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ITAHARI INTERNATIONAL COLLEGE

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Group Name: (The Elements AJ05)			
SN	**Student Name**	**College ID**	**University ID**
1.	Kumar Khulal	NP05CP4A180028	18028904
2.	Jushan Shrestha	NP05CP4A180026	18028902
3.	Sanjaya Shrestha	NP05CP4A180057	18028933
4.	Geeta Ojha	NP05CP4A180024	18028900

I confirm that I understand my coursework needs to be submitted online via Google Classroom under the relevant module page before the deadline in order for my assignment to be accepted and marked. I am fully aware that late submissions will be treated as non-submission and a mark of zero will be awarded.

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1. Group Work: Introduction

The system name 'Darpan Dental Home Application' is developed for the existing Dental Clinic. Darpan Dental Home Clinic has introduced this system to overcome the problem faced while tracking the records of a patient. This system helps to keep the record in a computerized system eliminating all the paper works of the clinic. Moreover, the system is designed for a clinic to carry out the daily operation smoothly and effectively.

This project is an attempt to provide the advantage of a systematic recording system for the organization. It helps to reduce the error while recording different data like patients' payment, medical report, appointment details, etc. The records in the clinic are also secured. The workload of staff for recording different data of patients in the clinic is reduced. The recorded data is easily provided to people which can be time-saving as well. After using this system, the clinic resource can be utilized effectively, and daily works can be done smoothly as the staff workloads are reduced.

Waterfall model of software development life cycle (SDLC) is used to develop this system. This model has a distinct goal in each development phase. The requirement for the system is clear and well known. Also, the project is very short so, the waterfall model approach was used. The sequential phases in the waterfall model are:

Requirement gathering and analysis: Possible requirement of the system to be developed are collected and documented in this phase.

System design: The gathered requirement from the first phase is studying and the design is prepared accordingly. The design helps in system requirements and hardware specifications.

Implementation: according to the design, the system is developed in small programs called units with functional testing.

Integration and testing: units developed in the implementation phase are integrated into a system after testing the system.

Deployment of the system: After the functional and non-functional testing, the product is deployed into the market.

Maintenance: issues are fixed and to fix those issues, patches are released. After the maintenance better version of the product is released (tutorialspoint, 2020).

1.1. Aims and Objectives

The main goal of the project called "Darpan Dental Home Application" is to maintain all patient, employees, payment, appointment and check-up information. The project is entirely built for administrative purposes, so access is guaranteed only to the admin. The main purpose of this project is to create an application for this dental clinic to reduce the problem, such as keeping patient records during payment and booking appointment, as well as maintaining all information of patient payment, patient and staff registration, check-up, appointment and patient reports.

1.2. Tool and Techniques

To complete the project successfully different tools and technique were used. Here are some analytical tools and technique used during the completion of this project.

- **Ms Word**

Microsoft word is a non-free commercial word processor designed by Microsoft that allow the user to create different types of documents. Word used .doc or .docx file extension for text documents. Word is important for making the proper formatting of the documentation by checking the spelling and grammar errors, adding header, footer and page number. And the word file can also be converted into pdf, PowerPoint and others format (Simpo, 2014). Our project whole documentation is also done is word and final document is converted into pdf format.

Figure 1: Figure of MS Word

- **Visio**

Visio is a drawing and diagramming program of Microsoft office package that is used for layouts, diagrams and charts. As other diagramming software, Visio provides a library of templates and shapes of various charts. It is used for creating data flow diagrams, structure chart and so other diagrams for professional look that is used in this project (Lucidchart, 2020).

Figure 2: Figure of Visio

Draw.io

Draw.io is a free diagramming application that is used for creating and sharing diagrams within a web browser. It also allows user to work on offline diagrams and save locally using draw.io's desktop app. Draw.io provides an in-built interface with drag and drop functionality and customizable diagram templates. Diagrams can be created and edited and it also allows to restore changes, import and export in various formats and share our diagrams. Entity Relationship diagram is created using this application in our project (GetApp, 2020).

Figure 3: Figure of Visio

2. Environmental Model Specification

2.1. Statement of Purpose

model	Representation
Statement of Purpose	To store the error free record of people in a systematic way and to get back the information and generate report in a dental clinic the system is developed.

Table 1: Statement of purspose

Model Element	Representation
System	Darpan Dental Home Application
General description	It is very difficult for the clinic to maintain the record of patient, staff, patients' payment and other information. This system is introduced to overcome such problem and to make the recording easier and systematic. For the staff it is also easier to get the information from system and can generate report accordingly. So, this system will exist in the clinic.
Responsibilities	This system manages to keep all the record of patient and staff accurately and computerized. The data redundancy of patient is also avoided in the clinic. The appointment time and date are also checked and informed the patient and staff about their appointment. This system can display all the record of patient like medical report, appointment detail, payment detail and other records. Valuable report of patient can also be generated, and the detail stored in the system is secured.
Specific exclusions	patient and staff are not allowed to generate the report. Only admin is authorized to generate the requested report. Once the staff leaves the clinic permanently, they no longer can access to the system. patient is only accessed to view their own reports.

Table 2: Statement of purpose details

2.2. Event list

Event List is defined as the list of stimuli that occur in the environment to which the system must respond. There are three types of event list, which are discussed in a detail way below:

i) **Flow-oriented events**: They are associated with the flows of data in the system.
ii) **Temporal events**: They are caused by the 'arrival' of a point in time.
iii) **Control events**: External stimuli occur at some unpredictable points in time.

Event list of given scenario is listed below:

1. Register user
   1.1. Register patient details
   1.2. Register staff details
2. Login user
   2.1. Login patient with their valid username and password
   2.2. Login staff with their valid username and password
   2.3. Login admin/manager with their valid username and password
3. Book Appointment
   3.1. Patient can book the appointment for the given date
   3.2. Patient can view the book appointment
   3.3. Patient can update the book appointment
   3.4. Patient can cancel the book appointment
   3.5. Staff can view the book appointment
   3.6. Admin/manager can cancel the book appointment
4. Send Feedbacks
   4.1. Patient can send feedbacks to the Darpan Dental Home.
   4.2. Staff can view the feedbacks
5. Set Remainder for patient
   5.1. Patient can set the remainder with their appointment date and time
   5.2. Admin/manager can set the remainder for exceeding six moth of checkup

6. Report of patient
    6.1. Patient can view their report details
    6.2. Admin/manager generates the report of patient
7. Update patients profile
    7.1. Patient can update their profile
8. Registration info of patient
    8.1. Staff can view user registration details
    8.2. Staff can confirm the user registration details
    8.3. Staff can cancel the user registration details
9. Maintain records of patient
    9.1. Staff keeps/maintain record of patient
    9.2. Staff can maintain the checkup records
    9.3. Staff can maintain follow up schedule records (send message to patient if it's time for follow up)
    9.4. Admin/manager can update the patient record
10. Payments details of patient
    10.1. Admin/manager can refund the payment at the time of cancel appointment
    10.2. Staff keeps record of patient payment details
    10.3. Online payment can be done with their appointment by the patient
    10.4. Cash payment can be done at the time of book appointment
11. Offer
    11.1. Admin/manager inform about offer to the staff (offers discount or other offers)
12. De register a staff
    12.1. Admin can deregister to the staff (after de register staff detail should be dropped from database so he/she cannot use the system)

2.3. Context Diagram

Context Diagram is defined as a diagram used to give an overview of the entire system. The Context Diagram shows the system under consideration as a single high-level process and it also shows the relationship that the system has other external entities. The another name for Context Diagram is a Context-Level Data-Flow Diagram or a Level-0 Data Flow Diagram (Modern analyst.com, 2017). Context Diagram shows the scope and boundaries of a system at a glance including the other systems that interface with it. This diagram is easy to draw due to its limited notation. It can benefit a wide audience, which include stakeholders, business analyst, data analysts, and developers.

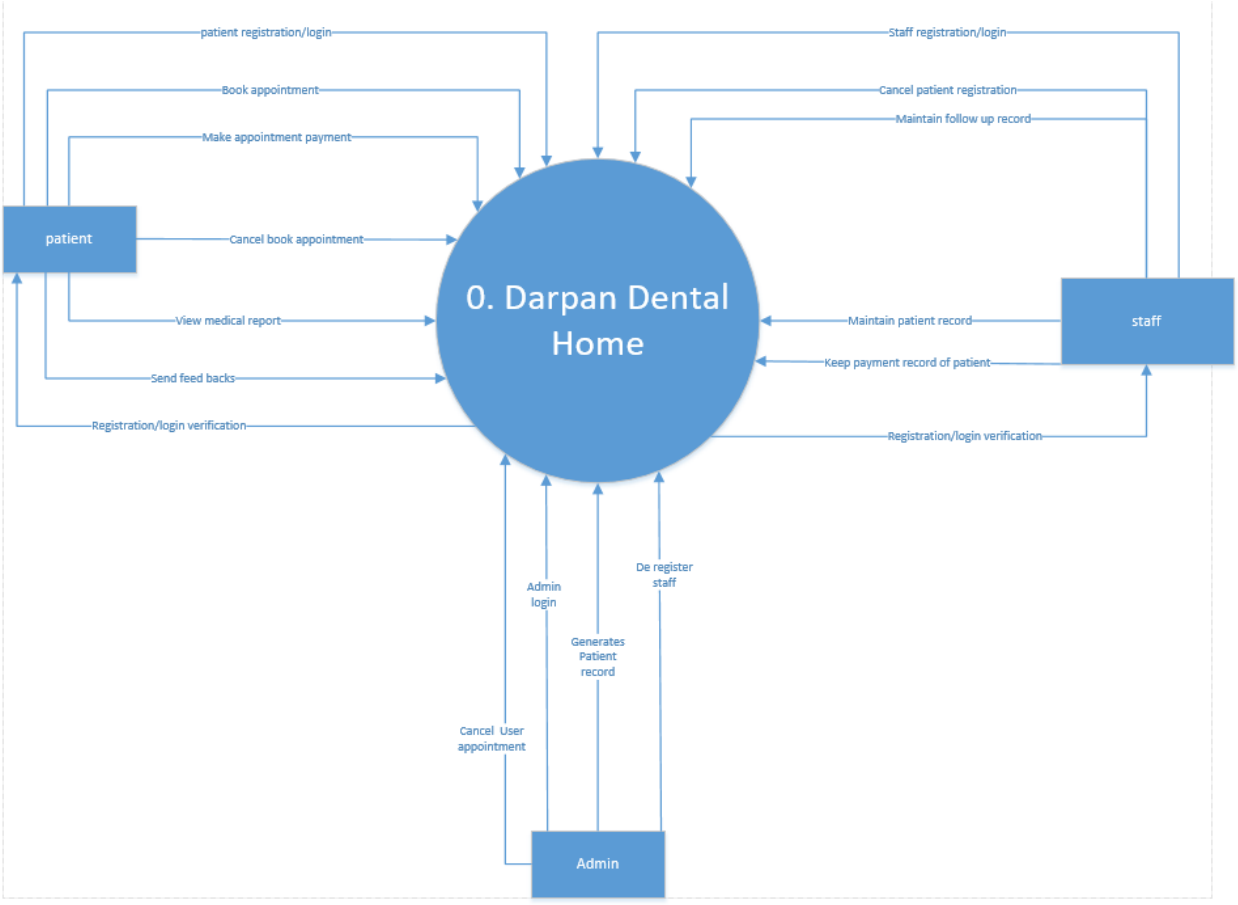


Figure 4: Context diagram of Darpan Dental home

The context diagram of ‘Darpan Dental Home Application’. The external entities envolved are patient, staff and admin. This diagram show the main function that the external entities

can do in the system. patient can register and login into the system and can book an appointment, cancel booked appointment, view medical report, send feedbacks to the system or clinic through the system. similary, staff also register and login into the system and maintains the record of patients' payment, follow up record and patient record respectively. Staff also can cancel the registration of patient in ths system. Also, the admin can login into the system and cancel patients' appointment, generated report and de-register a staff.

3. Internal Model Specification

3.1. DFD

A data flow diagram demonstrates the flow of information through a process in a system. It is composed of inputs and outputs data, data stores and the various sub process and the flow of data. Data flow diagrams are classified at various levels. Starting from the zero level its complexity increases as the level increases (Lucidchart, 2020).

DFD level zero is also known as a context diagram is the basic data flow diagram with little details of the information. It is represented by single process that specifies the function of entire system.

