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**School of Computing and Mathematical Sciences**

**CO7201 Individual Project**

**Preliminary Report**

**AN AUTOMATED SYSTEM FOR LOCAL GPS**

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Contents

[**1.** **Aims and Objectives** 3](#_Toc191476340)

[**1.1** **Challenges** 3](#_Toc191476341)

[**2.** **Requirements** 3](#_Toc191476342)

[**2.1** **Essential** 3](#_Toc191476343)

[**2.2** **Recommended** 4](#_Toc191476344)

[**2.3 Optional** 4](#_Toc191476345)

[**3.** **Technical Specification** 4](#_Toc191476346)

[**4.** **Requirements Evaluation Plan** 5](#_Toc191476347)

[**4.1. Evaluation Criteria** 5](#_Toc191476348)

[**4.2. Testing Method** 5](#_Toc191476349)

[**5.** **Background Research and Reading list** 6](#_Toc191476350)

[**5.1** **Related Work** 6](#_Toc191476351)

[**5.1.1** **Existing Web Applications GP.** 6](#_Toc191476352)

[**5.1.2** **Articles** 7](#_Toc191476353)

[**5.1.3** **Software Design and Technical Research** 7](#_Toc191476354)

[**6.** **Time-plan and Risk Plan** 8](#_Toc191476355)

[**6.1 Time plan** 8](#_Toc191476356)

[**6.2 Risk Plan** 12](#_Toc191476357)

[**7.** **References** 12](#_Toc191476358)

# **Aims and Objectives**

United Kingdom is the sixth largest economical country across the globe[1], and yet it is facing healthcare crises. Few of the major reasons that contribute to downfall of the healthcare sector within the UK are lack of staff, an aging population, burnout of existing staff and over population. On the 2nd of October 2024 a report published by BBC News stated that, the cities that had most patient per GP were Thurrock, Leicester, Blackburn with Darwen’s, Luton and Melton Keynes and Portsmouth [4].

While this is just a broad overview of the healthcare sector, the ground reality is far more disturbing. Patients are not able to receive proper treatment due to reasons zero knowledge about availability of doctors or nurses, no information regarding minor injuries, never-ending appointment forms and, sometimes not even able to secure one appointment.

Inorder to address these issues, the aim of this project is to design/develop An Automated System for Local GPs, which will be helpful for both healthcare staff and Patients. The Web app would be developed considering objectives such as data security, less time-consuming processes and user-friendly UI. These objectives will cater the need of both healthcare staff and Patients by allowing staff to set availability prior then a month, retrieve medical history of patients with ease and provide prescriptions while maintaining medical records. On contrary, the patients will be able to manage/ view prescriptions, for minor injuries they could leverage informative articles and free one-to-one chat feature available on the Web App. This project will allow the patients to access the GP on-demand without waiting for weeks or months and this will also optimize the workload for the staff.

# **Challenges**

* Security of the web application due to data confidentiality.
* User friendly Designs, without much re-routing.
* Easy appointment scheduling without much hassle.
* One-to-One Chat feature for GP and Patients.
* Payment integration.
* Cloud Deployment.

# **Requirements**

# **Essential**

* **Registration:** The patient will be able to register to the webapp using secure login credentials, allowing them to add/upload their previous medical history. Registration of Doctors and Nurses will be performed by Admin.
* **Availability:** The Doctor and Nurses will be allowed to set their availability prior to a month.
* **Book appointment:** As per the need of patients they can book the appointment with the available Doctor/Nurse.
* **Provide prescription:** The Doctor will be able to access medical history of patients and provide a digital prescription on the web app.
* **Admin Dashboard: The dashboard will help to add/delete patients, add/delete doctors, add/delete nurses and scheduling the bookings for senior citizens.**
* **Staff Dashboard:** The Dashboard will help staff to set their availability, view booked appointments, provide prescriptions, view patients medical history and send prescription to pharmacy.
* **Patient Dashboard:** The Dashboard will show the Doctor/Nurse Availability, book appointment, view prescriptions, upload the prior medical history, previous booked appointments records.

