

ENSE 374 – Software Engineering Management

MediLocate

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# Introduction

MediLocate is a web-based application designed to streamline how Canadians book medical appointments, addressing common frustrations like long wait times and communication barriers. Traditional appointment booking methods are often inefficient, leaving patients frustrated and clinics overwhelmed. MediLocate offers a user-friendly platform for patients to easily schedule appointments and for medical staff to manage their availability.

The rationale for this project stems from the urgent need to modernize healthcare access. With the rise of digital solutions, there’s a clear demand for a platform that simplifies the booking process while maintaining flexibility and reliability for both patients and healthcare providers. MediLocate’s design aims to fill this gap by providing a seamless and accessible solution.

**Project Requirements**

Stakeholders have outlined the following key requirements for MediLocate:

* **User Roles and Logins**:
  + Patients should be able to browse clinics, view availability, and book appointments.
  + Medical staff should manage schedules, update availability, and share information.
* **Clinic and Appointment Management**:
  + Clinics must be able to upload addresses and set schedules weekly, biweekly, or monthly.
* **Search and Filtering**:
  + Users should search clinics by location, specialty, or user reviews.
* **User-Friendly Interface**:
  + The platform should be intuitive for all users, offering quick and clear navigation.
* **Real-Time Updates**:
  + Both patients and clinics should access up-to-date availability.

For detailed requirements, refer to the Project Requirements Document.

**Overview of the Document**

The next sections will provide:

1. **Design Problem Analysis**: A detailed breakdown of challenges in the current appointment scheduling process.
2. **Proposed Solutions**: Exploration of design alternatives and justification for the chosen approach.
3. **Implementation Plan**: Key technical details and project roadmap.
4. **Project Management Plan**: Strategies for development, testing, and deployment phases.

# Design Problem

Accessing healthcare in Canada should be simple, but for many, it’s a frustrating process. Despite the universal healthcare system, patients face long waits, challenges in booking appointments, and limited clinic availability. These issues are more than inconveniences—they can delay diagnoses and treatments, leading to serious health risks.

## Problem Definition

For a detailed analysis, refer to [Business Case](Business%20Case.pdf).

Canada’s healthcare system struggles with accessibility. With only 2.6 physicians per 1,000 people, the demand for medical services far outstrips the supply. Nearly **30% of Canadians** report trouble accessing care, and **20% of patients** experience delays of over a week just to see a family doctor. This imbalance frustrates patients and sometimes prevents them from receiving critical care.

The impact is widespread:

* **Patients’ Health**: Delayed care can worsen medical conditions, increase anxiety, and lower quality of life.
* **Rural Disparities**: People in remote areas face even more obstacles, with fewer healthcare facilities and long travel times.
* **Clinic Operations**: Manual appointment scheduling adds administrative strain, increases errors, and reduces efficiency.
* **Provider Burnout**: Overloaded clinics struggle to manage patient flow, often leading to staff burnout and declining care quality.

Without an efficient system, patients and providers both suffer from mismanaged resources and unmet needs.

## Project Charter

For more details, refer to the [Project Charter](Project%20Charter.pdf).

MediLocate addresses these problems by offering a streamlined, web-based solution that simplifies appointment booking for patients and eases scheduling management for clinics. This platform is designed to reduce inefficiencies, improve patient access, and support healthcare providers in delivering quality care.

This section introduces the challenges MediLocate aims to solve and sets the foundation for the project’s goals and strategies. The following sections will explore the project’s design, solution strategies, and implementation plan.

# Solution

In this section, we provide an account of some solutions our team brainstormed to implement the MediLocate project. Each solution varied in its approach, features, and the ability to meet the constraints outlined in the business case. The iterative nature of engineering design allowed us to refine these ideas until we selected the final solution that best balanced all requirements.

MediLocate was conceived to bridge the gap in healthcare accessibility by offering a platform where clinics can efficiently manage their availability and patients can seamlessly book appointments. This system helps reduce wait times, improve healthcare service efficiency, and ensure that patients have timely access to necessary care.

