

SYRACUSE UNIVERSITY
SCHOOL OF INFORMATION STUDIES

Healthcare Measure

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School of Information Studies

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EXECUTIVE SUMMARY

Overview

Healthcare quality measures are tools that help us measure healthcare processes and their outcomes in order to provide high-quality healthcare to attain more quality goals that include patient centered treatment that is effective, safe, equal and affordable. Measures are focused and have a specific point of care. Healthcare reform is a general rubric used for discussing major health policy creating or changes. It is intended to broaden the population that receive health care, reduce cost of medical bills, increase the access to health care specialists, and improve the quality of healthcare.

A true Population Health Management system is not just about gathering data but also about providing tools which help take action on the basis of the data, for example, notifying patients of upcoming refills, making appointments, securely sharing the data with health care organizations etc.

Problem Statement

The problem being faced right now is the uneven quality of healthcare provided over all the geographic locations, underuse or overuse of services and misuse of services. Too often the quality of healthcare provided to the patients is substandard or patients receive excessive services which undermine the quality of care and make it expensive. This can lead to poor health, increased disabilities and a weak healthcare industry.

The goal is to collect more information about the patient's health, the healthcare received and the outcomes. This will help doctors, healthcare institutions and the healthcare industry as a whole to create new strategies to improve it.

Proposed Solution

The goal of our system is to gather and analyze clinical data of patients and to identify opportunities to improve the health care facilities and also the financial outcome of the health care provider. This calls for technical intervention to support data aggregation, filtering and use of data analytics. Along with these the system must also possess reporting capabilities to publish the findings.

We seek to improve the health outcomes of a group of people by monitoring and identifying individual patients in that group. The two measures that we have considered are tobacco use screening and caesarean birth.

Data comes from multiple sources that can be collected through various means, such as claims, assessment tools and chart abstraction. We will determine the numerator and denominator of the measures. For example, in tobacco use screening the numerator will be 'The number of patients screened for tobacco use within the first day

of admission' and the denominator as 'The number of patients 18 years of age and older'.

Expected outputs from the measure system are:

- a. Display messages once user has finished uploading the files.
- b. Determine numerator and denominator once all the data is received.
- c. Display the outcome of each file, whether it has been accepted or rejected.
- d. Generate aggregate reports.

Project Overview

Healthcare quality measures are tools that help us measure healthcare processes and their outcomes in order to provide high-quality healthcare to attain more quality goals that include patient centered treatment that is effective, safe, equal and affordable.

The purpose of the project is to implement an approach that strives to impact the delivery of care to a group of individuals with similar health care needs. With the help of data collected from the various medical institutions, the State of Massachusetts intends to distribute the pool of money to different racial/ ethnic groups and the way it has to be paid out is based on state law.

Customers Need and Benefit

The problem being faced right now is the uneven quality of healthcare provided over all the geographic locations, underuse or overuse of services and misuse of services. Too often the quality of healthcare provided to the patients is substandard or patients receive excessive services which undermine the quality of care and make it expensive. This can lead to poor health, increased disabilities and a weak healthcare industry.

The goal is to collect more information about the patient's health, the healthcare received and the outcomes. For patients, they need a strong healthcare industry. They want the high quality of healthcare with fewer services. Additionally, the less expensive charge would make them much satisfied. For physicians, they want the latest information about patients and easy to access to this information. From the healthcare organization perspective, they prefer large volume of quality healthcare and less cost of delivering healthcare. The healthcare system requires interface friendly and preventative care.

The measure will help doctors, healthcare institutions and the healthcare industry as a whole to create new strategies to improve it. This health care measure will collect more information about the patient's health, the healthcare received and the outcomes,

which would eliminate unnecessary steps for information transition and ease the burden for customers to remember all their information. Additionally, it can satisfy all needs of customer which are mentioned before.

The patients - Patients receive better coordinated care as they are reminded regularly of mandatory health visits or procedures which are needed to manage a known condition, hence reducing the chance of missing a lab test, drug interaction or complication. They also save on cost of expensive procedures by the act of preventive care. The patients hence enjoy better health.

The physicians - Physicians have the information of their patients when required improving patient-physician interaction and also providing timely care.

The healthcare organization - Healthcare organizations benefit from increase in volume of quality healthcare and also the cost of delivering healthcare can be quantified.

The healthcare system - The whole system benefits from improved preventive care.

Project Name

Healthcare Quality Measures

Project Sponsor

Paul Callahan

Team Members

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- Apurva Talreja
- Hanqian Li
- Tejaswita Dheer

Project Objectives

The purpose of this project is to replace the current system and add two new criteria into the system – tobacco free and cesarean.

Project Scope

1. The measures that will be included in the system are tobacco use screening and cesarean birth.
2. The provider, i.e., the clinics, hospitals and independent physicians will be able to use the system.
3. The technology used will be MySQL (Database), and MS Access as database application.
4. Feedback and aggregate reports will be generated.

Assumptions

1. The data collected will represent the general population
2. The conditions used in the algorithm to filter the data covers all the conditions.

Constraints

1. The two selected measures will be the core healthcare issue focused on.
2. Our focus is on filtering the data based on the logics provided for the selected measures rather than improving the system quality.

Criteria of Success

- Efficiently and effectively used the input data
- Successful flow of transactions
- Output produced within specific time

Business Benefits

- Cost of the system reduced
- Time consumed to efficiently use the system reduced
- User friendly interface

REQUIREMENTS

Users

- State of Massachusetts
- Healthcare providers
- Medical Institutions
- Patients and end users

Product Risk: Data Collected is time sensitive. Also, the data is private. So, the data security must be kept in mind. Delayed Government functions. The residents of Massachusetts and Medical institutions are delayed in receiving the benefit that is due to them. Design flaws – can lead to incorrect calculation of the numerator and denominator.

Product Dependency: The system will be dependent of the state government policies. Also, the system will be dependent of the staff who use the system. The data to be entered is dependent upon the information that is captured by the medical institutions. The information should be provided by the institutions within the time frame provided and in the appropriate format.

Data Requirements: Only xml data format can be uploaded. Data must be in the format as specified so that it can be read and stored. Archival of data will be done after 3-10 years but it is preferred to be available indefinitely due to laws and regulations.

Product Assumptions: The data collected will represent the general population. The algorithm to filter the data covers all the conditions. The backend will contain a SQL database and MS Access to contain forms and reports. (The software specifications have not been defined by the clients). The processing power and tech specs are decided by us based on estimate of traffic of information. The personnel from the medical institutions have to be trained to use the web interface for upload and also on what data has to be populated in the XML file in the correct format.

Product Constraints: The two selected measures will be the core healthcare issue focused on. The focus is on filtering the data based on the logics provided for the selected measures rather than improving the system quality. The provider does not have the authority to change/correct report information once it is uploaded.

Access (Roles)/ Security: Users have to enter username and password to enter the system. System will keep track of who logged in the system and for what purpose. The medical institutions have the role of collecting the data and medical records of the patients. They have access to the system to upload all the information within the provided timeline. The State of Massachusetts will have access to all the data uploaded in real time. Security is of paramount importance since the information being shared is

sensitive and personal data of individuals. We need to install strong security features (both physical and virtual).

Operating Environment Requirements: The product is primarily going to be on the web platform with the medical institutions interfacing with the web to upload the data that they have. For the backend/ database MySQL will be used and MS Access will be used for the front end to develop reports and forms.

Usability Requirements: Develop a web interface which is user friendly and accessible by all the institutions. Since most of the users may not be tech savvy we have to make sure that the pages are easily navigable with instructions. Logo will be that of the client, State of Massachusetts.

Data Collection approach

- State of Massachusetts
- Medical Institutions Record

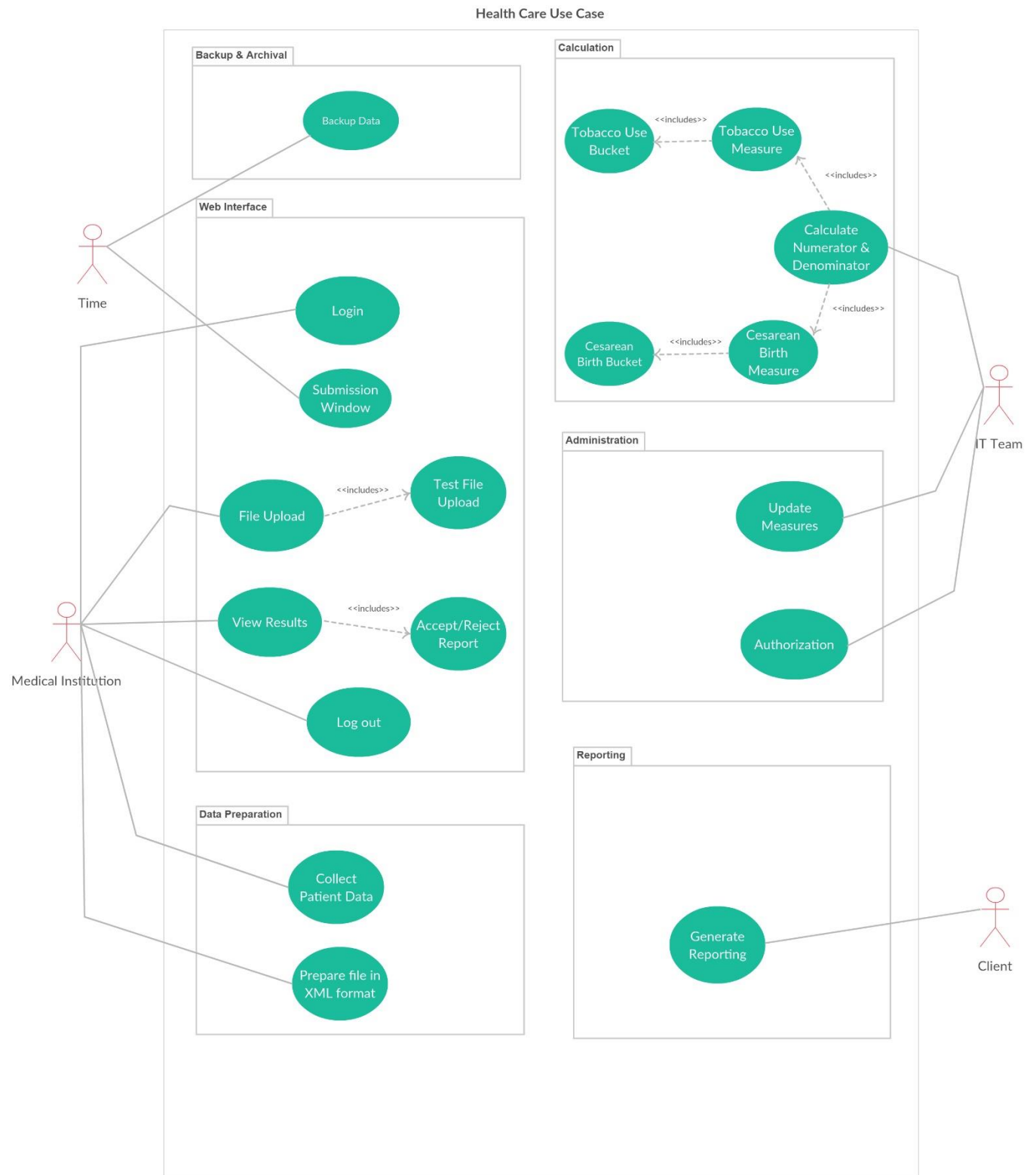
Functional Requirements

- Buckets are created to store data
- Reports exported come in functional requirement
- The system will be open for just 60 days