# **Recommended**

* **Deployment on the cloud**
* **Articles for minor injuries & awareness:** Inorder to tackle mild external injuries, Articles will be provided inorder to take safety measures at home which will reduce some staff workload.
* **View prescription:** The patient will be able to view the prescription provided by the Doctor/Nurse online.
* **Buy and Pay prescriptions:** For the prescribed medicine the patient can buy and pay for the prescription either online or offline.

# **2.3 Optional**

* **One to one chat:** Due shortage of Doctor/Nurse, if in case there's a follow-up required for a specific patient, or a patient requires immediate attention the chat feature can be leveraged.
* **Responsive Web Application.**
* **Video Consultation**

# **Technical Specification**

The below attached table provides brief description of each of the component that will be used in the project(refer table 1).

|  |  |  |
| --- | --- | --- |
| **Component** | **Name** | **Summary** |
| Database | MongoDB/ SQL | Storing and managing the data either structured or unstructured data. |
| Backend | Python, Flask |  |
| Frontend | React JS, HTML, CSS, JS | Design a dynamic and responsive web application [6]. |
| API | REST |  |
| Authentication | JWT/OAuth | Secure authentication. |
| Cloud Deployment | AWS / Azure | Hosting the application considering the availability and consistency. |
| Version control | Git, GitLab | Track of the whole project. |
| IDE | Visual Studio Code |  |
| Testing | Manual testing, User Feedback(frontend), Unit testing, Postman (API) | Testing the application inorder to understand the mistakes and redo the work inorder to achieve the task. |
| Designing | Figma, Sketch (paper & pen), Draw.io | For each of the web application pages design a low-fidelity design, wireframes , ER Diagram, Use case diagram and Class diagram. |
| Documentation | MS Word |  |
| Operating System | Windows |  |

**Table 1: Technical Specification**

# **Requirements Evaluation Plan**

# **4.1 Evaluation Criteria**

* Functionality: Features such as User authentication, prescription management and appointment booking are the essential aspects of this project, which should be fully functional.
* Usability: The User Interface, navigation and accessibility needs to be tested through user testing, especially considering elderly people.
* Security: Testing should be carried out to test that there is no data leakage and medical records are handled safely.
* Scalability: The Web app should be able to handle multiple user simultaneously, while maintaining the same responsiveness.

# **4.2 Testing Method**

* Unit Testing: Each component should be tested individually.
* Integration Testing: Test how well frontend, backend and database work together.
* User Acceptance Testing: Test the application with end users like elderly people and Doctors.

# **Background Research and Reading list**

# **Related Work**

# **Existing Web Applications GP.**

Currently there are various GP websites that provide the services online, but lacks in appointment booking, user interface or complex navigation. Regent Street Clinic[5] is one such example, this website has a load of pop-ups, and the UI is very much complex to understand from end user perspective. The major drawback seems to be in the appointment booking, as this application asks for up-front payment.

Another example is Leicester Holistic GP [3], where the website has a very bad user experience, for booking an appointment the form behaves weird, no-proper colours used and less interactive.

Similarly, Highfield Surgery Seven Street[2] website, serves all the necessary services, however, lacks the fundamental of website development, which would be the User Interface. The very first step to consider before building the UI is to identify the key users. Considering UK’s current demographics, a lot of the users of healthcare services are elder people. Providing a lot of information such as news, options to book self-service would seem bit overwhelming to the elderly people.

The mentioned website shows a broad comparison about the existing GP web application which develop a fault inorder to convey a smooth experience. Due to which this project aims to deliver a user-friendly interface considering the principles of user interface and user interaction, smooth appointment booking and maintain medical history digitally

.

