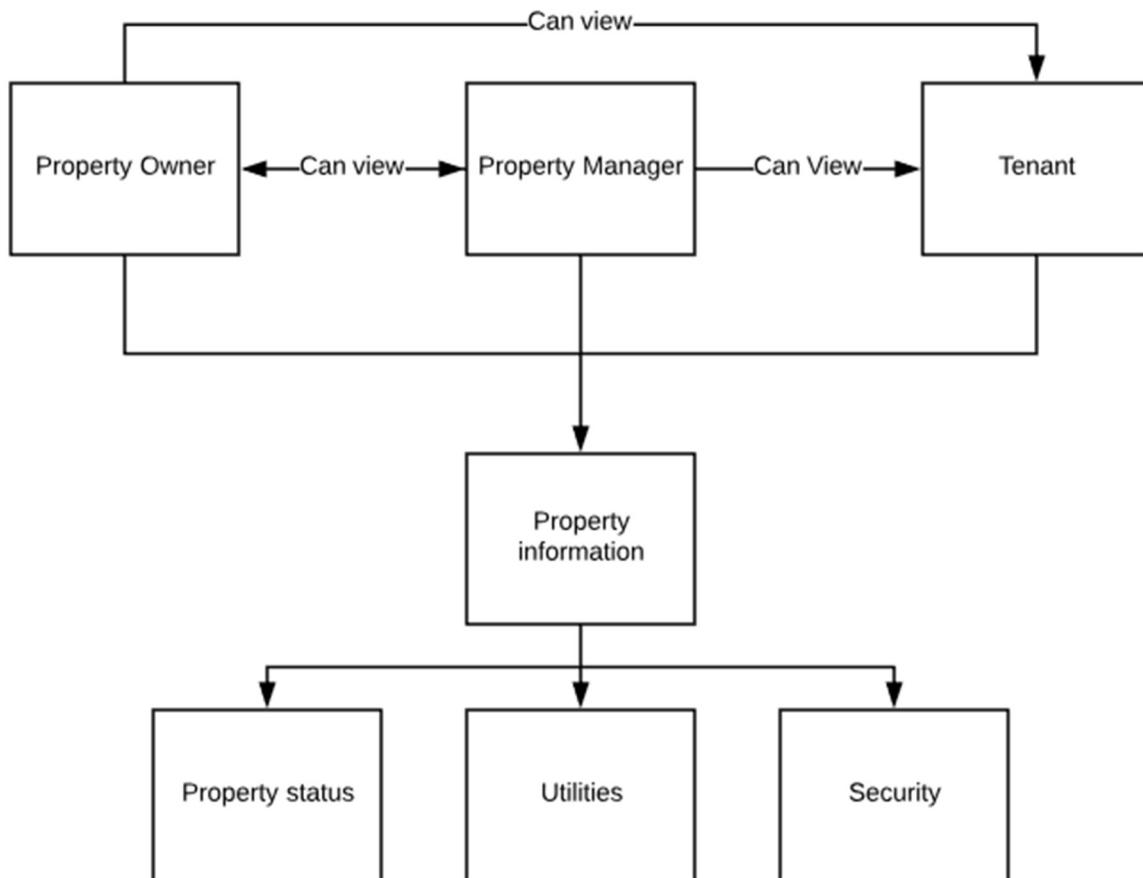
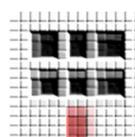


Figure 4 flow chart of user interaction with the system



11. Iteration Designs

During the development of the system, a UI (user interface) will go through several iterations. Often, the initial designs are low fidelity, allowing fast prototyping with less detail. Further into the design process, high fidelity designs are created to best simulate the finished products.

11.1. Low Fidelity Designs

Low fidelity are extremely quick and cheap designs that give an idea of where items, buttons and other UI elements are positioned. But do not necessarily describe how a will system function.

11.1.1. Design A

Figure 5 is the login page. It allows the user to input their credentials and access their account.