## Solution 1

Our first solution focused on creating a platform where clinics could upload and manage their schedules with flexibility, allowing them to update their availability on a weekly, biweekly, or monthly basis. This would empower patients with a clear and up-to-date view of appointment slots, enabling them to choose times that fit their schedules without the hassle of phone calls.

**Reasons for Not Selecting:** While this solution provided transparency for patients and clinic management, it lacked two key features:

* **Automated reminders**: Critical for reducing missed appointments and improving patient adherence to their scheduled visits.
* **Electronic Health Record (EHR) integration**: Essential for medical staff to access patient histories efficiently and offer better care.

Without these features, the solution wouldn't provide the full value needed for a seamless healthcare experience, and we decided to move forward with more comprehensive alternatives.

## Solution 2

The second solution improved upon the first by integrating an interactive map using the Google Maps API, displaying clinics near a user's location. This approach provided a more intuitive and visual way for patients to find and book appointments with local clinics, offering details like addresses, operating hours, and available services. Additionally, we planned accessibility features such as text-to-speech for visually impaired users.

**Challenges:**

* Integrating Google Maps with real-time scheduling data was complex and could create maintenance challenges.
* Development time for accessibility features would require additional resources and testing.

This solution addressed usability and accessibility, but the technical complexities and additional time needed for accessibility features meant it wasn't quite the best fit for the project at this stage.

## Final Solution

**Solution Overview:** This final solution incorporates the most critical features to enhance the user experience for both patients and healthcare providers. It combines a robust appointment scheduling system, the ability for patients to easily find the right healthcare professional, and upfront visibility into the costs of medical services. It also focuses on simplifying appointment management for medical professionals to help them gain more patients and keep their schedules organized.

1. **Why this solution is better:**

This solution addresses the business needs identified in the case by enabling both patients and healthcare providers to efficiently book and manage appointments. By offering transparent service pricing, and simplifying the process of finding medical professionals, it helps build trust and ensures a smooth experience for all users.

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Solution 1** | **Solution 2** | **Final Solution** |
| **Appointment Scheduling** | Flexible scheduling options, but lacked automated reminders | Interactive map with location-based search, but lacked integrated scheduling | Complete scheduling system with automated reminders and real-time updates |
| **Finding Medical Professionals** | Clinics can upload availability | Clinics displayed via a map, but without detailed filtering | Detailed search based on specialties, location, and availability |
| **Pricing Transparency** | Lacked pricing details | Map-based solution but no pricing display | Transparent pricing for all services upfront |
| **Patient/Professional Interaction** | Simple schedule view | Interactive map for location-based choices | Allows patient review, appointment requests, and professional profile management |
| **System Complexity** | Simple, lacked key features | Complex, but missing some essential features | Comprehensive, integrates key features while maintaining usability |

### Components

This final solution builds on the previous work while refining the features and keeping the system simple and effective. The components include:

* **Frontend (User Interface):** A user-friendly web interface where patients can book appointments and healthcare providers can manage their schedules and patient interactions.
* **Backend (Server/Database):** A relational database (SQL) for storing medical professional profiles, appointment details, and pricing information.
* **Appointment Scheduling:** Patients can schedule appointments with real-time availability, and healthcare professionals can manage their appointments.
* **Transparent Pricing:** Healthcare professionals can set and display the cost of their services upfront, ensuring transparency for patients.
* **User Profiles:** Patients can create profiles to manage their appointments, while healthcare professionals can manage their availability, specialties, and patient reviews.
* **Notifications:** Patients and healthcare professionals will receive automated reminders about upcoming appointments, reducing no-shows.

**Block Diagram (Fig. 1):**

* Patient → Selects professional and books appointment → System updates availability.
* Healthcare Professional → Manages availability, specialties, and service costs → System updates patient view.

