Alfred Hospital System
<AlfredHospital >

Software Needs Assessment

Prepared for
<Allegany County Health Industry>
<Alfred>

Prepared by
Soumya Konar
CISY 8503 - Capstone

Last Updated: December 9, 2022
Document: AlfredHospital_NeedsAssessment.docx

Table of Contents

Version History

Document Version	Date	Author(s)	Details/Description
1.0.0	2022-11-12	Soumya Konar	Initial version; whole document
1.0.1	2022-11-16	Soumya Konar	Modified
1.0.2	2022-11-30	Soumya Konar	Modified
1.0.3	2022-12-04	Soumya Konar	Modified
1.0.4	2022-12-10	Soumya Konar	Submitted

1.0 Introduction

1.1 Purpose

The purpose of this software needs assessment is to highlight a relational database management system that allows for the storage and manipulation of patient data and corresponding patient treatment and history for a primary care physician. This system requires a high level of security while allowing for easy entry and retrieval of patient data. This system would provide informative reports to its end users based upon the end user's role.

The intended audience would be divided into the roles and users, and we will discuss that more in detail as we go through the needs assessment paper. The intended audience consists of any individual who wants to get an overview of the hospital – Guests, Patients, and the Admin. The other users are all employees of Alfred hospital, consisting of Receptionists, Nurses, Physicians and Billers.

1.2 Scope

The software artefacts that will be produced are:

A prototype for a website locally hosted using Visual Studio 2022, IIS Express, and SQL Server Management Studio 2019. The proposed system will allow different roles (users) to have an interface they need to view, manipulate, store, and establish relations between entities as needed. But when it is implemented as a system for Alfred Hospital – it will be hosted on Azure. (More details in Requirements).

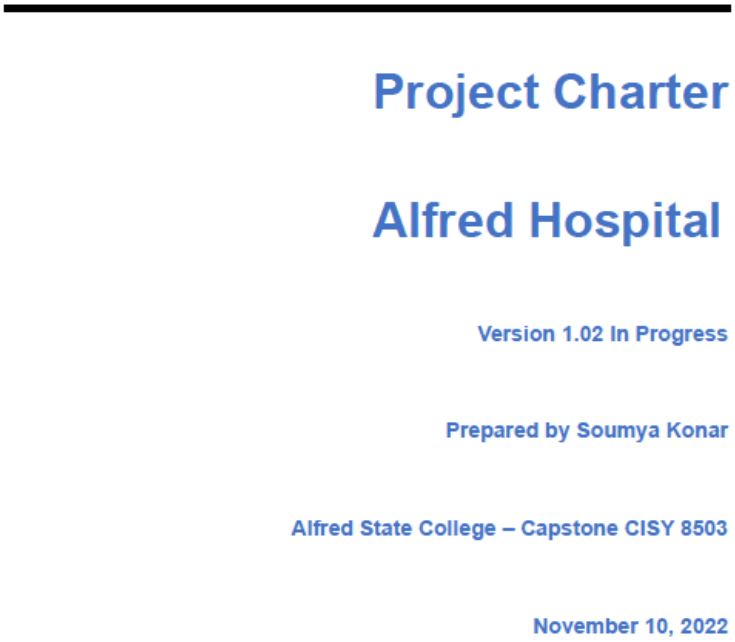
The objective of this system is to streamline the process Alfred Hospital currently has into a better one through a solution created by the software development team on-hand here. The goals of this system again vary based on user roles and permissions – catering to the user using the system – guests, patients, administrator, nurse, physician, receptionist, and biller.

The benefit of this system is to provide security and automation to Alfred Hospital's system. This system will be upgraded as it goes on various stages therefore leading to more benefits – but at the point the main advantages is to provide a streamlined and secure process for the users. While the administrator can store and manipulate information at the back-end level.

1.3 References

The attached documents are referenced to create this Software Needs Assessment document.