DFD level 1 breakdown the single process of context diagram into sub-processes to provide more details than level 0.

DFD level 2 and 2+ breaks the process into more detailed sub-processes to provide them enough information of the system briefly (smartdraw, 2020).

3.1.1. DFD Fragments

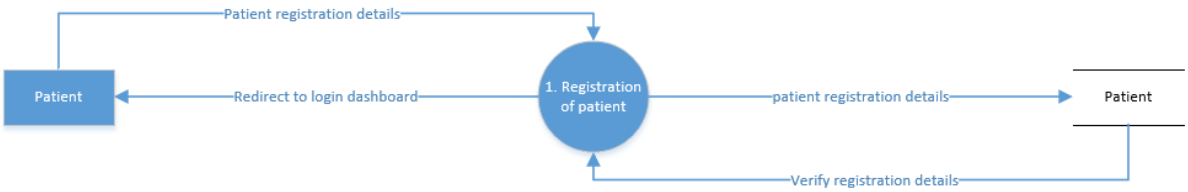


Figure 5: DFD Fragment of Patient registration

From the above figure, we can see that one entity is involved in the process of **patient registration**. First, the **patient** sends his/her details for the registration which is recorded in the **patient entity**. Furthermore, detail of patient for registration is verified and redirected to login dashboard.

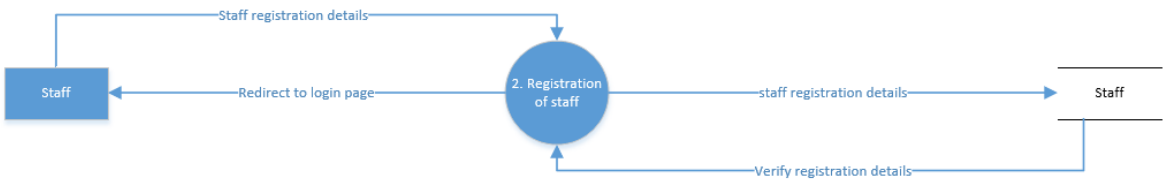


Figure 6: DFD Fragment of Staff registration

From the above figure, we can see that one entity is involved in the process of **staff registration**. First, the **staff** sends his/her details for the registration which is recorded in the database of **staff entity**. Furthermore, detail of staff is verified and redirected to login dashboard.

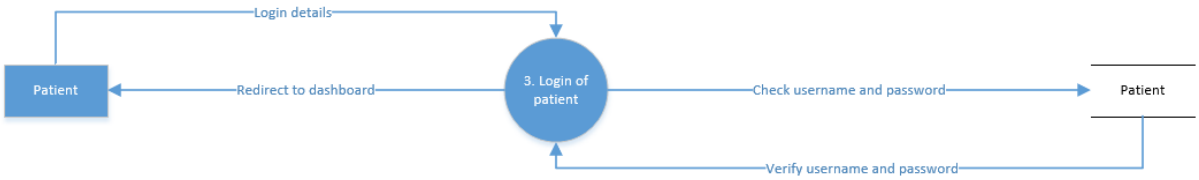


Figure 7: DFD Fragment of login patient

From the above figure, we can see that only one entity is involved in the process of **login of patient**. Firstly, the **patient** sends his/her login details i.e. username and password which gets checked in the database of **patient entity**. After the username and password are verified, patients are redirected to dashboard.

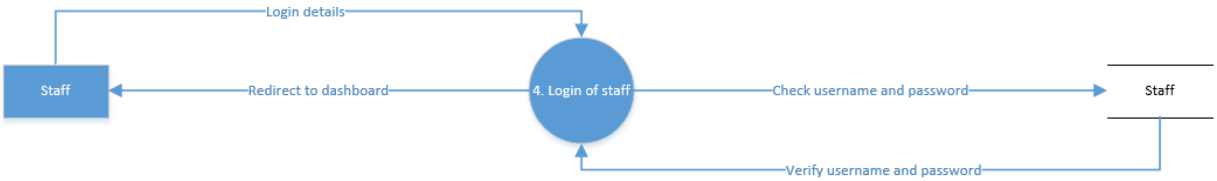


Figure 8: DFD Fragment of Login staff

From the above figure, we can see that only one entity is involved in the process of **login of staff**. Firstly, the **staff** sends his/her login details i.e. username and password which gets checked in the database of **staff entity**. After the username and password are verified, staffs are redirected to dashboard.

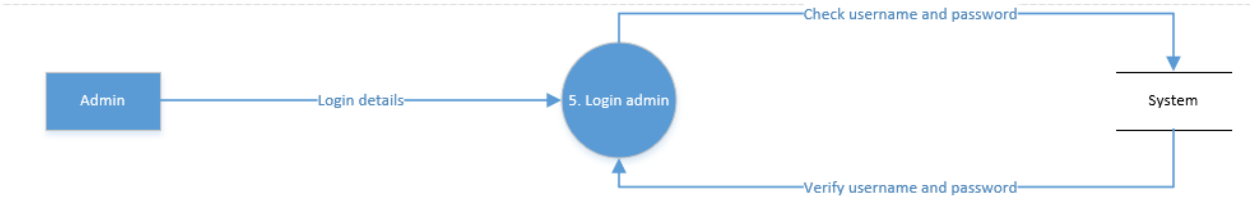


Figure 9: DFD Fragment of Login Admin

From the above figure, we can see that only one entity is involved in the process of **login of admin**. Firstly, the **staff** sends his/her login details i.e. username and password which gets checked in the database of **system entity**. After the username and password are verified, admin is redirected to dashboard.

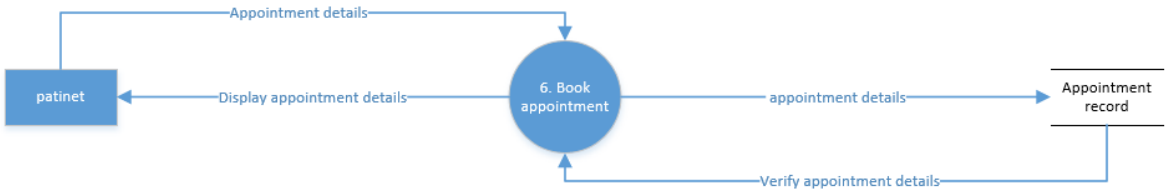


Figure 10: DFD Fragment of book Appointment

From the above figure, we can see that only one entity is involved in the process of **booking an appointment**. Firstly, the **patient** sends his/her details for booking an appointment which is further stored in the database of **appointment record entity**. After that, the appointment details are verified, and the appointment details can be viewed by the patient.

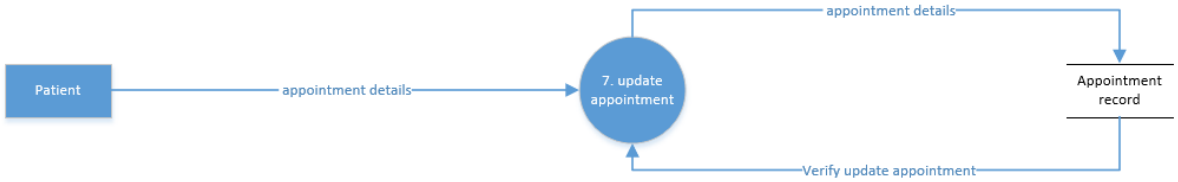


Figure 11: DFD Fragment of Update appointment

From the above figure, we can see that only one entity is involved in the process of **updating an appointment**. Firstly, the **patient** sends his/her appointment details for updating an appointment which is further checked in the database of **appointment record entity**. After that, the appointment details are verified, and the updated appointment details can be viewed by the patient.

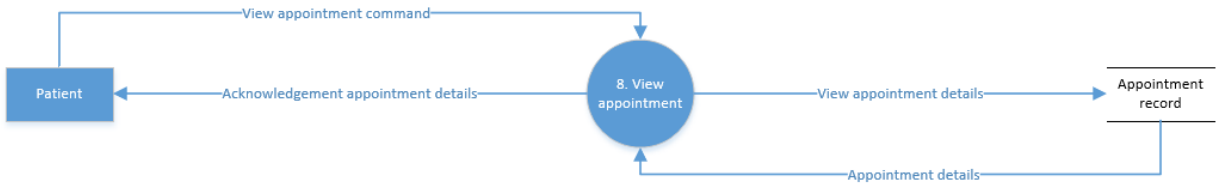


Figure 12: DFD Fragment of view appointment

From the above figure, we can see that only one entity is involved in the process of **viewing appointment** for patient. Initially, the **patient** request for viewing appointment which is further checked in the database of **appointment record entity**. Furthermore, the command for request to view appointment is verified and the patient can view their all appointment details.

Figure 13: DFD Fragment of Cancel appointment

From the above figure, we can see that only one entity is involved in the process of **canceling appointment** by patient. Firstly, the **patient** requests for canceling appointment which is further checked in the database of **appointment record entity**. Furthermore, the appointment is checked and verified, after that the appointment is cancelled.

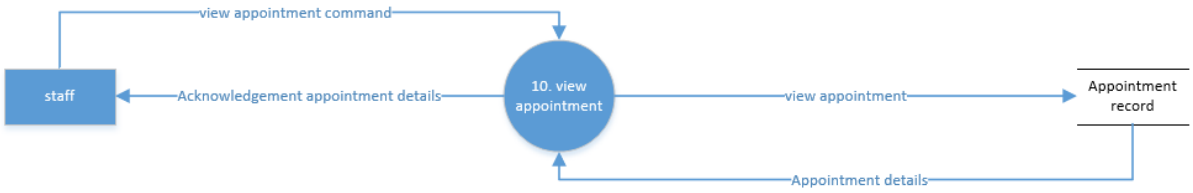


Figure 14: DFD Fragment of view appointment

From the above figure, we can see that only one entity is involved in the process of **viewing appointment** for staff. Initially, the **staff** request for viewing appointment which is further checked in the database of **appointment record entity**. Furthermore, the command for request to view appointment is verified and the staff can view their all appointment details.

Figure 15: DFD Fragment of cancel appointment

From the above figure, we can see that only one entity is involved in the process of **canceling appointment** by admin. Firstly, the **admin** request for canceling appointment which is further checked in the database of **appointment record entity**. Furthermore, the appointment is checked and verified, after that the appointment is cancelled.

Figure 16: DFD Fragment of Send feedbacks

From the above figure, we can see that only one entity is involved in the process of **sending feedbacks**. Initially, the **patient** sends feedbacks in the form of message which is stored in the database of **feedback record entity**.

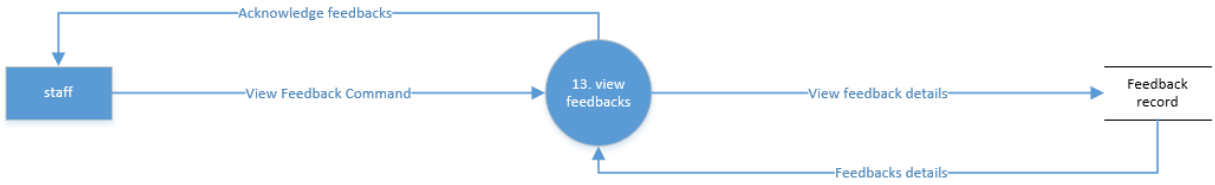


Figure 17: DFD Fragment of View feedbacks

From the above figure, we can see that only one entity is involved in the process of **viewing feedbacks** by staff. Initially, the **staff** request for viewing feedback which is further checked in the database of **feedback record entity**. Furthermore, the command for request to view feedback is verified and the staff can view feedback details given by patient.

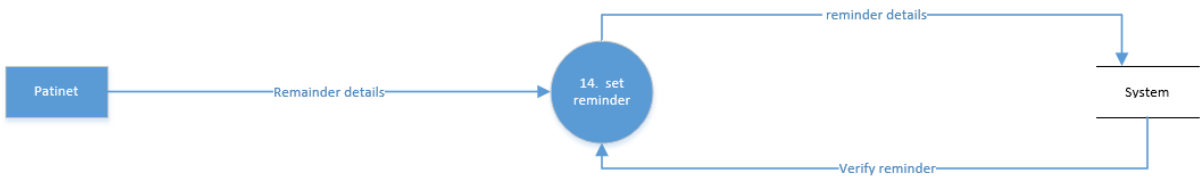


Figure 18: DFD Fragment of set reminder

From the above figure, we can see that only one entity is involved in the process of **setting reminder** by patient. Initially, the **patient** sends remainder details which is further stored in the database of **system entity**. After that, the remainder details are verified, and the reminder is set up.

