

Project Report:

Dental Clinic Management System

Version 2.0 : Laboratory Exercise-03

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1 Introduction

1.1 Purpose

This document serves to describe the processes undertaken in the inception of the Dental Clinic Management system software project. The purpose of this document is to provide a detailed description of the DCMS ,a web application.It will give in detail the purpose of the system, features of the system and the constraints under which the system will operate. An outline of what the software aims to do at each stage, ie problem to be solved.

1.2 Problem Statement

Managing a dental clinic may be cumbersome at times, the paperwork that the receptionist have to do and the time patients have to spend waiting in queue is excessive. DCMS is system that will remedy this situation by allowing multiple patients at the same time

Hard copy files stored in cabinnets pose a security threat since it is possible for unauthorized personel to gain access because of negligence. The system will allow for the use of username and passwords, a secure measure that ensures that only permitted users can see and do certain tasks. Where in the contrary, files can easily fall into the wrong hands, be tampered with or lost.

Human error in the collection and capturing of all data occures where patients either fill in their details incorrectly or the receptionist captures the data wrongly. DCMS will allow for data validation to occur, where the user will be alerted immedeiatly if any data is incorrect or missing,ensuring the data is consistent in the database.

Paper files are hard to back up, the database storing capabilities adopted by DCMS will offer the ability to back up all data.

The automation of calculations and instantaneos syncing of events will allow for a well intergrated clinic with real time updates and time saving processing.

1.3 Project Objectives

The software is aimed at replacing manual paper systems that currently exists at a dental clinic. Users will remotely have access to relevant services based on requirements. The project objectives are :

- reduce the paper work the receptionist have to do on daily basis
- cut the amount of waiting time in queues
- ensure and protect patient's privacy
- reduce human error in capturing data
- reduce paper work for doctors

1.4 Stakeholders

Anyone that is influenced by or influences a project is a stakeholder. There are two types of stakeholders , internal and external stakeholders.

- **External**

- Patients

- Patients are able to make appointments and view their bill

- Dentist

- Dentists can login ,view and set their own schedule of appointments. Write out a prescription for a patient and view a patient's profile(medical record).

- Receptionist

- receptionist logs in with their username and password, views and manages appointments, performs day open and close activities. He also sends reports to admin and help with registering those patients who that are having problems with registering.

- Admin

- The administrator has the authority to add or remove a doctors

and receptionist. He grants permission to receptionist and dentists the authority to view and generates report. He also has the authority to add or delete patients from system. He also manages the system

- **Internal**

- Scrum team
responsible for developing the software
- Product owner
someone in charge of the entire project
- Scrum master
The link between the scrum team and the product owner (project manager)
- Equipment suppliers
They supply the hardware needed for the operation of the system. (i.e) Computers

1.5 Scope

DCMS (Dental Clinic Management System) is a web application that provides support for managing the services of a small dental clinic.

1.5.1 Software Benefits and Objectives

The software is aimed at replacing manual paper systems that currently exists at a dental clinic. Users will remotely have access to relevant services based on requirements. Having a digital filing system will reduce human error by having text validations before data is captured. Having database will allow for backups.

1.6 Definitions, Acronyms and Abbreviations

Term	Definition
DCMS	A Dental Clinic Management System application
User	Anyone who will be interacting directly with the system..
Netbeans	an integrated development environment for java
Java	A general-purpose computer-programming language that is concurrent, class-based, object-oriented
PHP	Hypertext Preprocessor is a server-side scripting language designed for web development.
Json	JavaScript Object Notation is an open-standard file format that uses human readable text to transmit data objects consisting of attribute-value pairs and array data types

1.7 References

- IEEE Recommended Practice for Software Requirements Specifications
- <https://www.bmc.com/blogs/software-requirements-specification-how-to-write-srs-with-examples/> (Accessed Aug 2018)
- Zainab Murtadha- Dentist Web Based Patient Information System and Services in Cloud
- Virtual Medical Home SRS-Bapuju Institute
- <https://krazytech.com/projects>

1.8 Project Overview

Front End tasks: This involves the making of User Interfaces. These are the screens that the users will be seeing when using the system.

- Create Patient(Input will be patient details)
- Log in(Uusername and Password)
- Create Appointment(PatientId and Date/Time)
- Create Bill(PatientID, DoctorID and Consultation Details)
- View Schedule(DoctorID and Date/Time)
- View Bill(PatientID)

Back End tasks:

- Create Database with table and entities as listed in ERD
- Use back-end frameworks to build server-side software. PHP and JSON
- Cloud computing integration-Allowing Database to be accessed remotely.

1.8.1 Existing System

The present system is manual based. It involves paper work in the form of maintaining files, making appointments and billing. The manually based system has the following disadvantages:

- it is a limited system.
- looking for a patient's file may take a long time
- patients have to queue to make an appointment

- There is no backup files.
- files are prone to damage.
- editing file problems. storage space may be limited.
- Patient's personal information is not protected, it can be accessed by anyone.

1.8.2 Proposed System

DCMS is an automated system that can be accessed via the internet. It has the following advantages.

- Easy to store and search for files.
- Patients can make appointments online and avoid long queues.
- Each patient has a profile that can only be accessed by authorized users i.e (doctor or receptionist).
- The system can be accessed remotely.