- Project Charter (Either click or attached with the submission)



Project Charter

Alfred Hospital

Version 1.02 In Progress

Prepared by Soumya Konar

Alfred State College – Capstone CISY 8503

November 10, 2022

- Project Plan (Either click or attached with the submission)

teamgantt
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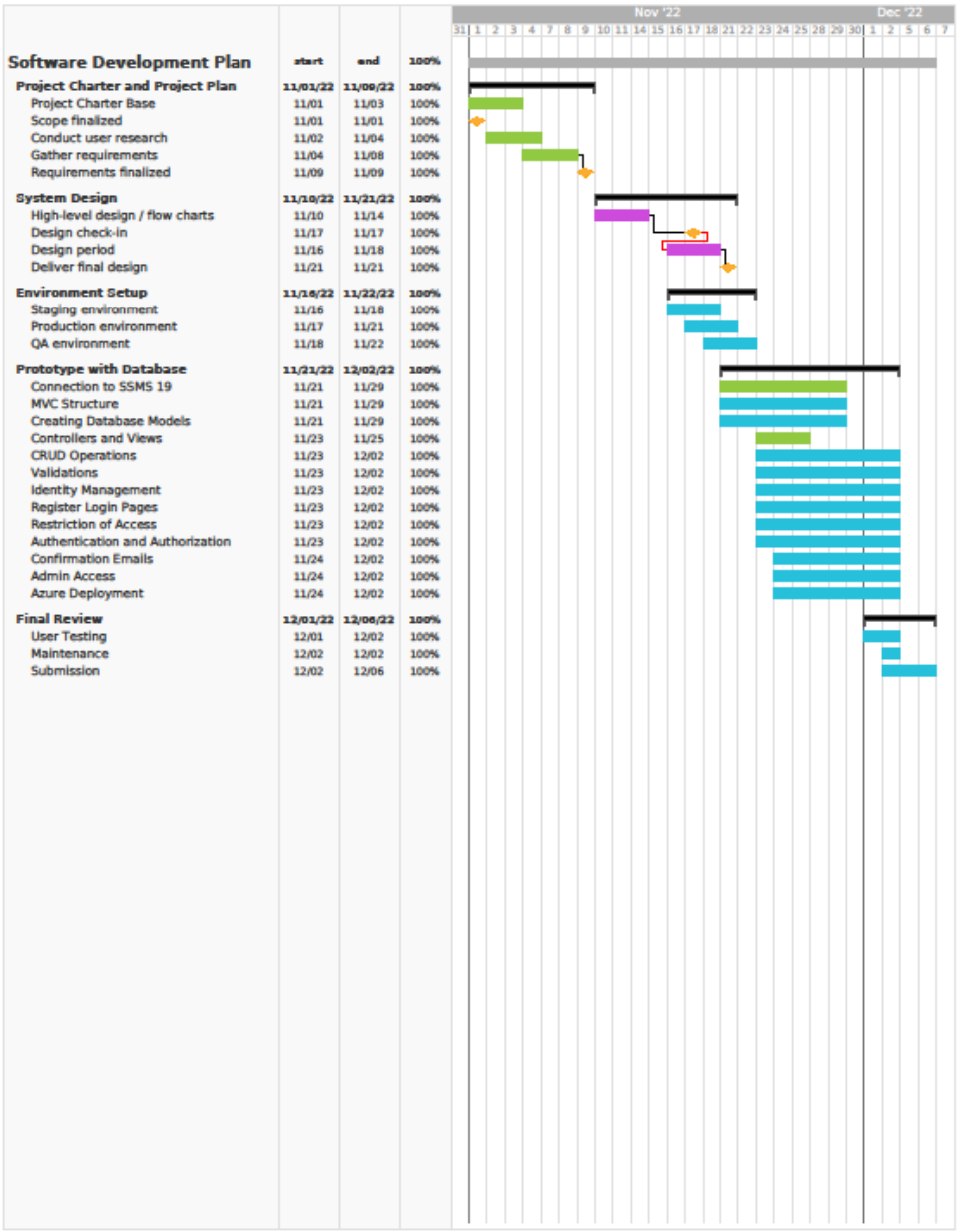


Software Development Plan	start	end	100%
Project Charter and Project Plan	**11/01/22**	**11/09/22**	**100%**
Project Charter Base	11/01	11/03	100%
Scope finalized	11/01	11/01	100%
Conduct user research	11/02	11/04	100%
Gather requirements	11/04	11/08	100%
Requirements finalized	11/09	11/09	100%
System Design	**11/10/22**	**11/21/22**	**100%**
High-level design / flow charts	11/10	11/14	100%
Design check-in	11/17	11/17	100%
Design period	11/16	11/18	100%
Deliver final design	11/21	11/21	100%
Environment Setup	**11/16/22**	**11/22/22**	**100%**
Staging environment	11/16	11/18	100%
Production environment	11/17	11/21	100%
QA environment	11/18	11/22	100%
Prototype with Database	**11/21/22**	**12/02/22**	**100%**
Connection to SSMS 19	11/21	11/29	100%
MVC Structure	11/21	11/29	100%
Creating Database Models	11/21	11/29	100%
Controllers and Views	11/23	11/25	100%
CRUD Operations	11/23	12/02	100%
Validations	11/23	12/02	100%
Identity Management	11/23	12/02	100%
Register Login Pages	11/23	12/02	100%
Restriction of Access	11/23	12/02	100%
Authentication and Authorization	11/23	12/02	100%
Confirmation Emails	11/24	12/02	100%
Admin Access	11/24	12/02	100%
Azure Deployment	11/24	12/02	100%
Final Review	**12/01/22**	**12/06/22**	**100%**
User Testing	12/01	12/02	100%
Maintenance	12/02	12/02	100%
Submission	12/02	12/06	100%