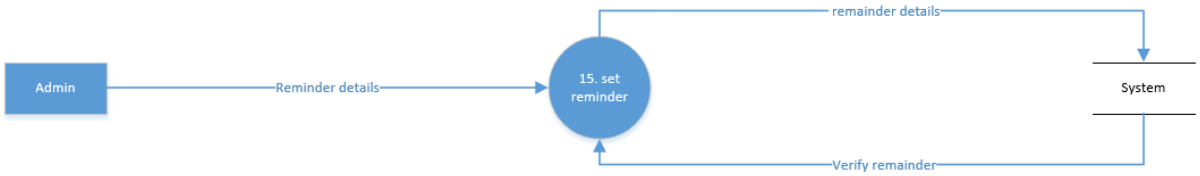


Figure 19: DFD Fragment of set reminder

From the above figure, we can see that only one entity is involved in the process of **setting reminder** by admin. Initially, the **admin** sends remainder details which is further stored in the database of **system entity**. After that, the remainder details are verified, and the reminder is set up.

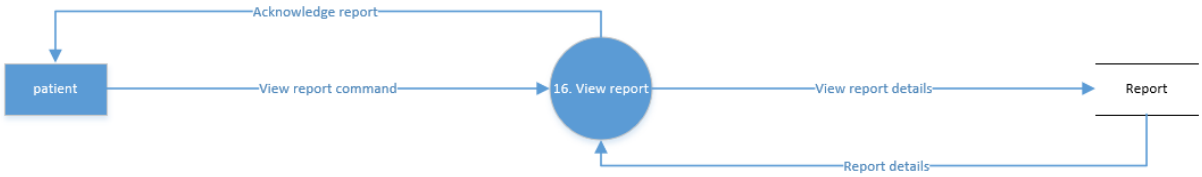


Figure 20: DFD Fragment of view report

From the above figure, we can see that only one entity is involved in the process of **viewing report** by staff. Initially, the **patient** requests for viewing report which is further checked in the database of **report entity**. Furthermore, the command for request to view report is verified and the patient can view their all reports.

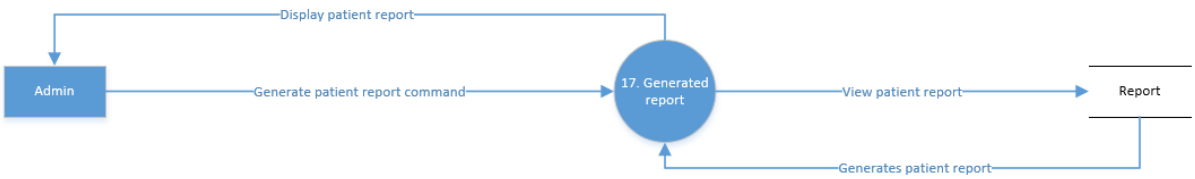


Figure 21: DFD Fragment of generate report

From the above figure, we can see that only one entity is involved in the process of **generating report** by admin. Initially, the **admin** requests for generating report which is further checked in the database of **report entity**. Furthermore, the command for request to generate report is verified and the report of patient is generated by admin.

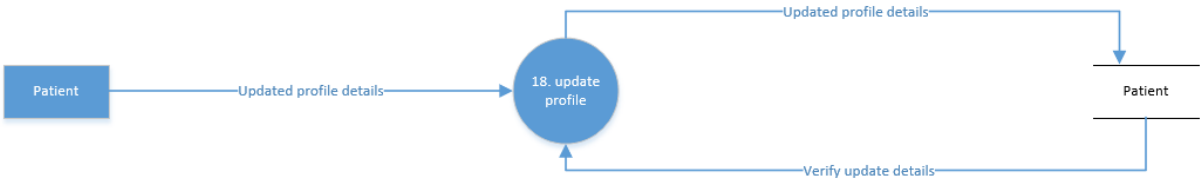


Figure 22: DFD Fragment of update profile

From the above figure, we can see that only one entity is involved in the process of **updating profile** of patient. Firstly, the **patient** request to update profile, which is further checked in the database of **patient entity**. After that, the updated profile is verified and redirected to updated profile.

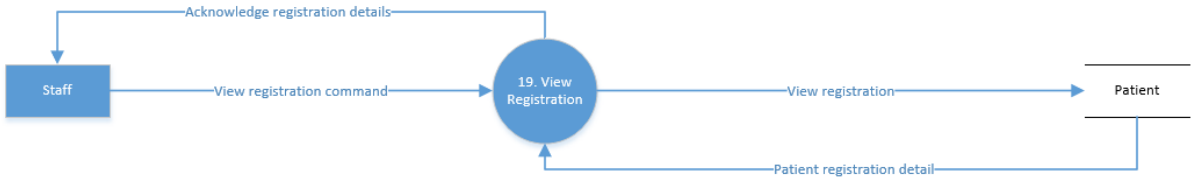


Figure 23: DFD Fragment of view registration

From the above figure, we can see that only one entity is involved in the process of **viewing registration** of patient. Initially, the **staff** requests for viewing registration of patient which is further checked in the database of **patient entity**. Furthermore, the command for request to view registration of patient is verified and the staff can view all the registration of patients.

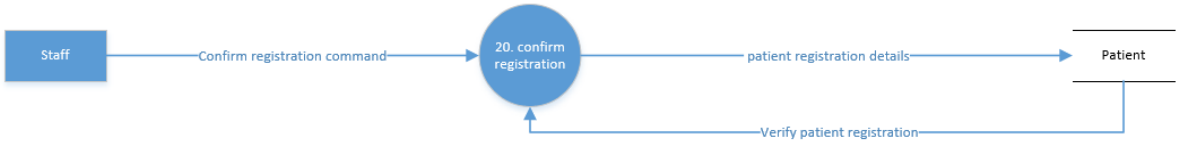


Figure 24: DFD Fragment of Confirm registration

From the above figure, we can see that only one entity is involved in the process of **confirming the registration** of patient. Firstly, the **staff** sends the request to confirm the registration of patient which is further checked in the database of **patient entity**. After that, the command for request to confirm the registration of patient is verified and the registration of patient is confirmed by staff.

Figure 25: DFD Fragment of cancel registration

From the above figure, we can see that only one entity is involved in the process of **canceling registration** by staff. Firstly, the **staff** request for canceling the registration of patient which is further checked in the database of **patient entity**. Furthermore, the registration detail is checked and verified, after that the registration of patient is cancelled.

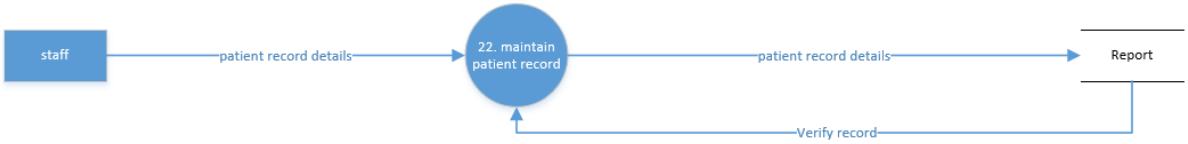


Figure 26: DFD Fragment of maintain patient record

From the above figure, we can see that only one entity is involved in the process of **maintaining the patient record** by staff. Firstly, the **staff** request for maintaining the patient record which is further checked in the database of **record entity**. After that, the command to request patient record is verified and the patient record is maintained by staff.

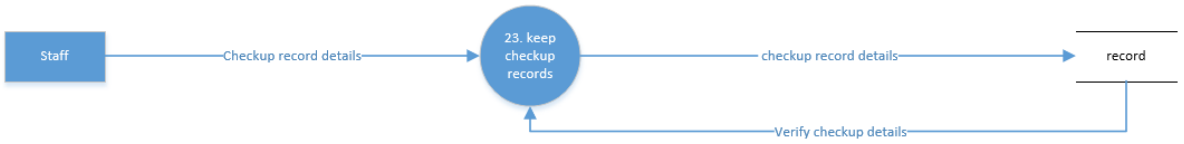


Figure 27: DFD Fragment of checkup record

From the above figure, we can see that only one entity is involved in the process of **keeping the records of checkup** of patient. Firstly, the **staff** request for the record of checkup which is further checked in the database of **record entity**. After that, the details of record for checkup is verified and staff keeps the record of checkup.

Figure 28: DFD Fragment of follow up schedule

From the above figure, we can see that only one entity is involved in the process of **following up the schedule** of patients. Firstly, the **staff** sends request for the schedule of patients to follow up which is further checked in the database of **patient record entity**. After that, the details schedule to follow up for patient is verified and staff can follow up patient schedule.

Figure 29: DFD Fragment of update record

From the above figure, we can see that only one entity is involved in the process of **updating the record**. Firstly, the **admin** sends the request for the details of record which is further checked in the database of **record entity**. After that, the record detail is verified, and the record is updated by admin.

Figure 30: DFD Fragment of refund payment

From the above figure, we can see that only one entity is involved in the process of **refunding the payment**. Firstly, the **admin** sends the request for the details of receipt payment to refund which is checked in the database of **payment record entity**. After that, the payment receipt detail is verified, and the payment is refunded to patient.

Figure 31: DFD Fragment of maintain payment record

In the above figure, we can see that only one entity is involved in the process of **maintaining the payment record** of patients. Initially, the **staff** request for the payment record of the patients which is further checked in the database of **payment record entity**. After that, the command to request for the payment details are verified and the staff is allowed to keep the payment record of patients.

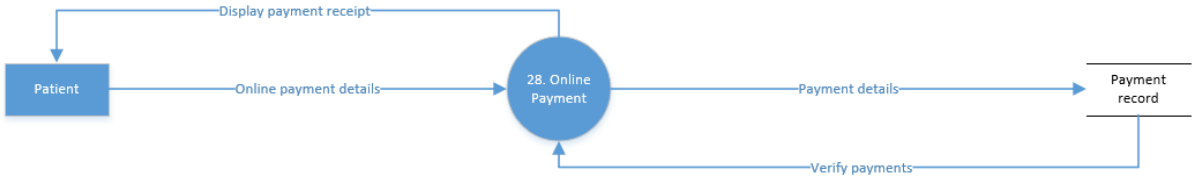


Figure 32: DFD Fragment of online payment

In the above figure, we can see that only one entity is involved in the process of **online payment**. Firstly, the **patient** sends details about the online payment which is stored in the database of **payment record entity**. After that, the payment is verified, and the patient receives the receipt of online payment.

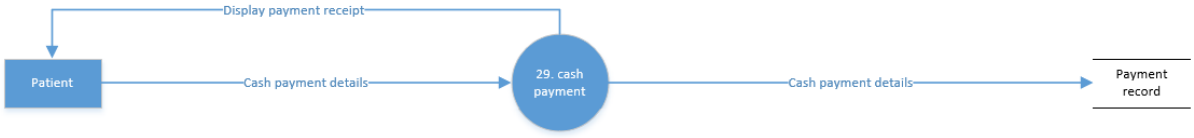


Figure 33: DFD Fragment of payment record

In the above figure, we can see that only one entity is involved in the process of **cash payment**. Firstly, the **patient** sends details about the cash payment which is stored in the database of **payment record entity**. After that, the payment is verified, and the patient receives the receipt of cash payment.

Figure 34: DFD Fragment of inform orders

From the above figure, we can see that only one entity is involved in the process of **informing about offer** to the patients. Firstly, the **admin** sends about the offer details which is stored in the database of **system entity**. After that, the offer detail is verified, and the patients are informed about the offer.

Figure 35: DFD Fragment of de-register staff

In the above figure, we can see that only one entity is involved in the process of **de-registering the staff** by the admin. Firstly, the **admin** sends the command for de-registering the staff which is further checked in the database of **de-register staff entity**. After that, the registration detail of staff is verified, and the staff is de-registered by the admin.