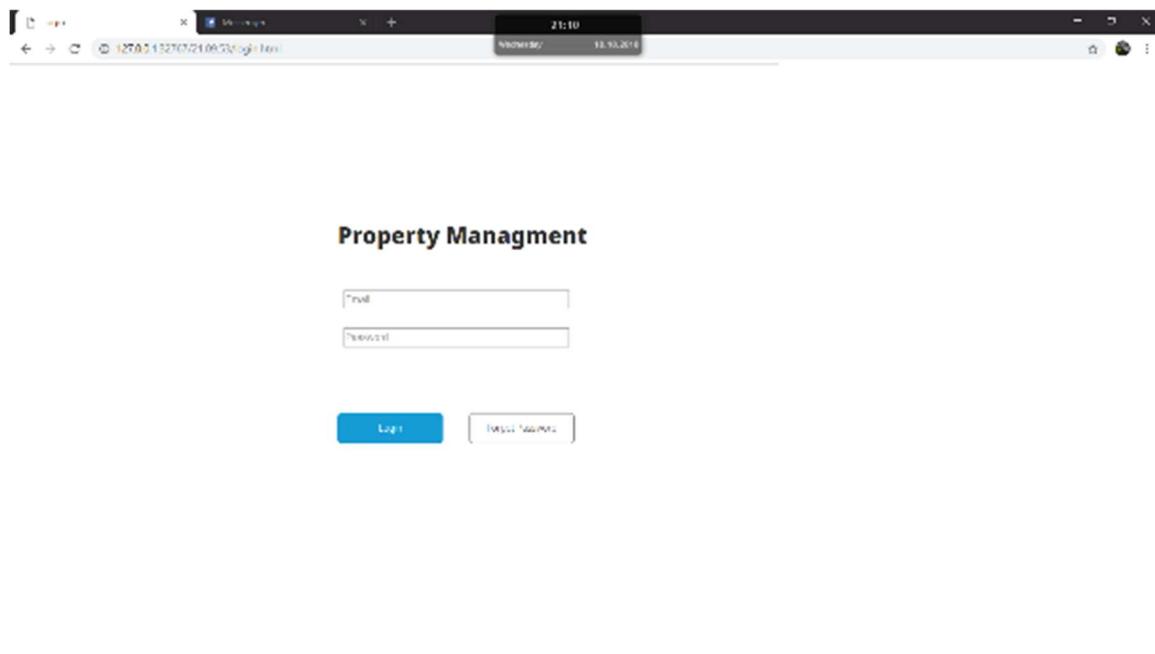
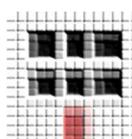


Figure 5 low-fi prototype 1: login screen



The navigation pane on the left allows the user to toggle through the different pages of DPM after logging in. Figure 6 is the account details page. It shows the current details including their profile picture. The page also allows the user to change their details.

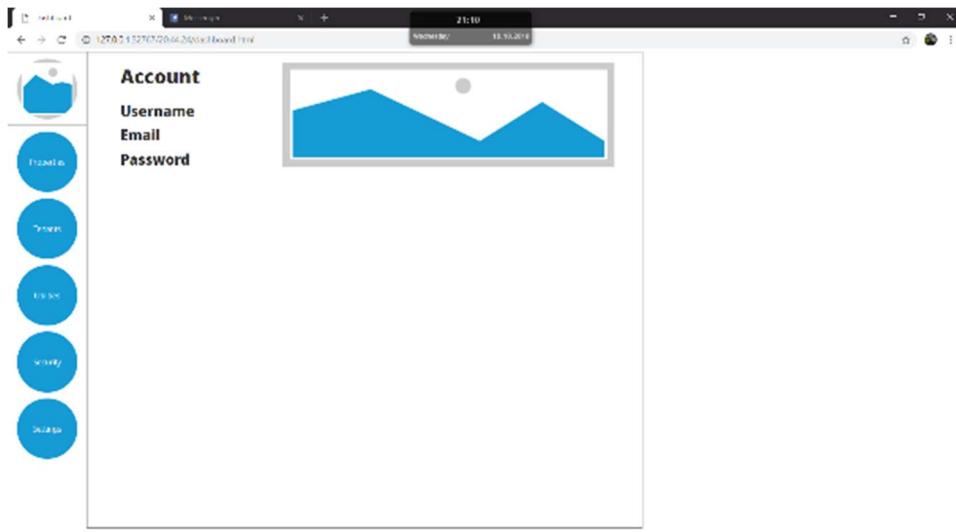


Figure 6 low-fi prototype 1: account screen

Figure 7 is the properties page. It displays the properties being managed using DPM on the left and the detailed view on the right.