1. [*https://highfieldsurgerysevernstreet.co.uk/*](https://highfieldsurgerysevernstreet.co.uk/)

*The provided website for a GP serves all the necessary services, however, lacks the fundamental of website development, which would be the User Interface. The very first step to consider before building the UI is to identify the key users. Considering UK’s current demographics, a lot of the users of healthcare services are elder people. Providing a lot of information such as news, options to book self-service would seem bit overwhelming to the elderly people.*

1. [*https://www.regentstreetclinic.co.uk/*](https://www.regentstreetclinic.co.uk/)

*Similarly, this website has a load of pop-ups, and the UI is very much complex to understand from end user perspective. The major drawback seems to be in the appointment booking, as this application asks for up-front payment.*

1. [*https://www.leicest* (Regent Street Clinic, n.d.)(Leicester Holistic GP, n.d.)*er-holistic-gp.co.uk/*](https://www.leicester-holistic-gp.co.uk/)

*The website has a very bad user experience, for booking an appointment the form behaves weird, no-proper colours used and less interactive.*

# **Articles**

Upon examining the existing GP web application, the articles provide understanding about the challenges that were faced by the GP and the healthcare. The article “General practice on the brink: what should reform look like?” [8]written by Dr Rebecca Rosen that was published on 17th May 2022, tells about the problems that were faced by the Patient and GP and also provides a solution such as the major four fundamentals functions that GP must be able to cover, appointment scheduling for minor problems and acute problems and use of digital technologies.  
Another article “The growing crisis in general practice: a call to save our surgeries”[5] written by Rebekah Price published on Tuesday 15 October 2024 informs about the crises that were being faced by the GP and administration work and increase in the demand and expectation of the patient and what can be provided to the patient is far more difficult.

1. [*https://www.nuffieldtrust.org.uk/news-item/general-practice-on-the-brink-what-should-reform-look-like*](https://www.nuffieldtrust.org.uk/news-item/general-practice-on-the-brink-what-should-reform-look-like)

*The article “General practice on the brink: what should reform look like?” written by Dr Rebecca Rosen that was published on 17th May 2022, tells about the solution for the problems that were faced by the Patient and GP such as the major four fundamentals functions that GP must be able to cover, appointment scheduling for minor problems and acute problems and use of digital technologies.*

1. [*https://www.bma.org.uk/news-and-opinion/the-growing-crisis-in-general-practice-a-call-to-save-our-surgeries#:~:text=A%20crisis%20in%20General%20Practice,load%2C%20the%20pressure%20is%20immense*](https://www.bma.org.uk/news-and-opinion/the-growing-crisis-in-general-practice-a-call-to-save-our-surgeries#:~:text=A%20crisis%20in%20General%20Practice,load%2C%20the%20pressure%20is%20immense)

*The article that was published on Tuesday 15 October 2024,* *informs about the crises that were being faced by the GP and administration work.*

# **Software Design and Technical Research**

The publication “Software Testing Techniques and Levels in Software Development”[9] written by Samuel Gbli Tetteh tells when exactly to start with the testing, types of the testing software such as manual testing, automated testing, white box testing, black box testing , grey box testing, load testing and stress testing. However, it also mentions about the levels of the software testing that is unit testing, integration testing, system testing and validation testing.

In Addition, “Types of software Architecture pattern”[10] talks about the software architecture patterns that are been used in real world, where in this project the Micro-Service architecture will be used due to its functionality[11].

1. [*https://www.researchgate.net/publication/387460992\_Software\_Testing\_Techniques\_and\_Levels\_in\_Software\_Development*](https://www.researchgate.net/publication/387460992_Software_Testing_Techniques_and_Levels_in_Software_Development)

*The publication tells us that when exactly to start with the testing, types of the testing software such as manual testing, automated testing, white box testing, black box testing , grey box testing, load testing and stress testing. However, it also mentions about the levels of the software testing that is unit testing, integration testing, system testing and validation testing.*

1. [*https://www.geeksforgeeks.org/types-of-software-architecture-patterns/#what-is-software-architect*](https://www.geeksforgeeks.org/types-of-software-architecture-patterns/#what-is-software-architect)

*This publication talks about the software architecture patterns that are been used in real world, where in this project the Micro-Service architecture will be used.*

1. [*https://www.geeksforgeeks.org/microservices/*](https://www.geeksforgeeks.org/microservices/)

# **Time-plan and Risk Plan**

## **Time plan**

During the entire time plan, the software development life cycle stages is been considered and will be implemented accordingly.

NOTE: The time plan may change if in case of any delays.

A Gantt chart has been provided for the time plan (refer figure:1).

