

An online integrated healthcare information system

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Outline

- Introduction
- Background
- Motivation
- Proposed Approach
- Requirement Analysis
- Prototyping /Design
- Implementation
- Evaluation
- Discussion and Future Work
- Conclusion

Introduction

- Healthcare service is vital part for human life
- Consult with physician when people are sick
- Illness quickly recovery
- Less cost in treatment
- Different criteria to select a doctor
- Unqualified Medical Practitioners
- Wrong treatment procedure
- Difficulty to complaint about physician
- Consider social status in treatment
- Patient review on treatment

Introduction Contd..

- Review doctor's degree, overall experience, area of specialist, patient's comments from reliable information system
- Patient's feedback on treatment independently
- Review patient's feedback by doctor
- Doctor's awareness of patient experience
- Improvement doctor's competence level
- Prescription management
- Availability of medical historical records
- Verify qualified doctor in practice
- Authenticated demography of patient
- Make the most well-considered medical decision

Background study

Existing online healthcare system

After review the online healthcare service system, we prepared a comparison statement on different kind of services they offered.

Online Service Provider	Doctor's Profile Management	Doctor's Appointment	Doctor Search with full profile	Patient Feedback	Medical History	Prescription Management	Patient Access on Medical Records
Doctorola	Yes	Yes	Partial	No	No	No	No
Practo	Yes	Yes	Partial	Partial	Partial	Yes	No
Bd Health Solution	Partial	Yes	Partial	No	No	No	No
iCliniq	Partial	Yes	Partial	No	No	No	No
Praava Health bd	Yes	Yes	Partial	No	No	No	No
Olwel bd	Partial	Partial	No	No	No	No	No

Background study...

- Limitation of existing system

Since most of the online healthcare service focus on doctor's appointment, medication to the remote patient, finding doctor, and online medical advice as well as providing family healthcare service including clinical test.

We have observed some limitations such as

- Finding doctor with review of complete doctor's profile like degree, experience, patient's comments
- Patient feedback system
- Medical historical records
- Prescription management
- Doctor's verification

Background study..

- Objective
 - To develop an online integrated healthcare system where the patient could search and choose a good physician and able to make a decision by reviewing the doctor's profile, experience and feedback by other patients on a particular disease
 - To create the impact on the mindset of a physician towards the patient satisfaction because of considering the ability of patient's feedback in the system.

Motivation

Media Reports

প্রথম আলো

এইচএসপি পাস চিকিৎসক!

প্রতিনিধি, মাদারীপুর

০১ মার্চ ২০১৯, ২১:০৫
আপডেট : ০১ মার্চ ২০১৯, ২১:০৫



প্রত্যক্ষকারী আর্ডার নিয়ে চিকিৎসা সেওয়ার অপরাধে পুলিশ অমিতকে আটক করে। পরে ড্রামামাশ আদালত তাঁকে ৩ মাসের কারাদণ্ড দেয়। সিজন সার্কল কারাবন্দ, সদর উপজেলা, মাদারীপুর, ০১ মার্চ ২০১৯। ছবি : প্রথম আলো

নাম তার অমিত স্বীর্ভনিয়া (৩৭)। তবে রোগীর বাবস্থাপনে লেখেন 'ডা. এ আর অমিত'। সেই চিকিৎসা শব্দের জন্ম। কিন্তু চিকিৎসক হওয়ার পথে তাঁকে আটকায় কে? নিজেই হয়ে বসেছেন এক বেসরকারি হাসপাতালের চিকিৎসক। সেবা দিচ্ছেন রোগীদের। নিজের পরিচয়ে লিখেন মাদারীপুর চকু হাসপাতালের মেডিকেল অফিসার। তবে তার সব জরিজুরি আর চিকিৎসা বিন্যাস গভীরতা ধরা পড়ে ড্রামামাশ আদালতের কাছে। ঘটনাটি ঘটেছে মাদারীপুর সদর উপজেলার পানিছত্র এলাকায়।

Home > City

12:00 AM, July 01, 2018 / LAST MODIFIED: 02:13 AM, July 01, 2018

Three-year-old dies due to 'wrong treatment'

Two investigation committees formed

Woman dies from 'wrong treatment' in Savar's Momtaz Uddin General Hospital

Savar Correspondent, bdnews24.com

Published: 06 Jul 2018 06:23 PM BdST | Updated: 06 Jul 2018 06:36 PM BdST

র্যাভের হাতে গ্রেফতারের পর কারাগারে ডিগ্রির অভাব নেই ভুয়া চিকিৎসক
কোয়ার মাসে আয় তিন লাখ