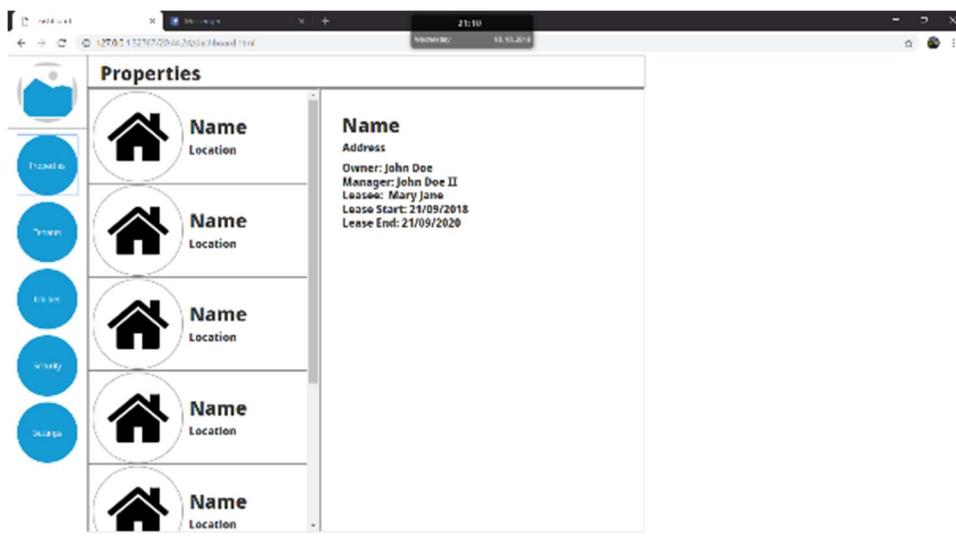


Figure 7 low-fi prototype 1: properties screen

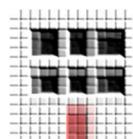


Figure 8 is the tenants page. It displays the tenants currently occupying properties on the left and a detailed panel on the right.

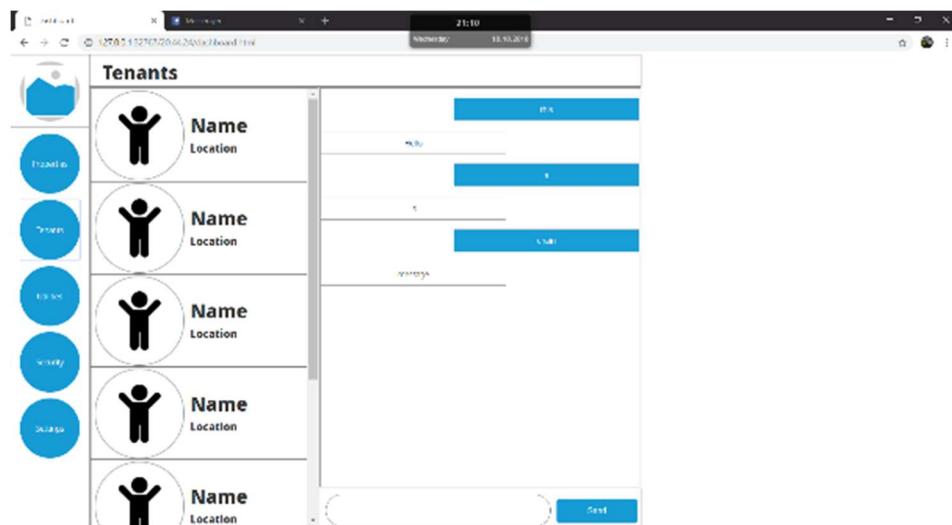


Figure 8 low-fi prototype 1: tenants screen

Figure 9 is the utilities page. It displays the utilities in grouped sections of all properties on the left pane and detailed information on the right pane.

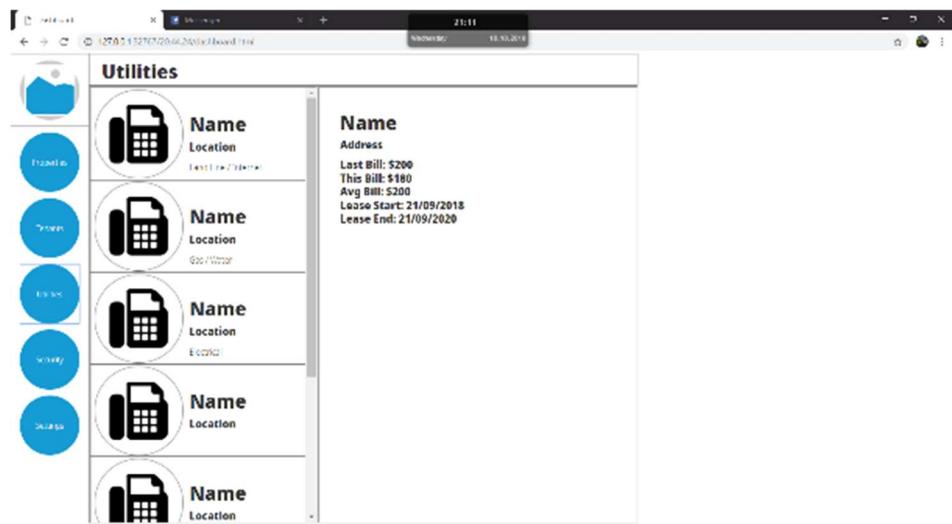


Figure 9 low-fi prototype 1: utilities screen

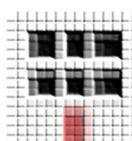


Figure 10 is the security page. It displays the security status of the property on the left pane and detailed information on the right pane. Details include alarm status and CCTV.