**Week 1 : 10/02/2025 - 16/02/2025**

* ***Milestone Achieved: Planning and Requirement Analysis (Stage 1).***

In this week, the supervisor(in-person) meeting was scheduled, and the task were gathering the information about the current system of the GP, draw the ER-Diagram, Use Case Diagram for the project and submission of the Project Description (14th February 2025). The milestone achieved within this week was the 1st stage of software development lifecycle that is Planning and Requirement Analysis.

**Week 2 : 17/02/2025 - 23/02/2025**

* ***Milestone Achieved: Defining Requirements (Stage 2) & Design(Stage 3).***

The plan during this week was to draw the Use Case Diagram, design the wireframes for each of the web application page and draft for the preliminary report. Upon completion of the diagrams, //how did it become useful.

**Week 3: 24/02/2025 - 02/03/2025**

* ***Milestone Achieved: Start of Development (stage 4)***

The supervisor(in-person) meeting will be held which will help to get feedback on the preliminary report. The task will be designing the login/register page for the web application and submit the preliminary report (28th February 2025).

**Week 4: 03/03/2025 - 09/03/2025**

* ***Milestone Achieved: Login/Register Successful.***

The group supervision meeting will be held. The task to do within this week is to work with the backend login of login/register and design the user interface for the dashboard of (Doctor / Nurse / Patient). Upon successful completion of the login/register, the manual testing and API testing will be conducted.

**Week 5: 10/03/2025 - 16/03/2025**

* ***Milestone Achieved: Dashboard Successful.***

The supervisor(in-person) meeting is scheduled where the completed task will be shown and will get the feedback on the user interface of the login/register page and dashboard (if completed). This week the logic for the dashboard will be completed and will start designing the Appointment booking page. Once completed with the dashboard, manual testing plus the API testing will be done.

**Week 6: 17/03/2025 - 23/03/2025**

* ***Milestone Achieved: Appointment Booking Successful.***

The logic for the appointment booking and designing the prescription management will be done within this week. And the draft for the Interim report will be done.

**Week 7: 24/03/2025 - 30/03/2025**

The supervisor(in-person) meeting is scheduled were I’ll be showcasing the completion till the appointment booking and start designing the One-to-one chat feature. Therefore, the interim report will be submitted (28th March 2025).

**Week 8: 31/03/2025 - 06/04/2025**

The logic for the one-to-one chat will be implemented and the principal marker interview will be held.

**Week 9: 07/04/2025 - 13/04/2025**

* ***Milestone Achieved: Essential Requirement Achieved along with few of the Recommended and Optional feature.***
* ***Milestone Achieved: Testing (Stage 5).***

The supervisor (in-person) meeting will be held where the working application will be shown. The web application will be tested and if in case any backlogs are remaining it will be completed during this week. If time persist, the cloud architecture will be designed which will help to deploy the application.

**Week 10 & Week 11: 14/04/2025 - 27/04/2025**

* ***Milestone Achieved: Deployment and Maintenance (Stage 6).***

The supervisor (in-person) meeting will be held and during this two week the applicant will be successfully deployed to the cloud and the final report template will be drafted and submitted (25th April 2025).

**Week 12: 28/04/2025 - 04/05/2025**

The group supervisor meeting will be held, and the previous backlogs will be completed plus writing the final report will be started.

**Week 13: 05/05/2025 - 11/05/2025**

The supervisor (in-person) meeting will be held. During this week, continuation of final report and testing the code will be conducted.

**Week 14: 12/05/2025 - 18/05/2025**

In this week, the final report and code will be submitted (16th April 2025).

**Week 15: 19/05/2025 - 23/05/2025**

In this week, the final viva will be conducted.

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**Figure 1: Gantt Chart**

# **6.2 Risk Plan**

The table 2 shows the risk, impact and mitigation that can be occurred during the development of the project.

|  |  |  |
| --- | --- | --- |
| **Risk** | **Impact** | **Mitigations** |
| Data Privacy | High | Secure the login using JWT. |
| Integration Service | High | Perform API testing at earliest stage. |
| Cloud Deployment | High | Plan early deployment inorder to mitigate upcoming issue. |
| Payment Integration | High | Troubleshoot any integration issue. |

**Table 2: Risk Plan**

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