Project Brief

Document Information

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Contents

Approval

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Introduction

Currently, there are many applications out there that advertise real estate and properties, for example *daft.ie.* Although these applications allow users to make informed decisions through a mixture of innovative product features and in-depth quarterly market analysis, as well as allowing users to select and filter different search results, there does not seem to be a system out there that accurately predict the price of the property. By analysing the data provided by the user we hope to provide an accurate price prediction model, which will not only give an estimate of the value of the property at the time of posting but will also show how that price might change over time. We hope to achieve this using inflation rates that will affect the price and various data points provided by the user. We believe that this is an important feature that customers should be aware of to let them know the value of what they are purchasing as well as what the value will be in the future and this will be one of the selling points of our product. By developing this application, we wish to expand on the existing products that are out there by implementing a prediction model using AI and machine learning algorithms, as well as presenting them using a graphical interface.

We will strive to modernize and advance the experience of buying and selling real estate through innovation and modern tools and technologies. We want users to feel comfortable in making informed decisions about their purchases. Through the innovative features, we have developed on our websites such as interactive dashboard, search filter results, prediction model, and built-in messaging system we hope to achieve exactly that. Along with said features of our application, getting users to interact with the application is also very important. The user interface should be easily understandable and present elements so that potential users can easily interact with it. In

order to achieve that, we implanted fundamental concepts of UI/UX to provide a user-friendly experience, while visiting our website during and after, we want users to have an emotional connection and leave them satisfied. Building an effective UI/UX design removes components that can confuse, irritate, or disappoint a user.

The project will make use of some if not all the components we have learned thus far:

- Security (Authentication, Integrity, validation of data)
- Http Protocol
- Python Programming and Django framework
- Web Programming (HTML, CSS, jQuery, JS, any other relevant languages/libraries that will be added as progress)
- If we have sufficient time, we could migrate our product to the cloud (e.g., AWS)
- Optimization and speed

The Prediction Model

Linear regression is a Supervised Machine learning Model for finding the relationship between independent variables and dependent variable. As Linear regression performs the task to predict the response (dependent) variable value based on a given explanatory variable, we decided that this would be the appropriate algorithm to use for our prediction model. This technique finds outa linear relationship between x (input) and y (output).

We first needed a dataset with various data points that would help us in making the prediction model accurate. For this project. For this project, we gathered large amounts of data on residential property prices in Ireland only as the training set for our algorithm. We cannot guarantee the accuracy for other countries since they were not included in our training data.

From a user's perspective, taking advantage of our algorithm is as simple as making a post on the site, the information provided will be used to create a price estimation. The fields that are factored into our prediction are; size of the house in M^2 . No. of bedrooms, No. of bathrooms, type of house, energy rating, and location. In future, we will continue to add more data points and train our linear regression algorithm to increase its prediction accuracy. Currently, based on our tests, we are confident that our algorithm as it is now will provide fair and accurate prices. Our algorithm will determine the current and future estimated prices and display them to our users as a chart which can be seen graphically represented in the dashboard.

Project Management Team

The roles throughout the project have been changing on a weekly basis depending on the tasks and workload for that particular week. There were no dedicated roles throughout the project as team members had various skills and expertise that were required for various tasks throughout.

Role	Description	Appointee(s)
Product owner	Responsible for overseeing the development of the project, checking in weekly in scrum meeting.	Jason Quinlan
Front end developer	Organizing the layout of the site. Work on the about page. Setting up password reset and change layout of posts/profile page. Work on the search function. Fix design for user guide. Finish Dashboard	Katy Yeung
Backend developer	Implementing price prediction model & graph representation of price over time using chart.js, validating and storing user data. Implement search function, charting price estimation. Return values to Kevin for chart. Finish working on the prediction model. Use AWS to deploy the application. Implement search filter	Kieran O'Sullivan & Kevin Mukuna
Documentation	Maintaining & updating product documentation (e.g., product brief), organising work using pivotal tracker, testing current build. Draw the architecture diagram and update the brief. Assist with the prediction model and the about page/user guide. Add additional diagrams and have version 2.0. Write user guide/about page. Description for architecture diagram. Gantt chart for week 6. Pdf for beta release. Finish documenting the project	Hassan Tariq & Killian O'Driscoll