2 Software Requirements Specifications

2.1 Overall Description

Based on

2.1.1 Product perspective

2.2 Functionality

2.3 Usability

Dr's Philip S & Mansoor F Incorporated
FresherBreath
 Practice No.: 0409812
 Tel: 011 403 0780
 The Annex, Lower Students Union (C)
 University of Witwatersrand,
 Braamfontein, 2001
 campus@fresherbreath.co.za
 www.fresherbreath.dental
Call 0861 FRESHER

1. PATIENT DETAILS

Surname: _____ First Names: _____
 Date of Birth: _____ I.D. No: _____
 Occupation: _____ Gender: _____
 Tel (H): _____ Tel (W): _____
 Cell: _____ Email: _____
 Home Address: _____ Code: _____
 Work Address: _____ Code: _____
 Postal Address: _____ Code: _____

2. PERSON RESPONSIBLE FOR ACCOUNT

Same as above ☐

Surname: _____ First Names: _____
 Date of Birth: _____ I.D. No: _____
 Occupation: _____ Gender: _____
 Tel (H): _____ Tel (W): _____
 Cell: _____ Email: _____

3. PAYMENT DETAILS PRIVATE ☐ MEDICAL AID ☐

MEDICAL AID CARD

MEDICAL AID CARD
DRIVERS LICENCE

DECLARATION
 I, the undersigned do hereby agree that:
 1. In order for the consulting dentist to provide me with accurate and correct advice and treatment, I am required to undergo a full and complete examination. I consent to such examinations and agree to pay the costs thereof.
 2. All missed appointments, unless cancelled 24 hours before the appointment, will be charged for in full and I agree to pay the costs thereof.
 3. I accept full liability for the payment of all fees and charges for all consultations and treatments I receive. If I am covered by a medical insurance scheme, whether I am, the main member or a dependant, the liability for payment remains with me in the event of non-payment by the scheme.
 4. In the event of the account not being settled in full within 30 days of being due, I am aware that the matter will be handed to a debt collector for pursuit that may involve listing credit bureaus. I agree that my Id Number may be used in tracing or listing transaction. I am also aware verbal notification of this transaction will be made.
 5. I, undertake to be liable for all legal costs as between attorney and client as well as tracing/ collection fees due, should it be necessary for me to be taken for the recovery of any amounts owing, arising out of treatment received by the above patient.
 6. I agree to inform the practice of any change of address or telephone and to my medical records being made available to all dental practices I practice from time to time.

Signature of Member / Patient: _____ Date: _____
 Full Name: _____
 Page 1 of 1
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1. GENERAL CONDITIONS

1. Any Heart Conditions ☐ NO ☐ YES
 2. Rheumatic ☐ NO ☐ YES
 3. High Blood Pressure ☐ NO ☐ YES
 4. Any blood clotting disorder ☐ NO ☐ YES
 5. Any anti-coagulant therapy ☐ NO ☐ YES
 6. History of diabetes ☐ NO ☐ YES
 7. History of prophydia ☐ NO ☐ YES
 8. Asthma ☐ NO ☐ YES
 9. History of T.B. ☐ NO ☐ YES
 10. Any lung conditions ☐ NO ☐ YES
 11. Liver disease ☐ NO ☐ YES
 12. Hepatitis ☐ NO ☐ YES
 13. Epilepsy ☐ NO ☐ YES
 14. Cortison therapy - past or present ☐ NO ☐ YES
 15. Multiple Sclerosis ☐ NO ☐ YES
 16. HIV/AIDS ☐ NO ☐ YES

2. ALLERGIC PATIENTS

1. Are you pregnant ☐ NO ☐ YES
 2. Are you on the pill ☐ NO ☐ YES
 3. Any bleeding disorders ☐ NO ☐ YES

3. ORAL CONDITIONS

1. Any immediate dental problems ☐ NO ☐ YES
 2. Do your gums bleed easily ☐ NO ☐ YES
 3. Are your teeth sensitive to hot, cold or sweet ☐ NO ☐ YES
 4. Are you aware of clenching or grinding your teeth ☐ NO ☐ YES
 5. Do you have bad breath ☐ NO ☐ YES
 6. Do you have recurrent sores in the mouth ☐ NO ☐ YES
 7. Do you have any problems with your tongue ☐ NO ☐ YES
 8. Do you have swellings in the mouth ☐ NO ☐ YES
 9. Are you self-conscious about the appearance of your teeth ☐ NO ☐ YES

How important do you consider dental health ☐ FAIRLY ☐ EVERY ☐ ESSENTIAL

Allergies: _____

Are you on Medication: _____

Family Doctors Name: _____ Tel: _____

MEDICINES / TABLETS

Have you ever taken any of the following:

1. Anti-depressants: Name: _____
 2. Tranquillisers: Name: _____
 3. Pain Killers: Name: _____
 4. Blood thinners: Name: _____
 5. Blood pressure: Name: _____
 6. Others: Name: _____
 Name: _____

DENTAL SEDATION

1. Have you received any form of sedation ☐ NO ☐ YES
 2. Local Anesthetic (Injection) ☐ NO ☐ YES
 3. Inhalation Sedation (Gas) ☐ NO ☐ YES
 4. Pills ☐ NO ☐ YES
 5. Were you pleased with the result ☐ NO ☐ YES

For Private Patients a deposit must be made on all work requiring a technician's fee.