1.4 Overview of Document

This needs assessment will highlight the system overview of Alfred Hospital and then dive into the functionality and requirements of this database management system. With the attached diagrams, the relations between entities are established along with the security requirements and deliverables provides with the Needs Assessment document.

2.0 System Overview

This section introduces the Alfred Hospital Database Management system context and design and discusses the background of the Alfred Hospital project in context.

2.1 Project Perspective

This system was originated for the need of a new system in the hospital management sector in Allegany County, NY – specifically Alfred, NY. This is a new self-contained system that can provide the above listed benefits and meet the requirements of various user roles. As we proceed throughout the document, we understand how the database management system can provide user permissions and segregate functionality based on the authorization level, any user of the system has.

2.2 System Context

The strategic issues this management system can solve for Alfred Hospital can go a long way. This system is designed for any user to interact with the interface without having any prior knowledge in the Information Technology sector. The business case we are trying to solve with the establishment of this system is to have a secure login process for a patient to create an appointment along with the admin and other users to have their functionality separated from the rest. The focus of this system is security – as a hospital stores private information regarding patients and their diagnosis history. For this very reason, all employees in Alfred Hospital – regardless of their authorization level need to be HIPAA compliant.

2.3 Assumptions

Some of the assumptions that have been made at the initiation of the project are as follows:

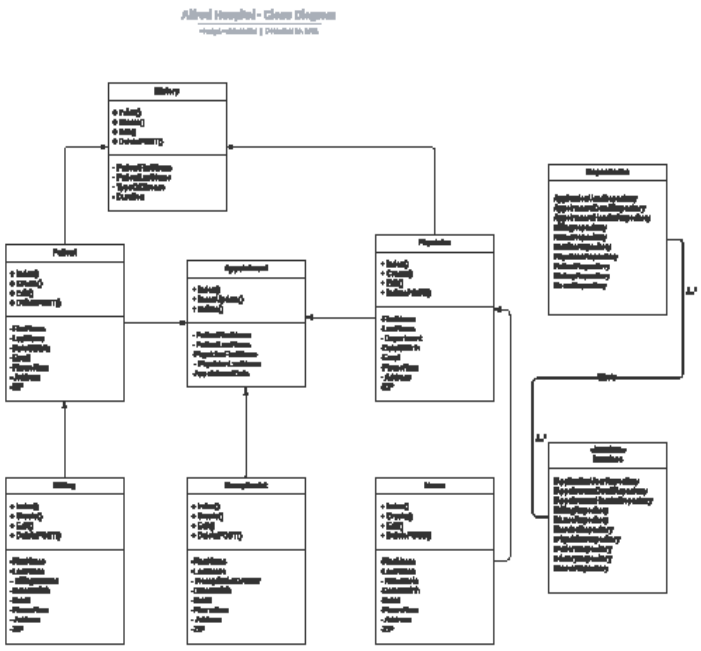
- This can be considered as an assumption and dependency – but all employees go through mandatory training for HIPAA compliance and are HIPAA compliant during their tenure in Alfred Hospital
- Any employee cannot start their duties without proper authorization access.
- The hospital administrator or admin team can assign user roles to any of the employees.

- Storing information is a necessity for the hospital in terms of retrieving records as needed.

3.0 Domain Model

The *Domain Model* section includes Class Diagrams and Class Specifications.