3.1.2. DFD Level 1

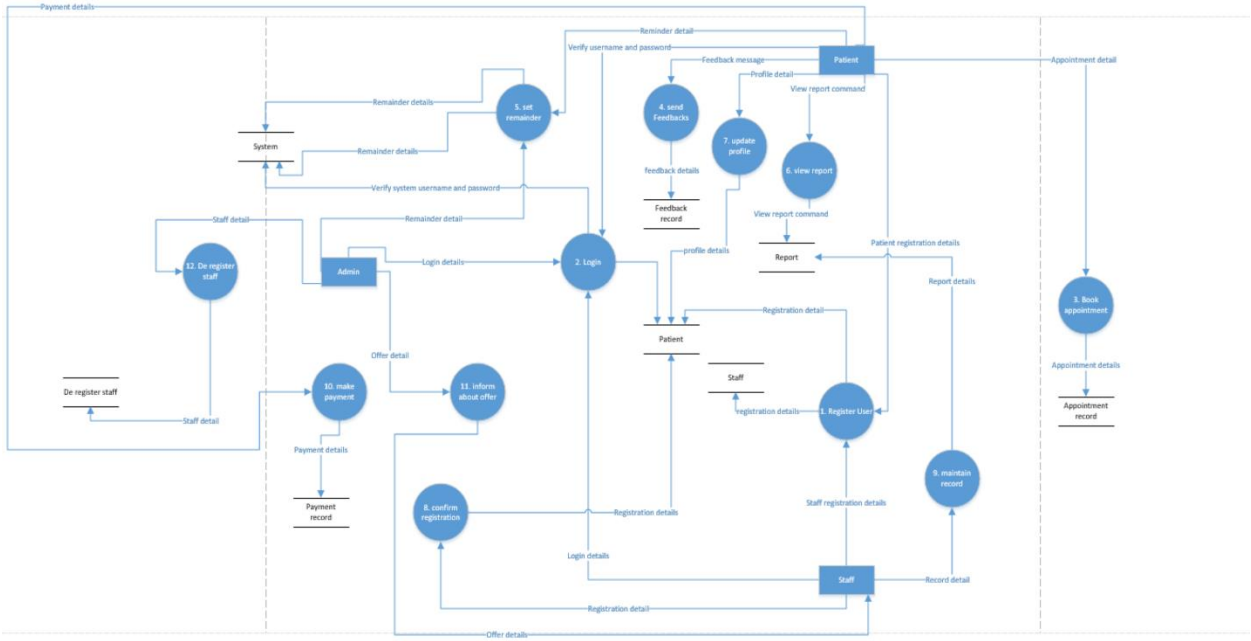


Figure 36: DFD leve; 1 of Darpan Dental Home

The above figure shows the level 1 DFD 'Darpan Dental Home Application'.

External Entity

- Patient
- Staff
- Admin

Processes

- Registration, Login, Book appointment, send feedback, set reminder, generate report, update profile, confirm patients' registration, maintain record, make payment, inform about offer, deregister-staff

Data Flow

- Registration detail, username and password, appointment detail, payment detail, report detail, record detail, patient detail, staff detail, admin detail, remainder detail, feedback messages, offer detail

Data store

- Patient, staff, appointment record, report, payment record, de-register staff, system, feedback record, patient record

First, the patient provides necessary registration detail like username, password, name, address, date of birth and is logged in into the system once the registration is verified by staff. The patients are recorded in patient data store. Then the patient can book the appointment which is stored in appointment record data store. patient can also set the reminder for appointment which is stored in data store named system. The patient can also update their registration info. In this system, the patient report is recorded in report data store. The staff kept different records of patient like patient which is stored in patient record data store. The admin can generate the patients' report which is also stored in patient report data store. Also, the admin deregisters staff and the detail of de-registered staffs are recorded in data store. patient is informed about the different offers by admin.

3.1.3. DFD level 2

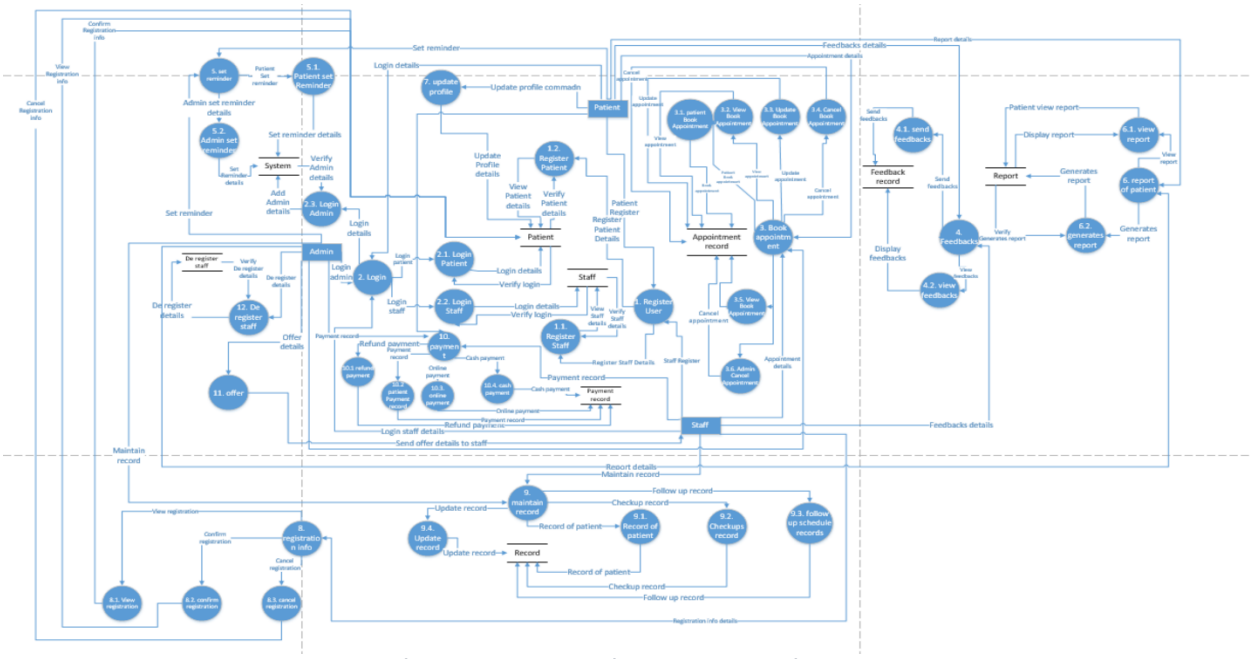


Figure 37: DFD Level 2 Darpan Dental Home

From the figure above, we can see that either a patient or a staff can register by sending the details of the register that are stored in the database of the patient and staff respectively. Once the registration details have been verified, they will be redirected to a login page. After inserting the username and password that is further checked in the staff and patient database, only access to the system will be provided. Admin can access the system after the username and password verification that is checked in the system database. After sending an update request to their respective database, patient, staff and admin can also update their profile. The patient can view, update and cancel the appointment after booking the appointment that is stored in the appointment database after the registration into the system. Administrators and staff have the privilege of viewing and canceling the appointment, but only staff have the privilege of confirming patient registration. Patients can also send and view feedback, which is stored in the database of feedback records, after accessing the system. Patients can set reminder and admin set reminder for patients over 6 months after booking for appointment, which is stored in the system database. Upon logging into the medical record database, the staff will follow the schedule, log and manage the patient check-up information. During the patient's staff checkup, the admin created the patient report and patient can access the reports that are stored in the database report entity. Patients can pay online or by check that is stored in the database payment record. Patient gets the receipt of payment, staff keeps the patient's payment information record and admin will refund the patient's payment. Admin send details of the offer that are stored in the database system entity through which information on the details of the offer is passed on to the patient and patient may de-register the staff.

3.2. Entity Relational Diagram (ERD)

Entity Relational Diagram is a software engineering tool used for data modeling, system design and demonstrating the logical structure of databases (ConceptDraw, 2020). It is a visual representation of the relationship between different entities with the system. During the planning stage of the software development project, an entity-relationship diagram is used. It is used based on data flow diagrams and identifies different elements of the system and their relationship among them. An Entity, attribute, and relationship are the three basic elements, and Cardinality and Optionality are two notations used in the ER Diagram (creately, 2020). The rectangle is used to represent an entity, oval is used to represent attributes and diamond is used to represent the relationship among entities. The logical structure of the database is connected to the user with the help of ER Diagram (javatpoint, 2020).

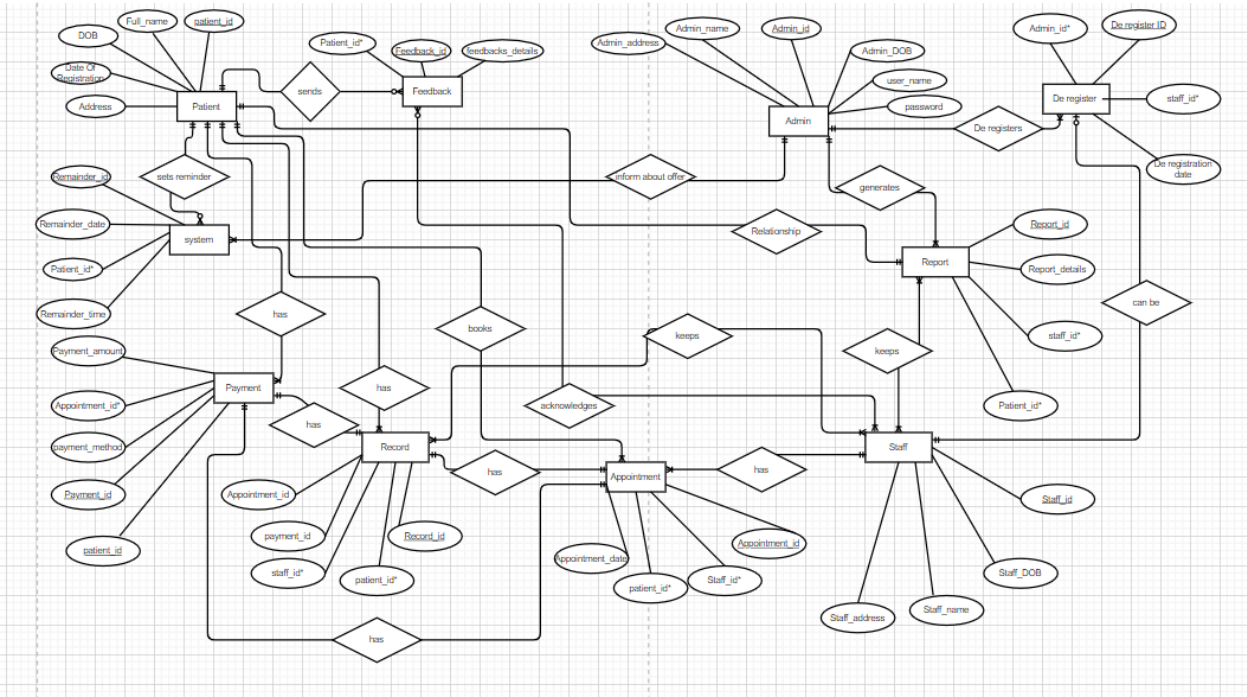


Figure 38: Entity Relational Diagram

The above diagram represents the ERD diagram of ‘Darpan Dental Home Application’. Above shown ERD describes the existing relation between two different entity in the system. The entities hold the different attributes. The relation between two entities is

shown with the representation of primary key and foreign key. The '___' line represents primary key where as '*' represents foreign key.

According to the diagram, the patient can book an appointment, set reminder, send feed-back and make payment using the system. Also, the staff also has appointment, keeps record of patient and their report and acknowledges the feed backs send by the patients using the system. Similarly, can generate patients' report, deregister staff and inform patient about different offers using 'Darpan Dental Home Application System'.