Definition

Background:	Given the current situation in the world and how it's affecting the economy, property prices are quite volatile, and it can be hard for a seller to get an idea of how much their property is actually worth. Providing a simple, accurate prediction of how much their property is worth will be of great value to our users.
Main Goal:	Our main goal is to build a web application that advertises property and uses a prediction model to give accurate prices of property, allowing customers and real estate agents to make informed decisions easily.
Desired Outcomes:	The desired outcome is to create an application that is easily accessible and beneficial to users, advancing our skills in the process. We want to make sure we deliver a quality product that works as promised
Constraints and Assumptions:	Time constraint, lack of group work experience, lack of resources, working remotely. Assumption made would be that the data will need to be real and accurate as possible to make accurate predictions.
Interfaces:	No other prior experience of developing a similar product before, although some group members have experience of developing web applications.
Project Approach:	In-house based on the different skill sets of group members and by assigning roles to each member while having meetings and updating the product owner regularly.

Project Product Description:	The product is a web application that will advertise property and come up with accurate prices using a prediction model. The web application will allow users to register and create an account to allow easy access of data and allow users to post on their profiles. Users can delete and edit their posts as they wish. Posts can be archived before deleting them. A range of products will be displayed on the home page for people to see without having to login or register. If we have time, we can add additional features on the side that show news posts and other announcements etc. For example, Dr**.** Quinlan has a land of x acres and he wishes to sell it. He can post about it on the web application. The goal will be to use the data provided by Mr. Quinlan, and our pre-defined matrix in the backend and compare the prices with already existing objects to analyse what the value of the property is currently and what it will be in the future. This will be represented with a graphical user interface showing changes throughout. Example factors affecting the prices of the property will be inflation, deflation in the market and various attributes of the property, such as size, number of rooms etc.

Project Objectives

	Target	Tolerance
Scope:	Functions include: • Creating an account by registering • Graphical representation of price prediction model using chart.js • Posts visible on home page to all users, with or without an account • Accurate price predictions • Users will be able to edit/delete their posts • Archive posts before deleting them • Authentication for user registration • Automate the web application using a .sh script • Multiple picture uploads in a gallery format	Most of the items mentioned here are integral to our product. While strictly speaking some of them (for instance the ability for users to edit/delete posts) are optional, we feel that they are necessary for our users to have a pleasant, productive experience using our site. Our hope is to implement all of the features mentioned here and more.
Time:	8 weeks	No tolerance on the timeline of the project, final submission is due after 8 weeks and there will be no room to work on the project after that deadline.
Cost:	Time: 20 hours a week Computing power Storage: Cloud costs & databases to store property information	Due to the relatively short timeline, we don't have much tolerance here. While it is true that some weeks will involve more work than others, we believe that an average of 20 hours a week is what is needed to get the product finished in time.
Quality:	Functional, user friendly, competitive	Little tolerance here, our goal is to provide a product which is easy to use and gives users all the facilities they need to buy/sell property.
Risks:	Not finishing the development of the application due to time constraints	

Benefits:	Provides customers/real estate agents with a better experience by giving them accurate price predictions based on the current market Provide reliability to the customer as costs are accurate relative to the market Provide the best possible user experience

MoSCoW Prioritization:

What our product must have:

- ✓ Users must be able to register an account and login
- ✓ Users must be able to upload a post/s of their property
- ✓ There must a price prediction model with a graphical representation
- ✓ The prediction model must be able to predict current and future price of property
- ✓ Ability for users to edit and delete their posts.
- ✓ When users register, they get an authentication link to their email