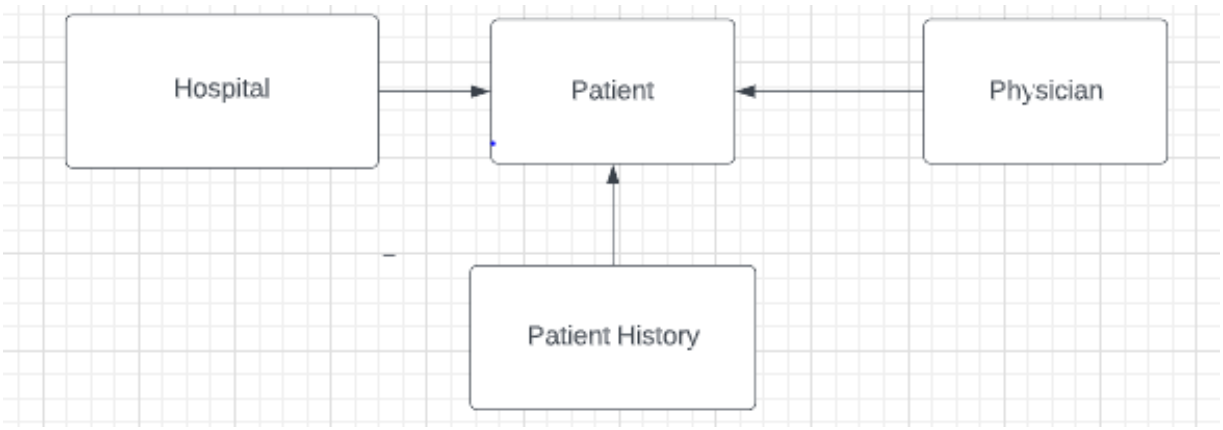
3.1 Class Diagrams **(Either click or attached with the submission)**



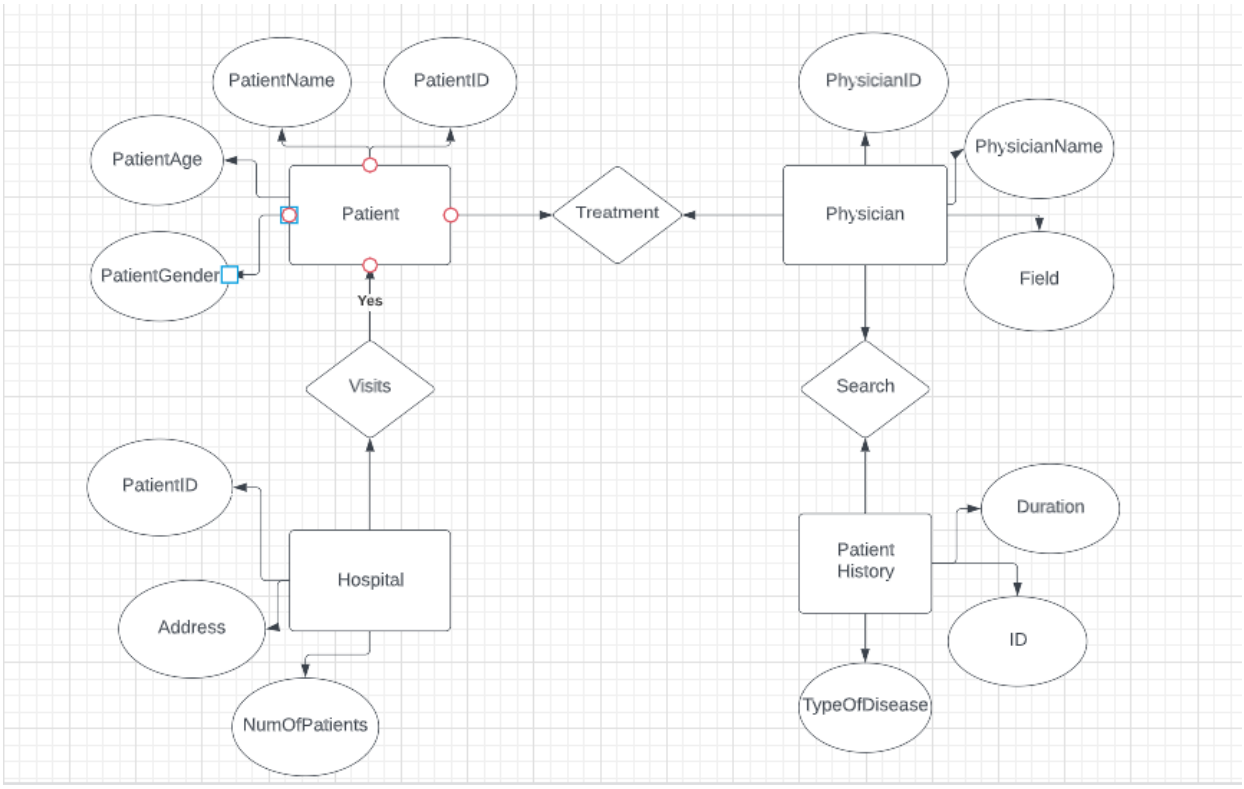
3.2 Relationship Diagrams

Entity – Relationship Diagrams are attached – these versions were the initial versions for the prototype and will be modified to update other entities as the hospital grows in the area.