Non Functional Requirements

- Security of the system is maintained
- System should be in accordance with the State of Massachusetts and the Medical Institutions
- Data of patients who are older than 60 years should not be included

USE CASE ANALYSIS



USE CASE GLOSSARY

ACTOR GLOSSARY			
ENTITY		DEFINITION	
Medical Institution		Health professionals and institutions that are responsible for updating the patients (health) record in the information system.	
Time		Actor concept responsible for triggering temporal events.	
Client		The client in this case is the State of Massachusetts for which the information system is being developed.	
IT Team		Actor building and maintaining the system.	
USE CASE GLOSSARY			
USE-CASE ID:	USE CASE NAME	USE CASE DESCRIPTION	PARTICIPATING ACTORS AND ROLES
WEB INTERFACE			
CTTS-001	Login	This use-case describes the event of medical institution to get access to enter to the system to do further operations.	Medical Institution
CTTS-002	File upload	This use-case describes the event of medical institution to upload patients' data in XML format to the system.	Medical Institution
CTTS-003	Test file upload	This use-case describes the event of medical institution to check whether their files they uploaded fit the format requirement and ensure files which uploaded to system have the same format.	Medical Institution
CTTS-004	View results	This use-case describes the event of medical institution to view the status of uploading files.	Medical Institution
CTTS-005	Accept/Reject reports	This use-case describes the event of medical institution to get notice of the status of file uploading, and they would take actions based on the Accept or Reject reports.	Medical Institution
CTTS-006	Logout	This use-case describes the event of medical institution to leave the system.	Medical Institution
CTTS-007	Submission Window	This use-case describes the event of time being a factor for the medical institutions. There is a fixed duration during which the medical institutions can upload the data and not after or before it.	Time
DATA PREPARATION			
CTTS-008	Collect Patient Data		Medical Institution
CTTS-009	Prepare File in XML Format		Medical Institution
CALCULATION			

CTTS-010	Calculate Numerator and Denominator	This use case describes the event of calculating the numerator and denominator for the measures defined in the system.	IT Team
CTTS-011	Tobacco Use Measure	This use case describes the event of defining the measure for 'Tobacco Use'	IT Team
CTTS-012	Cesarean Birth Measure	This use case describes the event of defining the measure for 'Cesarean Birth'	IT Team
CTTS-013	Tobacco Use Bucket	This use case describes the event of defining the buckets for 'Cesarean Birth'. Here all the exceptional cases are passed and stored.	IT Team
CTTS-014	Cesarean Birth Bucket	This use case describes the event of defining the buckets for 'Cesarean Birth'. Here all the exceptional cases are passed and stored.	IT Team
ADMINISTRATION			
CTTS-015	Update Measures	This use-case describes the event of updating/changing the pre-defined measures when directed by the client.	IT Team
CTTS-016	Authorization	This use-case describes the event of giving permission to other users to perform specific tasks in the system, keeps track of users that are accessing the system and for what reason.	IT Team
REPORTING			
CTTS-017	Generate Reports	This use-case describes the event of the system generating a final report based on all the calculations.	Client

CRITICAL USE CASE NARRATIVES

HEALTHCARE MEASURES USE CASE NARRATIVE

Login

Use-Case Name:	Login	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-001	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	IT Team – interested in evaluating the performance of system.	
Description:	This use-case describes the event of medical institution to get access to enter to the system to do further operations.	
Precondition:	No previous condition	
Trigger:	This use case initiate when medical institutions start to use this system.	
Typical Course of Events:	Actor Action	System Response
	Step 1: Getting access to login page. Step 2: Inputting username and password to the system. Step 3: Waiting for notification of system.	Step 1: receiving the username and password. Step 2: verification users' identity. Step 3: informing the user their login in status. Step 4: Allocating resource to users.
Alternate Courses:	Step 3: The actor did not provide the correct user name and password necessary to log into the system. They would be notified of the discrepancy and prompted to provide the correct user name and password.	
Conclusion:	This use-case concludes when the actor receives the confirmation that they log in system successfully.	
Postcondition	System allocates resource for actor to finish their job.	
Business Rules:	Medical institution must possess the username and password.	
Implementation, Constraints and Specifications:	GUI to be provided for the actor. GUI should be user-friendly, so actor will be able to learn and use it with minimal training.	

	The system should be secure by allowing only authorized users to access the information. There should be a backup plan for the system.
Assumptions:	Medical institution has been granted the valid user name and password to access the system.
Open Issues:	No open issues

File upload:

Use-Case Name:	File upload	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-002	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Client	
Other Interested Stakeholders:	IT Team – interested in evaluating the performance of system.	
Description:	This use-case describes the event of medical institution to upload patients’ data in XML format to the system.	
Precondition:	This party uploading a new file must be logged in the system.	
Trigger:	This use case initiate when medical institutions start to upload files to the system.	
Typical Course of Events:	Actor Action	System Response
	Step 1: Uploading files Step 2: Waiting for response of the system.	Step 1: receiving the newly updated files. Step 2: Transferring them to format test center. Step 3: Waiting for results of testing. Step 4: Send notification to uploading reports that users can view by their own.
Alternate Courses:	Step 2: The actor did not upload files successfully. It would generate a report that concludes of the discrepancy and prompted to upload the files again.	

Conclusion:	This use-case concludes when the actor receives the confirmation that they upload files into system successfully.
Postcondition	System would generate a report of the status of uploading files.
Business Rules:	System would transfer the uploaded files to format test center automatically.
Implementation, Constraints and Specifications:	GUI to be provided for the actor. GUI should be user-friendly, so actor will be able to learn and use it with minimal training. The system should transfer the uploaded files to format test center automatically. There should be a backup plan for the system.
Assumptions:	Medical institution would upload files separately.
Open Issues:	No open issues

Test file upload

Test file upload		Use-Case Type Business Requirements: ✓
Use-Case Name:	Test file upload	
Use-Case ID:	CTTS-003	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	IT Team – interested in evaluating the performance of system.	
Description:	This use-case describes the event of medical institution to check whether their files they uploaded fit the format requirement and ensure files which uploaded to system have the same format.	
Precondition:	This party test uploaded new files must be done after actors uploaded files into the system.	
Trigger:	This use case initiate when medical institutions uploaded files into the system.	
Typical Course of Events:	Actor Action	System Response
	Step 1: Waiting for the system response.	Step 1: receiving the uploaded files. Step 2: Identification the format of files.

		Step 3: Matching the format with standard format. Step 4: Generating results to results report that users can view it by themselves.
Alternate Courses:	No alternate course	
Conclusion:	This use-case concludes when the verification process was done within the system successfully.	
Post Condition	System generate results to result report that users can view it.	
Business Rules:	Uploaded files must be tested their format.	
Implementation, Constraints and Specifications:	The system should abstract the format features within limit time. The system should use process to matching two formats features in an acceptable speed.	
Assumptions:	The system should possess standard format feature in its database.	
Open Issues:	No open issues	

View results

Flow Records		
Use-Case Name:	View results	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-004	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	IT Team – interested in evaluating the performance of system.	
Description:	This use-case describes the event of medical institution to view the status of uploading files.	
Precondition:	This party show the results of verification process when the uploaded files finished the test process.	
Trigger:	This use case initiate when the system generates a report of results of format testing.	
	Actor Action	System Response

Typical Course of Events:	<p>Step 1: Sending request to view the results.</p> <p>Step 2: Waiting for the system response.</p> <p>Step 3: Getting access to view results.</p> <p>Step 4: Taking actions to the results.</p>	<p>Step 1: receiving the request.</p> <p>Step 2: Searching the database to find the result.</p> <p>Step 3: Showing results in webpage.</p>
Alternate Courses:	<p>Step 4: The actor did not upload files successfully. It would generate a report that concludes of the discrepancy and prompted to upload the files again.</p>	
Conclusion:	<p>This use-case concludes when the actors view their results successfully.</p>	
Post Condition	<p>System generate results of whether their files are uploaded or failed.</p>	
Business Rules:	<p>Uploaded files must have an accept status.</p>	
Implementation, Constraints and Specifications:	<p>GUI to be provided for the actor.</p> <p>GUI should be user-friendly, so actor will be able to learn and use it with minimal training.</p> <p>The system should give the result in an acceptable speed.</p>	
Assumptions:	<p>The system should possess a format to display the result to users.</p>	
Open Issues:	<p>No open issues</p>	

Accept/Reject reports:

Accept/Reject reports:		
Use-Case Name:	Accept/Reject reports	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-005	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	IT Team – interested in evaluating the performance of system.	