বিশেষ সংবাদদাতা | প্রকাশের সময় : ৩ এপ্রিল, ২০১৮, ১২:০০ এএম



ডিগ্রির অভাব নেই ভুয়া চিকিৎসক ওয়াসী উর রেজার। নামের পাশে চারটি ডিগ্রি। আবার সহকারী অধ্যাপক। তিনি মেডিসিন ও শিশু বিশেষজ্ঞও। রাজধানীতেই তিনি নিয়ম করে প্রতিদিন সকাল ও রাতে রোগী দেখেন। সন্ধ্যাবে এক দিন রোগী দেখেন ফুটবলারও। আদতে তিনি শুধু এইচএসপি পাস। মাসে তার আয় তিন লাখ টাকা। রাজধানীর রামপুরার পূর্ব হাজীপাড়ার দি ঘশোর মেডিসিন কর্নার থেকে র্যাভের নির্বাহী ম্যাজিস্ট্রেট সারওয়ার আলমের নেতৃত্বে র্যাভের একটি দল গত রোববার রাত নয়টার দিকে অভিযান চালিয়ে ওই ভুয়া চিকিৎসককে গ্রেফতার করে। পরে র্যাভের ড্রামামাশ

www.bdnews24.com/140214/18186-188-00000000-18-000000-00000000-00000000-00000000-00000000-00000000

Motivation ..

- Patient's Feedback

- Patient

- Share the treatment experience

- Doctor

- Accountability and awareness of treatment of patient

- Doctor Search

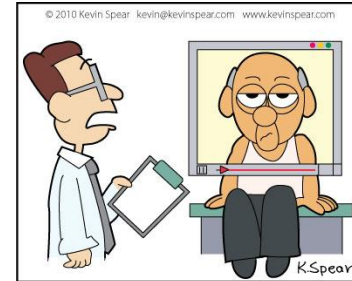
- Patient's feedback

- Doctor's educational qualification

- Service and working experience

- Health Records

- Instant access of prescription by doctor and patient

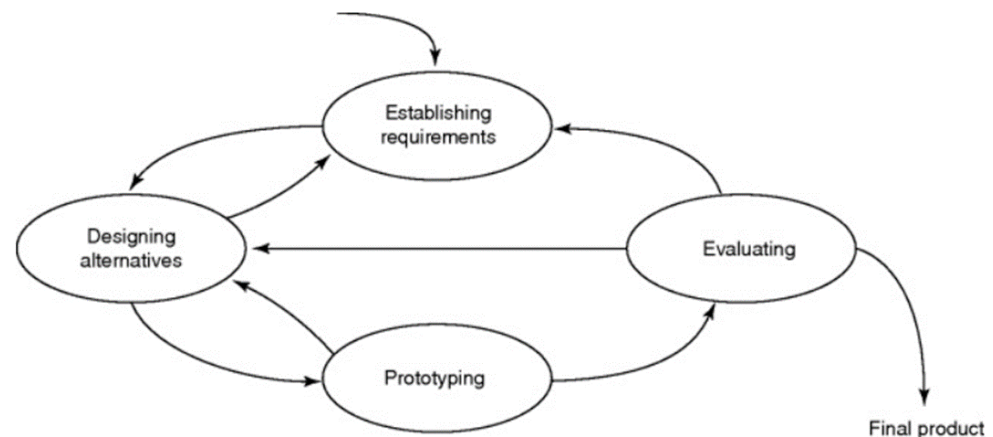


"You've come down with a viral video."



Proposed Approach

- We have followed User-Centered Design (UCD) approach to design and implement this online application.
- The goal of the User-Centered Design is to make the application with very high usability. This includes how convenient the application is in terms of its usage, manageability, effectiveness and how well the product is mapped to the user requirements.
- Four basic activities for user-centered design have engaged in when doing activity
 - *Identifying needs and establishing requirements*
 - *Conceptual design/prototype*
 - *Implementation*
 - *Evaluation*



Requirement gathering

- Conducting interviews with patients
 - Interviews with patients about to know their current behavior when they feel sick and want to get an appointment of a desired physician for treatment.
- Conducting interview
 - How would you find a recommended doctor for your treatment?
 - Are you facing any difficulties during your treatment?
 - After treatment, do you share the experience with others and why?
 - How do you think the patient experience could be better?

Requirement gathering ..

- Requirement gathering
 - Questionnaire
 - We have conducted the survey on patient satisfaction and focus on treatment experience
 - Persona and scenario
 - Study patient experience
 - Studied two real patient experience where they shared the treatment process and patient experiences.
 - One case is infection in Ear and another is urology disease.

Requirement gathering ...

- **Persona**

In the UCD process, a persona representing the user may be created. A persona is a user archetype used to help guide decisions about product features, navigation, interactions, and even visual design.

Patient

GOALS:

- Best treatment
- Find the competent doctor
- Efficient medical service
- Share the treatment experience

PAINT POINTS:

- Difficulties in finding the desired doctor from a reliable system
- Unable satisfactory treatment
- High medical expense

Doctor

GOALS:

- Provide the best treatment
- Ensure patient satisfaction
- Better understanding of strength and weakness of consultancy
- Higher publicity

PAINT POINTS:

- Missing patient's previous medical records
- Unable to provide quality attention while treatment due to the large number of patient waiting
- Lack of proper measures in the area of specialty

Requirement gathering ..

- Scenarios

- Scenario 1: After sick, patient is looking for a specialist doctor and sometimes they don't know the right doctor. So they depend on listening from their relatives or friends based on their personal experience or assumption about a doctor and they could not provide any fact-base doctor's information from any kind of source where related information is stored. Therefore sometimes patient have good experience and sometimes they could not get proper treatment. Repeat the overall treatment with new doctor.