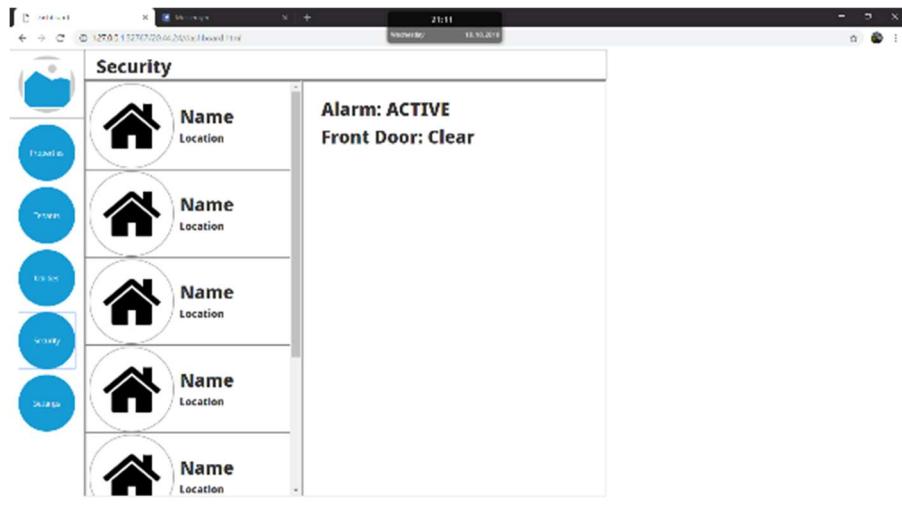


Figure 10 low-fi prototype 1: security screen

Figure 11 is the settings page.



Figure 11 low-fi prototype 1: settings screen

11.1.2. Design B

The second low fidelity prototype provides friendliness to universal devices by using large menus and segregating the detailed information.

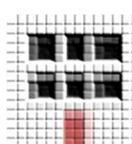


Figure 12 is the user accounts page. It displays the details of the user such as the username and email address. If the user owns a property in DPM, then the user's property is listed in the Property owned text box and if the user is a tenant, then the user's house is listed in the Tenant text box. The page also shows the profile picture of the user for easy identification.

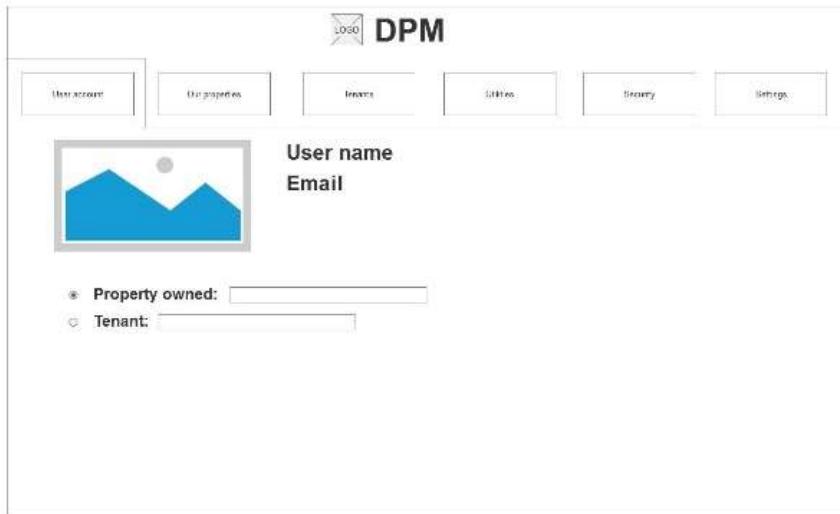


Figure 12 low-fi prototype 2: account screen

Figure 13 is the Properties page. All the properties of DPM are listed in the form of tiles. This reduces the use of navigation sliders and the user can locate any property in the page in a short span of time. Each property's photo is listed within a particular tile. In addition to this, fewer information such as the lease start date, lease end date etc are also seen in the tile.

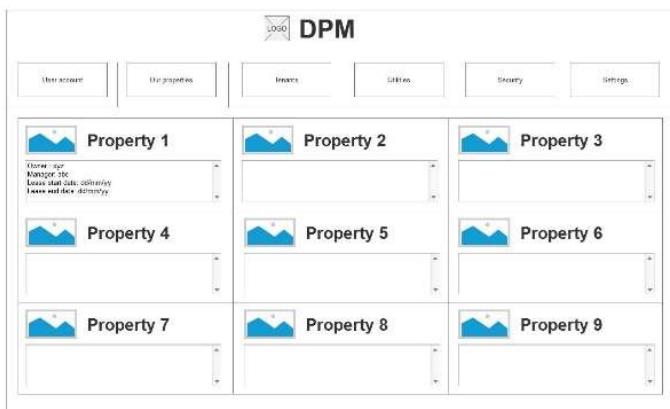


Figure 13 low-fi prototype 2: property screen

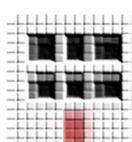


Figure 14 is the property information screen when clicked and enlarged from the previous page.