3.3. Data Dictionary

Data Dictionaries are defined as a file or a set of files which includes a database's metadata i.e. data that describes other data. The data dictionaries hold the records about other objects in the database, such as data ownership, data relationships to other objects, and other data (javaTpoint, 2018). It is an essential component of any relational database. The data dictionary (ies) includes information about the following:

- Name of the data item
- Aliases
- Description/purpose
- Related data items
- Range of values
- Data structure definition/forms

Patient

Attributes	Datatype	Size	Description	Example
Patient_id	Varchar	10	Unique	P01
Full_Name	Varchar	100	Name of patient	Aditya Basnet
DOB	Date	Auto	Date of birth of patient	12/01/1999
Date of registration	Date	Auto	Registration date details	11/01/2020
Address	Varchar	100	Address details of patient	Dulari

Table 3: Patient data dictionary

Admin

Attributes	Datatype	Size	Description	Example
Admin_id	Varchar	10	Unique	AD01
Admin_name	Varchar	100	Name of admin	Jushan Shrestha
Admin_DOB	Date	Auto	Date of birth of admin	11/07/1998
Admin_address	Varchar	100	Address details of admin	Barghachi

Table 4: Admin data dictionary

Staff

Attributes	Datatype	Size	Description	Example
Staff_id	Varchar	10	Unique	S01
Staff_name	Varchar	100	Name of staff	Geeta Ojha
Staff_DOB	Date	Auto	Date of birth of staff	21/10/1998
Staff_address	Varchar	100	Address details of staff	Ithari

Table 5: staff data dictionary

System

Attributes	Datatype	Size	Description	Example
Reminder_id	Varchar	10	Unique	R01
Patient_id	Varchar	10	References from patient table	Aditya Basnet
Reminder_date	Date	Auto	Reminder date set by patient	10/01/2020
Reminder_time	Time	Auto	Reminder date set by patient	1:00 PM

Table 6: system data dictionary

Feedbacks

Attributes	Datatype	Size	Description	Example
Feedbacks_id	Varchar	10	Unique	FE01
Patient_id	Varchar	10	References from patient table	Aditya Basnet
Feedbacks_details	Varchar	255	Feedbacks send by patient	Darpan Dental Home is best for teeth

Table 7: Feedbacks data dictionary

Appointment

Attributes	Datatype	Size	Description	Example
Appointment_id	Varchar	10	Unique	APP1
Staff_id	Varchar	10	References from staff table	S01
Patient_id	Varchar	10	References from patient table	Aditya Basnet
Appointment_date	Date	Auto	Appointment date of patient	07/01/2020

Table 8: Appointment data dictionary

Report

Attributes	Datatype	Size	Description	Example
Report_id	Varchar	10	Unique	R01
Staff_id	Varchar	10	References from staff table	S01
Patient_id	Varchar	10	References from patient table	Aditya Basnet
Report_details	Varchar	255	Report details of patient	Blood test

Table 9: Report data dictionary

Payment

Attributes	Datatype	Size	Description	Example
Payment_id	Varchar	10	Unique	P1
Appointment_id	Varchar	10	References from appointment table	APP1
Patient_id	Varchar	10	References from patient table	Aditya Basnet
Payment_method	Varchar	100	Payment method by patient for appointment	Online
Payment_amount	Integer	Auto	Amount paid by patient for appointment	2000

Table 10: Payment data dictionary

Record

Attributes	Datatype	Size	Description	Example
Record_id	Varchar	10	Unique	RE101
Staff_id	Varchar	10	References from staff table	S01
Patient_id	Varchar	10	References from patient table	Aditya Basnet

Table 11: Record data dictionary

De register staff

Attributes	Datatype	Size	Description	Example
Deregister_id	Varchar	10	Unique	R101
Staff_id	Varchar	10	References from staff table	S01
Deregister date	Date	Auto	Date of deregister	2010/10/10
Admin_id	Varchar	10	References from admin table	Aditya

Table 12: Deregister staff data dictionary

4. Design Specification

4.1. Structure Chart

Structure Chart in Software Engineering is defined as a chart which shows the breakdown of the whole system into the lowest functional modules, it describes functions and sub-functions of each module of a system to a greater detail (GeeksforGeeks, 2020). It represents hierarchical structure of modules and partitions the system into black boxes i.e. functionality of the system is known to the users but inner details remain unknown. Inputs are given to the black boxes and appropriate outputs are generated. There are two types of Structure Chart as below:

i) **Transform Centered Structured**: These are designed for the systems that receives an output which is transformed by a sequence of operations being carried out by one module.

ii) **Transaction Centered Structured**: These Structure describes a system that process a number of different types transaction.

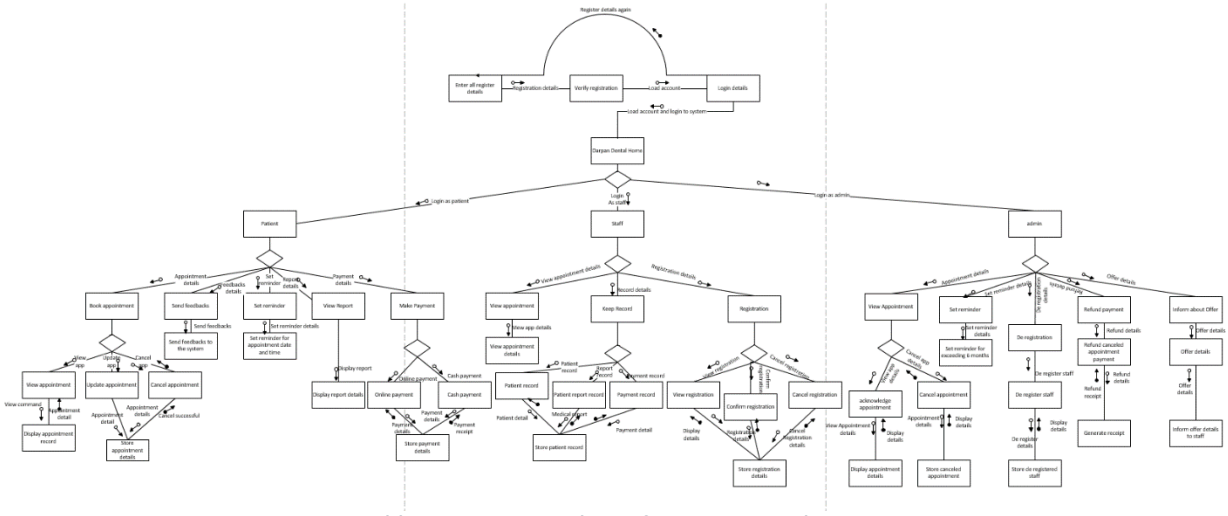


Table 13: Structure chart of Darpan Dental Home

The above figure is the structure chart of 'Darpan Dental Home Application'. The stucture chart describes the function of external entities patient, staff and admin in the system. patient can book appointment, send feedbacks, set remainders, view report and make payment. The records of patient activities are stored in specific data store as well. The staff can view booked appointment, keep record and confirm or cancel registration and

the detail is stored in specific data store. Similaly amdin can also control some function of system like rufunding charge, inform about offers, generate reports.

These functions describe the whole working system with its sub-functions, movement of data, control parameters and conditions.

5. Assignment Diary

5.1. Assumption

1. Staff can view the feedbacks
2. Cash payment can be done at the time of book appointment

5.2. Omission

The entire scenario given by question is fulfill so there is no omission.

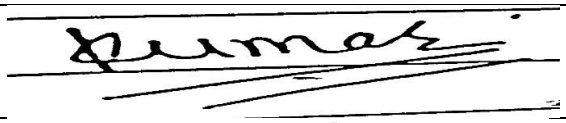
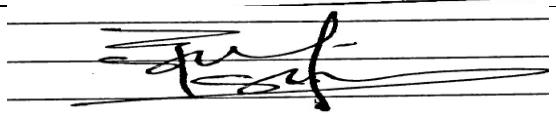
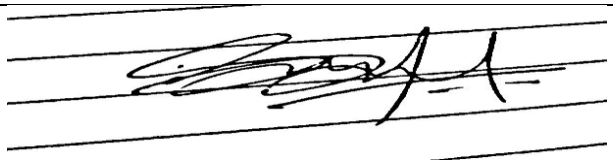
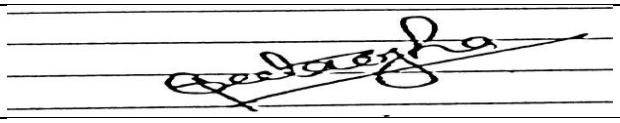
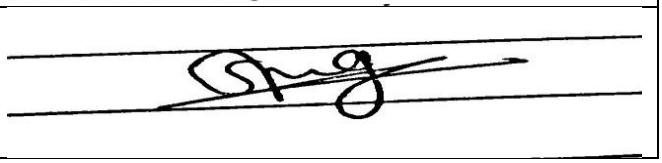
5.3. Meeting Minutes

Group Meeting 1

Meeting	Groupwork Meeting 1
Date of Meeting	December 16
Time	10:00 am to 11:30 am
Location	Library

Table 14: Group Meeting 1

1. Meeting Objectives
On the date December 16 we had our first meeting for the group work. Firstly, we all discussed about the Environmental Model and list out the Event lists. And further discussion about the event list was done on S.E class onwards.

Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Group Meeting 2

Meeting	Groupwork Meeting 2
Date of Meeting	December 22
Time	1pm to 4 pm
Location	Library

Table 15: : Group Meeting 2

1. Meeting Objectives
On the date December 22 we had our second meeting for group coursework. Here, we disused about the finalized event list and the part of event list was divided among the group members individually for DFD fragments.

Table 16: Objective of Meeting 1

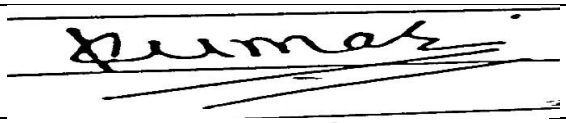
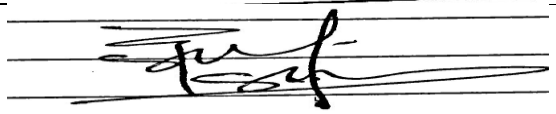
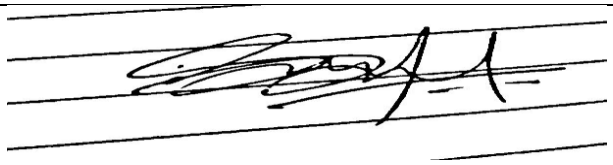
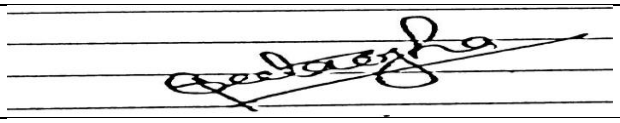
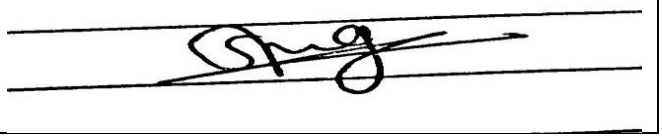
Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Table 17: Attendance sheet of meeting 1

Group Meeting 3

Meeting	Groupwork Meeting 3
Date of Meeting	December 23
Time	10am – 11:30am and 2pm to 4pm
Location	Library

Table 18: : Group Meeting 3

1. Meeting Objectives
We had our third meeting on December 23, the DFD fragments were combined and the final DFD was done by joining all the DFD fragments. And we divided the work among us.

Table 19: : Objective of Meeting 2

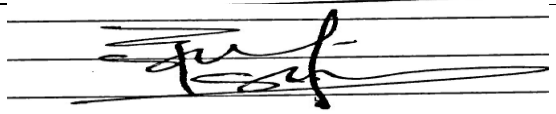
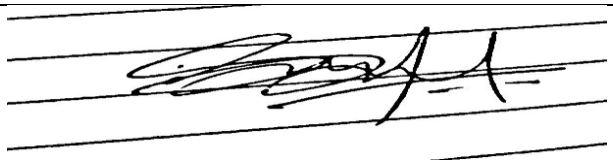
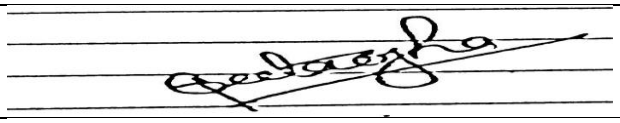
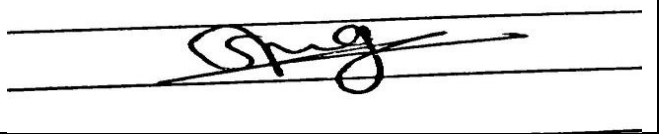
Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Table 20: Attendance sheet of meeting 2

Group Meeting 4

Meeting	Groupwork Meeting 4
Date of Meeting	December 27
Time	10:00 am to 11:30am
Location	Tutorial class, Eden

Table 21: : Group Meeting 5

1. Meeting Objectives
On December 27 we had our fourth group meeting. Here, we discussed about the Er-diagram and structure chart and divided the individual task among us.