Description:	This use-case describes the event of medical institution to get notice of the status of file uploading, and they would take actions based on the accept or reject reports.	
Precondition:	This party shows the status of uploading files.	
Trigger:	This use case initiate when the system generates a report of results of format testing.	
Typical Course of Events:	Actor Action	System Response
	Step 1: View results through browser.	Step 1: Searching the database to find the result. Step 2: Showing results in webpage.
Alternate Courses:	Step 2: The system would show whether the uploaded files are accepted or rejected.	
Conclusion:	This use-case concludes when accept and reject status shows in the results.	
Post Condition	System display the status of uploading files.	
Business Rules:	Files only have an accept or reject: two kind of status.	
Implementation, Constraints and Specifications:	GUI to be provided for the actor. GUI should be user-friendly, so actor will be able to learn and use it with minimal training. The system should give the result status in a good position.	
Assumptions:	The system should ensure users can saw the status with good formatting.	
Open Issues:	No open issues	

Logout

Use-Case Name:	Logout	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-006	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	IT Team – interested in evaluating the performance of system.	
Description:	This use-case describes the event of medical institution to leave the system.	
Precondition:	This party submitting a logout request after users log in the system before.	
Trigger:	This use case initiate when the actors send a request to logout.	
Typical Course of Events:	Actor Action	System Response
	Step 1: Pressing the logout button. Step 2: Waiting for the system response. Step 3: Taking actions to notification of the system.	Step 1: Receiving the logout request. Step 2: Logging out the system. Step 3: Notifying Users.
Alternate Courses:	Step 3: The medical institution should resend the logout request if they are notified failed in logout.	
Conclusion:	This use-case concludes when medical institution log out the system successfully.	
Post Condition	No post condition	
Business Rules:	One user can and only can logout the system after the login before.	
Implementation, Constraints and Specifications:	GUI to be provided for the actor. GUI should be user-friendly, so actor will be able to learn and use it with minimal training. The system should notify users whether they successfully logout.	
Assumptions:	No assumptions	
Open Issues:	No open issues	

Submission Window:

Use-Case Name:	Submission Window	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-007	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Time	
Other Participating Actor:	Medical Institution	
Other Interested Stakeholders:	IT Team – Defining the period of submission in the system. Client – State of Massachusetts	
Description:	This use-case describes the event of time being a factor for the medical institutions. There is a fixed duration during which the medical institutions can upload the data and not after or before it.	
Precondition:	No previous condition	
Trigger:	This use case initiate when medical institutions start to use this system.	
Typical Course of Events:	Actor Action	System Response
	Step 2: Enter the details within the duration	Step 1: Portal Open Step 3: Portal Close
Alternate Courses:	No alternate course if the upload is not done within the specified time.	
Conclusion:	This use-case concludes when the time duration for file upload expires.	
Postcondition	No postcondition	
Business Rules:	The state requires that the time duration be strictly maintained.	
Implementation, Constraints and Specifications:	The Medical institution must make the file submissions within the provided time period	
Assumptions:	The Medical institutions are aware of the submission open and deadline.	
Open Issues:	No open issues	

Collect Patient Data

Use-Case Name:	Collect Patient Data	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-008	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Medical Institution	
Description:	This use case describes the patient data's collection as a factor of medical institution. The medical institution is allowed to collect the patient's data for their internal purposes	
Precondition:	No previous condition	
Trigger:	This use case initiate when medical institutions start to use this system.	
Typical Course of Events:	Actor Action	System Response
	Access the details of patient's data	Allow the medical institution to collect the data with authentic login id and password
Alternate Courses:	No alternate course	
Conclusion:	The use case concludes the surety of the institution to collect the data.	
Post condition	No post condition	
Business Rules:	The medical institution should strictly use the sensitive patient's data for legal purposes.	
Implementation, Constraints and Specifications:	• The medical institution should be allowed the access by the IT team	
Assumptions:	The IT team allows the access of data to the institution	
Open Issues:	No open issues	

Prepare File in XML Format

Use-Case Name:	Prepare File in XML Format	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-009	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Medical Institution	
Description:	The format of the file uploaded should be modified to XML format which is the only permitted format by the state of Massachusetts	
Precondition:	The file should be uploaded	
Trigger:	The use case initiates when the file uploads to the system	
Typical Course of Events:	Actor Action	System Response
	File converted to the XML format	Allow the file to convert to XML file format
Alternate Courses:	No alternate course	
Conclusion:	File is converted	
Post condition	No post condition	
Business Rules:	The uploaded file should be strictly used for business purposes.	
Implementation, Constraints and Specifications:	• The use case is defined on the fact that the file must be converted for use and access to the medical institution	
Assumptions:	File is uploaded	
Open Issues:	No open issues	

Calculate Numerator and Denominator

Use-Case Name:	Calculate Numerator and Denominator	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-010	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	IT Team	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use case describes the event of calculating the numerator and denominator for the measures defined in the system.	
Precondition:	The numerator and denominator is defined by the clients.	
Trigger:	This use case is used when the medical institution uploads their data and the calculation takes place in the system.	
Typical Course of Events:	Actor Action	System Response
	Step 1: IT Team defines the Numerator and denominator for the measures	Step 2: The system enforces the rules.
Alternate Courses:	No alternate course	
Conclusion:	The use case concludes when the numerator and denominator for a particular record has been calculated.	
Postcondition	The system generated the Numerator and Denominator	
Business Rules:	The uploaded file must have the required details for the calculation	
Implementation, Constraints and Specifications:	The use case depends on the conditions that the client has defined and what the IT Team has implemented in the system.	
Assumptions:	NULL	
Open Issues:	NULL	

Tobacco Use Measure

Use-Case Name:	Tobacco Use Measure	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-011	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use case describes the event of defining the measure for ‘Tobacco Use’	
Precondition:	The measure is defined by the client.	
Trigger:	This use case is triggered when the calculation requires the measure details	
Typical Course of Events:	Actor Action	System Response
	Step 1: IT Team defines the Measure for Tobacco Use	Step 2: The system Implements the measure for all the records uploaded
Alternate Courses:	No alternate course	
Conclusion:	This use case concludes when the measure has been calculated.	
Postcondition	The system sorts on the basis of the measure	
Business Rules:	The uploaded file must have the required details for the calculation	
Implementation, Constraints and Specifications:	The use case depends on the conditions that the client has defined and what the IT Team has implemented in the system.	
Assumptions:	NULL	
Open Issues:	NULL	

Caesarean Birth Measure

Use-Case Name:	Cesarean Birth Measure	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-012	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use case describes the event of defining the measure for ‘Cesarean Birth’	
Precondition:	The measure is defined by the client.	
Trigger:	This use case is triggered when the calculation requires the measure details	
Typical Course of Events:	Actor Action	System Response
	Step 1: IT Team defines the Measure for cesarean birth	Step 2: The system Implements the measure for all the records uploaded
Alternate Courses:	No alternate course	
Conclusion:	This use case concludes when the measure has been calculated.	
Postcondition	The system sorts on the basis of the measure	
Business Rules:	The uploaded file must have the required details for the calculation	
Implementation, Constraints and Specifications:	The use case depends on the conditions that the client has defined and what the IT Team has implemented in the system.	
Assumptions:	NULL	
Open Issues:	NULL	

Tobacco Use Bucket

Use-Case Name:	Tobacco Use Bucket	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-013	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use case describes the event of defining the buckets for ‘Cesarean Birth’. Here all the exceptional cases are passed and stored.	
Precondition:	The bucket condition is provided by the client. The condition has to be satisfied.	
Trigger:	Whenever the bucket condition is triggered.	
Typical Course of Events:	Actor Action	System Response
	Step 1: IT Team defines the conditions for Tobacco Use buckets	Step 2: The system Implements the conditions for all the records uploaded
Alternate Courses:	No alternate course	
Conclusion:	This use case concludes when all the records are read and sorted into buckets if required	
Postcondition	The system sorts on the basis of the bucket condition	
Business Rules:	The uploaded file must have the required details for the calculation	
Implementation, Constraints and Specifications:	The use case depends on the conditions that the client has defined and what the IT Team has implemented in the system.	
Assumptions:	NULL	
Open Issues:	NULL	

Caesarean Birth Bucket

Use-Case Name:	Cesarean Birth Bucket	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-014	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	Medical Institution	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use case describes the event of defining the buckets for ‘Cesarean Birth’. Here all the exceptional cases are passed and stored.	
Precondition:	The bucket condition is provided by the client. The condition has to be satisfied.	
Trigger:	Whenever the bucket condition is triggered.	
Typical Course of Events:	Actor Action	System Response
	Step 1: IT Team defines the conditions for cesarean birth buckets	Step 2: The system Implements the conditions for all the records uploaded
Alternate Courses:	No alternate course	
Conclusion:	This use case concludes when all the records are read and sorted into buckets if required	
Postcondition	The system sorts on the basis of the bucket condition	
Business Rules:	The uploaded file must have the required details for the calculation	
Implementation, Constraints and Specifications:	The use case depends on the conditions that the client has defined and what the IT Team has implemented in the system.	
Assumptions:	NULL	
Open Issues:	NULL	

Update Measures

Use-Case Name:	Update Measures	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-015	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	IT Team	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use-case describes the event of updating/changing the pre-defined measures when directed by the client.	
Precondition:	Web browser is opened, and the actor is logged in.	
Trigger:	Client has made changes in the measure.	
Typical Course of Events:	Actor Action	System Response
	Primary Actor Action Step 1: Once the actor (IT team) is logged in, they click on the 'Update Measures' tab. Step 3: The actor either updates a measure or adds a new one.	System Response Step 2: The system displays two options: a) a list of existing measures and cases b) an option to enter a new measure in the system Step 4: The system saves the changes made.
Alternate Courses:	NA	
Conclusion:	The use case ends once the system display the message – 'Successfully updated'.	
Postcondition	Either existing measure is updated or a new measure is added.	
Business Rules:	Only the IT Team can update measures in the system.	
Assumptions:	The changes are made after they are approved by the client.	