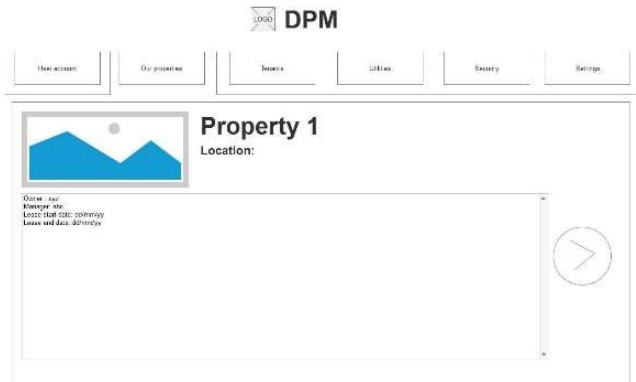


Figure 14 low-fi prototype 2: property information screen

Figure 15 is the tenants screen. This displays all the tenants under DPM. They are listed in the form of tiles. Once clicked on a particular tenant, more information is available on that tenant such as his location and contact details. A chat area is also available for the users to chat with the tenant through our website.

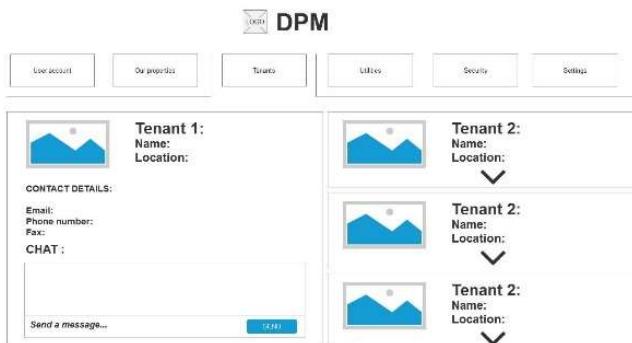


Figure 15 low-fi prototype 2: tenant screen

Figure 16 shows our security page. The user can select the block and unit and check if the alarm is active or not. 2 live camera view can also be seen which is installed in front of each unit in the building.

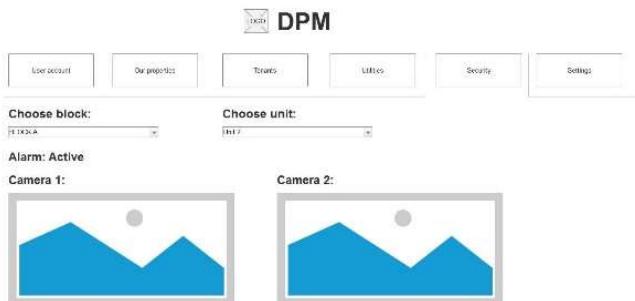


Figure 16 low-fi prototype 2: security screen

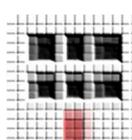


Figure 17 shows the utilities screen. All the contact information of the utilities such as gas, water, internet and electricity are available in form a grid. It is also possible to view the bill details.

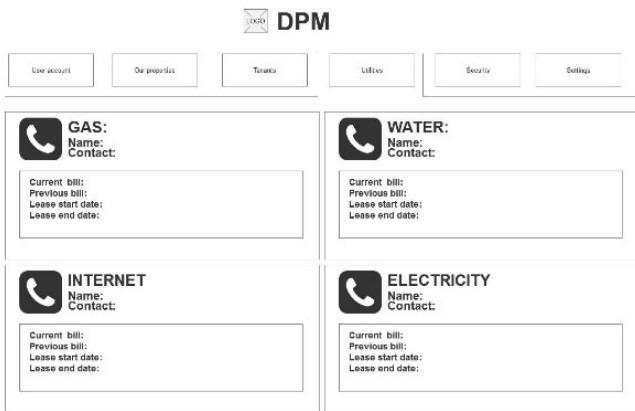


Figure 17 low-fi prototype 2: utilities screen

Figure 18 shows the Settings page. It is possible for the user to edit their profile. Details such as their email, phone number and fax can be modified.