CDM –



ERD –



4.0 Throw-Away Prototyping

Prototype materials and documents are attached with the Software Needs Assessment document.

5.0 Requirements

The *Requirements* section defines the Functional and Non-Functional Requirements of the proposed system.

5.1 Use Case Requirements

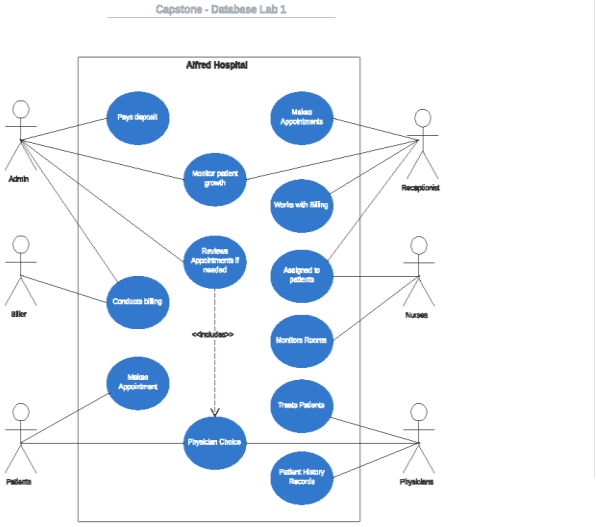
All the requirements have been gathered, analyzed, and prioritized.

5.1.1 Actor Goal List

Actor	Goal	Priority
Any	HIPAA Compliant (Except Patients)	1
Admin	Assigns Roles and Maintains DB Queries	1
Patient	Creates Appointment, Bill Payment, History	2
Physician	Treats patients on appointments, prescribes meds	3
Nurse	Works with Physician and assigned rooms for rounds	3
Receptionist	Makes an Appointment (In person)	2

- More Actors have been listed throughout the prototype and can be included in the use case specification and list.

5.1.2 Use Case Diagrams (Either click or attached with submission)



5.2 Functional Requirements

The functional requirements are the core section of the needs assessment for Alfred Hospital. The main aspect of this system is security – with a hospital being in store of patient's data and health history, employee's information and payroll, patient's insurance and billing data, and the hospital

5.2.1 Usability Requirements

■ Public

□ Internal

5.2.2 Maintenance Requirements

- There is a strict backup schedule and maintenance cycle for Alfred Hospital Database management system. Every week on Tuesday from 2 am to 6 am, maintenance cycle would initiate with checking all the system functionality and requirements.

5.2.3 Security Requirements

This database is heavily revolved around security, with all the components being connected through authentication and authorization. The prototype system has the following requirements in this version:

- Register and Login Functionality
    - This includes various elements like:
    - Confirmation of a valid email when registering.
    - Forgot Password functionality
    - Login and Register Pages Validation for each field
    - Password requirements (minimum 6 characters, need an uppercase, numeric, and alphanumeric character
    - Logout page and functionality
    - Validation of input fields (user input)
    - Client side and server-side validations added and integrated with the system.
    - Having required and optional fields criteria
    - Filter and Sanitization has been done in the basic level of security
    - SSL certificate established at the initiation of the system.
    - Encryption of SQL Server through TSL certificate. (Commands attached in Appendix)
    - The prototype is currently being hosted on Microsoft Azure (Cloud hosting solutions)
    - Currently, the hashing case is the standard one imported for ASP NET. Identity Framework.

- The other main security feature is the different types of authorization levels.
    - Patient has access to the home page, to make appointments, and view the summary.
    - Physicians have access to their specific patient list, appointments page and nurse round list.
    - Billers have access to the biller's page to make new billings.
    - Receptionists have access to make a new appointment for in-person patient visits
    - Nurses have access to appointments and rooms pages.
    - Guests have access to the main page until they register for any functionality.
- In terms of physical security:
    - On top of being hosted on Microsoft Azure (cloud) – there will be a backup for Alfred Hospital Database management system in a secure locked room within the hospital headquarters. This can be used as a backup if somehow the system hosted on the cloud is corrupted, security threats and more.