Authorization

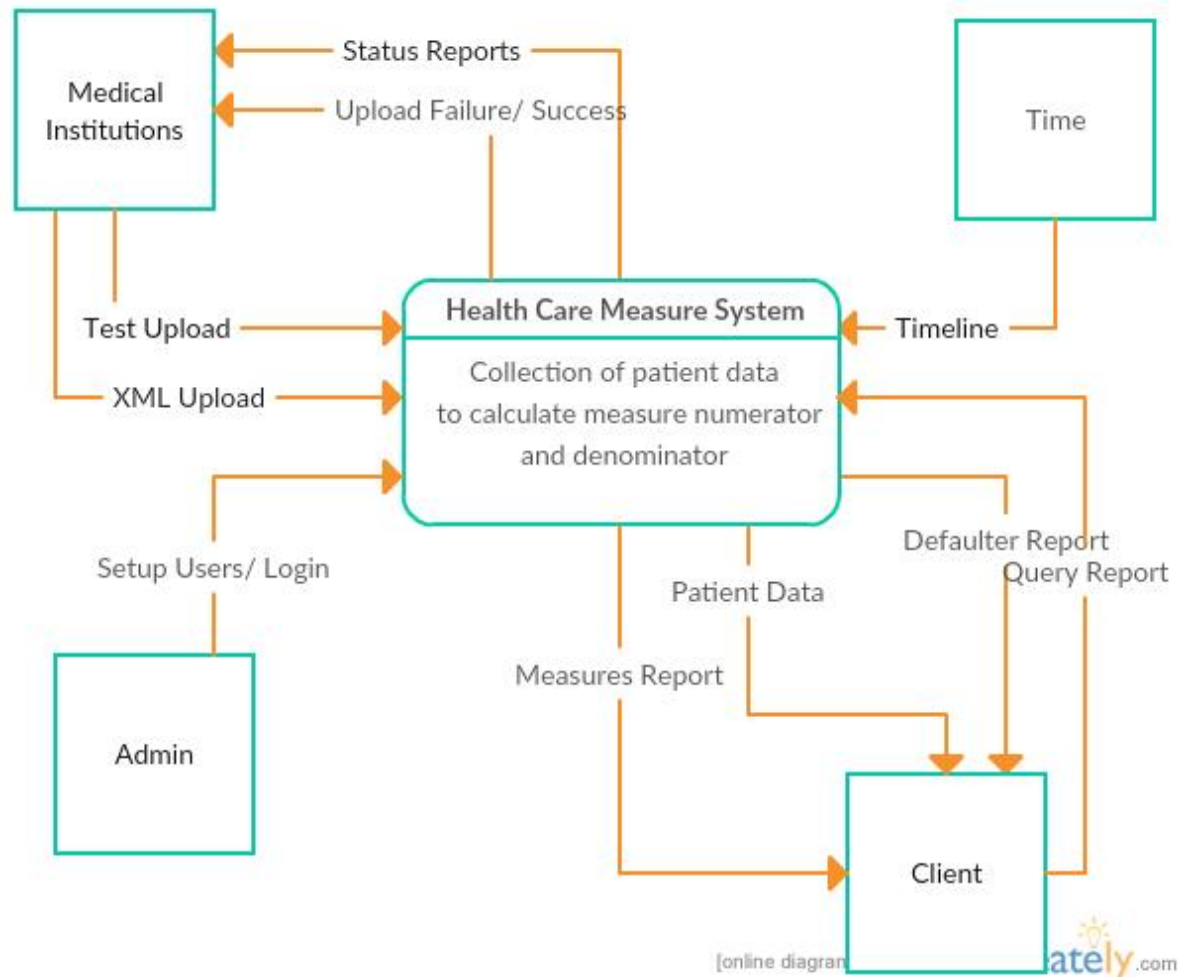
Use-Case Name:	Authorization	Use-Case Type Business Requirements: ✓
Use-Case ID:	CTTS-016	
Priority:	High	
Source:	Function Requirement R 1.0	
Primary Business Actor:	IT Team	
Other Participating Actor:	Null	
Other Interested Stakeholders:	Client – State of Massachusetts	
Description:	This use-case describes the event of giving permission to other users to perform specific tasks in the system, keeps track of users that are accessing the system and for what reason.	
Precondition:	Primary actor, i.e., the IT team has access to the system.	
Trigger:	Another actor is accessing the system.	
Typical Course of Events:	Actor Action	System Response
	Primary Actor Action Step 2: The actor receives the notification from the system and assess the activity performed by the user.	System Response Step 1: Another user enters the system for which the system sends a notification to the IT team and record the activities.
Alternate Courses:	Step 2: If the actor has not tracked the activities (performed by other users) within a definite time, a reminder will be sent again via system.	
Conclusion:	The use case ends successfully once the IT team evaluates the user activity.	
Postcondition	Either existing measure is updated or a new measure is added.	
Business Rules:	The IT team has the authority to allow/deny access to a user due to irregularities.	
Implementation, Constraints and Specifications:	IT team has 24/7 access.	
Assumptions:	The client is informed about any anomalous actions.	
Open Issues:	How much time should be given to the IT team to assess the activities performed?	

Generate Reports

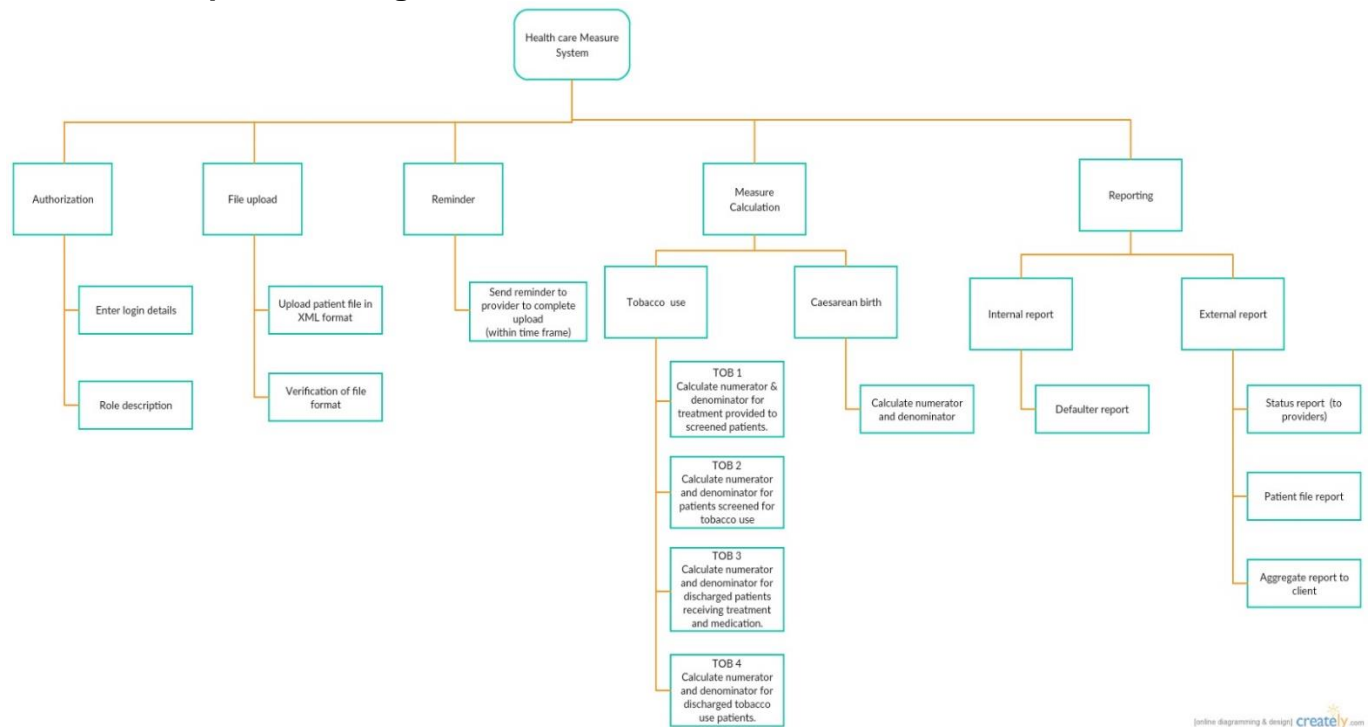
Use-Case Name:	Generate Reports	Use-Case Type Business Requirements: ✓	
Use-Case ID:	CTTS-017		
Priority:	High		
Source:	Function Requirement R 1.0		
Primary Business Actor:	Client – State of Massachusetts		
Other Participating Actor:	Null		
Other Interested Stakeholders:	Null		
Description:	This use-case describes the event of the system generating a final report based on all the calculations.		
Precondition:	Patient's records are uploaded in xml format.		
Trigger:	All the calculations related to the measures are complete.		
Typical Course of Events:	Actor Action	System Response	
	Primary Actor Action Step 3: The client views the final report generated.	System Response Step 1: The system completes all the tasks mentioned in the Calculations subsystem. Step 2: The system generates a final report based on the calculations.	
Alternate Courses:	Step 1: The uploaded file is erroneous and does not undergo through all the calculations and is marked as rejected.		
Conclusion:	The use case ends successfully once the report is generated and viewed by the client.		
Postcondition	This use case marks the end of the information system.		
Business Rules:	Only the client has access to the final report.		
Implementation, Constraints and Specifications:	The final report is in xml format.		
Open Issues:	Should the completed report and respective EMR be removed from the system after a definite time? If yes, then what should be the duration for keeping a complete record in the system?		