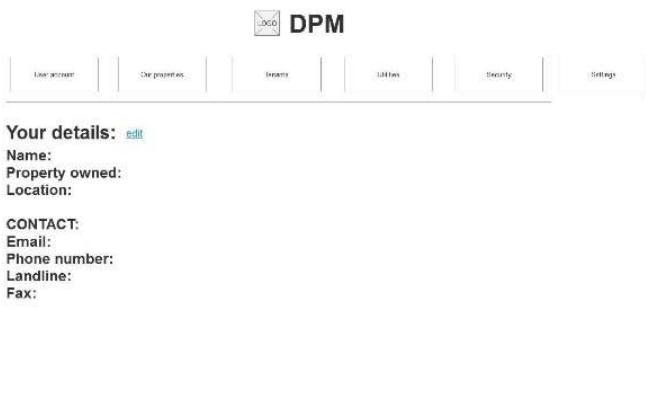
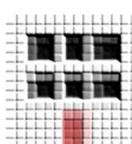


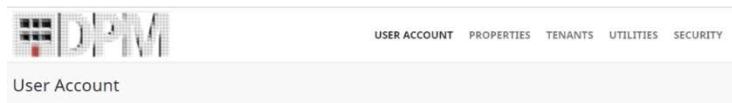
Figure 18 low-fi prototype 2: settings screen



11.2. High Fidelity Design

A high-fidelity design incorporates the layout and ideas of previous low fidelity designs. It is a much closer representation of the final product as it allows the user to test system functionalities. The company name, logo and menu are static. As an accessibility feature, the menu bar highlights each tab as the mouse is moved over.

Figure 19 is the user account page. It shows the details of the current logged in user and can be edited by clicking on the desired field.



Details:

Full name: Blake Rogan
User name: brogan
Email: blake@rogan.com
Password: ****

Statistics:

Properties managed: 3
Properties occupied: 3

Figure 19 hi-fi prototype: user account screen

Figure 20 is the properties page. The owner and manager are able to view the lease status of the properties on this page.

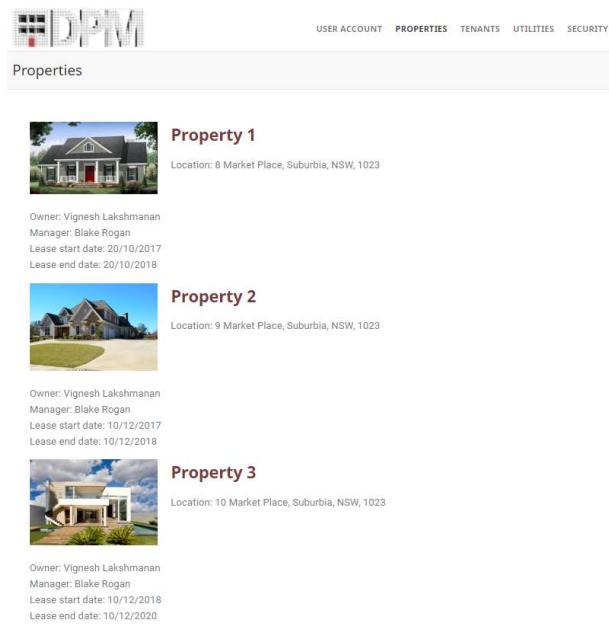


Figure 20 hi-fi prototype: properties screen

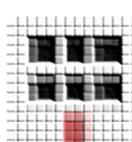


Figure 21 is the tenants page. This is a two-column page with the selected tenant on the left, showing their details while the other tenants are on the right with lesser detail.

Tenant	Name	Address	Email	Phone	Fax
Tenant 1	Jane Doe	9 Market Place, Wollongong, NSW, 2500	jane@gmail.com	0487 926 835	N/A
Tenant 2	Darien Benson	8 Market Place, Wollongong, NSW, 2500			
Tenant 3	Bronte Bond	10 Market Place, Wollongong, NSW, 102310			

Figure 21 hi-fi prototype: tenants screen

Figure 22 is the utilities page. This displays the current utilities being used by the tenant in a vertical fashion. Details are not hidden as they can be missed, and late payments incur fees.

Tenant	Gas	Water	Internet	Electricity
Tenant 1	Current usage: 15GJ Previous bill: \$280.82 Balanced owed: \$0 Next payment due: 12/31/2018	Current usage: 60kL Previous bill: \$300.82 Balanced owed: \$0 Next payment due: 12/31/2018	Current usage: 500GB Previous bill: \$60.00 Balanced owed: \$0 Next payment due: 10/31/2018	Current usage: 500kWh Previous bill: \$509 Balanced owed: \$0 Next payment due: 10/31/2018
Tenant 2	Current usage: 12GJ Previous bill: \$220.82 Balanced owed: \$0 Next payment due: 12/31/2018	Current usage: 70kL Previous bill: \$320.82 Balanced owed: \$0 Next payment due: 12/31/2018	Current usage: 723GB Previous bill: \$60.00 Balanced owed: \$0 Next payment due: 10/31/2018	Current usage: 400kWh Previous bill: \$409 Balanced owed: \$0 Next payment due: 10/31/2018

Figure 22 hi-fi prototype: utilities screen

Figure 23 shows the security page. If a property has IoT enabled CCTV, they are available on this page. The user can cycle through the different cameras using the navigation buttons under each window.