### Features

* **Appointment Scheduling:** Patients can schedule appointments with real-time availability, and healthcare professionals can manage their appointments.
* **Transparent Pricing:** Healthcare professionals can set and display the cost of their services upfront, ensuring transparency for patients.
* **User Profiles:** Patients can create profiles to manage their appointments, while healthcare professionals can manage their availability, specialties, and patient reviews.
* **Notifications:** Patients and healthcare professionals will receive automated reminders about upcoming appointments, reducing no-shows.

### Environmental, Societal, Safety, and Economic Considerations

* **Environmental Impact:** Reducing paper-based appointment systems helps minimize environmental waste and contributes to sustainability.
* **Societal Impact:** The solution provides easier access to medical care by improving scheduling efficiency. It also helps patients make informed decisions by providing transparency in pricing and reviews.
* **Economic Considerations:** This platform is designed to reduce administrative overhead, improve appointment adherence, and drive patient satisfaction. While the initial development costs are moderate, the platform’s long-term savings and scalability make it a worthwhile investment.
* **Safety and Security:** The platform follows privacy regulations (e.g., HIPAA) to ensure that patient data is secure. It also improves patient safety by reducing scheduling errors and providing clear information about healthcare provider

### Limitations

* **No Payment Integration:** Currently, there is no payment system integrated within the platform, though it can be added in future versions.
* **No EHR Integration:** The platform doesn’t yet integrate with Electronic Health Records (EHR) systems, limiting the ability to access patient health data directly. However, this feature can be added later for enhanced functionality.
* **Dependence on Internet Connectivity:** As a web-based platform, it requires reliable internet access, which may limit its availability in areas with poor connectivity.
* **Lack of Authentication for Medical Professionals:** There is no built-in authentication process to verify the credentials and qualifications of medical professionals on the platform. This could lead to concerns over the legitimacy of service providers, which will be addressed in future versions by integrating a secure verification system.

# Team Work

Since this is a group project, you must have a fair distribution of tasks among yourselves. To this end, you must hold meetings to discuss the distribution of tasks and to keep a track of the project progress.

## Meeting 1

Provide Links to ‘Meeting Agenda, Meeting Minutes, Change Request, Project Status Report, Issue Log’ documents.

## Meeting 2

Provide Links to ‘Meeting Agenda, Meeting Minutes, Change Request, Project Status Report, Issue Log’ documents.

# Project Management

Provide the link to ‘Milestone-based Schedule’ document. Use Gantt chart as well to show the progress of your work here. Mention all the tasks along with their predecessors. Provide the slack time of each task and identify the critical path.

# Conclusion and Future Work

In this project, we successfully developed a comprehensive **appointment scheduling system** for medical professionals, enabling patients to find the right specialists, schedule appointments, and understand upfront costs for services. The system also allows medical professionals to manage their appointments efficiently, ensuring a streamlined process for both patients and practitioners.

Despite the progress made, several limitations remain. Notably, the solution lacks **authentication for medical professionals**, **payment system integration**, and **EHR (Electronic Health Record) integration**. Additionally, the system does not provide real-time updates, which can be crucial for seamless operation.

#### **Lessons Learned Report**

A detailed overview of the key takeaways and insights gained throughout the development process can be found in the **Lessons Learned Report**.

#### **Recommendations for Future Design Improvements**

1. **Authentication for Medical Professionals**: Future versions of the system should incorporate proper authentication mechanisms to ensure that only authorized medical professionals can access sensitive patient and appointment data.
2. **Payment System Integration**: Adding payment functionality within the platform would allow patients to pay for services directly through the system, improving convenience and automating the billing process.
3. **EHR Integration**: To improve the efficiency of patient care, integrating the system with an Electronic Health Record (EHR) system would provide medical professionals with real-time access to patient medical history and current treatment plans.
4. **Real-time Updates**: Implementing real-time updates would ensure that patients and medical professionals are always in sync with appointment status, cancellations, or rescheduling, providing a more dynamic and responsive experience.

In summary, while the current system serves as a solid foundation for appointment scheduling and patient management, there are ample opportunities for future enhancements that would improve security, usability, and overall functionality.

# References

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* Do not put any reference if it is not cited in the text.