DATA FLOW ANALYSIS

Context Diagram

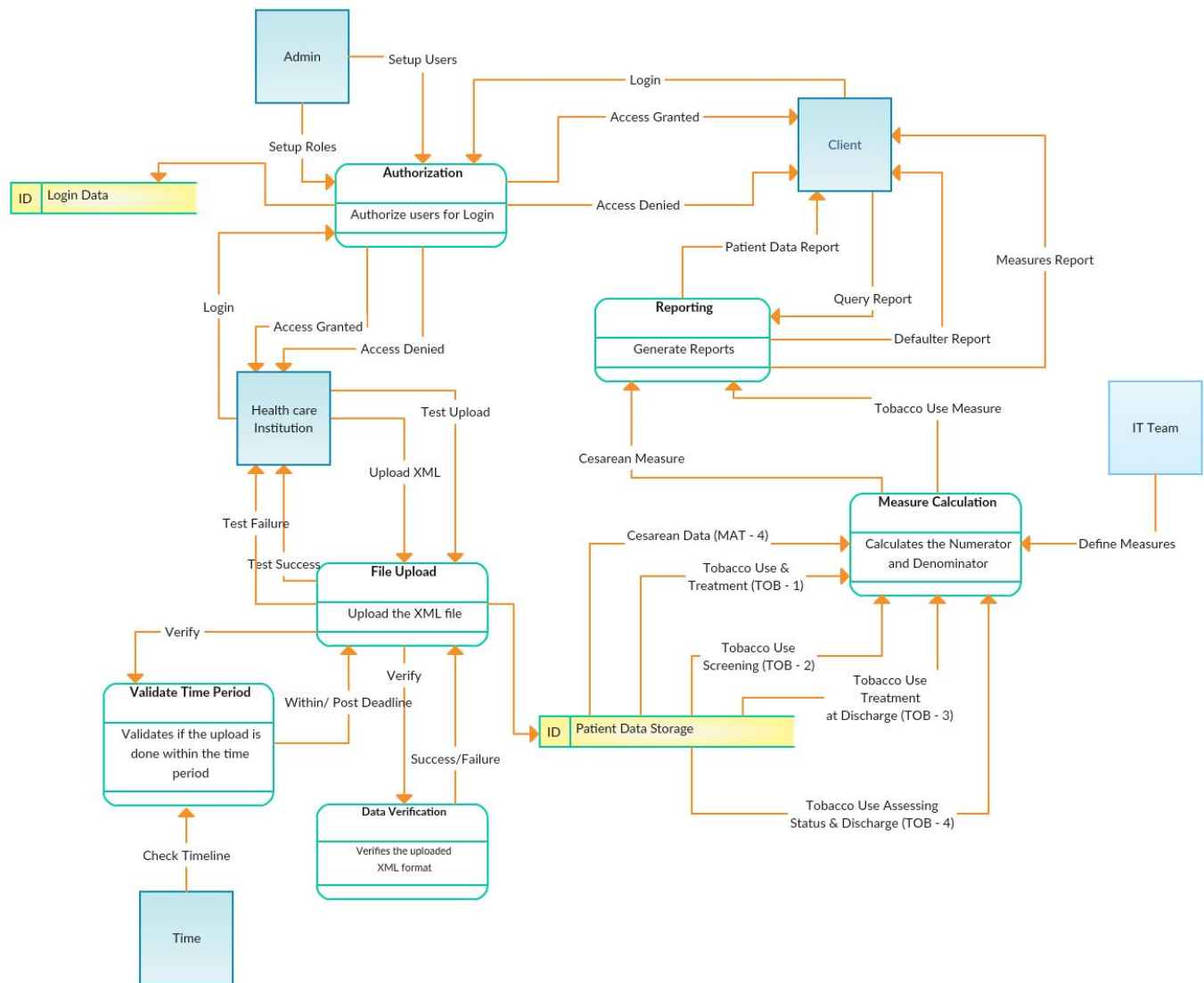


Event Decomposition Diagram

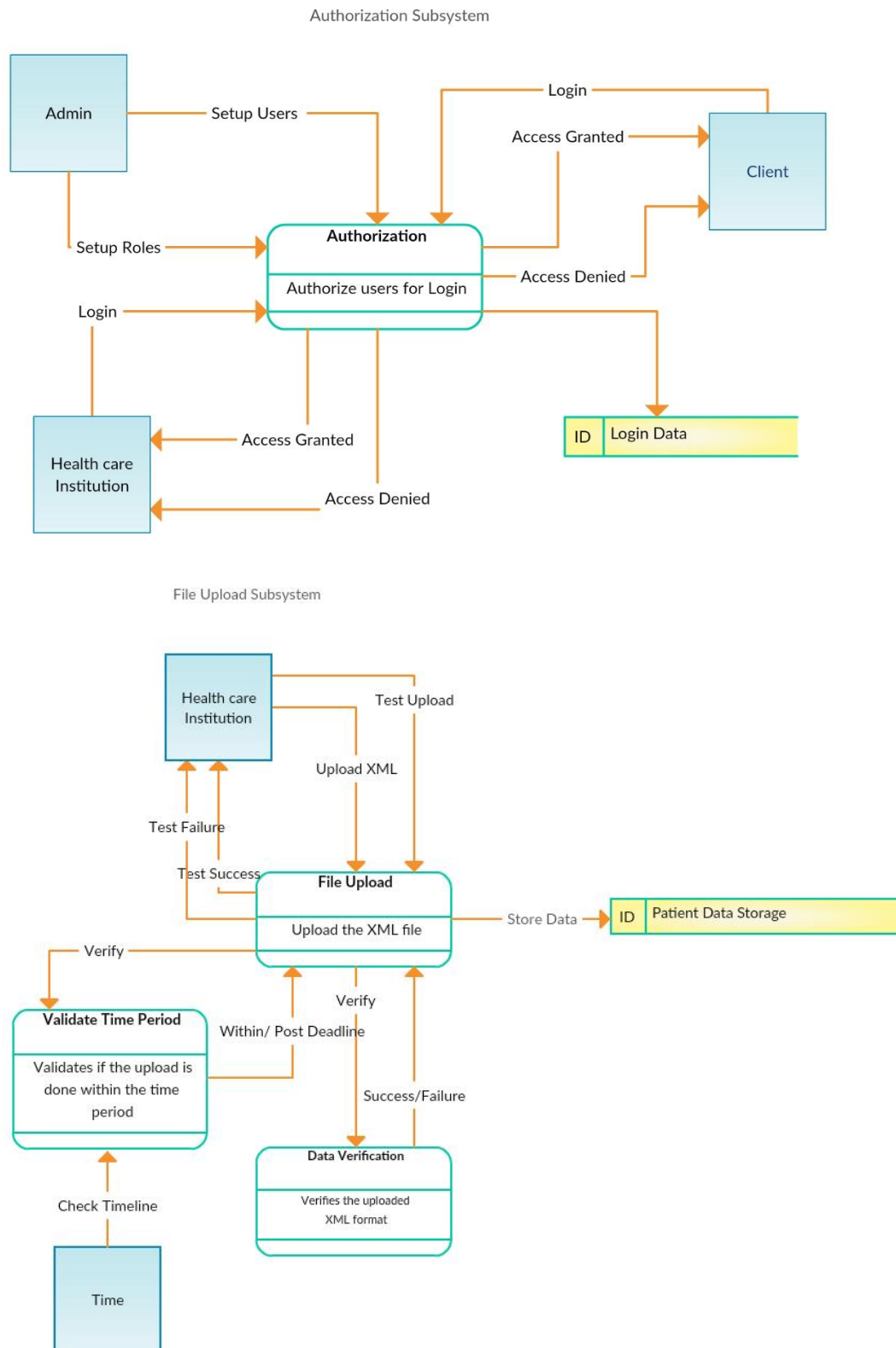


[online diagramming & design] [createy.com](https://www.createy.com)