- ✓ ***What our product should have:***
- ✓ Users should be able to customize their profile and upload profile picture etc.
- ✓ Users should be able to search and filter properties by various attributes
- ✓ A .sh script to automate the execution tasks
- ✓ A page dedicated to user guide, which shows users how to use the website

What our product could have:

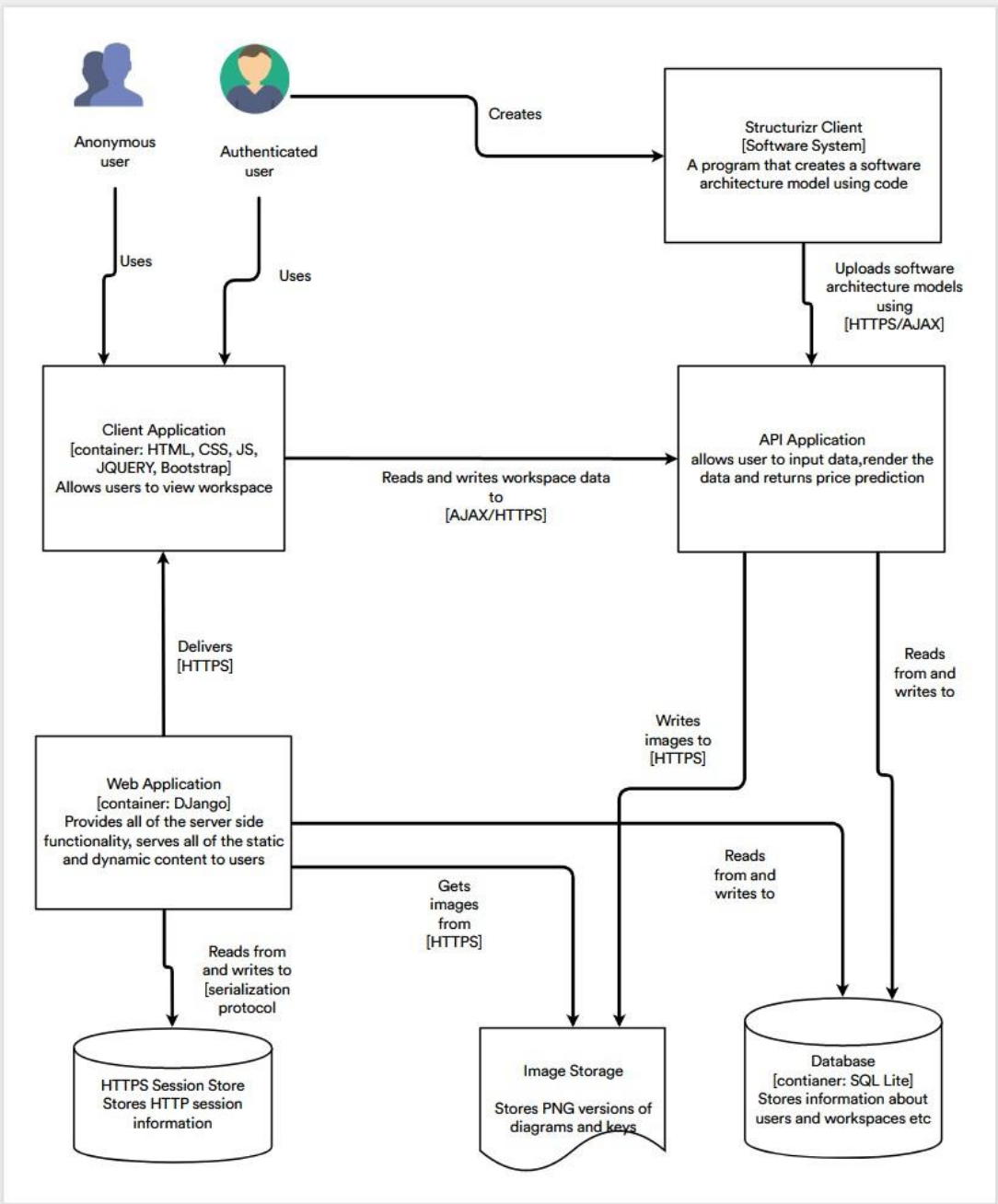
Chat/messaging system for users to communicate with each other, inquire about posts etc.