“Ability to review the success or failure treatment cases of a doctor on any particular treatment before chooses any doctor and seeks for appointment”.

- Scenario 2: When patient is dissatisfied, there is no option to share any comments or feedback about the treatment even though; they are experienced unfortunate behavior or treatment by the doctor. Sometime, they complaint to authority and no proper investigation is conducted. However, in some case, it takes years to review and conclusion the complaint by the respective legal authorities and most of cases, patient are ignored.

“Patients will have the opportunity to share their experience about the doctor's treatment through the online feedback system so that other patient could review.

Requirement gathering ...

- Scenarios
 - Scenario 3: Currently in BMDC (Bangladesh Medical and Dental Council), there are around 91000 doctors are registered and published in their website ([www. bmdc.org.bd](http://www.bmdc.org.bd)). However, we noticed in the Daily Newspapers that legal agency identified doctors who don't have proper MBBS degree and are not registered in BMDC but are practicing. So, treatment from such a fake doctor completely in danger and life threaten. **“Need to prevent such “Fake Doctor” in practice”.**
 - Scenario 4: When we visit doctor, sometimes patient would not able to bring previous medical records like prescription but it's very important for a doctor to know past medical records if any for make well-decision and lack of such documents may not lead the treatment right way. **“Available patient's medical records online and doctor could review during consultation and make better medical decision for treatment.”**

Requirement gathering ...

- Identify the problems
 - No reliable system to update patient experience
 - Patient experience about a particular treatment by doctor can not be shared with other patients.
 - Hand-written prescriptions leading mistake to buy medicine and missing the doctor's advice
 - Considering social status of a patient during consultation
 - Improper behavior by doctor's assistant
 - No option to validate the doctor's qualifications and experiences
 - Rushing in the process of treatment
 - There is no reliable evidence or process-oriented information about the performance of a physician.
 - No success or failure records available for public judgments .
 - Lack of proper seriousness while handling the patient in the chamber.
 - Not able to verify the doctor's identity and qualifications and experiences

Requirement gathering ...

- **Scope of works**

- User (Doctor, Patient and doctor's assistant) registration system
- Manage eHealth records for the patient.
- Ability to provide feedback on patient experience for a particular treatment.
- Ability to review the success or failure stories of a doctor for better understanding before the appointment for treatment.
- Ability to identify the strength or weakness of a doctor

Requirement gathering ...

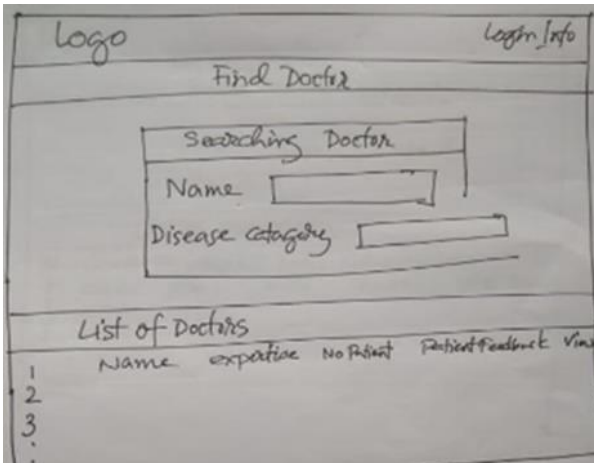
- Types of requirements
 - Functional
 - Doctor's verification
 - Patient's registration
 - User login
 - Manage doctor's profile
 - Searching doctor in relevant disease arena
 - View patient treatment activities
 - Doctor appointment
 - Patient prescription
 - Review patient's previous medical records
 - Patient feedback on a particular treatment case
 - Patient data privacy
 - Authentication and authorization

Requirement gathering ...

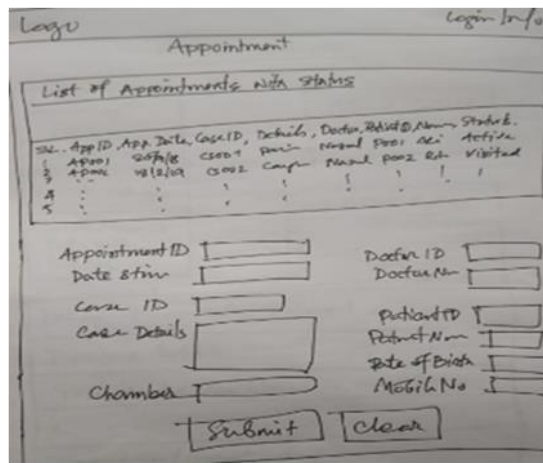
- Types of requirements
 - Non-functional
 - Engaging
 - Helpful
 - Motivating
 - Enhancing sociability
 - Emotionality fulfilling
 - Data requirements
 - Patient demographic data
 - Doctor's profile data
 - Medical records