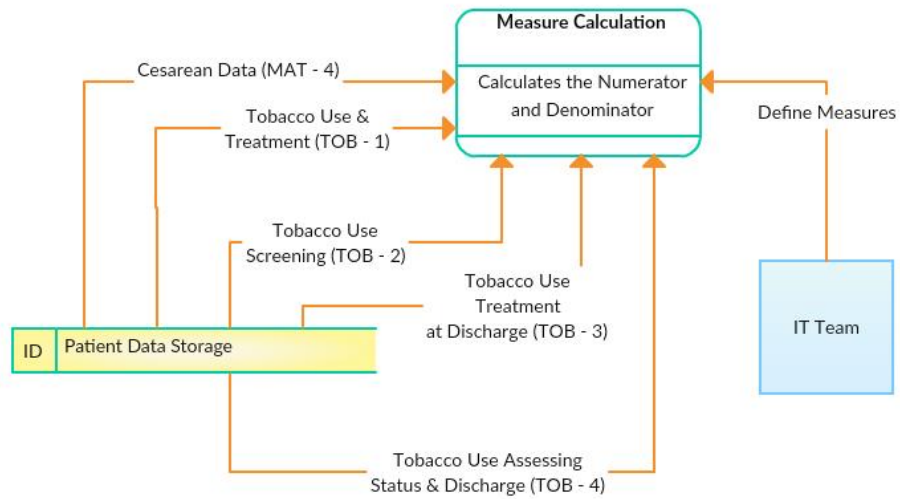
Level 1 Data Flow Diagram



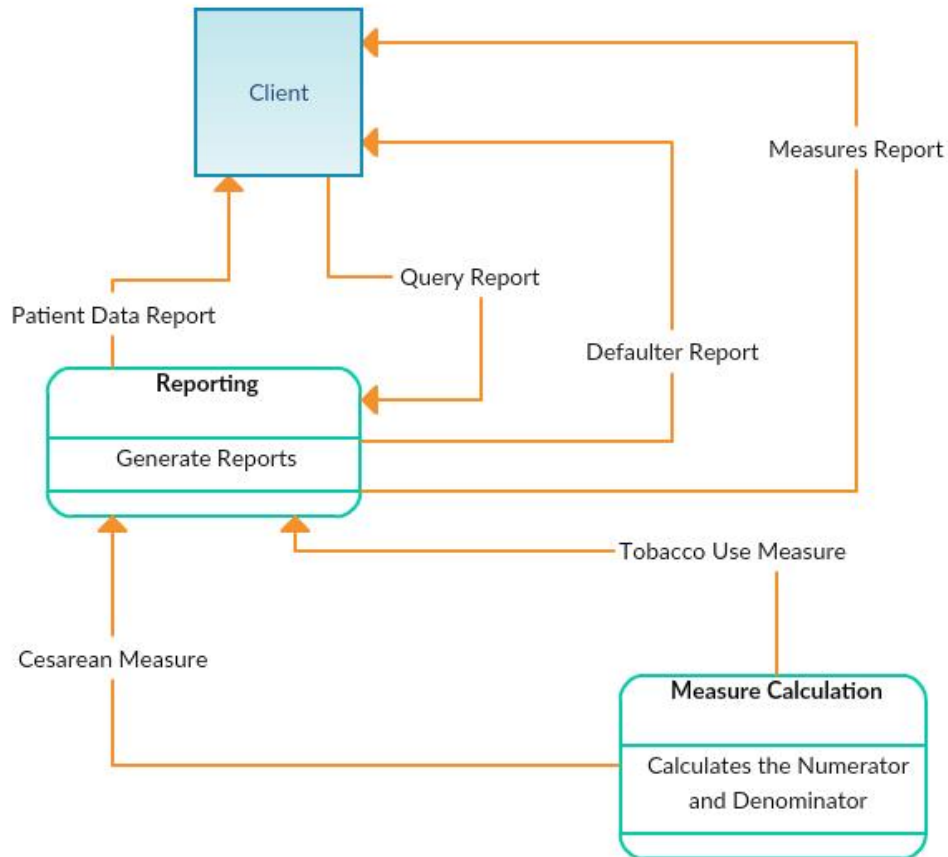
Primitive Data Flow Diagram



Measures Calculation Subsystem

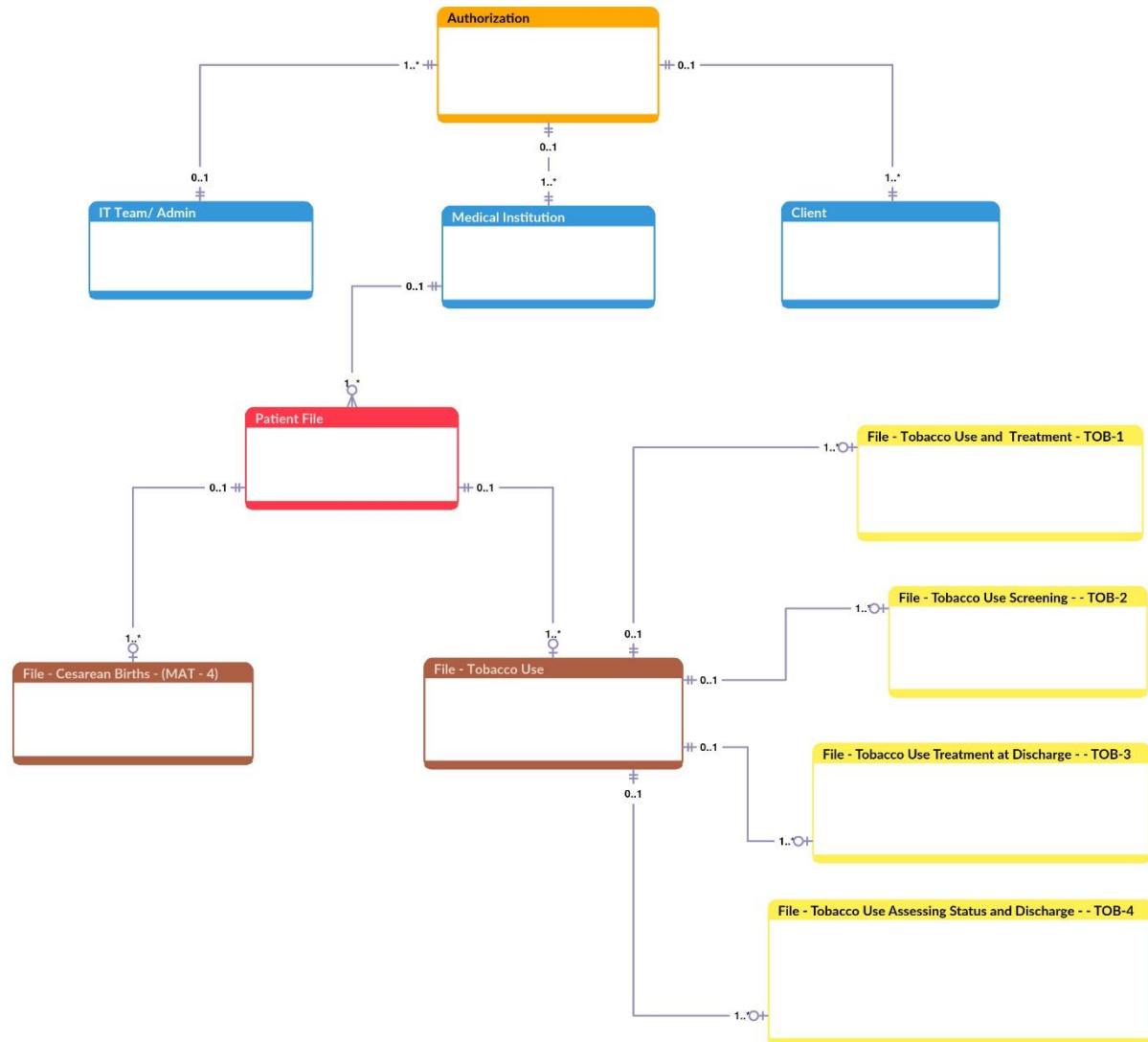


Reporting System

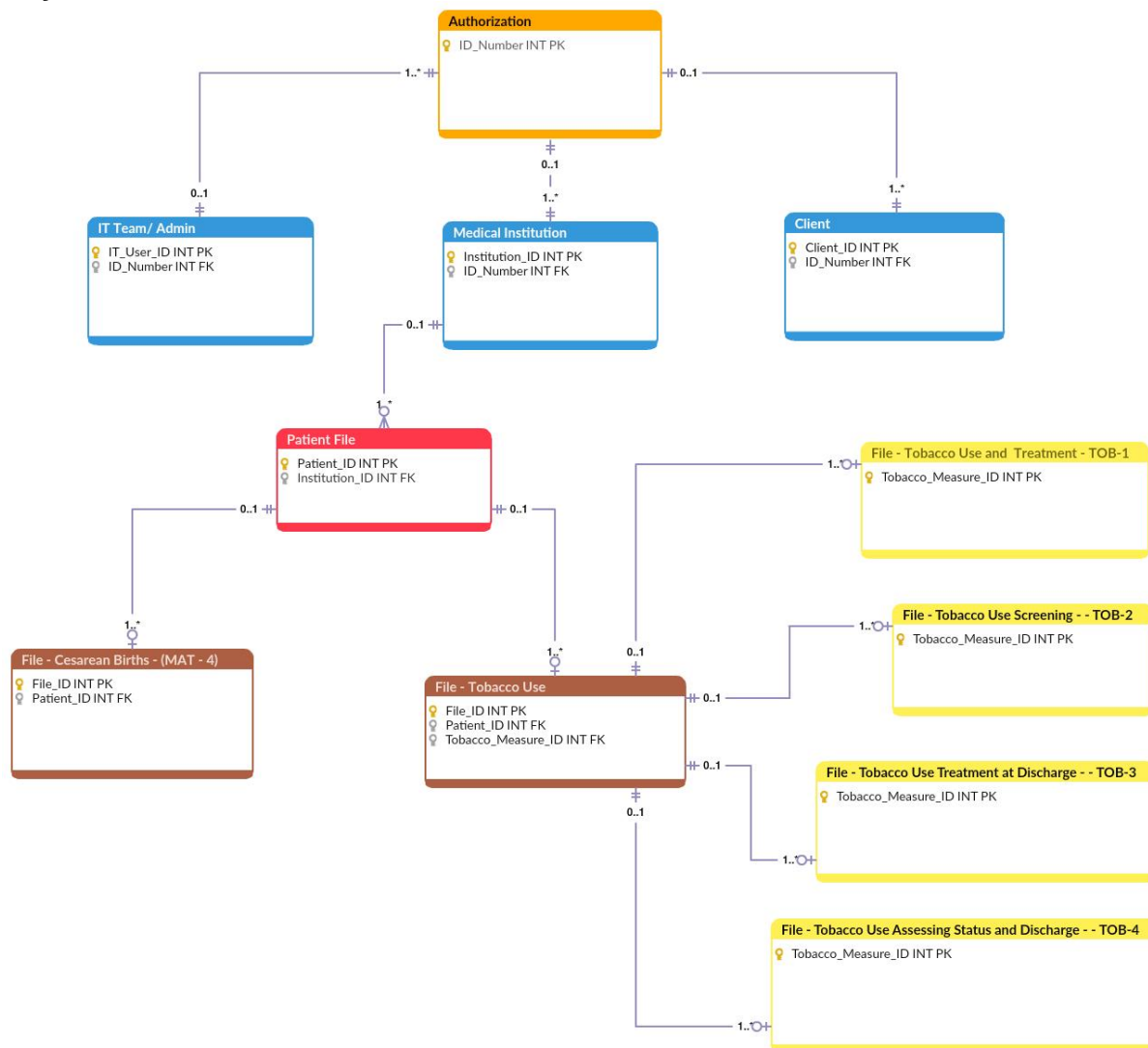


ENTITY RELATIONSHIP DIAGRAMS

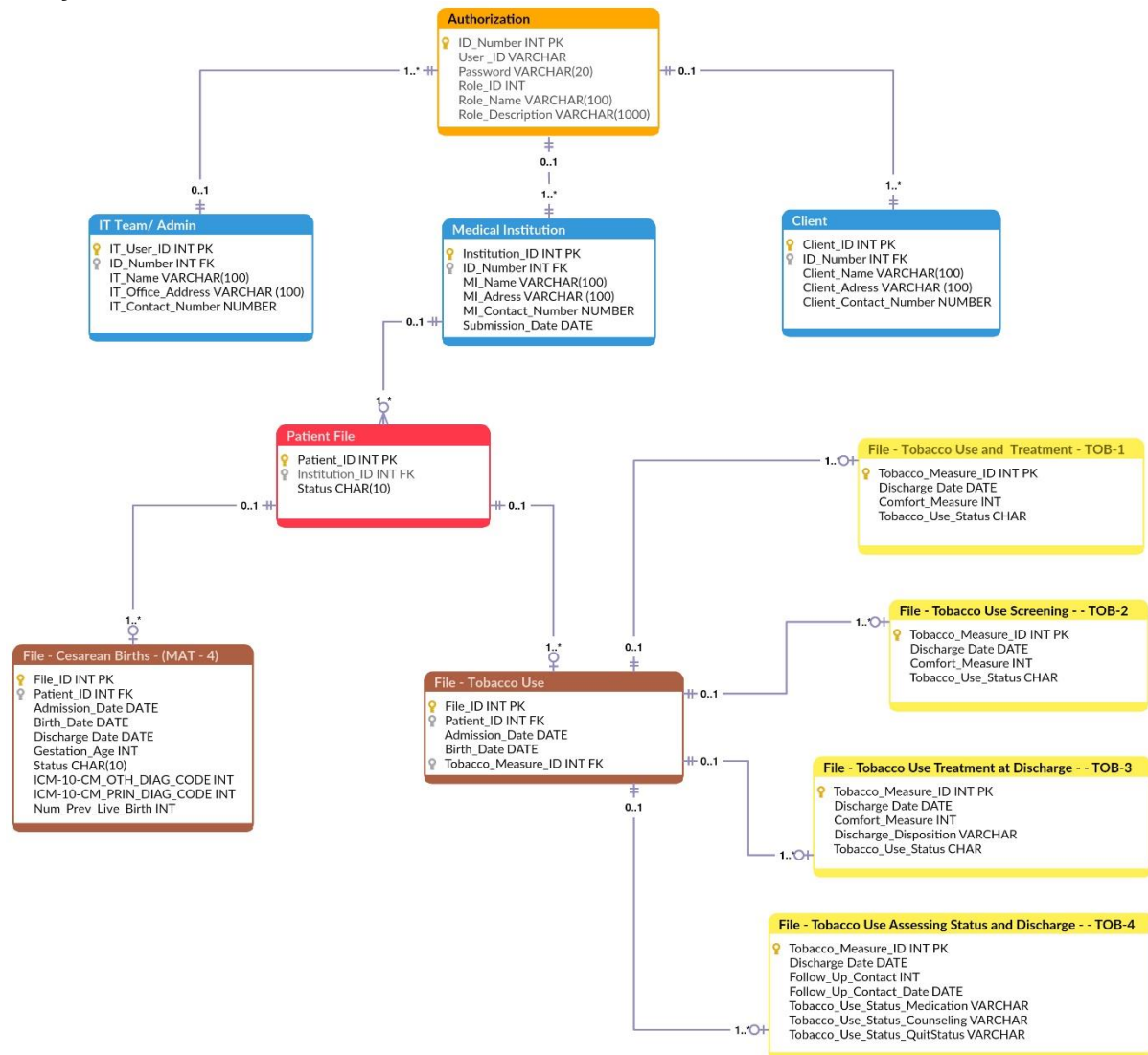
Context Data Model



Key Based ERD



Fully Attributed ERD



ENTITY DEFINITION MATRIX

Entity	Description
Authorization	This entity is responsible for handling the User ID and Passwords for all the users (Admin, Client & Medical Institution) which is required to log the users in the web portal. Each user is assigned a role which will determine what authorization and what functions the user can perform once logged in.
IT Team/ Admin	This entity is responsible for the maintenance and proper functioning of the information system.
Medical Institution	This entity includes information about various medical centres and institutions that upload patients' file asking for the claim returns from the client.
Client	This entity represents the user for this system, in this case – State of Massachusetts.
Patient File	This entity includes all the details about the patients, e.g., measure type, responsible medical institution etc.
File – Caesarean Births (MAT-4)	This entity includes information about those patients that fit the conditions for Caesarean birth measure.
File – Tobacco Use	This entity includes information about those patients that fit the conditions for Tobacco Use measure.
File – Tobacco Use and Treatment (TOB-1)	This entity includes the treatment and counselling provided/offered to the screened patients.
File – Tobacco Use Screening (TOB-2)	This entity includes information about those patients that are screened for tobacco use based on some pre-defined criteria.
File – Tobacco Use Treatment at Discharge (TOB-3)	This entity includes information about the treatment and medication provided to the screened tobacco patients upon discharge.
File – Tobacco Use Assessing Status and Discharge (TOB-4)	This entity includes information about discharged patients that were screened for tobacco use.