If there are any other facts we should know, please state them _____

Name: _____ Signature: _____ Date: _____

THANK YOU FOR YOUR CO-OPERATION IN THIS VITAL INFORMATION

(a) Patient personal details

(b) Medical details

Figure 1: Paper forms to be replaced

3 Project Design and Architecture

3.0.1 Architecture

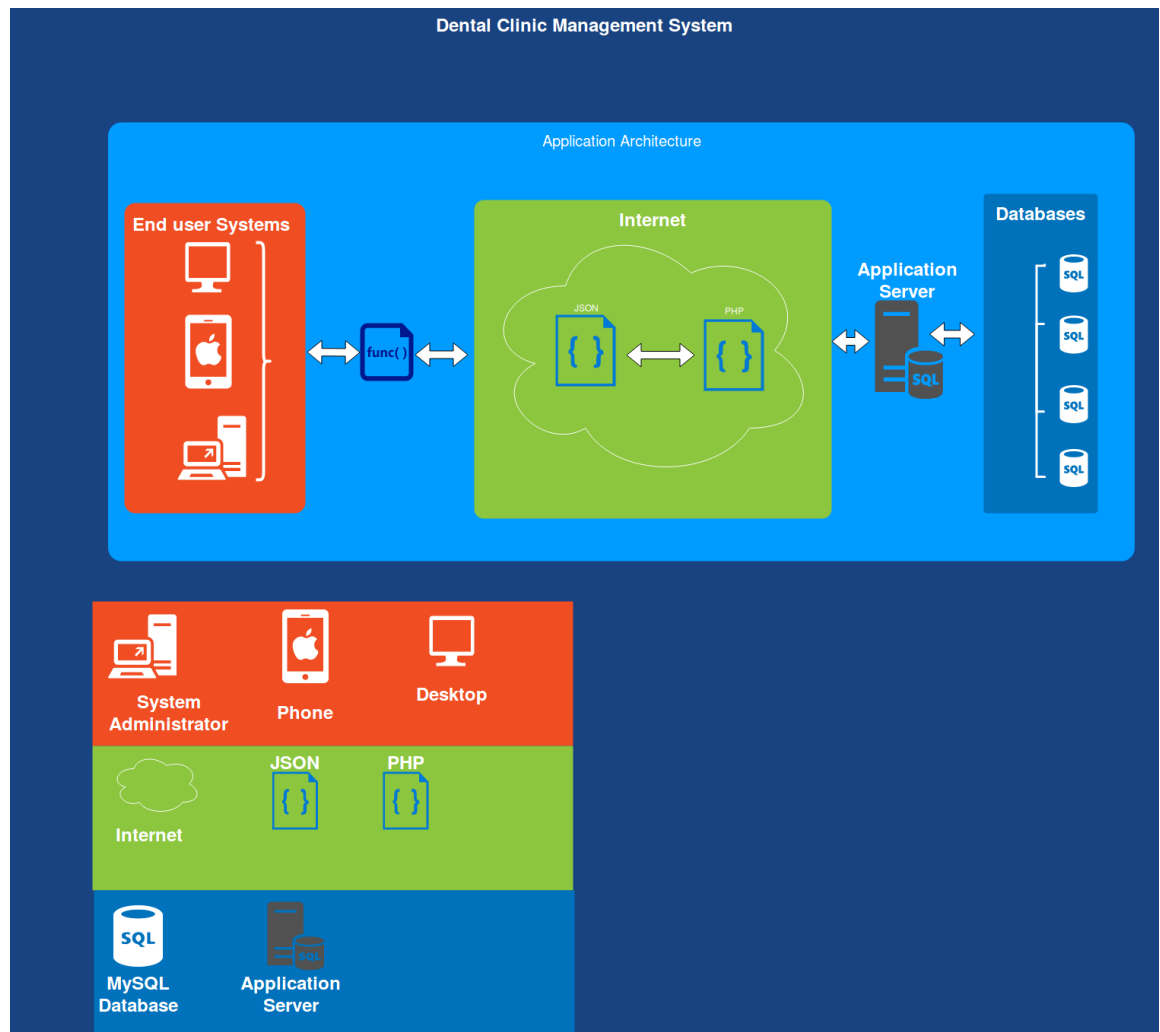


Figure 2: architecture

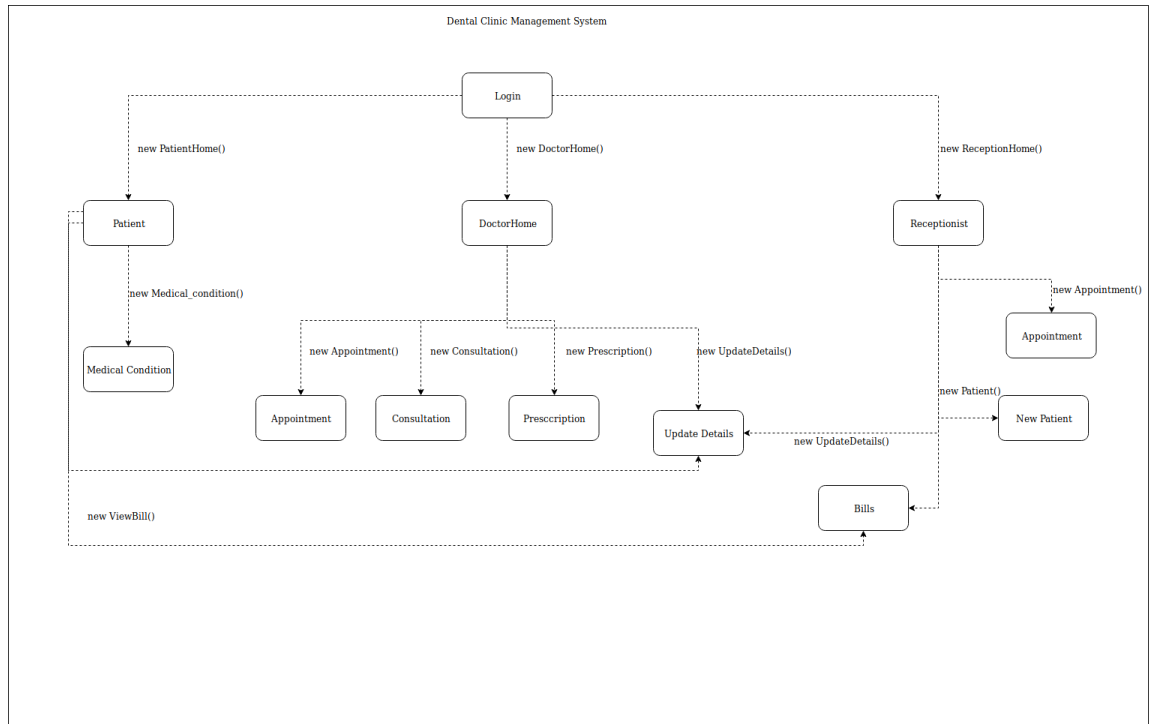


Figure 3: DCMS login

3.0.2 Implemented Database Tables

3.0.3 Entity Relationship Diagram

3.0.4 Software Tools

- Database Server: Microsoft SQL Server
- Client: Any web browser
- Programming Language: Java
- Development Tools: Netbeans IDE 8.2