Prototyping/Design

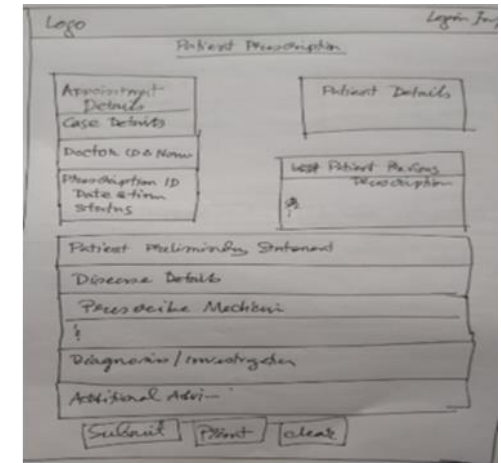
- Prototypes are an interactive demo of what the application will look like and scope of works earlier in the project lifecycle
- Hand sketches
 - It is a way to design the application at the structural level. It is used to layout the content and functionality on a page which takes into account user needs. Here we used earlier in the development process to establish the basic structure of pages before visual design and content added.



Finding Doctor



Appointment



Prescription

Prototyping/Design ...

- Interactive Prototyping
 - An interactive prototype of some kind which allows users to navigate from page to page and use functionality
 - There are varieties of specialist prototype tools available on the markets that are designed to make prototyping easy and interactive such as Balsamiq, Axure, Mockingbird etc. Here we have used Balsamiq tool for prototyping this application.

Window Name

Online Healthcare Solution [Home](#)

Login to OHS

Mobile

Password

User Type

[Forgot Password??](#)

Not Registered yet ?? [Click here to Register >>>](#)

© OHS Developed by ABC System Solution

Login Page

Dashboard

Find Doctor

Treatment Activity

Treatment Feedback

Analytics

Search Doctor

Doctor (optional)

Disease (optional)

Location

Doctor List

Doctor's	Doctor's	Area	No of	Success	Overall	Acti
D14326	Dr. Amit	Heo	432	68%	432	View
D14328	Dr. Md. Mohan	Heo	234	61%	398	View
D14343	Dr. Abdul	Heo	432	87%	321	View
D14326	Dr. Amit	Heo	432	68%	432	View
D14326	Dr. Amit	Heo	432	68%	432	View
D14326	Dr. Amit	Heo	432	68%	432	View

Find Doctor

Prototyping/Design ...

- Interactive Prototyping

Online Healthcare Solution
A better way to provide health service

Feedback Details

Patient ID : P1234	Doctor ID : D1234	Case ID : C81234
Patient Name : Mr. ABC	Doctor Name : Dr. ABC	Date : 03/04/2018

Dear Patient / Relative,
Your honest feedback and responses are very important for other patients and doctor as well. Please answer the following questions and the patient treatment and your experience with the doctor.

- After visiting with the doctor, is your condition improved?
Rating: Please explain briefly
100%
- Are you satisfied with the overall treatment?
Rating: Please explain briefly
100%
- How well did your doctor explain your treatment?
Rating: Please explain briefly
100%
- How well did your doctor's diagnosis?
Rating: Please explain briefly
100%
- How well did your doctor's prescriptions?
Rating: Please explain briefly
100%
- How well did your doctor explain your follow-up care?
Rating: Please explain briefly
100%
- How satisfied were you with the amount of time your doctor spent with you addressing your needs?
Rating: Please explain briefly
100%

Patient feedback

Online Healthcare Solution
A better way to provide health service

Appointment Detail

Patient ID : P1234	Patient Name : Mr. ABC	Case ID : C81234	Prescription ID : PR1234
Doctor ID : D1234	Date : 03/04/2018	Appointment ID : AP1234	

Diagnosed For ? Blood Pressure Weight

Select Diseases

Patient History / Symptoms

(1)

Add Another

Prescribe Medicine

Medicine Name	Quantity Each Day	Routine	Duration (days)	Advice
<input type="text"/>	<input type="text"/>	<input type="radio"/> Daily <input type="radio"/> Interval	<input type="text"/> Days	<input type="text"/>

Add Another

Additional Advice For Patient to Follow

(1)