Table 22: : Objective of Meeting 3

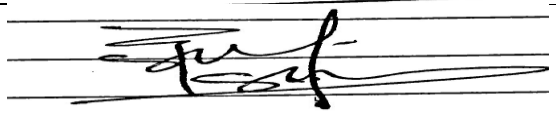
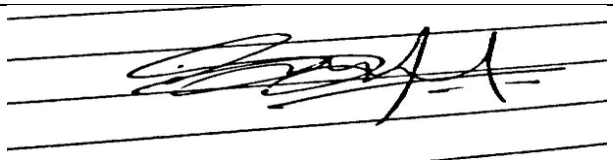
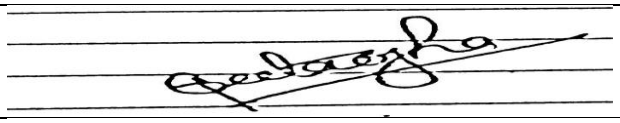
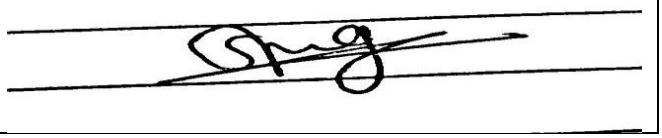
Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Table 23: Attendance sheet of meeting 3

Group Meeting 5

Meeting	Groupwork Meeting 5
Date of Meeting	January 8
Time	12:30pm 4 pm
Location	Library

Table 24: Group Meeting 5

1. Meeting Objectives
We had our fifth group meeting on January 5. The description for overall diagrams used in the project were done.

Table 25: Objective of Meeting 5

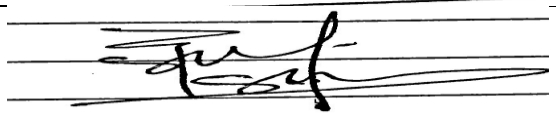
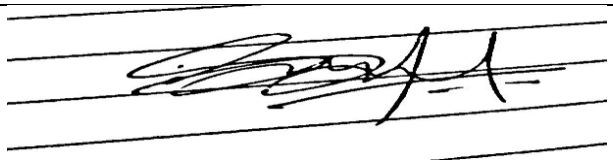
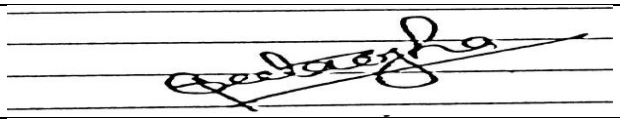
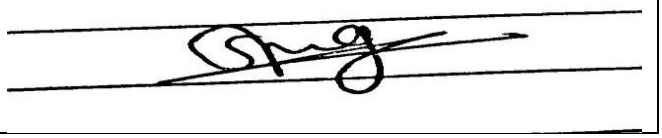
Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Table 26: Attendance sheet of meeting 5

Group Meeting 6

Meeting	Groupwork Meeting 6
Date of Meeting	January 8
Time	12:30pm 4 pm
Location	Library

Table 27: Group Meeting 6

2. Meeting Objectives
We had another group meeting on January 6. The individual task and the divided task among the members were combined. And the task and diagrams were modified and were finalized.

Table 28: : Objective of Meeting 6

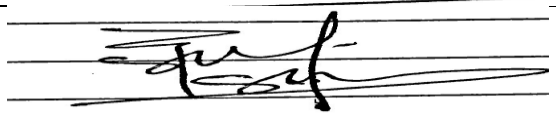
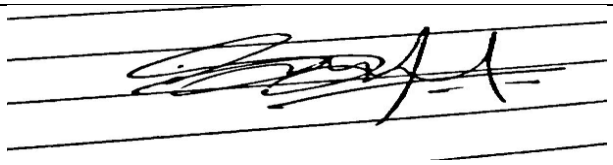
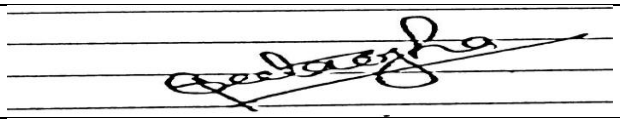
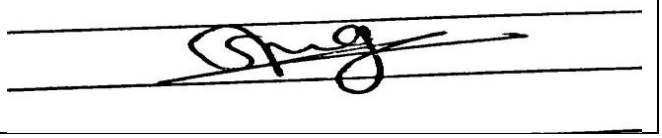
Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Table 29: Attendance sheet of meeting 6

Group Meeting 7

Meeting	Groupwork Meeting 7
Date of Meeting	January 9
Time	12:30 pm to 2:30 pm
Location	Tutorial Class, Karnali

Table 30: Group Meeting 7

1. Meeting Objectives
We had our final group meeting on January 9 where the formatting for the documentation was made and review of coursework was done. The project was overall checked and modified as necessary.

Table 31: Objective of Meeting 7

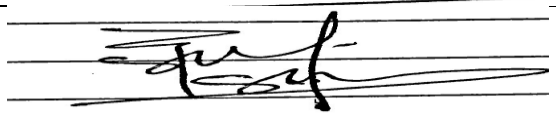
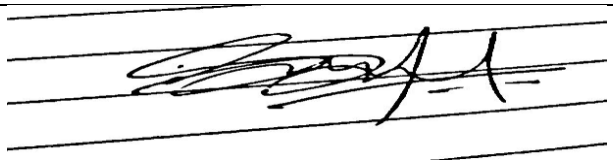
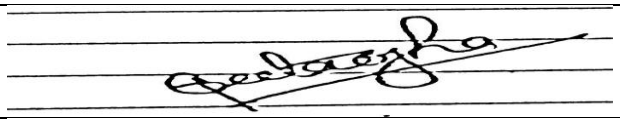
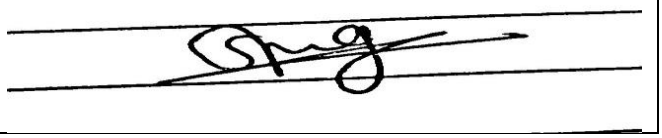
Name	Signatures
Kumar Khulal	
Jushan Shrestha	
Sanjay Shrestha	
Geeta Ojha	
Samjhana Ghatani	

Table 32: Attendance sheet of meeting 7

5.4. Group Responsibilities

Group member responsibilities in individual task is listed bellows: -

Task number	Task	Group member name
1	Register a patient	Kumar Khulal
2	Book appointment	Jushan Shrestha
3	Payment of patient	Geeta Ojha
4	Generates report of patient	Samjhana Ghatani
5	De-register staff	Sanjaya Shrestha

Table 33: Group responsibilities

6. Individual Task: Introduction

We have conducted a group meeting for deciding the individual tasks. There are altogether five questions in the individual tasks. We have divided the tasks individually among our group members. The first task i.e. Register a Patient is given to Kumar Khulal. In the same manner, Book Appointment is given to Jushan Shrestha, Payment of a Patient is given to Geeta Ojha, Generate report of a Patient is given to Samjhana Ghatani, De-register staff is given to Sanjaya Shrestha.

Student Name	Student ID	Module/Function
Kumar Khulal	18028904	Register a Patient
Jushan Shrestha	18028902	Book Appointment
Geeta Ojha	18028900	Payment of a Patient
Samjhana Ghatani	18028931	Generate report of a Patient
Sanjaya Shrestha	18028933	De-register staff

Table 34: Individual task table

7. Environmental Model Specification

7.1. Context Diagram

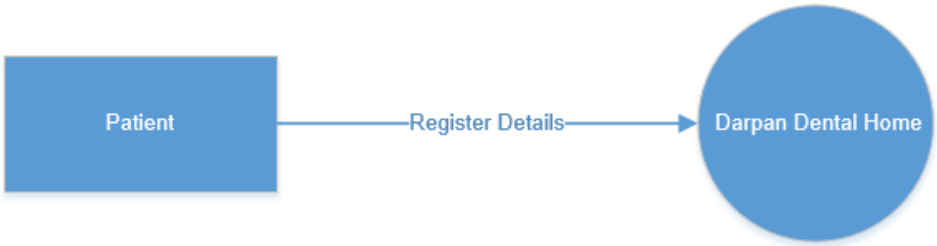


Figure 39: Context diagram of register patient

The above figure shows the context diagram of function‘patient registration ’. This function is carriied out by patient in a system.

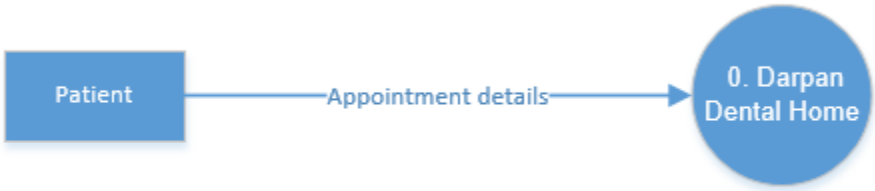


Figure 40: Context diagram of book appointment

The above figure shows the context diagram of function‘Book Appointment ’. This function is carriied out by patient in a system.

Figure 41: Context diagram of payment of patinet

The above figure shows the context diagram of function‘payment of patient ’. This function is carriied out by patient in a system.

Figure 42: Context diagram of generates report

The above figure shows the context of function‘generate report ’. This function is carriied out by admin in a system.

Figure 43: Context diagram of deregister staff

The above figure shows the context of function‘de register staff ’. This function is carriied out by admin in a system.

8. Internal Model Specification

8.1. Level 1 DFD

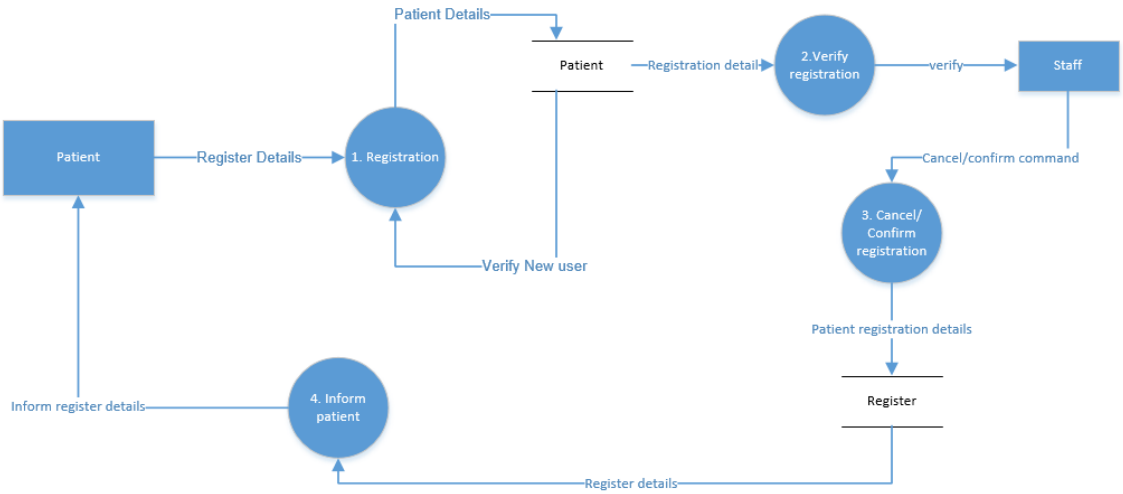


Figure 44: Level 1 DFD of Register staff

The above figure shows the level 1 DFD of function ‘registration’.

External Entity

- Patient
- Staff

Processes

- Registration
- Verify registration
- Cancel/confirm registration
- Inform patient

Data Flow

- Registration detail

Data store

- Patient
- Registration

First patient provides the necessary registration detail like username, password, name, address, date of birth and it is recorded in patient data store in database. Then the clinic staff acknowledges the patient registration and confirms if it is valid else it is canceled, and the record is updated in database. Then the patient is informed about their registration.

