

NEW YORK UNIVERSITY | ABU DHABI
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CS-UH 2012: SOFTWARE ENGINEERING

Project Proposal

Development of MedSync

PREPARED FOR:

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1. PROJECT TITLE:

MedSync: Streamlining Healthcare

2. PROJECT TEAM:

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3. PROJECT DESCRIPTION:

MedSync is a web application primarily aimed towards private general practitioners who seek to enhance doctor-patient interactions. Through a doctor-patient management system, we provide user-friendly interfaces for both the doctors and the patients. MedSync enables patients to smoothly schedule appointments by providing real-time availability updates. Patients could also receive medical prescriptions, access diagnostic reports, and even opt for remote consultations via the video chat option provided through the system; throughout their consultations, patients will stay informed with notifications. Furthermore, doctors who use our platform could utilize the power of ApiMedic to gain intelligent diagnostic support to aid them in making well-informed decisions quickly. The project encompasses both front-end and back-end solutions in collaboration with a database for storing patient and doctor information. The medical management system is set out to ensure that users stay ahead in the rapidly evolving digital healthcare landscape.

4. BUSINESS GOALS:

- Facilitate patient-doctor communication and interaction.
- Provide a seamless and user-friendly experience for both doctors and patients.
- Increase efficiency in appointment management.
- Enhance the accuracy and speed of diagnosis through AI recommendations.
- Streamline prescription processes through digital prescriptions.
- Enable remote access to the healthcare services of private doctors.

5. MAIN FEATURES (ENGINEERING OBJECTIVES):

The first and foremost feature to implement will be the registration and login for doctors and patients. Patients will have the option of registering on the application and logging in, while the doctors will be registered by the database administrator to ensure their authenticity. This user handling will be done through Passport JS.

For doctors, the platform will provide a centralized dashboard that displays detailed information including appointment schedules, patient information, prescriptions and diagnostic suggestions powered by the ApiMedic assistant. Similarly, the patients will be welcomed with a user friendly interface that streamlines the process of searching for relevant doctors, booking appointments with them, chatting or video calling with them, and viewing their own medical records and the assigned prescriptions.

Our platform will simplify the process of booking appointments to users by offering instant access to doctors' availability for scheduling, along with a user-friendly calendar interface that allows for easy selection of desired dates and times. Doctors could then confirm these appointments from their side, allowing them to effectively manage their schedules through a centralized view and make any necessary adjustments.

Digital prescriptions will be drafted and uploaded by the doctors including all the necessary information about medications, dosages, and instructions. Patients can then easily receive these digital prescriptions containing the thorough medication information. A doctor can also choose to upload any relevant diagnostic reports they want to share with the patient.

In interacting with each patient, doctors could further explore the symptoms of said patient and receive intelligent diagnostic support through our web app's integration of ApiMedic. This medical symptom checker will only be available to the doctors to ensure that the returned diagnosis goes through a professional first.

Our platform will not only contain a private chat feature with the doctors, but also a secure and encrypted video call option (handled through the Zoom Meeting SDK) for remote consultations for people who cannot or do not want to attend the appointment in person. These features will facilitate prompt communication between doctors and patients, keeping consultations streamlined.

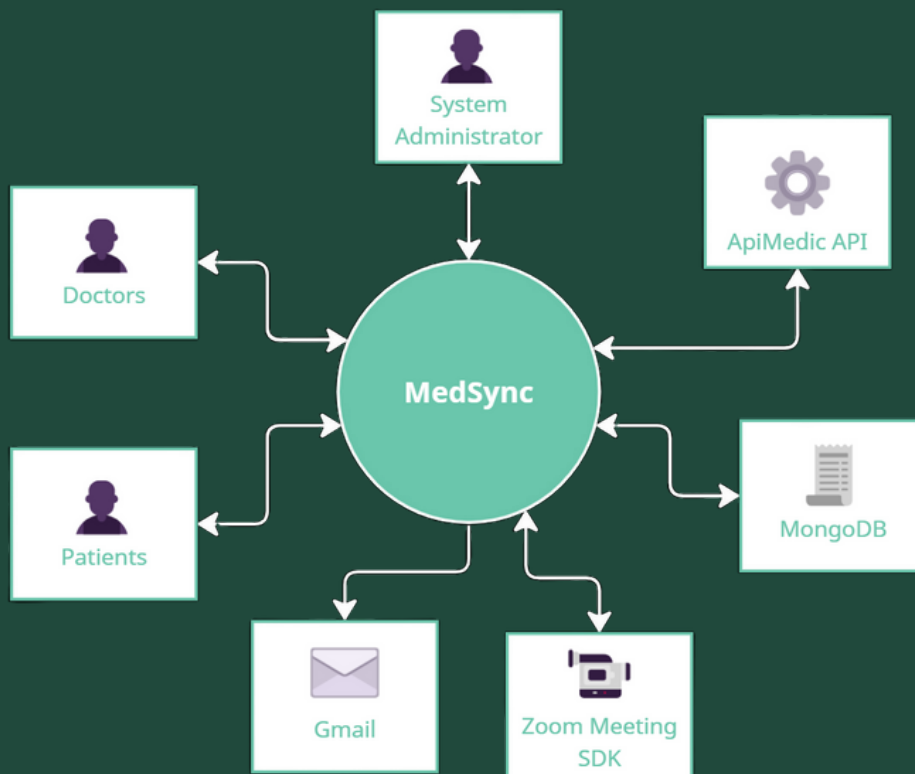
Throughout the consultation process, relevant notifications for both doctors and patients will be sent via email. The notification system will encompass a variety of alerts, such as appointment reminders to ensure both parties are prepared and punctual and chat updates to facilitate smooth conversations. Moreover, users will also be notified when their prescriptions are uploaded to the platform.