Add Another

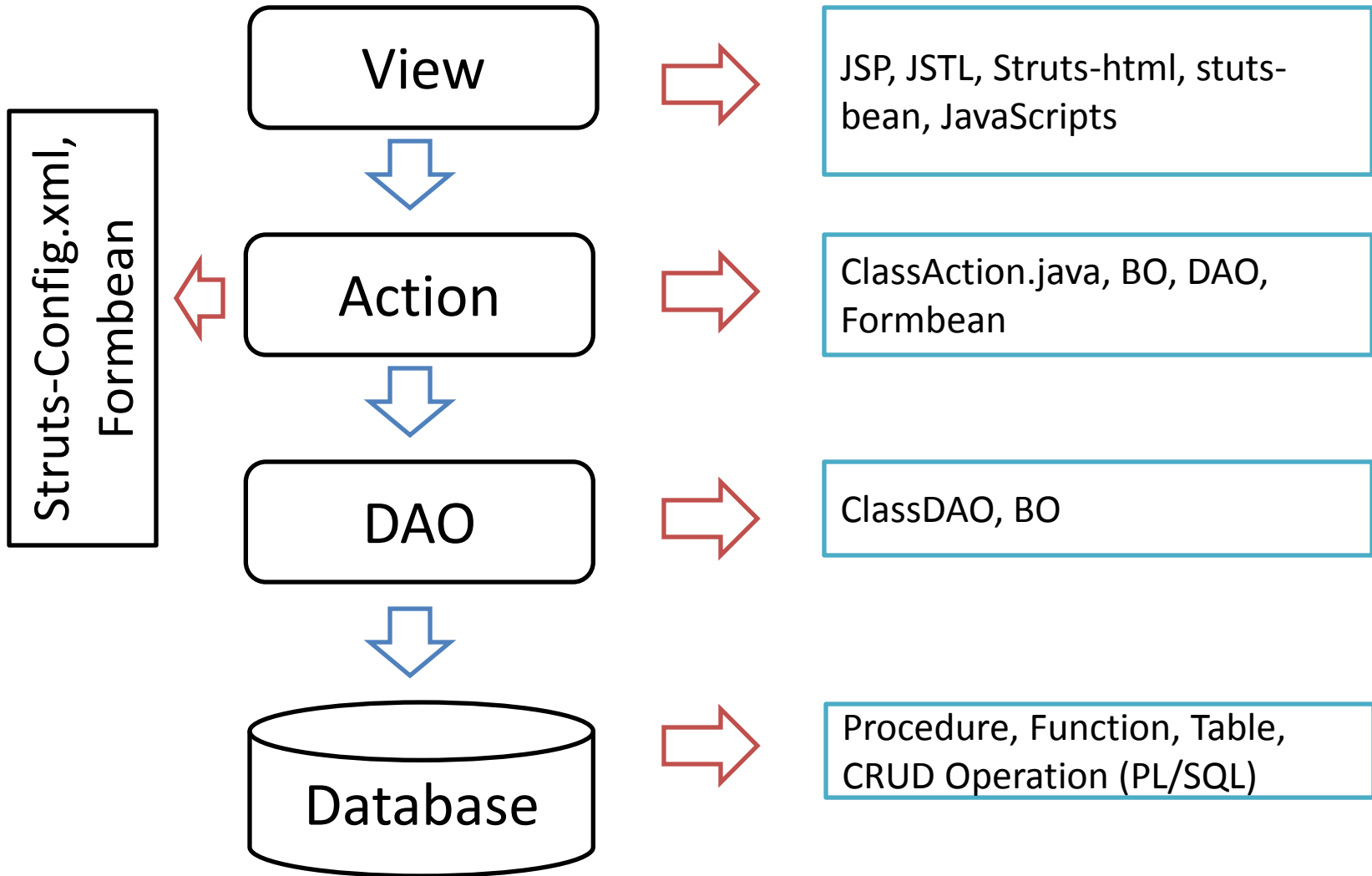
Submit

Prescription

Implementation

- Development platform and technologies
 - J2EE, JSP, Servlet
 - Struts 1.1 MVC frameworks
 - Oracle 11gR2 database
 - Web server (Tomcat 8.5)
 - Macromedia Dreamweaver 8 for coding jsp pages
 - IDE(Eclipse 3.0) for java coding (Action class, DAO, BO, Formbean, Struts-config)
 - Toad the Database administration tool for Oracle (Create table, procedure, function, sequence)

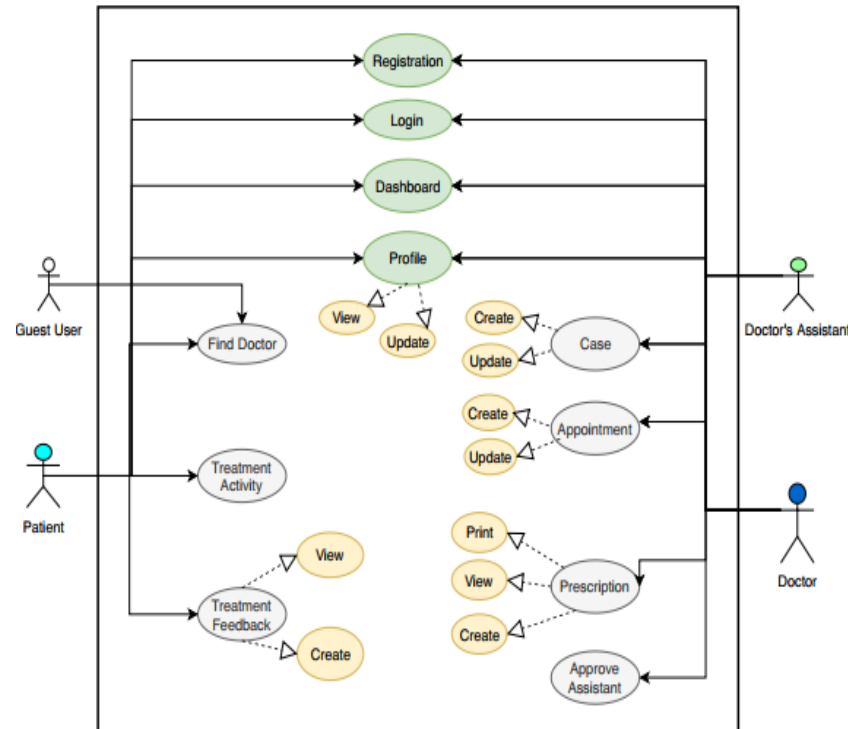
Implementation - System architecture



Implementation ...

