Development of a map-based web application to be used by visitors and staff at the Dyfi Wildlife Centre

Report Name	Project Outline
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1.   Project description

The Dyfi Wildlife Centre is a visitor centre run by the Montgomeryshire Wildlife Trust, situated on the Cors Dyfi Nature Reserve in Powys, Wales. Its purpose is to showcase the reserve's work, and its place as an osprey conservation, engagement, and research project [1]. This project will aim to create a map-based application to assist volunteers at the centre in providing a positive experience to their visitors, being used through a browser on a touchscreen Windows PC.

The project will develop a single-page web application to assist volunteers in providing information to visitors. The interface will involve the use of a map API, such as the OpenStreetMap API [2] or Google Cloud Maps Platform [3]. An interface for adding information about specific points of interest will also be developed. The application should also provide access to the Dyfi Osprey Project's existing osprey webcams.

The project will also develop an administration portal, where volunteers can enter and manage information about the nature reserve through a graphical interface. Initial requirements will have to be sought from the customer at some stage during the project. Information will be stored via persistent data.

The application will be used directly by the Dyfi Wildlife Centre. There is a need for the application to be maintainable and written with a view to long-term use. The project will place focus on sustainable software, along with the development of documentation for both end users and developers on how to use and maintain the application. Consideration will be placed on ensuring that it can be easily iterated upon for any future use-cases.

The project will utilise an adapted form of Agile Development for one-person software development [4], which will be further adapted for an academic software project. The project will place emphasis on Test-Driven Development, with the construction of a CI/CD pipeline to assist in delivering working software.

2.   Proposed tasks

The following tasks will be carried out as part of this project:
- **Investigation of technology stacks for development –** This task will research into which technology stack to use for the development of the application. A review will take place of the advantages and disadvantages of certain stacks. Prominent stacks to investigate would be a CSS framework such as Bootstrap or Material Design and then a choice between a JavaScript stack like MEAN (MongoDB, Express.js, Angular and Node.js) or other stacks such as Django's Python stack or Spring's Java stack. Research into choosing a technology stack will be consulted [5], as well as the customer's existing hosting infrastructure.
- **Creating the development environment** – This task will gather the necessary requirements for creating a local environment for development of the project. Use of container platforms such as Docker for Windows [6] may be beneficial. The task will also initialise a version control system, with a choice being made as to whether to use the department's git repository, or an external service, likely GitHub [7]. A choice will also be made as to the tools for a CI/CD pipeline.
- **Developing the application** – The development stage of this project will be broken down into two primary subtasks.
  - **User interface** – This subtask focuses on the UI, and the creation of the layout for the web application and the administration portal where data entered can

be edited. The map API chosen will also be embedded. Static mock data will be used during this phase.

- o **Back-end development** – This subtask focuses on implementing CRUD operations for data and building the database. It will also ensure an authentication protocol is selected to allow access to the administration portal. Any APIs used in the UI will be interfaced with the data.
- **Communicating with stakeholders** – Communicaton throughout the project with its stakeholders will be required. Weekly supervisor meetings will occur, as well as a web page containing a project journal to ensure the current progress of the project is clear. This project also involves an external customer; a contact at the Dyfi Wildlife Centre. Regular meetings, either in-person or by e-mail, will be required throughout the project to ensure that the customer's requirements are clear. Two demonstrations; a mid-project demonstration in March, and a final demonstration in May, will be scheduled, and suitable preparations for these will be made.
- **Creating documentation** – Documentation will be a crucial part of this project. This document and the final report will be created and disseminated to relevant people in the department. A project maintenance document will be created to ensure that future developers have a better understanding of how to maintain and iterate upon the project. A brief user manual will also be created to assist volunteers in using the system.

3.   Project deliverables

The project will output the following deliverables – all files mentioned will be submitted as part of the assessment, and be available on the project's version control system:

- **User Interface code** – Source code for the front-end UI will be provided as part of the technical submission, with any third-party scripts or tools included.
- **Back-end code –** Source code for the back-end UI will be provided as part of the technical submission. This will include code for the application and runtime frameworks and may include some form of installation script should it be required. A Docker image may also be provided, dependent on the development process used.
- **Tests** – A set of tests for each component of the application will be provided as part of the technical submission. Various type of testing will be implemented into the project as required, and data from a Continuous Integration platform will be submitted where available, either in the final report or a separate test specification.
- **Project manuals** – A manual will be created for the end user of the resulting project. This manual is intended to be brief, as operation of the app is not intended to be complicated, however it will act as a quick reference for end users. A project maintenance manual will also be created; this will describe the technical specifications required for the web app and describe how to maintain it.
- **User Stories** – An amalgamation of Kanban and XP (eXtreme Programming) will be used during the software development process, and stories will be used to discover what requirements are needed in the project. These will be broken down into tasks relevant to the technologies used in the application. One way of realising this deliverable would be to utilise GitHub's *Issues* function, and use of GitHub's *Project Boards* feature, namely its *Automated Kanban* template. Other tools such as Trello [8] may be useful for this, too. The stories and project board will be available in the repository, and a representation of them will be included as an appendix in the final report.
- **Notes for mid-project demonstration and final demonstration** – The first of the two demonstrations will include notes, which I will submit as part of the assignment, as well as any further discussions about the notes I may have with the supervisor or any other teaching staff. The final demonstration will not involve any documentation, however preparations must be made to ensure a successful demonstration of the project

4.   Annotated Bibliography

[1] "Dyfi Wildlife Centre | Montgomeryshire Wildlife Trust", *Montwt.co.uk*. [Online]. Available: https://www.montwt.co.uk/projects/dyfi-wildlife-centre. [Accessed: 02- Feb- 2020].

> *This website contains information relative to the Dyfi Wildlife Centre. It is useful to have a brief overview of the project's requirements, as well as being able to be used as a point of discussion with the customer.*

[2] *OpenStreetMap API*. OpenStreetMap Foundation, 2019.

> *The OpenStreetMap API provides open-source geodata that can be used to generate a map of the nature reserve. The benefit of this is that it does not require any form of subscription, however it does not provide a satellite overlay.*

[3] "Pricing & Plans | Google Maps Platform | Google Cloud", *Google Cloud*. [Online]. Available: https://cloud.google.com/maps-platform/pricing. [Accessed: 02- Feb- 2020].

> *This website provides information regarding the pricing model of Google Maps' API. It describes a free tier, and a review as to whether it will be sufficient for the purposes of this project is required. Google Maps provides a more robust interface, including markers as well as a satellite overlay.*

[4] A. Nystrom, "Agile Solo: Defining and Evaluating an Agile Software Development Process for a Single Software Developer", Masters' thesis, Chalmers University of Technology, 2011.

> *This is the title of a Masters' thesis that proposed an adaption of Agile software development for developers working by themselves. This will be a useful reference for ensuring there is a overlaying method to the development stages of the project. However, certain parts of the proposed method, such as regular reviews by other people, would not be possible in the context of an academic project.*

[5] Y. Brikman, "Choosing a Tech Stack," in Hello, Startup: A Programmer's Guide to Building Products, Technologies, and Teams, Sebastopol, O'Reilly Media, 2015.

> *This is a chapter from a book dealing with building products in a startup environment. While this is clearly not the case for this project, the chapter includes details and case studies on different technology stacks, which will be useful when looking for reputable information on stack choices.*

[6] *Docker Desktop for Windows*. San Francisco: Docker, Inc., 2020.

> *Docker for Windows is virtualisation software for Windows PCs. Docker runs software in containers, essentially lightweight virtual machines, that are isolated from its host. This would be useful for local development, as it avoids interfering with the host, as well as avoiding running development builds on a live server.*

[7] *GitHub*. GitHub, Inc. [Online]. Available: https://github.com. [Accessed 02- Feb- 2020]

> *GitHub hosts Git; a type of version control software. The intention is for the project's repository to use Git and it be hosted on GitHub. GitHub also provides useful tools such as issue tracking and project boards, which can be used as part of the software development process.*

[8] *Trello*. Sydney: Atlassian Corporation plc. [Online]. Available: https://trello.com/home. [Accessed 02- Feb- 2020]

> *Trello is a project management web application that uses boards and cards to realise a Kanban development process. It can integrate with GitHub's issue tracking feature and allows you to provide far more detail in cards. A decision will be made during the project's planning stage as to whether to use Trello's free tier or keep inside the GitHub ecosystem.*

Appendix A – Rich Picture

Web App for the Dyfi Wildlife Centre

I need a good database to store lots of different info

System for showing details about the centre

I want to keep information about our ospreys

I may not be technically trained, I want a user-friendly interface

Volunteer

I want to present information in an engaging way

Used by my volunteers

Project manager/Centre contact

I want it to have a map showing information about the nature reserve

View

I want to see where things around me are

Present

I want to learn more about the centre and its activities

Visitors

I want to be able to see the Ospreys live on a webcam.