6. SCOPE

The project's scope involves providing a platform through which doctors and patients can communicate and exchange information. This includes all the requests made by both parties, including appointment scheduling, text chats, video calls, and prescription sharing. Video calls will be incorporated via the third-party Zoom Meeting software development kit (SDK). The system also relies on the third-party application programming interface (API) ApiMedic to facilitate the diagnosis process to doctors; notifications sent to users will also be carried out externally through Gmail. Additionally, the management of the users, both patients and doctors, will be carried out through MongoDB's database services.

At the present time, this project does not deal with direct pharmacy integration; prescriptions made by a doctor will be available to the patient but not sent directly to a pharmacy. This project is also primarily concerned with private medical services not involving hospitals; it is designed to cater to the services of private physicians (e.g. family doctors), rather than the broader scope of a hospital-wide system. The system also does not deal with insurance processing; bills will be managed independently by the patients.

Simply put, MedSync is primarily concerned with **connecting private doctors with their patients**. Below is the context diagram for our system:



6. STAKEHOLDERS:

Directly involved/impacted:

- System administrators
- Private doctors
- Patients

Indirectly involved/impacted:

- Pharmacists
- Lab technicians
- Insurance providers
- Ministry of Health
- Hospital-employed doctors

8. CONSTRAINTS:

MedSync is a project that will begin from scratch. Technical and time constraints are the prominent issues that might arise with the project. We plan to use React for front-end and MongoDB to manage the database, which may be considerable feats for some members of the team who have not yet been exposed to them. Considering that the deadline for the project is the end of the Spring 2024 semester, time is another constraint that, unlike the technical factors, cannot be resolved through reading documentation and analyzing pre-existing code. A medical application takes careful and elaborate considerations during its implementation; the time constraint is, thus, also an obstacle in terms of the extreme attention to detail that such applications require in order to be successfully implemented.

The use of ApiMedic API to aid the diagnosis process and the Zoom Meeting SDK for incorporating video calls present external dependencies since the API and SDK are already in use rather than being created by the team. This might lead to compatibility issues between different versions of the same software or systems. The constraint of using the pre-existing API and SDK rather than creating their features from scratch comes from the time constraints within the project as well as technical challenges that might be present due to the backgrounds of the team.

There is also a testing constraint. Considering that actual doctors and patients would need to use the app in order to test its functions in real-world scenarios, it would unfortunately not be possible for us to carry out such accurate testing. Not only does this make it difficult to properly understand the needs of patients but also to improve the app within the limited timeframe of the project.

As with any team project, collaboration and group work might be another significant constraint. Due to each individual team member having a different schedule and other responsibilities, on top of the technical and time constraints, the issues surrounding proper teamwork might arise and hinder the timely delivery of certain features of the system.

9. RISKS:

The main risk within this project is the security risk posed by the integration of the registration and login features. These features are generally made available by the utilization of a database system, which can be prone to attacks such as SQL injection attacks. These attacks use malicious code in the form of SQL statements to access vulnerable information. In order to make the registration data secure, passwords are usually hashed and salted before storing in the database. We intend to use a good hashing function that is going to make sure our data remains secure—for example, bcrypt password hashing function which does not only salt the passwords before by default, helping prevent rainbow table attacks [1], but also utilizes slow hashing [1], which makes it harder to crack using brute force attacks.

Ensuring the confidentiality of data is an important factor that poses ethical risk concerns. Considering that our application stems from a real-world problem of non-electronic data management systems that are still standard in most countries, the project is meant to observe different techniques for maintaining the confidentiality of the data. The project intends to keep adequate standards when it comes to the data provided to the users themselves. Considering different data policy regulations such as the TPO (Treatment, Payment and Operations) portion of HIPAA (Health Insurance Portability and Accountability Act) in the United States of America, the app will regulate both the patients' and doctors' access to adequate information. In our platform, patients will not be able to view other patients' data, and doctors can only view the data of their own patients. Having in mind the time constraints, there is no possibility of eliminating all concerns, such as the amounts of data healthcare providers are sharing with Third Party Payers and Insurance Companies. So, although the team intends to take care of the highest risk factors relating to the confidentiality of data, it does not think it feasible to address them all for now. However, the scalability of the project is a great factor and the adequate documentation of the progress could be of great benefit for the future development of the project.

Technical risks are also bound to arise with an emerging system. The integration of the different external features discussed above, such as video chats, Gmail notifications, or diagnostic recommendation APIs, could pose significant risks for the project's successful development. To mitigate this risk, the project will employ a testing process for its different features. The technical issues which arise from increased loads and data volume can be reduced by planning the scalability of the application from its beginnings. To ensure that other technical issues such as software crashes do not impede the progress of the project, the team intends to make adequate backups for each step of the development. It is vital that a project has deliberate disaster recovery plans aimed at increasing the reliability and availability of MedSync, which could be hindered heavily by these technical risks.

10. REFERENCES:

- [1] Defuse security. 2018. "Secure Salted Password Hashing - How to Do It Properly." Crackstation. <https://crackstation.net/hashing-security.htm>.
[2] "Symptom Checker API." Apimedic. <https://apimedic.com>.
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11. APPENDIX:

Nothing to include.