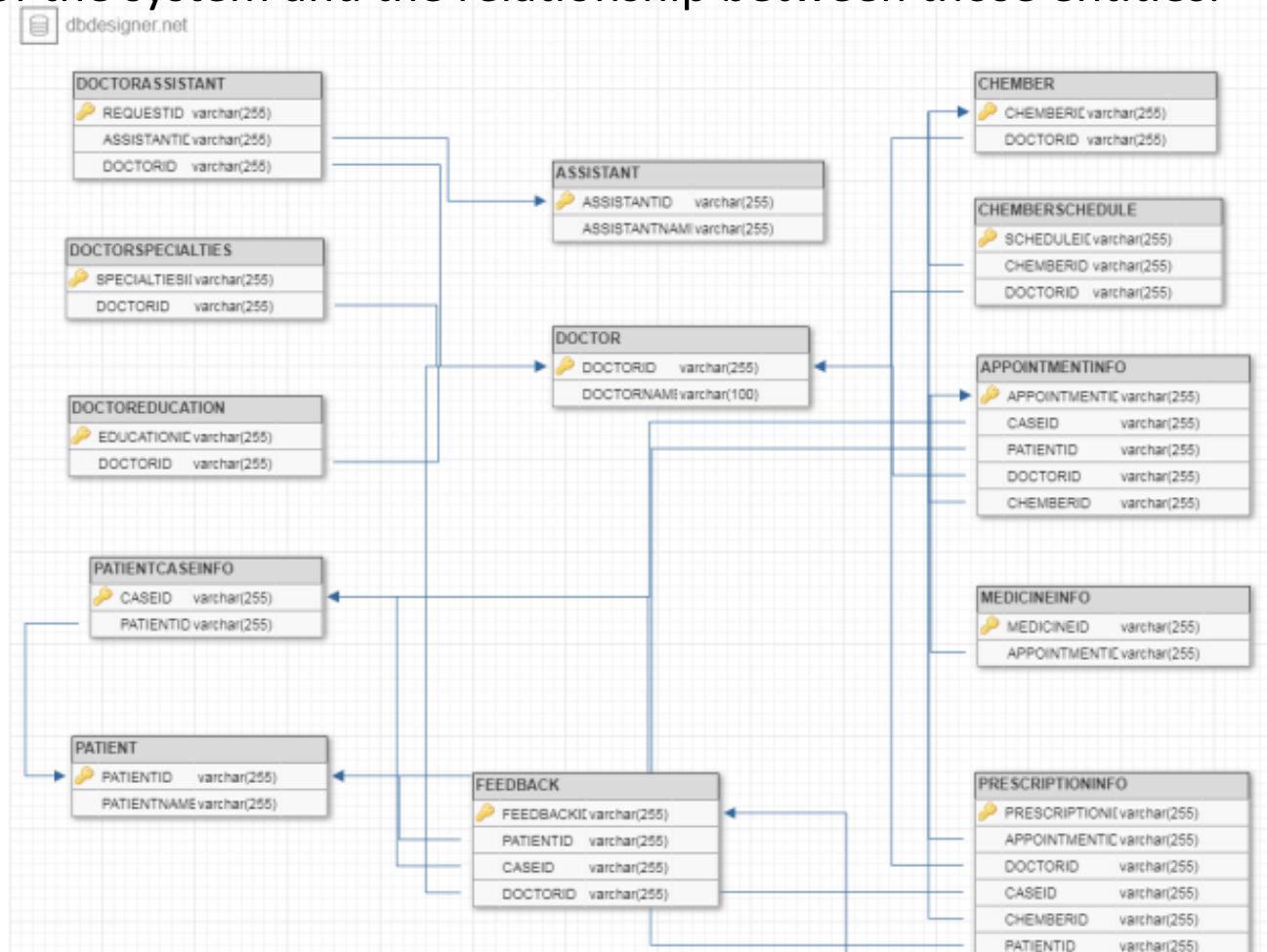
- UML Diagram

UML diagram is used with the purpose of visually representing a system along with its main actors, roles, actions in order to better understand about the system.