INPUT, OUTPUT AND REPORT SCREENS

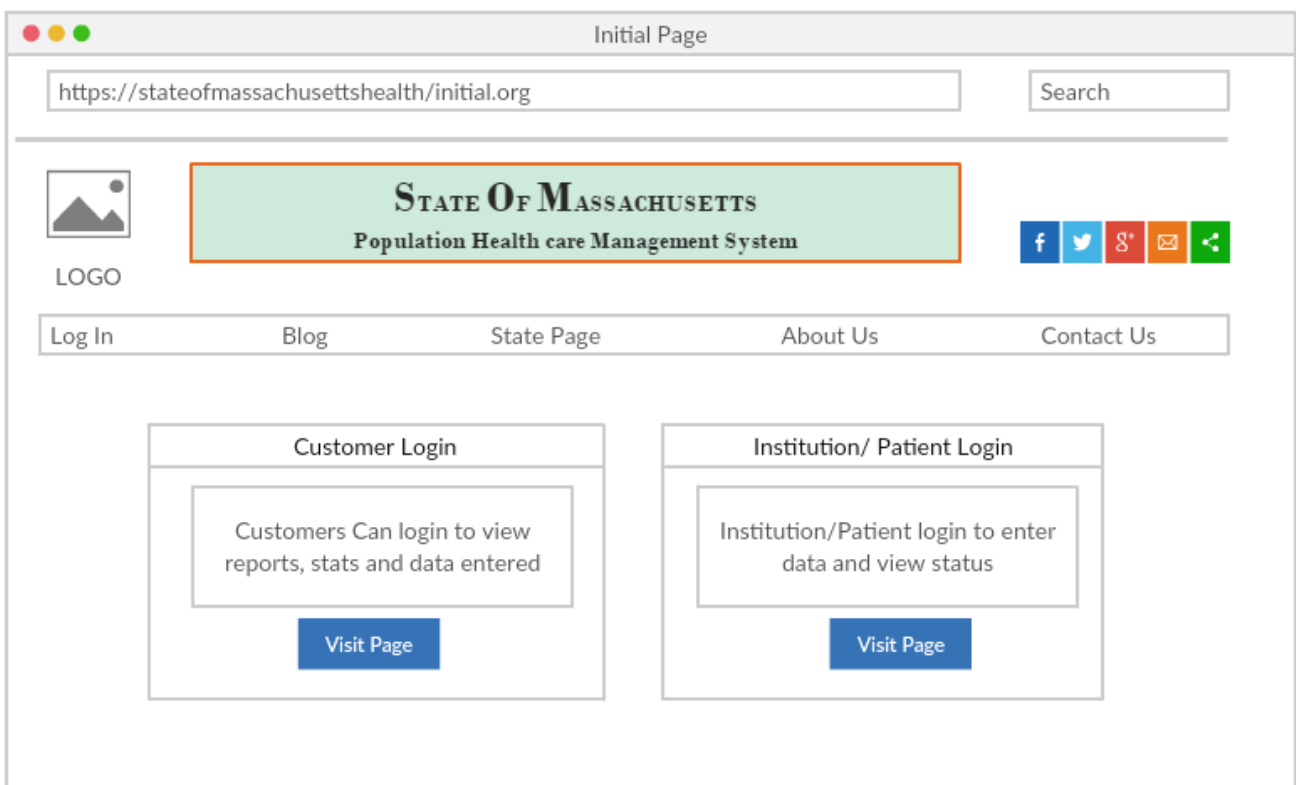
The website for the State of Massachusetts, Population Healthcare Management System will have the web page outlines for input, output and reports as depicted below. With the use of PHP scripting language embedded in browser html code and also using Javascript and CSS. The user data is saved to, retrieved from SQL tables.

Initial Page:

Here the users will get access to multiple tabs such as login page for Customer Login or Institution/ Patient Login. Based on the selection the respective screen appears.

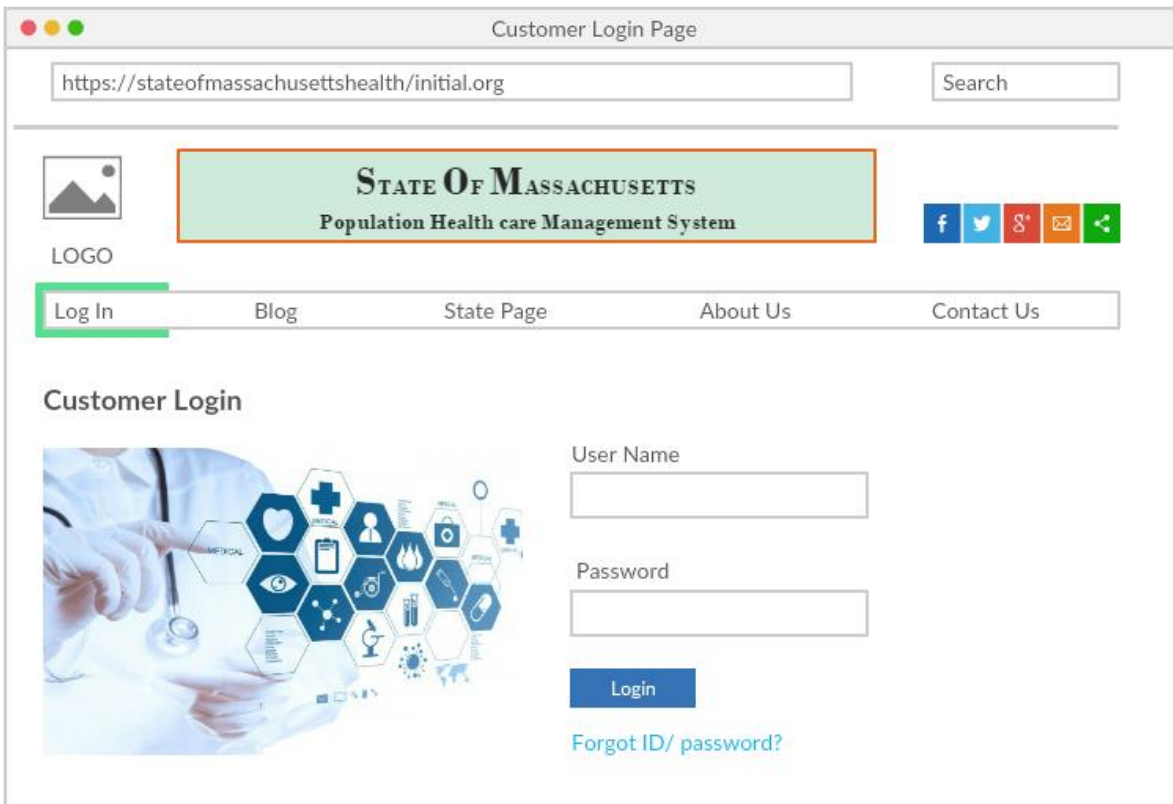
Based on which login is used the user is determined and they are allowed to do the respective actions they are authorized to do.

Apart from Login, here are other options such as 'Blog', 'State Page', 'About Us' and 'Contact Us' which will be populated with the data as per what is provided by the State of Massachusetts. There are links to social networks too which will redirect you to the linked pages.



Customer Login:

This is the login page for Customers to login to their account and view reports. Only customer User ID and password is accepted.



The screenshot shows a web browser window titled "Customer Login Page". The address bar displays "https://stateofmassachusettshealth/initial.org". A search bar is located in the top right corner. Below the address bar, there is a logo placeholder labeled "LOGO" and a green banner with the text "STATE OF MASSACHUSETTS Population Health care Management System". To the right of the banner are social media icons for Facebook, Twitter, Google+, Email, and a share icon. Below the banner is a navigation menu with links: "Log In" (highlighted with a green border), "Blog", "State Page", "About Us", and "Contact Us". The main content area is titled "Customer Login". It features a graphic on the left showing a hand holding a stethoscope over a cluster of hexagonal icons representing various medical and health concepts. To the right of the graphic are two input fields: "User Name" and "Password". Below these fields is a blue "Login" button and a link labeled "Forgot ID/ password?" in blue text.

Institution Login:

This is the login page for Institutions to login to their account to upload the xml file or to enter the patient data and view the data. Only Institution User ID and password is accepted.

The screenshot shows a web browser window titled "Institution/ Patient Login Page". The address bar displays "https://stateofmassachusettshealth/initial.org". A search bar is located in the top right corner. Below the address bar, there is a logo placeholder labeled "LOGO" and a green banner with the text "STATE OF MASSACHUSETTS Population Health care Management System". To the right of the banner are social media icons for Facebook, Twitter, Google+, Email, and a share icon. Below the banner is a navigation menu with links: "Log In" (highlighted with a green box), "Blog", "State Page", "About Us", and "Contact Us". The main heading is "Institution/ Patient Login". On the left, there is a graphic of a doctor's hand holding a stethoscope over a cluster of hexagonal icons representing various medical fields. On the right, there are two input fields: "User Name" and "Password". Below these fields is a blue "Login" button and a link "Forgot ID/ password?" in blue text.

Institution/ Patient Login Page

https://stateofmassachusettshealth/initial.org

Search

LOGO

STATE OF MASSACHUSETTS
Population Health care Management System

Log In Blog State Page About Us Contact Us

Institution/ Patient Login

User Name

Password

Login

[Forgot ID/ password?](#)

This page appears after the customer logs in. The reports page gives the user the option to apply filters and run the reports. Visualizations and tables are generated to give the users a better view of the data entered by the institutions.

Drop down menus and radio button help filter out the data. We have used radio buttons to select the Measure for which the report has to be run.

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Institution/ Patient Page:

During upload there is an option to check the format of the uploaded XML file to verify if the format is correct before final upload. On successful test the success message is delivered and an error message if the file format is incorrect.

If the institution prefers to enter the data manually then there is an Input option.

The entered data can be checked again using the patient file report.

The screenshot shows a web browser window titled "Institution/ Patient Page" with the URL "https://stateofmassachusettshealth/initial.org". The page features a header with the "STATE OF MASSACHUSETTS Population Health care Management System" logo and social media icons. A navigation bar includes "Institution Page", "Blog", "State Page", "About Us", and "Contact Us". The main content area has three sections: "Upload XML" with a "Path" input field, "Test Format", and "Upload" buttons; "Input Measures" with radio buttons for "Cesarean Birth" and "Tobacco Use & Screening", and an "Enter" button; and "Patient File" with input fields for "Patient Name", "Patient ID", and "Case Number", along with a "Generate Report" button.