- A separate section for properties for rent rather than sale
- ✓ Data visualization represented with a dashboard that will allow users to understand the analytics

What our product will not have:

- ✓ Our site will be limited to property only; users will not be able to buy/sell anything else
- ✓ Addresses will be limited; the property listed will only be limited to Ireland

Figure 1 – Software Architecture Diagram:



Explanation of the architecture diagram:

This is an overview of our architecture diagram. As you can see both the authenticated and anonymous user can go on the web application and view the client application. The authenticated user can then go on to interact with the software system login, upload new posts, view other profiles etc.

The software system uses HTTPS/AJAX to interact with the API which in return allows the authenticated user to upload posts, render data and get a price prediction in return. The client application which is the front end also reads and writes to the API application using AJAX/ HTTPS.

The API application interacts with the database to handle database queries and store user information and store server- side functionalities of the web application as well as that it will store the data that will be used for the prediction model.

The web application back end gets images from the image storage and the API application writes images to the image storage through HTTPS which stores PNG versions of images and keys. The back end of the web application delivers content to the client application using HTTPS.

Figure 2 - Use Case Diagram

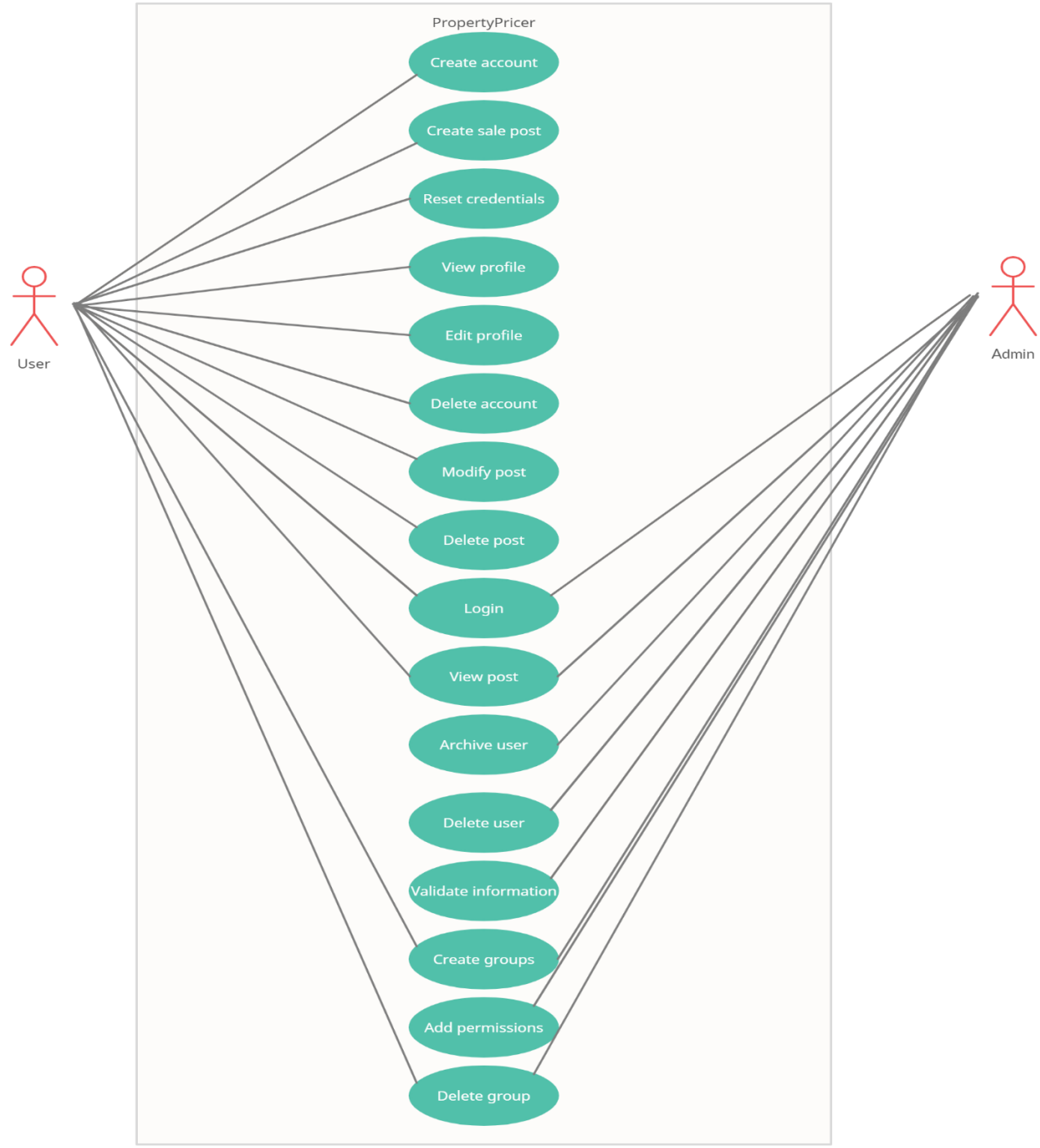
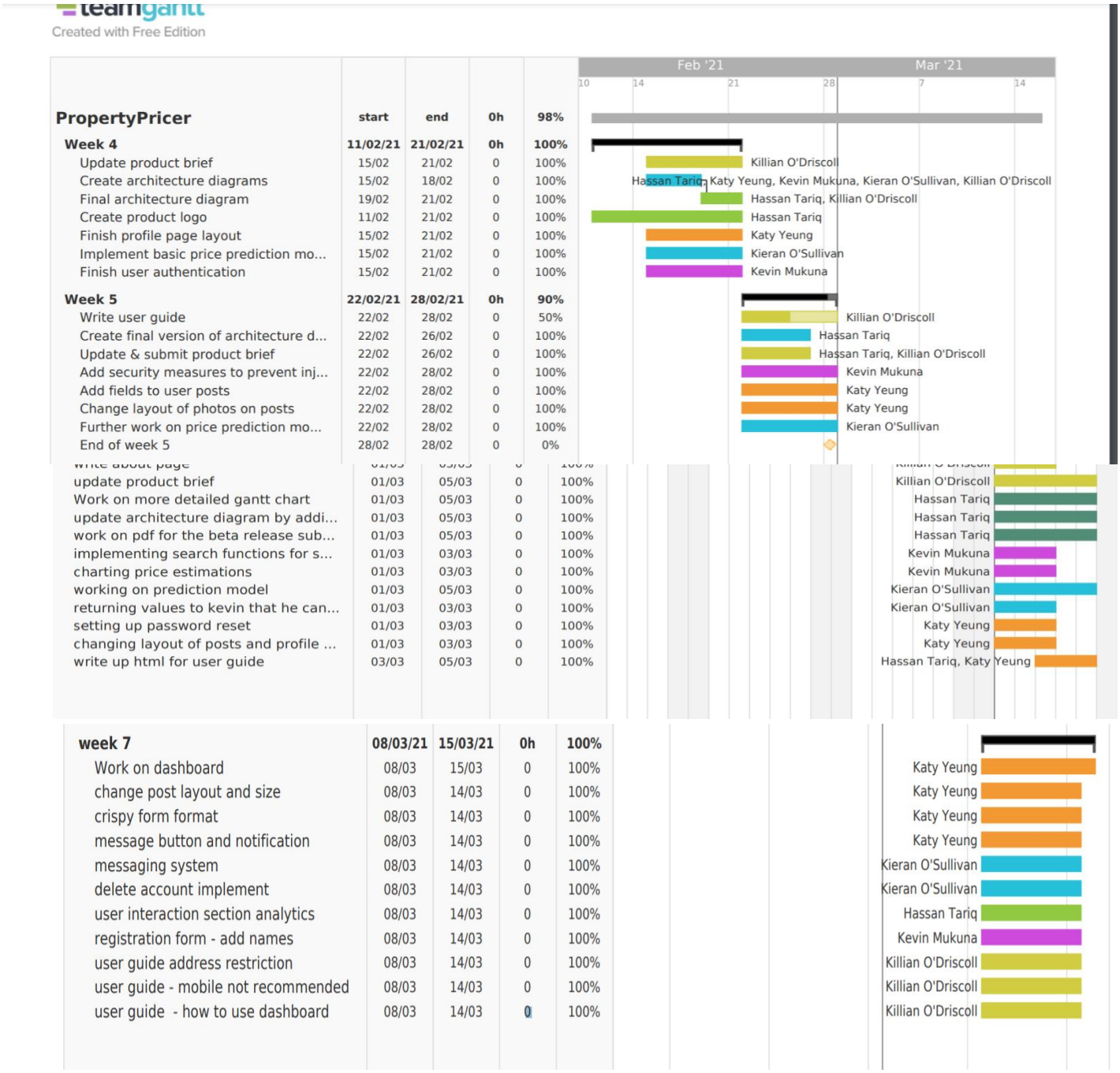