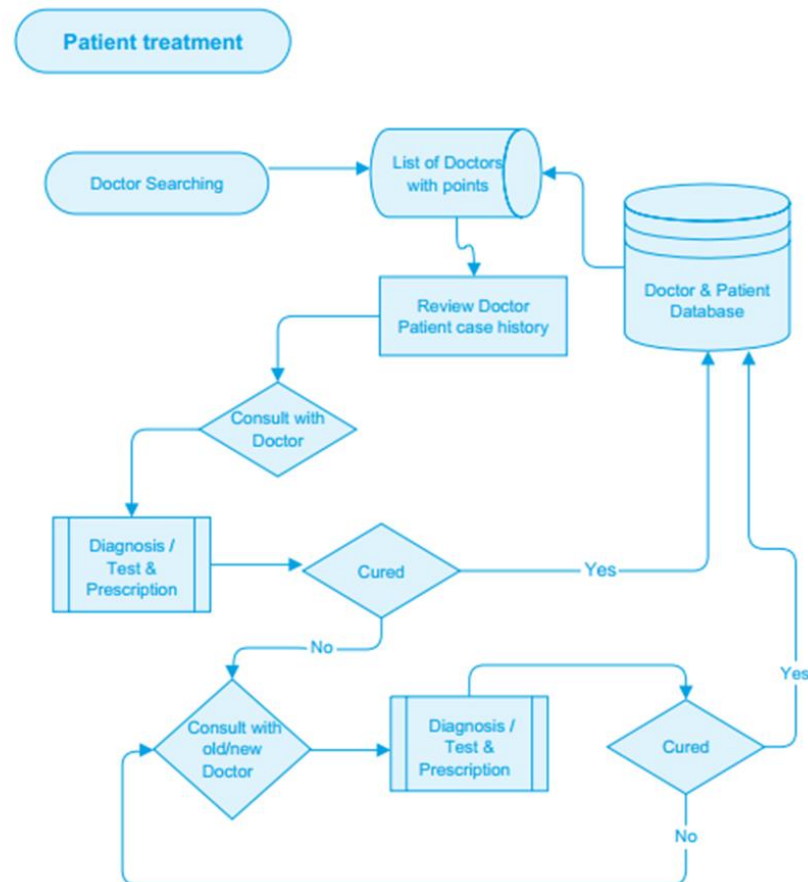
Implementation ...

ER diagrams are a visual representation of your database. It highlights the entities of the system and the relationship between those entities.



Implementation

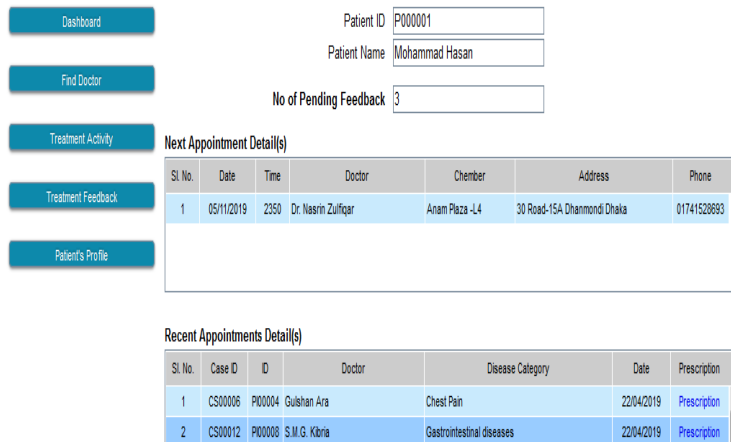
- Workflow diagram
 - Patient Treatment Work Flow Design



Implementation

- System view

- After review and analysis, the requirements and usability necessary changes have been made in the design and workflow process so that this application could be used more effectively and efficiently.



The Patient Dashboard includes a sidebar with navigation buttons: Dashboard, Find Doctor, Treatment Activity, Treatment Feedback, and Patient's Profile. The main content area displays patient information and appointment details.

Patient ID: P000001
Patient Name: Mohammad Hasan
No of Pending Feedback: 3

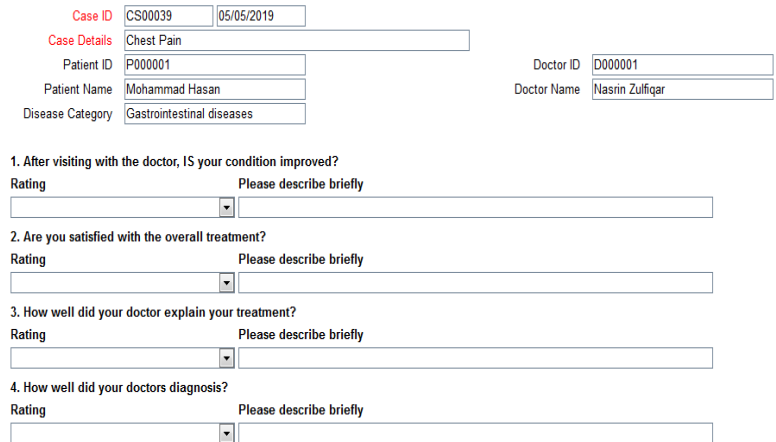
Next Appointment Detail(s)

Sl. No.	Date	Time	Doctor	Chamber	Address	Phone
1	05/11/2019	2350	Dr. Nasrin Zulfqar	Anam Plaza -L4	30 Road-15A Dhanmondi Dhaka	01741528893

Recent Appointments Detail(s)

Sl. No.	Case ID	ID	Doctor	Disease Category	Date	Prescription
1	CS00006	P00004	Gulshan Ara	Chest Pain	22/04/2019	Prescription
2	CS00012	P00008	S.M.G. Kibria	Gastrointestinal diseases	22/04/2019	Prescription

Patient Dashboard



The Patient Feedback form contains input fields for Case ID (CS00039), Date (05/05/2019), Case Details (Chest Pain), Patient ID (P000001), Patient Name (Mohammad Hasan), Disease Category (Gastrointestinal diseases), Doctor ID (D000001), and Doctor Name (Nasrin Zulfqar).