3.0.5 Hardware Requirements

The supported Operating Systems:

Field	Type	Null	Key	Default	Extra
PATIENT_ID	int(11)	NO	PRI	NULL	
ADDRESS_ID	int(11)	NO	MUL	NULL	
MED_CONDITION_ID	int(11)	NO	MUL	NULL	
NAME	varchar(20)	NO		NULL	
SURNAME	varchar(20)	NO		NULL	
DOB	varchar(10)	NO		NULL	
ID_OR_PASSPORT_NUMBER	int(11)	NO		NULL	
GENDER	varchar(10)	NO		NULL	
MOBILE_NUMBER	varchar(11)	NO		NULL	
EMAIL	varchar(20)	NO		NULL	
OCCUPATION	varchar(20)	NO		NULL	

11 rows in set (0.00 sec)

Figure 4: Patient Table

Field	Type	Null	Key	Default	Extra
DOCTOR_ID	int(11)	NO	PRI	NULL	auto_increment
NAME	varchar(20)	YES		NULL	
SURNAME	varchar(20)	YES		NULL	
EMAIL	varchar(20)	YES		NULL	
SPECIALIZATION	varchar(20)	YES		NULL	
PASSWORD	varchar(20)	YES		NULL	
ACTIVE	tinyint(1)	YES		NULL	

7 rows in set (0.00 sec)

Figure 5: Doctor Table

- **Microsoft Windows Vista SP1/Windows 7 Professional:**

- Processor: 800MHz Intel Pentium III or equivalent
- Memory: 512 MB
- Disk space: 750 MB of free disk space

- **Ubuntu 9.10:**

- Processor: 800MHz Intel Pentium III or equivalent
- Memory: 512 MB
- Disk space: 650 MB of free disk space

- **Macintosh OS X 10.7 Intel:**

- Processor: Dual-Core Intel
- Memory: 2 GB

Field	Type	Null	Key	Default	Extra
APPOINTMENT_ID	int(11)	NO	PRI	NULL	auto_increment
PATIENT_ID	int(11)	NO	MUL	NULL	
DOCTOR_ID	int(11)	NO	MUL	NULL	
RECEPTIONIST_ID	int(11)	NO	MUL	NULL	
DATE	varchar(10)	NO		NULL	
CHECKIN	varchar(10)	NO		NULL	
CHECKOUT	varchar(10)	NO		NULL	

7 rows in set (0.00 sec)

Figure 6: Doctor Table

- Disk space: 650 MB of free disk space

- **Smartphone Requirements:**

- Android running OS 4.0+
- iPhone running iOS 8+
- Windows Phone 8.1+

3.1 Product functions

DCMS will enable patients to book or make appointment and the output will be the date and time in which it is inline with the Doctors schedule. System will also provide a clear schedule which allows patients to see which Doctor is available at a particular slot. Who ever will be using the system has to go through registration first if he/she is first time user or login by providing username and password to access the DCMS. The system allows patients to request their bill and the patient can view or print the through system.

3.2 Business Rules

- Before a user can log in, they are required to be an existing user on the System. Existing users access the system (log in) using username and password.

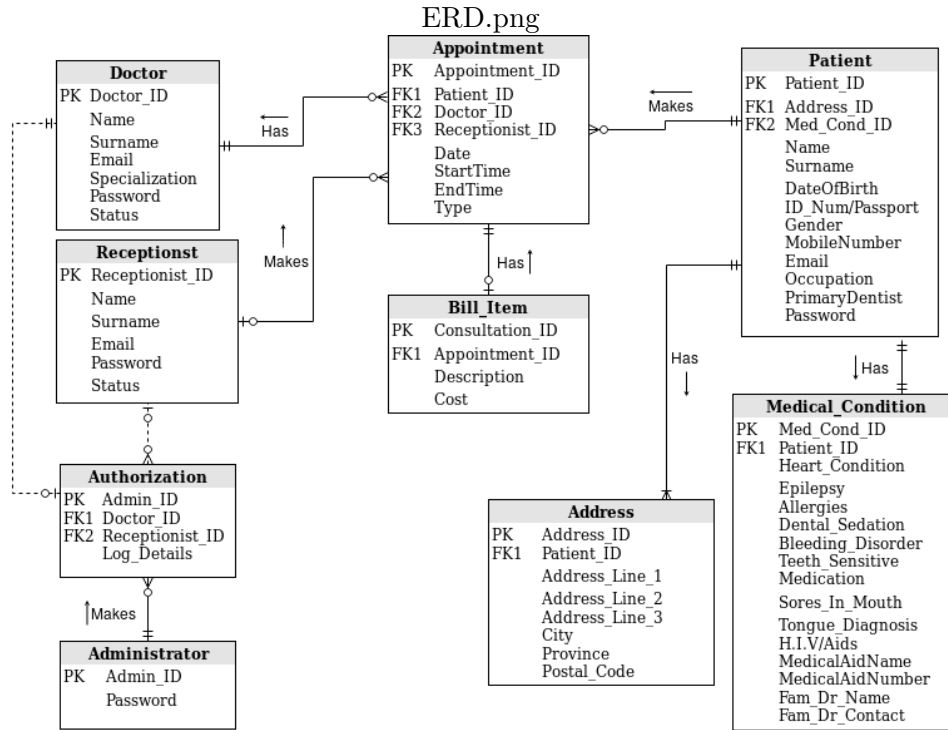


Figure 7: DCMS-ERD

- New Dentists and Receptionist's require an Administrator's authorization to be registered on the system.
- A new patient is required to enter their personal and medical details.
- An Appointment must be booked by the patient. They have the options of doing so telephonically (Where the receptionist will be the one capturing the appointment) or engaging directly with the system. Booking of an appointment requires viewing the relevant dentist's schedule to identify available slots.
- A Dentist can view their schedule. This means viewing all the appointments that have been booked for the doctor and displayed as of their requirement either Daily, Weekly or Monthly schedule calendar

view.