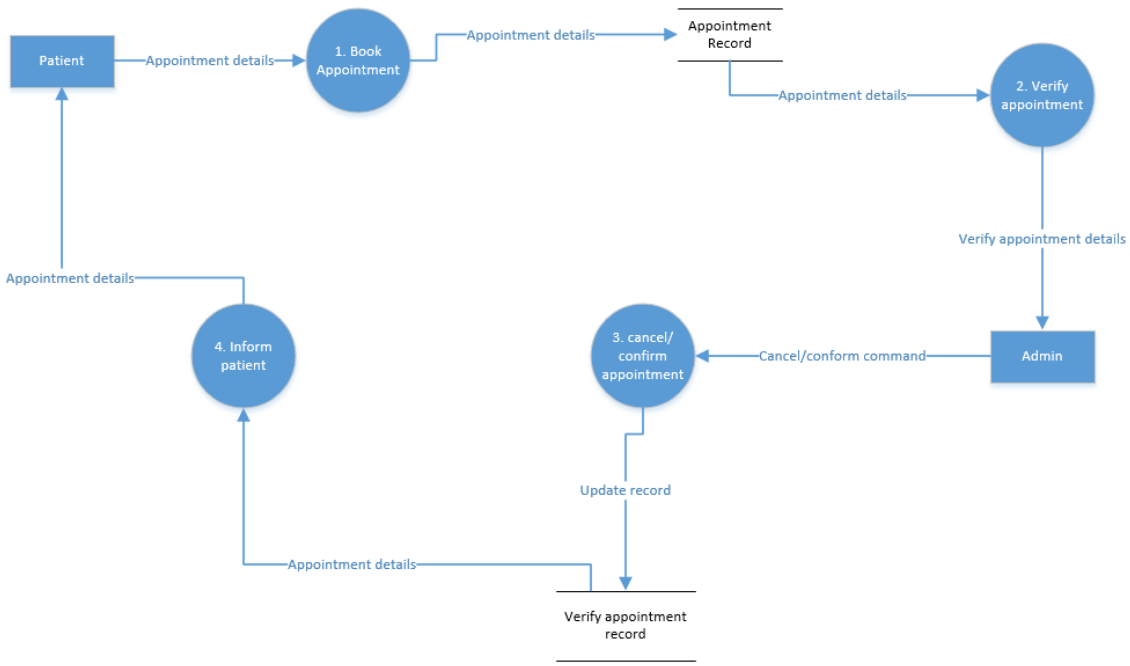


Figure 45: Level 1 DFD of Book appointment

The above figure shows the level 1 DFD of function‘Book Appointment ’.

External Entity

- Patient
- Admin

Processes

- Book appointment
- Verify appointment
- Cancel/confirm appointment

- Inform patient

Data Flow

- Appointment detail

Data store

- Appointment Record

First, the patient provides necessary appointment detail like staff name, date of appointment, time and patient name to book an appointment and it is stored in Appointment record data store. Then the patient's detail is further verified by admin. If the appointment is verified then it is confirmed else the appointment is cancel and updated in Appointment record data store. Then the patient is informed about their appointment status wheather it is canceled or confirmed with their appointment detail.

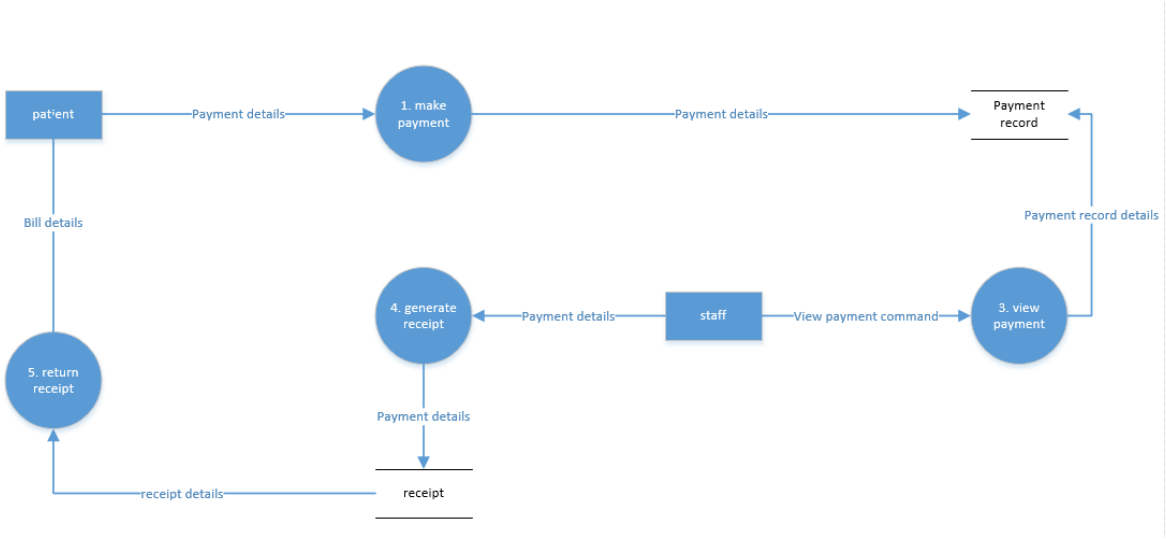


Figure 46: Level 1 DFD of payment of patient

The above figure shows the level 1 DFD of function 'payment of patient'.

External Entity

- Patient
- Staff

Processes

- Make payment
- View payment
- Generate receipt
- Return receipt

Data Flow

- Payment
- receipt

Data store

- Patient
- Registration

First patient provides the payment detail like payment amount, payment type and it is recorded in payment data store in database. Then the clinic staff acknowledges the payment detail and generate the receipt and recorded in bill data store. Then the receipt is returned to the patient.

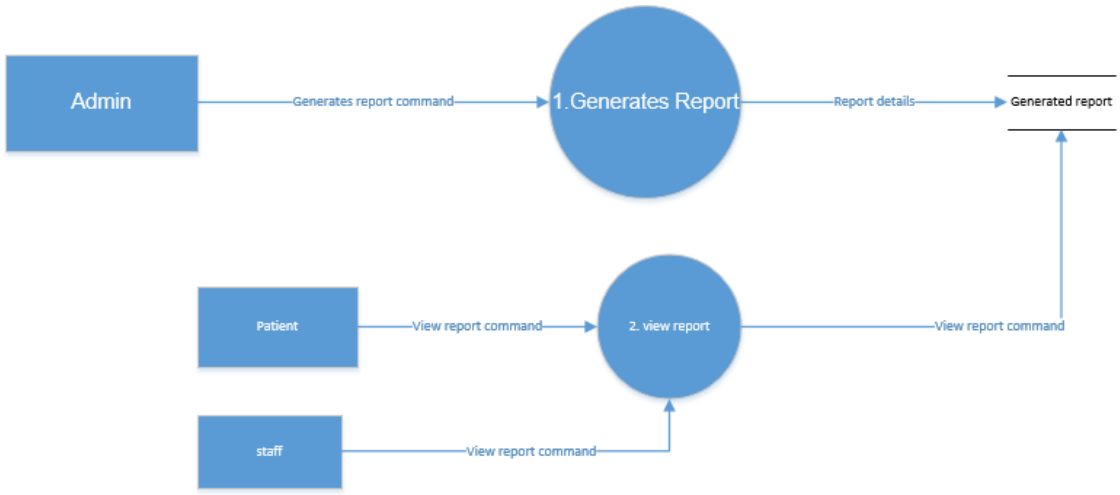


Figure 47: Level 1 DFD of generate sreport

The above figure shows the level 1 DFD of function ‘generate report’.

External Entity

- Admin
- Patient
- staff

Processes

- generate report
- view report

Data Flow

- report detail

Data store

- generated report

The admin commnads the system to generate the report like appointment record, patient record, staff record, medical report and the generated report is recorded in generated report data store. The the report detail is acknowledge by staff and patient as well.

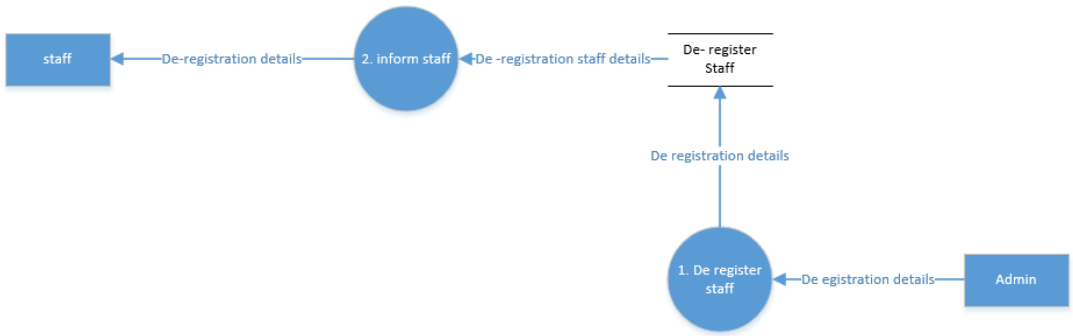


Figure 48: Level 1 DFD of De register staff

External Entity

- Admin
- Staff

Processes

- Deregister staff
- Inform staff

Data Flow

- Staff detail
- Deregistration detail

Data store

- Deregistered staff

First, the admin provides the staff detail like name, id.no, phonenumber and the staff is deregistered accordingly. The detail of deregistered staff is store in de registered staff data store. And the staff is informed about their deregistration along with the detail.

8.2. Level 2 DFD

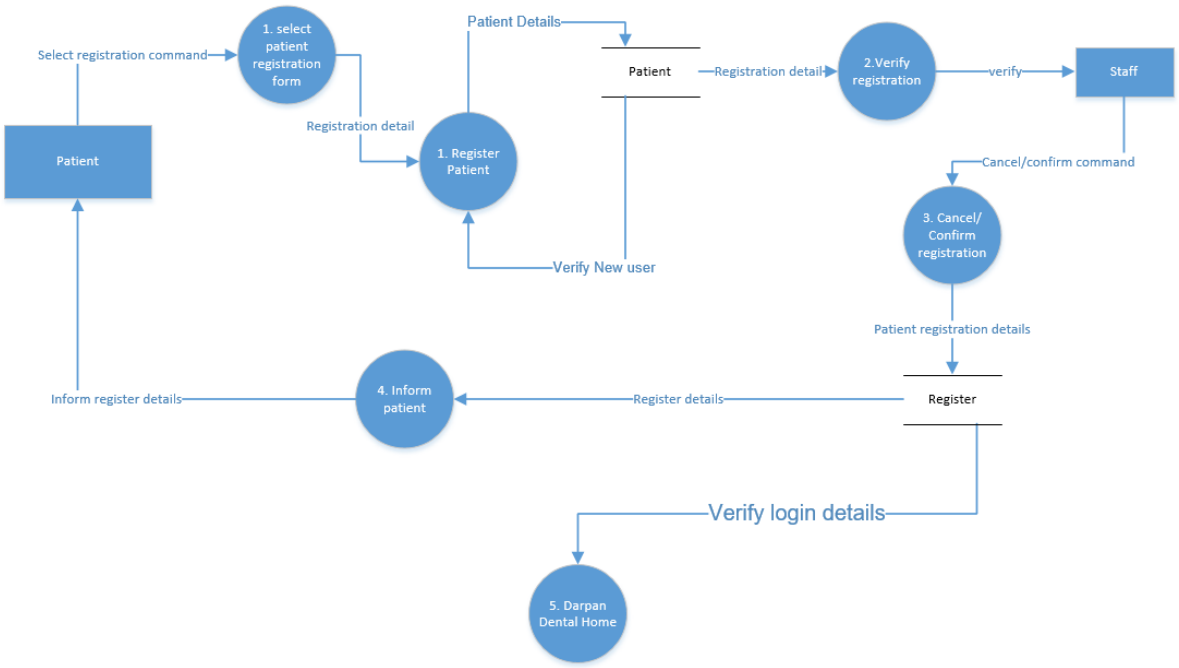


Figure 49: Level 2 DFD of register staff

The above figure shows the level 2 DFD of function ‘registration’.

External Entity

- Patient
- Staff

Processes

- Select patient registration form
- Registration
- Verify registration
- Cancel/confirm registration
- Inform patient
- Login to system

Data Flow

- Registration detail

Data store

- Patient
- Registration

First, the patient selects the patient's registration form and the necessary details like username, password, name, address, date of birth is provided. The registration detail is recorded in the database and staff verifies the registration of patient. If the patient registration is valid then the registration is confirmed else, it is canceled. After that the patient is informed about their registration and asked to login to the system with correct username and password.