1. After visiting with the doctor, IS your condition improved?
Rating: [Dropdown] Please describe briefly: [Text Area]

2. Are you satisfied with the overall treatment?
Rating: [Dropdown] Please describe briefly: [Text Area]

3. How well did your doctor explain your treatment?
Rating: [Dropdown] Please describe briefly: [Text Area]

4. How well did your doctors diagnosis?
Rating: [Dropdown] Please describe briefly: [Text Area]

Patient Feedback

Implementation

- System view

Dashboard

Doctor ID: D000001
Doctor Name: Nasrin Zulfqar

No. of Patients Today: 0
No. of Patients Last Month: 0
Total Patients: 14

Disease Category Detail(s)

Disease Category	No. of Patient
Gastrointestinal diseases	7
Genetic diseases	7

Recent Appointments Detail(s)

Sl. No.	Case ID	ID	Patient	Disease Category	Date	Prescription
1	CS00001	P00001	Mohammad Hasan	Genetic diseases	22/04/2019	Prescription
2	CS00002	P00002	Rahman Khan	Genetic diseases	22/04/2019	Prescription

Doctor dashboard

Appointment ID: AP00004
Appointment Date & Time: 22-04-2019 13:00
Case ID: CS00004
Case Date: 22-04-2019
Case Details: Fever again and again

Patient ID: P000003
Patient Name: Amir Raza
Gender: Male
Blood Group: A+
Age: 27 Year 10 Month(s) 13 Day(s)
Mobile No: 01711550103

Registration No: 50100
Doctor Name: Nasrin Zulfqar

Prescription Detail(s)

Sl. No.	Case ID	Pax ID	Disease Category	Date	View
---------	---------	--------	------------------	------	------

Prescription ID:
Prescription Date:
Next Visit Date:
Status: Visited

Patient Preliminary Statement: Having fever from last three days and has shivering due to cold and fever gets up and down now and then

Disease Category: <--Please Select One-->
Disease Name:
Weight:
BP:

Patient History/Symptoms:

Prescribe Medicine

Medicine Name	Quantity	Route	Days	Dose	Reason	Advice
<--Please Select One-->	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Diagnosis/Investigation:

Additional Advice for Patient to Follow:

Appointment ID:
Appointment Date & Time:
Case ID:
Case Date:
Case Details:

Patient Preliminary Statement:

Chamber: <--Please Select One-->
Status: Active

Doctor ID: D000001
Doctor Name: Nasrin Zulfqar
Patient ID:
Patient Name:
Gender:
Blood Group:
Date of Birth:
Mobile No:

Submit Clear

Appointment

Prescription

Evaluation

- In Heuristic evaluation process, user interacts with designs, prototypes, and specifications using their substantial knowledge of the kinds of problems that users typically encounter and then offer their opinions.
- No of Evaluator: 03
 - Navigate all the functions and reviewed the process step by step like login, dashboard, doctor finding, treatment activities, feedback, appointment, prescription, profile.
- ❑ Visibility of system status
 - The system always keep users informed about what is going on, through appropriate feedback within reasonable time.
- ❑ Match between system and the real world
 - The system speak the users' language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

Evaluation ...

User control and freedom

- Users often choose system functions by mistake and will notify clearly to go through an extended dialog.

Consistency and standards

- Users do not wonder whether different words, situations, or actions mean the same thing.

Error prevention

- Error messages is a careful design that prevents a problem from occurring in the first place. Check and present users with a confirmation option before they commit to the action.

Recognition rather than recall

- Ensure the user's load by making objects, actions, and options visible. The user do not have to remember information from one part of the dialog to another. Instructions for use of the system always be visible or easily retrievable whenever appropriate.

Evaluation ...

❑ Flexibility and efficiency of use

- Accelerators – unseen by the novice user –often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

❑ Aesthetic and minimalist design

- Dialogs do not contain information that is irrelevant or rarely needed. Every extra unit of information in a dialog competes with the relevant units of information and diminishes their relative visibility.

❑ Help users recognize, diagnose, and recover from errors

- Error messages expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

❑ Help and documentation

- The system is used without documentation, it may be necessary to provide help and documentation.

Conclusion and future works

- Patient ability to provide feedback in the online system which may review by other patient.
- Patient's could find a doctor based on facts like (experience, qualification, other patient's feedback on treatment) before appointment.
- Providing online medical historical records
- Doctor's could review the patient's experience for enhancement the patient satisfaction.
- Since it's an online web platform, hence it totally depends on the availability of internet service.
- Dependability of APIs service with outside system such as BMDC, NID service
- Patient's adequate knowledge on technology.
- Investment for security both Hardware & Application level
- Backup & restore process.
- Overall data privacy and protection.
- Technical support and services.
- Entire medical system automation

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Demo the OHS (Online healthcare system)

Thanks for your kind attention