- A consultation is created by a dentist. This follows the arrival of a patient for their appointment and discussions or dental procedures are conducted and recorded. A consultation can also be recorded for a patients failure to arrive for an appointment without cancelling. This consultation type is labelled as missed appointment.
- Generating Bill follows a consultation, this is where all the costs of the medical procedure are recorded. This may also include the recording of a missed appointment charge.
- Authorization is done by an administrator. This is required when new a receptionist or dentist is created. Similarly so when it will be updated or deleted.

3.2.1 Use Cases

Actor	Description
Receptionist	May assist patient with registration and booking, should they require assistance.
Administrator	Administrator is responsible for Doctors registration and other issues that directly related to the system like update or archive if necessary.
Patient	Patient may directly interact with the system during registration or booking process, depending on the patient's level of of computer literacy
Doctor	May set appointment with the patient, depending on patient's problem

Use Case	Description	Related Use case and Relationships
Create Patient	Patient or the Receptionist will interact with this use case. Step involved in this use case is entering demographic data.	
Read Patient	This use case will be used when accessing a patient's data. This includes when making appointment bookings and generating bills	Invoked by the Update Patient use case. <<include>> relationship.
Update Patient	The Receptionist or Patient will mainly interact with this use case. It will be accessed to update a Patient's demographic data	This use case invokes the Read Patient use case. <<include>> relationship
Create Administrator	An Administrator will interact with this use case. In order for Administrator to have an access to the system, an already existing Administrator should capture relevant data of new Administrator	
Create Appointment	The Patient, Receptionist or Doctor will interact with this use case. This use case will be triggered when a user wants to make an appointment.	This use case invokes read doctor and read patient

Read Administrator	The Administrator will interact with this use case. It will be triggered when Administrator request to view Administrator's profile.	This use case invokes the Update Administrator use case. <<include>> relationship.
Update administrator	An Administrator will interact with this use case. It will be triggered when there is a change in the demographic data of the Administrator.	This use case invokes the Read Administrator use case. <<include>> relationship.
Archive Administrator	Administrator will interact with this use case. it will be triggered by the other Administrator to archive an Administrator who no longer has an access to the system due to end employment contract or other reasons.	
Create Doctor	An Administrator will interact with this use case. It will capture Doctor's demographic data.	
Read Doctor	This use case is used when a doctors profile will need to be accessed. This will include when booking appointments, recording consultations and generating bill. It will be triggered when a user requests to view Doctor's details	

Create Bill	The Doctor will interact with this use case. This Involves capturing all charges of operations done on a patient during a consultation.	This use case invokes the Read Doctor,Read Patient use case. <<include>> relationship
Read Bill	The Doctor,Patient or Receptionist will interact with this use case. This Involves viewing and existing bill.	This use case invokes the Read Doctor,Read Patient use case. <<include>> relationship
Update Doctor	Administrator will interact with this use case. It will be triggered when an Administrator wants to modify Doctor's details	This use case invokes the Read Doctor use case. <<include>> relationship
Archive Doctor	Administrator will interact with this use case. It will be triggered when the Doctor no longer granted access to the system due to end of employment contract or other reason	
Generate Report	The Project Owner will interact with this use case. It will be accessed when the Project Owner wants to assess the effectiveness of the system.	

3.3 Fully Dressed Use Cases

3.3.1 Create patient use case

Use case name:	Create Patient
Scope:	Dental Clinical Management System for better health.
Triggering Event:	User request to create patient.
Brief description:	user request to create a new Patient profile. Either the Patient themselves via mobile phone, desktop, self-service terminal or Receptionist on behalf of the Patient. A form is displayed and prompt for the completion of all relevant data, including: The Patient's first-name, lastname, ID number, date of birth and email(if applicable). A prompt to confirm and save the profile is displayed. The user can double-check the entered data and confirm the creation of the profile. The profile is then created by creating a new record in the Patient table in the data store. Login details are generated and sent to the patient.
Actor(s):	Patient (Primary), Receptionist (Primary)
Related use cases:	N/A
Stakeholders and interests:	<ol style="list-style-type: none">1. Patient - wants all their demographic data (first-name, lastname, ID number, date of birth, mobile number and email address(optional)) to be accurately captured to ensure the completion of their profiles.2. Receptionist - wants to accurately capture Patient's demographic data (firstname, lastname, ID number, date of birth, mobile number and email address(optional)) on behalf of a computer illiterate Patient.
Pre-condition:	N/A
Post-condition:	<ol style="list-style-type: none">1. Created Patient's profile recorded in the Patient's data store.2. Login details are generated and sent to the Patient.

3.3.2 Create appointment use case

Use case name:	Create Appointment
Scope:	Dental Clinical Management System for better health.
Triggering event:	user request to create Appointment.
Brief description:	user request to create new Appointment. This involves Doctor's schedule where patient can select date and time available in the slot. Receptionist may also create appointment on behalf of patient. in case of emergency or serious problem depending on the condition of a patient a Doctor may also create appointment. Patient ID must be read first then time and date has to be selected on the Doctor's schedule and after successful booking confirmation message has to be generated and sent to the patient via email.
Actor(s):	Patient (primary), Doctor (primary), Receptionist (primary).
Related use cases:	Read Patient (includes), create consultation (extends).
Stakeholders and interests:	Patient - wants to make sure that appointment is done accordingly. 2. Receptionist - wants to accurately make appointment on behalf of those patients who have lack of computer skills. Doctor - wants to make appointment that is urgently and need serious attention.
Pre-condition	Patient must exist in the database.
Post-condition	Confirmation message must be send via email.

3.3.3 Use Case Diagram



Figure 8: DCMS-ERD

3.4 Project Constraints

- DCMS must run on any platform that supports Java.
- Data captured should be stored on a cloud database.