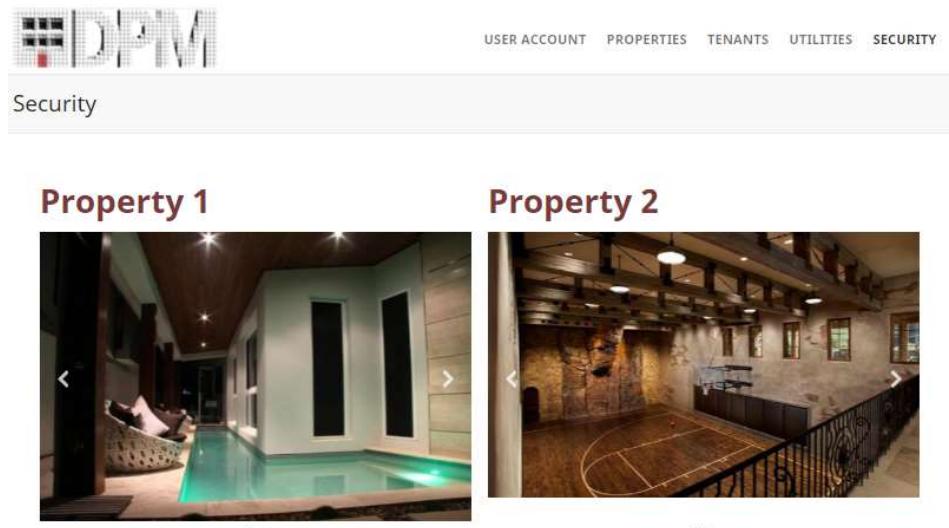
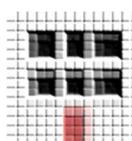


Figure 23 hi-fi prototype: security screen

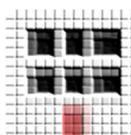


12. Discussion

The Destiny Property Management System's use of block chain (smart contracts) technology and Internet of Things technology can greatly improve the company's work efficiency and the security of client's properties. This DPM system can limit the chance of fraudulent activity and ensure that properties are managed fairly and that leases know what is in their contract. IoT technologies help to increase property security. Therefore, it can meet the all requirements of stakeholders. Such a contract allows people to sell realties, exchange shares, money, documents or any proprietary. One of the important features of smart contract implementation is that you won't need to use intermediary services such as brokers, notaries, agents etc to make a transaction because smart contracts has Autonomy, Decentralization and Auto-sufficiency three important features. At the same time, this management system also has the intelligence and connectivity characteristics of Internet of Things. It enables network accessibility and compatibility in the things.

There are many advantages of block chain (smart contracts) for the management of property. These mainly include agent neutrality in signing deals, automation in signing deals and time saving because it completely excludes human participation in transactions and everything is done by the prescribed program code. This is very important in preventing security issues because data in the decentralized registry cannot be lost or easily hacked. It is highly precise because no mistakes can be made due to the absence of hand-filled forms. However, there are also some weakness of block chain (smart contracts) for the management of property, such as, it needs the high-quality network speed, the huge cost of establishing the block chain management system and immutable smart contracts mean that they can be changed (amended).

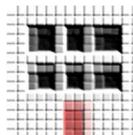
In addition, there are many advantages of Internet of Things for the management of property. The DPM System can make full use of the characteristics of Internet of things with huge data to analyse how properties are allocated and managed, the amount of time saved in monitoring, and continual tracking of the situations of the properties. However, there are also some disadvantages of Internet of Things for the management of property, including, compared with traditional management system, it may be complexity because it requires more complex systems to meet it, and the compatibility is also an issue because there is no standard for tagging and monitoring.



13. Conclusion

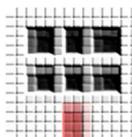
It is recommended that, by choosing the DPM system, you will be provided with a modern and efficient management model and secure properties management solution. The DPM system has been designed to increase the efficiency of properties management organizations and protect the properties safety of clients and organizations, thus limiting the risk of properties of clients and organizations.

The initial Low-Fidelity Design and High-Fidelity Design Choices have been provided and the advantages and disadvantages of the DPM with the block chain (smart contracts) Technology and the Internet of Things Technology has been discussed. In addition, how the DPM system works has been explained. Going forward we hope that the DPM System will facilitate excellent outcomes in managing and protecting the security of properties of the clients and organizations.