A dialog box titled "Dialog Title" with the message "Records successfully updated. Click 'OK' to proceed." and "OK" and "Cancel" buttons.

An error dialog box titled "Error" with a red "X" icon and the message "Test Run Unsuccessful. Please Check the Format and Run Again." and an "OK" button.

An information dialog box titled "Information" with a blue exclamation mark icon and the message "Test Run Successful. Click 'OK' to Upload." and "OK" and "Cancel" buttons.

FEASIBILITY ANALYSIS

Feasibility analysis is used to assess the strength and weakness of a proposed project and propose directions to achieve the desired results. We will be evaluating the feasibility of the project on the basis of 5 types of feasibilities: Operational Feasibility, Cultural Feasibility, Technical Feasibility, Schedule Feasibility and Legal Feasibility.

Operational Feasibility:

Involves undertaking a study to analyze and determine if the proposed solution meets the business needs.

#	Existing Systems Need	New System Features
1	Uneven Quality of healthcare provided	To implement equal and better quality of healthcare across all geographic locations in the state
2	Underuse, Overuse, or Misuse of Services	Implemented a login page to monitor each user actions
3	Expensive Services	Healthcare measures provided will be tracked down through the complete process of insurance policies
4	Collection of less information of patient's health, the healthcare received, and outcomes	Complete computerized and automated system will reduce the scope of errors
5	Old Strategies	More collection of information of patients healthcare received and outcomes will help doctors build new strategies

Challenges faced by this proposed solution:

All employees would be required to be trained to use the fully computerized system. A better IT staff would be needed in order to deal with the technical issues, if faced any, by the system.

Effective third party vendors' connection would be needed to deal with any issue faced by the system.

Cultural Feasibility

A cultural feasibility study is defined as one that investigates scientific as well as ethical, behavioral, and social issues in the design of a system. It is one of the important aspects of feasibility analysis to consider whether the system would be accepted by the medical institutions, State of Massachusetts, patient, and the IT team. Our whole team believes that the system we have designed would be accepted, and would be culturally feasible because the requirements of the system are gathered by studying the problems faced in the old system, and new features of the system will add benefit to the healthcare system. The medical institution will be able to upload and test the files, view and accept or reject reports, collect patients' data, convert the file in XML file format. These features in the new system are useful and better than the previous system where the medical institution wasn't able to have the complete access of the files.

We think that there may be some resistance towards the new system, and working on the system more and more along with giving proper training to the users will help the system to be implemented effectively. Also, feedbacks regarding changes needed to be made to make the system simpler would be highly advised and appreciated.

Technical Feasibility

With the technical feasibility analysis we intend to assess if the technical resources meet the intended capacity and the technical team is able to convert the idea into a working system.

System Requirements

2 Routers

2 Web Servers

2 Database Servers (One main and one for backup)

Data Warehouse (For Archival and Reporting)

PC in every medical institution (Prerequisite)

Power Backup System (UPS)

Miscellaneous network and network security components

Hardware Requirements for Web and Database Servers

Item	Web server (minimal)	Web server (recommended)	Combined Web & Database Server (minimal)	Combined Web & Database Server (recommended)
Processor	1,6 GHz CPU	2 x 1,6 GHz CPU	2 x 1,6 GHz CPU	4 x 1,6 GHz CPU
RAM	1,75 GB RAM	3,5 GB RAM	3,5 GB RAM	7 GB RAM
HDD	1x 40 GB of free space or more is recommended 1x 40 GB of free space or more is recommended for the software that is listed in the software requirements			
Software	Microsoft .NET Framework 4.5			

Software Requirements for Web Servers

Component
Internet Information Services (IIS) 6, 7.0, 7.5 or 8
Windows PowerShell 2.0, 3.0 or 4.0

Software requirements for Database Servers

Microsoft SQL Server 2012 Service Pack 1

OR

Microsoft SQL Server 2012

Remote Connection Requirements

It should be possible to access the servers using a remote desktop (RDP) connection.	Make sure the connection is secure.
The remote user to log in that should have local admin rights.	

Supported Operating Systems

Operating System
Windows Server 2012 R2
Windows Server 2012
Windows Server 2008 R2
Windows Server 2008
Small Business Server 2008
Windows Essential Business Server 2008, Standard or Premium edition
Windows Server 2003 R2 with Service Pack 2 or later
Windows Server 2003 with Service Pack 2 or later
Small Business Server 2003 R2 with Service Pack 2 or later

Schedule Feasibility

Schedule feasibility is the most important of all. The project will fail if it is not completed on time. This project being an initiative of the State of Massachusetts, is time sensitive and hence the project schedule has been designed in such a way that there is ample lag time to make sure that all the components are in place and double checked. Any error in the system may lead to incorrect calculation of measures and this effect will lead to incorrect healthcare management.

Legal Feasibility

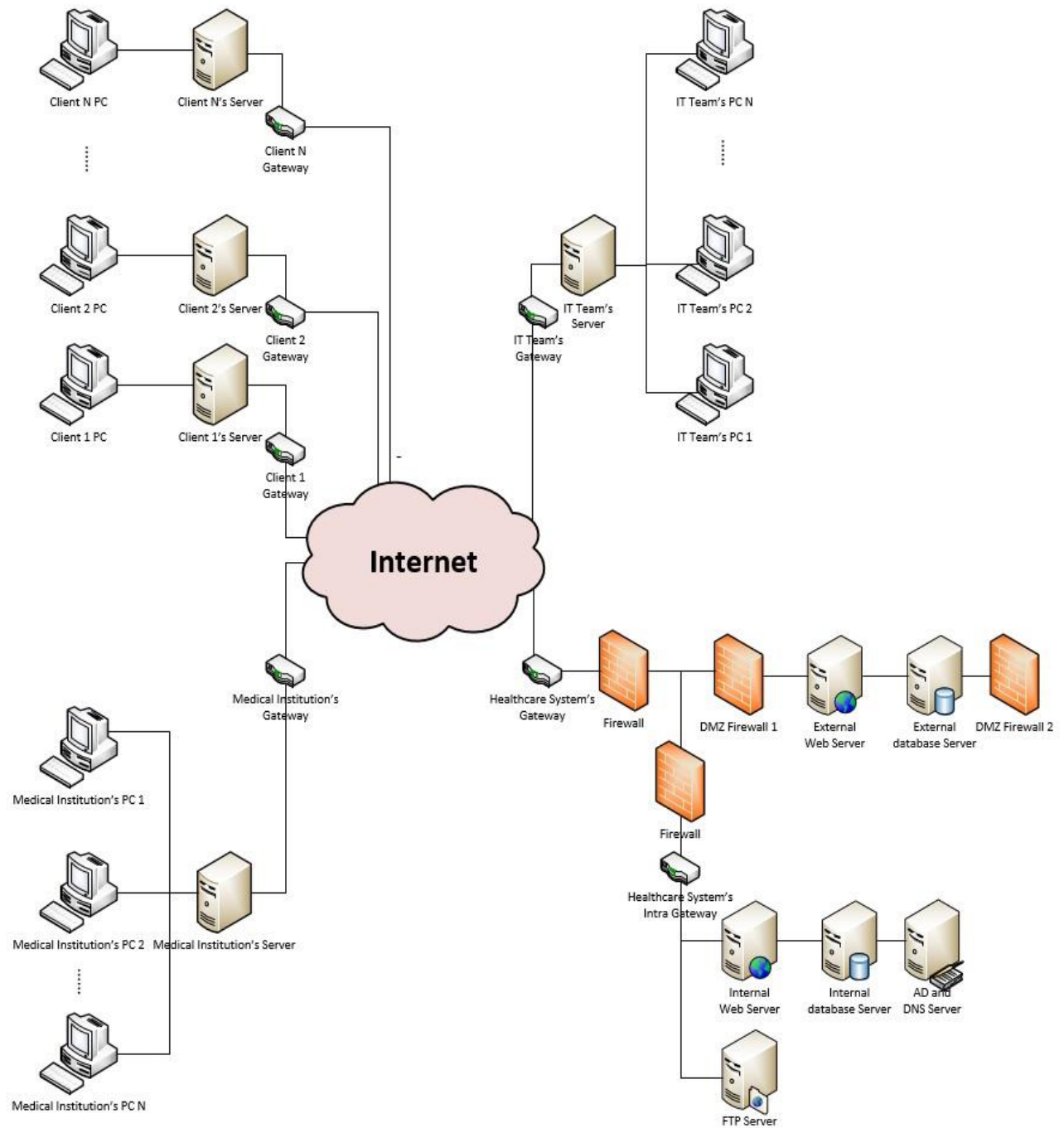
There are a certain legal issues that have to be taken into consideration:

- The data being gathered will be the property of the State of Massachusetts
- Medical institutions will not have to provide the Patient's private details such as name and address to maintain patient/ doctor confidentiality.
- The system has been designed in such a way that individual institutions have their own login and they can access only their data to maintain confidentiality
- Strong security measures have to be implemented to make sure that unauthorized individuals don't have access to sensitive information.

Gap Analysis

We will take up the role of collaborating with the stakeholders to conduct an analysis of the existing measures portfolio and address the gap in this domain. The gap are applicable in evaluating the type of measures (caesarean birth and tobacco use) to people with certain health conditions. The purpose of this is to recommend prioritized approaches to close the gap by the adoption and refinement of quality measures.

SYSTEM ARCHITECTURE



IMPLEMENTATION PLAN

1. Development

Our healthcare measurement system will consist the following components:

- a. Database system running on database management system Microsoft SQL server
- b. Backend application ASP.NET
- c. Front end application Microsoft Silverlight
- d. Microsoft Visio is an IDE which will be used

We have a proper implementation plan. We will hire a development team to write the code for the system. This can take 4-6 months of development and 20-30 days for testing and then a month for implementation.

2. Testing

- a. Unit testing of each block of code will be done during the development process.
- b. Integrated testing of code while implementing the code into the software package.
- c. System testing will lead to improving the software
- d. Testing will then be approved by the state of Massachusetts

3. Implementation

The system will be implemented by the state government in accordance with the locations. They will be providing us the locations and we will implement the system in those places.

4. Training

The staff will be properly trained to use the system effectively.

5. Support

Our IT team will support if any problems will be faced by the staff of in the system. Within a proper amount of time, support will be provided.

COMMENTS AND INSIGHTS

- a. User interface is required to be changed if we make any changes in the ERD or DFD of the system.
- b. Gathering of requirements took a lot of time.
- c. Our group worked really hard on this and proper communication was done among the group mates.