- The user needs to be connected to the internet.

4 Agile Approach : SCRUM

4.1 Scrum Roles

- Product owner - Represents the customer/users. He Provides the specifications or requirements of the product, along with their priorities. This prioritized list of features is the product backlog.
- Scrum master - Enacts scrum values and practices. They Remove impediments, which are the obstacles that disrupt progress.
- Scrum team -perform analysis, design, program, test, document, and so forth

5 Agile Approach:SCRUM

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- Scrum team -perform analysis, design, program, test, document, and so forth

5.2 Scrum Artifacts

5.2.1 User Stories

Patient

- As a patient, I want to be able to register on the system, so that I can have credentials to use to access the system
- As a patient, I want to be able to log in the system, so that I can access my portal on the system
- As a Patient, I want to be able to book an appointment, so that I can have a time reserved for me
- As a Patient, I want to be able to view my appointments, so that I can stay informed of the time and date.
- As a Patient, I want to be able cancel an appointment, so that I can change it's details without being charged a missed appintment fee.
- As a Patient, I want to be able view my bill, so that I can know all charges I have been charged.

Dentist

- As a Dentist, I want to be able to register on the system, so that I can have credentials to use to access the system
- As a Dentist, I want to be able to log in the system, so that I can access my portal on the system
- As a Dentist, I want to be able to view my schedule , so that I can stay informed.
- As a Dentist, I want to be able create a Consultation/Bill, so tha I can record all conducted procedures.

Receptionist

- As a Receptionist, I want to be able to register on the system, so that I can have credentials to use to access the system
- As a Receptionist, I want to be able to log in the system, so that I can access my portal on the system

- As a Receptionist, I want to be able to book an appointment, so that I can have a time reserved for a requesting patient
- As a receptionist, i want to be able to cancel an appointment, so that cancelled appointments are shown as such

Administrator:

- As an Administrator, I want to be able to authorize the creation of a new Doctor/Receptionist so that I can be able to ensure all relevent users are legitimate.

5.2.2 Product Backlog

This is a list of prioritized features. The product backlog of DCMS is given below.

Priority Rank	Item	Description
1	Register	Capturing the data of a new user
2	Authorize new Dr/Receptionist	Administrator authorizes the creation of a new Dr/Receptionist
3	Log in	User access the system using username and password
4	Create Appointment	User needs to be able to create an appointment slot reservation
5	View Appointment	User needs to be able to view their upcoming appointments.
6	Create Bill	Generate an invoice
7	Veiw Bill	View an invoice
8	Create e-prescription	Dentist generates e-prescription for patient
9	View e-rescription	Patient view e-prescription made by dentist

Figure 9: Priority List

5.2.3 Sprint Backlog

During the first sprint plan meeting, the product backlog was used to develop sprint backlogs. The first sprint comprises of 4 tasks/items. The tasks and

their description are given below.

Item	Description	
	Front End	Back End
Register	Develop a screen that allows user to select user type to register, and input required data	Run SQL query to insert data into database and verify that the same user does not already exist
Authorize new Dr/Receptionist	The administrator should be able authorize new Drs or new receptionists. They should be presented with a list of all users awaiting authorization where they can drill down into the individual user before authorization.	The status of a new dr/receptionist is set to pending authorization. It is under this condition where the admin will make the decision to authorize or not, where the user status will be updated to either active(Approved) or rejected
Login	Any user should be able to select their user type and use their correct username and password to log in. Should either be incorrect, an appropriate error message should be shown	The user type selected indicates the table in the database where the username and password should be checked in.
Create Appointment	Develop a screen that allows user to create a new appointment. This is done by selecting the doctor and the time and date of the appointment	After the user has selected the doctor and date. The query then uses these 2 fields to return the doctors schedule for the day so that appointments do not clash.

Figure 10: Sprint 1

Each task was estimated to take at most 10 hrs. The first sprints ran for 5 days. Daily scrum meetings were conducted to check the progress of each team member and to unblock any impediments. At the end of each sprint, sprint review meetings were conducted to test and demonstrate the functionality of the product. A sprint burn down diagram which shows the progress of the first sprint is given below

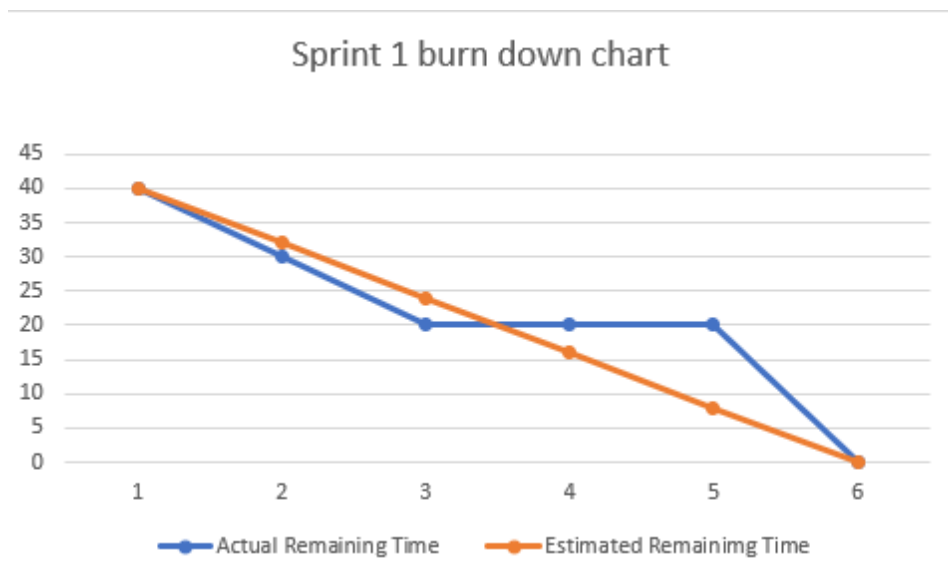


Figure 11: Sprint 1 burndown diagram

During the second sprint plan meeting, the product backlog was used to develop sprint backlogs. The second sprint comprises of 6 tasks/items. The tasks and their description are given below.