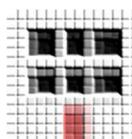
References

- ChromaWay, 2018. *Land Registry*. [Online]
Available at: <https://chromaway.com/landregistry/>
[Accessed 14 6 2018].
- Intel, 2015. *Increase Property Owner Profitability with the Internet of Things*, US: Intel.
- Kejriwal, S. & Mahajan, S., 2016. *Smart buildings: How IoT technology aims to add value for real estate companies*, Sydney: Deloitte University Press.
- Lantmäteriet, Telia Company, Chromaway och Kairos Future, 2017. *Framtidens husköp i blockkedjan*, Sweden: Lantmäteriet, Telia Company, Chromaway och Kairos Future.
- University of Sydney Business School, 2017. *Sydney Business*, Sydney: University of Sydney Business School.
- Wonder Unit, 2018. *Storyboarder - The best and easiest way to storyboard*. | Wonder Unit.
[Online]
Available at: <https://wonderunit.com/storyboarder/>
[Accessed 9 10 2018].



15. Glossary

WORD	MEANING
INTERNET OF THINGS	Internet enabled devices such as door locks, lights, fridges, windows and security systems (cameras, alarms, etc)
BLOCKCHAIN	A contracts-based security system to ensure transparency and validity of items. Such as money (cryptocurrency), parcel delivery and property leasing
HVAC	Heating, ventilation and air conditioning systems
STAKEHOLDER	A party that has an interest in the system
ADS	Amazon Delivery Service
INVESTOR	A shareholder or owner of a property
TBC	To be confirmed
CCTV	Closed circuit television
HIG	Human Interface Guidelines
WCAG2.0 LEVEL AAA	Web Content Accessibility Guidelines version 2.0 Level AAA refers the certified level of accessibility that a system supports.
FURPS+	F: functionality (does it do what it is meant to do) U: usability (can it be used) R: reliability (is it predictable and explainable) P: performance (using minimal amount of resources (time, power, etc) S: supportability (how easy is it to keep running)



16. Appendices

17. Style Guide

17.1. Font

Google Noto font (<https://www.google.com/get/noto/#sans-lgc-display>) will be used in all documents and interface designs except where it is in direct conflict with an interface guild line outlined by a specific platform (e.g. Apple HIG)

Specifically:

Noto Sans Display Light will be used for body text

Noto Sans Display Medium will be used for headers

Noto Sans Display Extra Bold will be exclusively used for the logo

17.2. Logo

The following table describes how the logo can and cannot be used

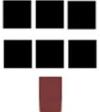
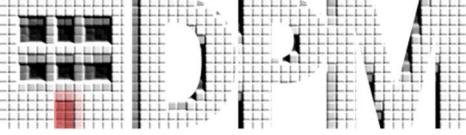
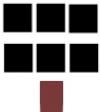
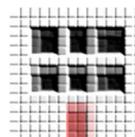
Allowed Logo Styles	Disallowed Logo Styles
 	✓  X
No artistic styling	Picture effects: any
	✓  X
Light Screen artistic styling	Picture styles any
	✓  X
When the logo is to large for its area use the small version	Resize the logo or crop

Figure 24 outline of acceptable logo usages with primary colour scheme



17.3. Colour

17.3.1. Icon

Due to the system not yet being prototyped the following colours only apply to documentation not code and are subject to change in Part B documentation when as part of the prototyping an array of colour schemes will be tested along with system designs.

The following table describes the logo colours:

Primary	Background	Windows and Text	Door

Figure 25 colour schemes used with the logo

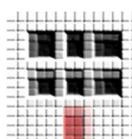
The logo may also be subject to colour change if it is required to fit in with the design of the system. In which case two logo styles will be used. One for the documentation as described here and one for the system.

17.3.2. Website/Application

The application that will be developed will use the following colours

Primary	Background	Text	Links

Figure 26 colour schemes used for the website



18. Member Breakdown of tasks

- 5430276 - Gustavo Borromeo
 - Executive summary
 - Introduction
 - Business domain
 - System Research
 - Stakeholder analysis
 - User personas
 - Part A documentation
 - Part B documentation
 - Part C video
 - Document formatting
- 5852869 - Vignesh Lakshmanan
 - System Research
 - User scenarios
 - Part A documentation
 - Low-fi prototype and wireframe
 - Low-fi description (Part B)
- 5735282 - Blake Rogan
 - System Research
 - Style Guide
 - Document Formatting
 - User Stories
 - Prototyping
 - Wireframe
 - Part A documentation
 - Part B documentation
 - Part C video (Low-fi audio recording)
- 5194945 - Lei Zhang
 - System Research
 - Part A documentation
 - Part B documentation
 - Storyboards
 - Requirements
 - Discussion
 - Conclusion
- 6056714 - Kazi Mashfique Alam
 - System Research