These are the desired security requirements in existence to the above ones:

- Mandatory HIPAA Compliance training in a regular interval of time (6 months to 1 year)
- To make sure that the cloud provider solution this database management system would use is HIPAA compliant.
- Moving forward, we would also integrate Dark Trace cyber-defense products for our system. Where it would prioritize threat detection, harden defenses, and reduce risks.
- Moving forward, the Alfred Hospital Database management system would use and implement the OAUTH 2.0 standard authorization protocol. It is designed to grant users a set of resources – like remote APIs and user data. This will also provide us with the token management platform, authorization requests, extensions, TLS, authorization grants and more.
- SHA-512 or Secure Hashing Algorithm will be used for the hash function in the login system.
    - Long hash value
    - Fast hash function
    - Not so easy to decrypt
- End to end encryption aspect to be covered in future versions
- Annual Employee Training (Security Awareness Training)
- Intrusion Detection System/ Intrusion Prevention System Implementation
- Using tool called Fortinet – HIPAA compliance with IPS
- EPHI encryption
- Auditing and Monitoring

5.2.4 Delivery Requirements

The prototype system has the following delivery requirements in this version:

- The system currently has a website and UI integrated with the back end.
- The back end is in a N-tier architecture (Model-View-Controller)
- For Financial Requirements and hosted in Microsoft Azure – a secure piece of software would lead up to $5000 monthly. This includes not only the prototype stage, but the upcoming versions in the next few years.
- HIPAA compliance implementation steps –
    - Create Privacy and Security Policies for the Organization.
    - Name a HIPAA Privacy Officer and Security Officer.
    - Implement Security Safeguards.
    - Regularly Conduct Risk Assessments and Self-Audits.
    - Maintain Business Associate Agreements.
    - Establish a Breach Notification Protocol.
    - Documentation and Re-training

These are the desired delivery requirements in existence to the above ones:

- To implement the system in relation to the software engineering metrics
- To enhance our UI with the implementation of information architecture.
- To make sure our UI allows end-users to understand the functionality of each link, button, page, and tool showcased on the website.
- To implement software design patterns in the existing and next stages of the development process for the Alfred Hospital Database management system.
- To allow users to generate real-time analytical reports based on data and authorization levels.

5.2.6. Desired Functionality and Features

Specific user-based functionality that will be delivered in the future functions include but are not limited to:

- When the services are offered in the front page, for the users to make a quick appointment – the Scan division would have a dropdown box for all types of scans like Xray, CT scan, MRI, Full body, brain, and other general scans.
    - The same can be done for Health Check Up (time periods).
- In case of an emergency, there will be a special provision for the users (patients) where they do not have to register or login to save a spot in the hospital. When a user interacts with the emergency division of the multiple services – they will direct to a list of resources or vital steps you can follow for different types of emergencies right after a bold prompt of our address and phone number.
- Another vital aspect of this system is to add, modify, and remove functionality as needed by the hospital administrator and user requirements.
    - This would open a channel of communication between the developer and hospital administrator.
    - Turning to users and stakeholders would allow us to incorporate more functionality which is actually “needed” for the system.

5.2.5 Legal Requirements

■ Yes - HIPAA Compliance

□ No

Compliance with the U.S. Health Insurance Portability and Accountability Act (HIPAA) requires companies that deal with protected health information (PHI) to have physical, network, and process security measures in place and follow them.

5.2.6 Scalability Requirements

This will be scalable through Microsoft Azure deployment and can be modified for different hospitals as needed. The system will be

deployed on Azure and scalable through different hospitals in Allegany County as needed.

5.3 Interface Requirements

5.3.1 External System Interfaces

<Are there any external systems interfaces required? >

☐ Yes

■ No (Not at the current prototyping stage)

6.0 Project Issues

6.1 Projected Development Effort

The development has resulted into a basic prototype as this stage, where it is going to be elevated and hosted on Microsoft Azure.

6.2 Proposed Project Schedule

This section details are highlighted in the Project Charted and Project Plan above.

6.3 Conversion / Load Requirements

6.3.1 Data Population

- Can be performed in two ways for this system.
    - Through the website by the users
    - From the Admin directly in the database

6.3.2 Reference tables and Baseline Data

Reference tables are highlighted in the database diagrams above.

Sign-Off

Name	Signature	Date
Soumya Konar	Soumya Konar	12/9/2022
	Software Developer	

Name	Signature	Date
Evan Enke		
	Project Sponsor and Supervisor	

Name	Signature	Date
Mr. Smith		
	Alfred Hospital Administrator	