Task	Description	
View Appointment	A patient or dentist should be able view their schedule for a desired week.	Query involves patient or dentist ID with date or week of appointment.
Create Bill	A dentist creates a bill for a patient by selecting all the items the patient has been treated with.	A bill requires the doctor and patient ID to be created. It also includes all the items and costs of the procedures conducted.
View bill	A patient should be able to view their bill after a consultation has taken place showing the total costs of procedures	Patient ID and date is used to view a patients bill
Create e-prescription	Develop a screen that allows user to create a new appointment. This is done by selecting the doctor and the time and date of the appointment	After the user has selected the doctor and date. The query then uses these 2 fields to return the doctors schedule for the day so that appointments do not clash.
View e-prescription	A patient or dentist should be able view their schedule for a desired week.	Query involves patient or dentist ID with date or week of appointment.

Figure 12: Sprint 2

A second sprint of 5 tasks was formed from the product backlog. Each task was estimated to take at most 10 hrs and the sprint ran for 9 days. The tasks and their description are given below. A sprint burn down diagram which shows the progress of the second sprint is given below

5.3 Sprint planning documents

Sprint is timeboxed incremental iterations, each aims to produce a potentially shippable increment (PSI).

Product backlog (priority list) - after meeting sprint backlog breaking user story to tasks

Sprint 1 - User stories + Fixes for any outstanding bugs

Daily scrums - what's been done, sprint review meeting followed by retrospective meeting

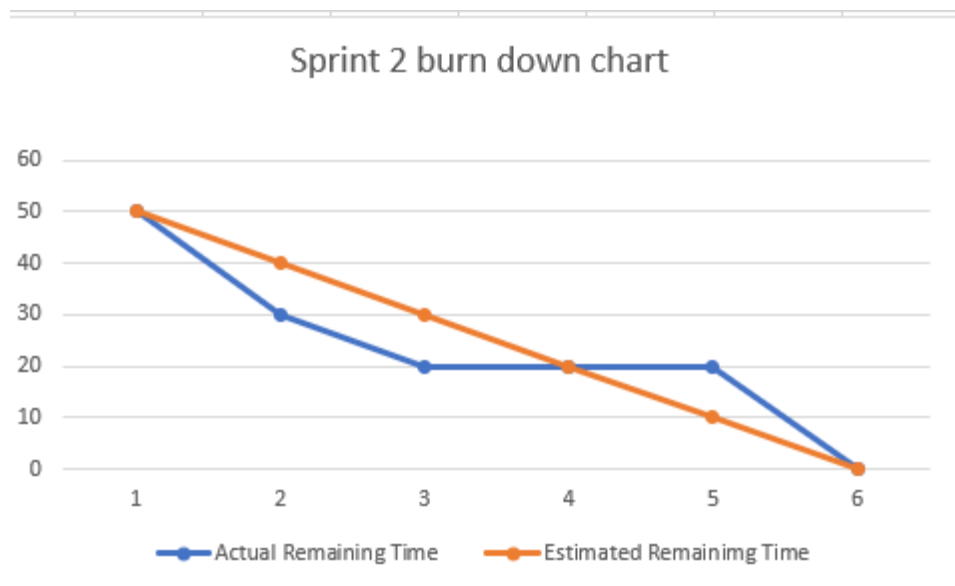


Figure 13: Burn down diagram

6 Module Descriptions and Demonstrations

6.1 Screenshots

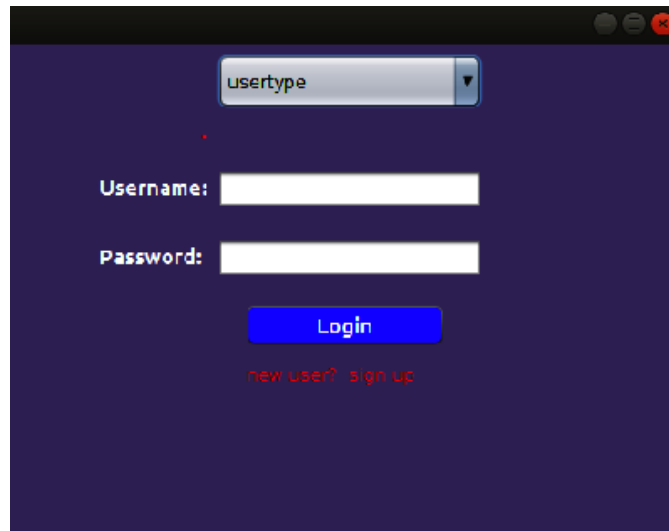


Figure 14: DCMS login

All users are required to login before they can begin using the software's main capabilities. The user begins by selecting the user type which they are (Patient, Dentist, Receptionist or administrator). The entered username is then checked in the appropriate database table to see if the password entered matches the one stored.

The doctor's username is taken as the doctor's practice number, all other users use their email addresses as usernames. Data validation is done on the screen to show appropriate error messages if anything is incorrect (refer to System Testing). Should the user be new and without a username and password, they are required to register as a new user. Based on the input of the combo box, the correct new user portal is loaded. The above the User Interface shows the registration of a new patient.

The above user interface shows the registration of a new dentist. The button on the top left (Authorize), is only clickable from the administrator

patient.png

New Patient

Firstname

Lastname

Date of Birth

ID/Passport No.

Gender

Select Gender

Mobile Number

Email

Password

Retype Password

Occupation

Address

Address line 1

Address line 2

Address line 3

City

Postal Code

Province

Select Province

Cancel

Next

Already a user?

Figure 15: Create patient

point of view. After the dentist has entered all their required data, in order to be able to use the created credentials to log in, the new dentist must first be authorized (approved to be legitimate) by the administrator.