Figure 3 – Weekly Gantt chart



PropertyPricer	start	end	0h	98%
Week 4	**11/02/21**	**21/02/21**	**0h**	**100%**
Update product brief	15/02	21/02	0	100%
Create architecture diagrams	15/02	18/02	0	100%
Final architecture diagram	19/02	21/02	0	100%
Create product logo	11/02	21/02	0	100%
Finish profile page layout	15/02	21/02	0	100%
Implement basic price prediction mo...	15/02	21/02	0	100%
Finish user authentication	15/02	21/02	0	100%
Week 5	**22/02/21**	**28/02/21**	**0h**	**90%**
Write user guide	22/02	28/02	0	50%
Create final version of architecture d...	22/02	26/02	0	100%
Update & submit product brief	22/02	26/02	0	100%
Add security measures to prevent inj...	22/02	28/02	0	100%
Add fields to user posts	22/02	28/02	0	100%
Change layout of photos on posts	22/02	28/02	0	100%
Further work on price prediction mo...	22/02	28/02	0	100%
End of week 5	28/02	28/02	0	0%
update product brief	01/03	05/03	0	100%
Work on more detailed gantt chart	01/03	05/03	0	100%
update architecture diagram by addi...	01/03	05/03	0	100%
work on pdf for the beta release sub...	01/03	05/03	0	100%
implementing search functions for s...	01/03	03/03	0	100%
charting price estimations	01/03	03/03	0	100%
working on prediction model	01/03	05/03	0	100%
returning values to kevin that he can...	01/03	03/03	0	100%
setting up password reset	01/03	03/03	0	100%
changing layout of posts and profile ...	01/03	03/03	0	100%
write up html for user guide	03/03	05/03	0	100%
week 7	**08/03/21**	**15/03/21**	**0h**	**100%**
Work on dashboard	08/03	15/03	0	100%
change post layout and size	08/03	14/03	0	100%
crispy form format	08/03	14/03	0	100%
message button and notification	08/03	14/03	0	100%
messaging system	08/03	14/03	0	100%
delete account implement	08/03	14/03	0	100%
user interaction section analytics	08/03	14/03	0	100%
registration form - add names	08/03	14/03	0	100%
user guide address restriction	08/03	14/03	0	100%
user guide - mobile not recommended	08/03	14/03	0	100%
user guide - how to use dashboard	08/03	14/03	0	100%

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