The creation of a new appointment can be done by either the patient or the receptionist. The details recorded include the patient making the booking and the doctor being booked for. Each patient has a preferred dentist, however one has the option of booking to see a different dentist who may have a different specialization for the needed appointments.

The appointment has a date and time selection, the dates available are from the schedule of the selected doctor for the given week. This is to ensure that appointments are not double booked for doctors.

The illustration above shows how a new appointment is structured and stored. The php admin

dentist.png

The image shows a web application window titled "dentist.png". The window has a dark blue header with a button labeled "Authorize" on the left and the title "New Dentist" in the center. Below the header, there is a registration form with the following fields:

- Name:
- Surname:
- Specialization:
- Practice number:
- Password:
- Retype Password:

At the bottom of the form, there are two buttons: a red "Cancel" button and a blue "Save" button. Below these buttons, a red error message "Already a user!" is displayed.

Figure 16: Create patient

Patient Medical Details

Heart Condition	Sores In Mouth
Epilepsy	Medical Aid Number
Allergies	Tongue Diagnosis
Dental Sedation	H.I.V/Aids
Bleeding Disorder	Medical Aid Name
Teeth Sensativity	Family Doctor Name
Medication	Family Doctor Contact

Cancel
Save

Figure 17: Create patient

HOME

Firstname:

Lastname:

Email:

Password:

RetypedPassword:

Cancel
Register

Already a user?

Figure 18: Create patient

The screenshot shows a web interface for creating an appointment. On the left, there is a calendar grid with columns for Monday through Friday. On the right, there is a form with the following fields and controls:

- Doctor:** A dropdown menu currently showing "Dr Mkhize".
- Patient ID:** An empty text input field.
- date:** A text input field with a calendar icon to its right.
- Time:** Two dropdown menus showing "07AM" and "08AM" with a "To" label between them.
- Time Selection Buttons:** A grid of buttons for different times: 7AM, 8AM, 9AM, 10AM, 11AM, 12PM, 1PM, 2PM, 3PM, 4PM, 5PM, 6PM, 7PM, and 8PM. The 1PM button is highlighted in blue.
- Buttons:** A red "Cancel" button and a blue "Schedule" button at the bottom right.

Figure 19: Create Appointment

The screenshot shows the phpMyAdmin interface. The left sidebar displays a database structure with various tables like 'employees', 'information_schema', 'login', 'mysql', 'performance_schema', 'sys', 'testDB', 'ADDRESS', 'ADMINISTRATOR', 'APPOINTMENT', 'AUTHORIZATION', 'CONSULTATION', 'DOCTOR', 'MEDICAL_CONDITION', 'PATIENT', and 'RECEPTIONIST'. The main area shows the 'APPOINTMENT' table with the following data:

	APPOINTMENT_ID	DATE	CHECKIN	CHECKOUT	DOCTOR_ID	PATIENT_ID	RECEPTIONIST_ID	CHARGE
<input type="checkbox"/>	3	08/10/2018	07AM	08AM	101	5552	NULL	charged
<input type="checkbox"/>	4	09/10/2018	07AM	09AM	101	5552	NULL	charged
<input type="checkbox"/>	5	18/10/2018	10AM	12PM	102	5551	1431	charged
<input type="checkbox"/>	6	10/10/2018	07AM	08AM	102	5551	NULL	uncharged

Below the table, there are controls for 'Show all', 'Number of rows' (set to 25), 'Filter rows' (Search this table), and 'Sort by key' (None). At the bottom, there is a 'Query results operations' section with buttons for 'Check all', 'With selected', 'Edit', 'Copy', 'Delete', and 'Export'.

Figure 20: Create Appointment

A screenshot of a web application window titled "Consultation". The window has a dark blue header bar with the title. The main content area has a light purple background. It contains two text input fields: one labeled "Description:" and another labeled "Cost:". Below these fields are two buttons: a red "Cancel" button and a blue "Charge" button.

Figure 21: Create patient

A screenshot of a web application window titled "Patient Medical Details". The window has a dark blue header bar with the title. The main content area has a light purple background. It contains two columns of text input fields. The left column includes: "Heart Condition", "Epilepsy", "Allergies", "Dental Sedation", "Bleeding Disorder", "Teeth Sensativity", and "Medication". The right column includes: "Sores In Mouth", "Medical Aid Number", "Tongue Diagnosis", "H.I.V/Aids", "Medical Aid Name", "Family Doctor Name", and "Family Doctor Contact". At the bottom of the form are two buttons: a red "Cancel" button and a blue "Save" button.

Figure 22: Create patient

7 System development review method

7.1 Sprint retrospective

What went right be

- j

What went wrong

- h

What should we do differently

- k

8 System Testing

8.1 Unit Tests

Unit testing also called component testing was performed on standalone modules to check whether they were developed correctly. The following standalone modules were tested

- **Login**

What was tested	Expected	obtained	verdict
Response to selecting user type from combo box	Correct portal opened for relevant user type selected, either login or creating new user.	If username and password valid, and valid user type chosen, user is directed to correct user portal	pass
Response to valid login user name and password	Accepts the user credentials	Accepts the user credentials	pass
Response to invalid login username or password	Error message" incorrect user name or password "	Error message" incorrect user name or password invalid"	pass
Response to Empty login	Message" please enter user name"	Message " please enter user name"	pass
Response to clicking the login button	Takes you to the relevant user home screen if credentials are valid	Takes you to the relevant user home screen if credentials are valid	pass
Response to clicking sign up button	Takes you to the registering page, depending on the user type selected	Takes you to the registering page, depending on the user type selected	pass

Figure 23: login testing

- **Register**

What was tested	Expected	Obtained	verdict
Response to empty required text field(first name,last name,email,password, retype password)	Message " enter required field"	Message "enter required field"	pass
Response to mismatching password	Error message"password does not match"	Error message" password does not match"	pass
Response to valid inputs	Message" data captured successfully"	Message"data captured successfully"	pass

Figure 24: Register testing