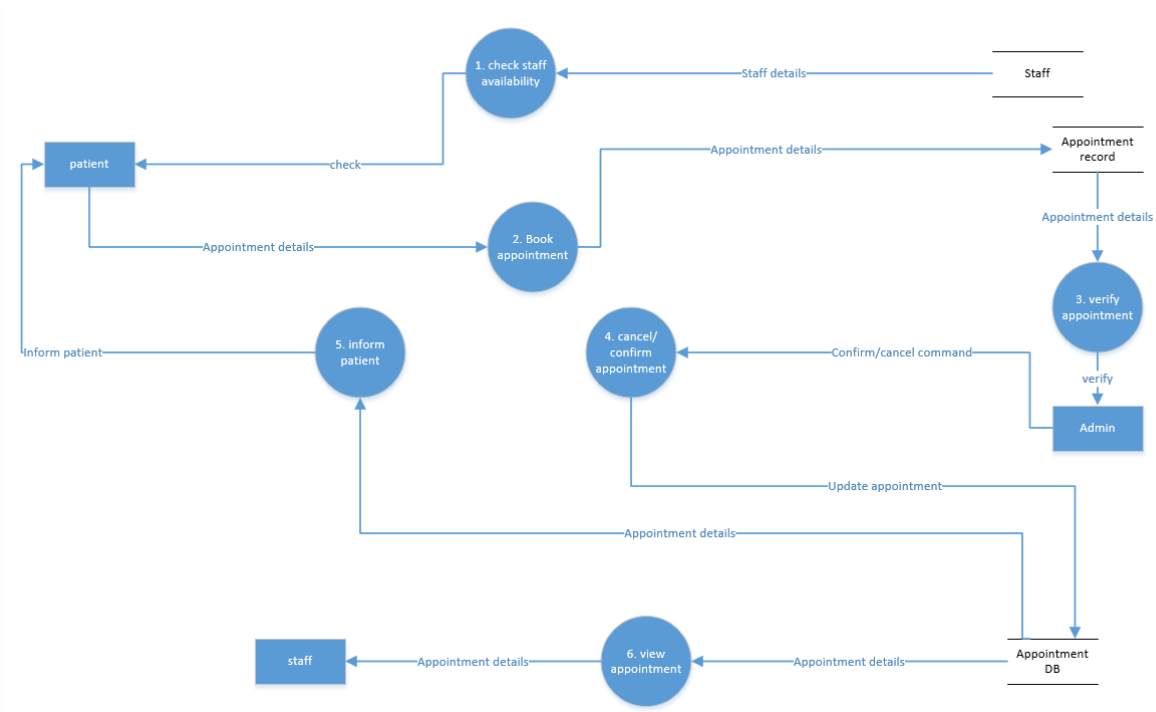


Figure 50: Level 2 DFD of Book appointment

The above figure shows the level 2 DFD of function'Book Appointment '.

External Entity

- Patient

- Staff
- admin

Processes

- check staff availability
- Book appointment
- Verify appointment
- Cancel/confirm appointment
- Inform patient
- View appointment

Data Flow

- Appointment detail
- Staff detail

Data store

- Staff
- Appointment Record

First, the availability of staff from the staff data store is checked form database. If the staff is available for appointment then the patiens provides their appointment detail staff name, date of appointment, time and patient name to book an appointment and it is recorded in Appointment Record data store. Futher, the verification of appointment is done by the admin. If the appointment is verified then it is confirmed else the appointment is cancel and updated in Appointment record entity. Then the patient is informed about the appointment whetheher it is canceled or confirmed and the booked appointment is acknowledged by the clinic staff.

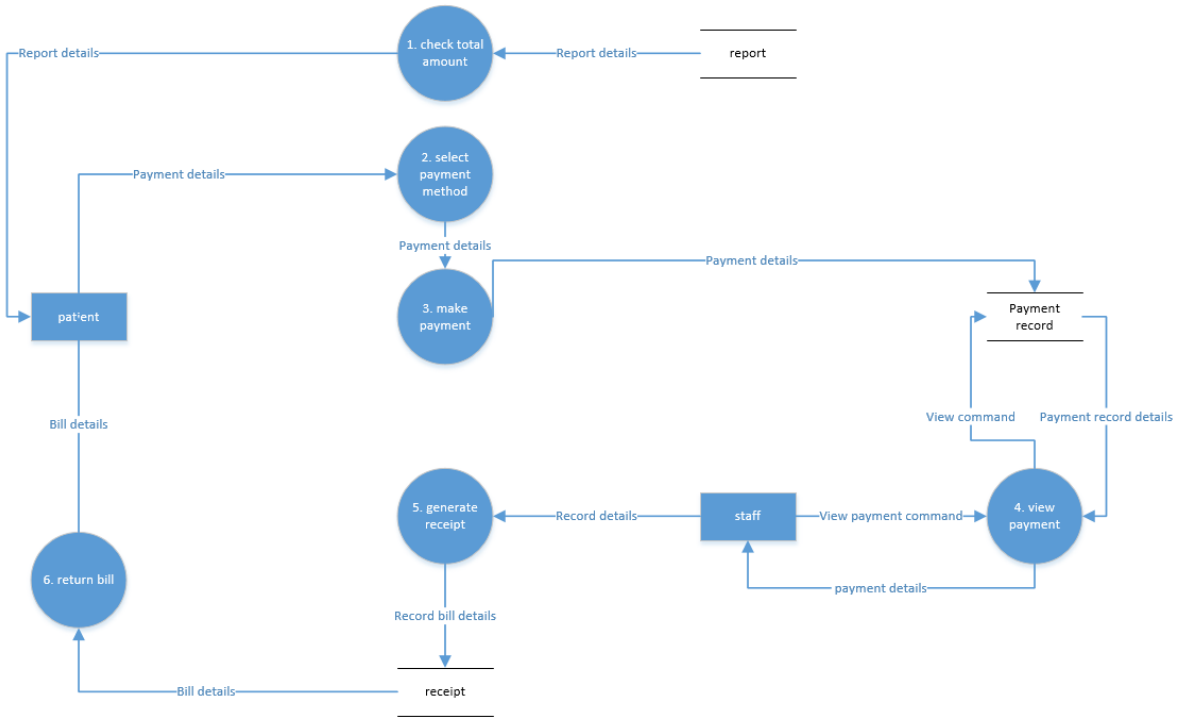


Figure 51: Level 2 DFD of payment of patient

The above figure shows the level 2 DFD of function ‘payment of patient’.

External Entity

- Patient
- Staff

Processes

- Check total amount
- Select payment method
- Make payment
- View payment
- Generate receipt
- Return receipt

Data Flow

- Payment
- Receipt
- report

Data store

- Patient
- Registration

First the total amount to be paid is checked by the patient. Then according the patient selects payment method i.e. cash and online payment and makes the payment. The payment detail like payment amount, payment type is recorded in the database and acknowledge by staff. Then accordingly the receipt is generated, and it recorded in receipt data store. Then the generated bill is returned to the patient.

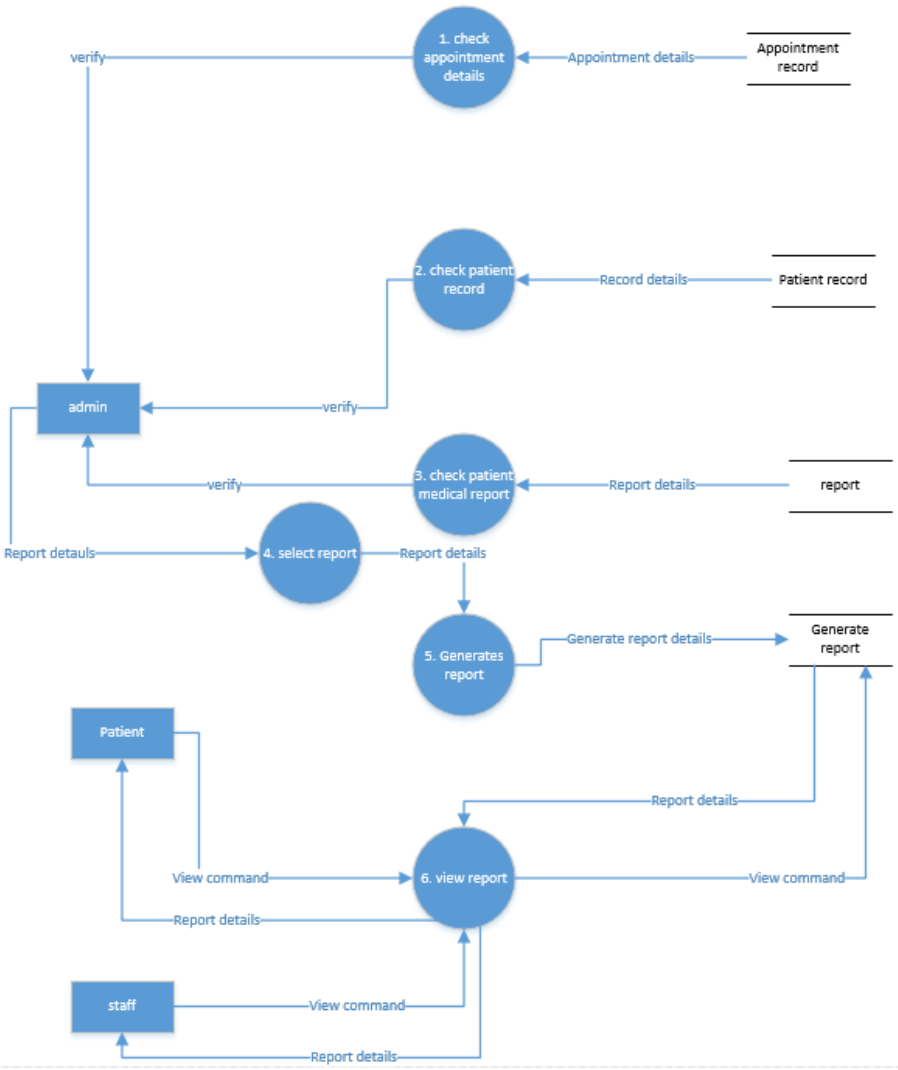


Figure 52: Level 2 DFD of generate report

The above figure shows the level 2 DFD of function ‘generate report’.

External Entity

- Admin
- Patient
- staff

Processes

- check appointment detail

- check patient detail
- check patients' medical report
- select report type
- generate report
- view report

Data Flow

- report detail
- appointment detail
- patient record detail
- generated report detail

Data store

- generated report
- appointment record
- patient record
- report

First, the appointment, patient record, patient medical report detail is checked and verified by admin from the data store appointment record, patient record and report respectively. Then the type of report to be generated is selected and report is generated. The generated repord is acknowledge by staff and patient as well.

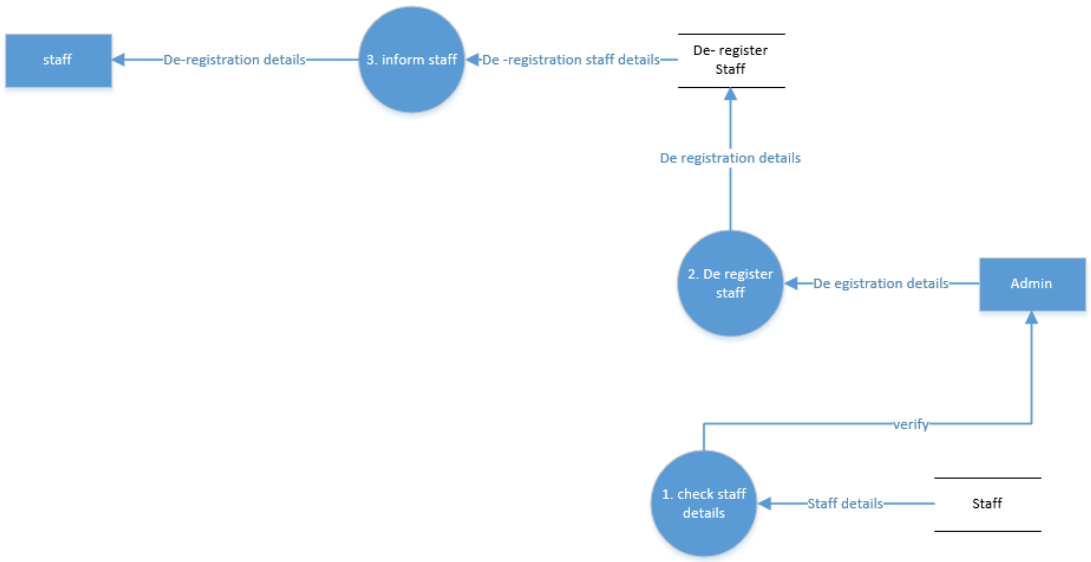


Figure 53: Level 2 DFD of de register staff

The above figure shows the level 2 DFD of function ‘de-register staff ’.

External Entity

- Admin
- Staff

Processes

- Check staff detail
- Deregister staff
- Inform staff

Data Flow

- Staff detail
- Deregistration detail

Data store

- Deregistered staff
- Staff

First, the staff to be deregistered is checked in staff data store and verified by admin. Then the admin provides the staff detail like name, id.no, phonenumber and the staff is deregistered accordingly. The detail of deregistered staff is store in de registered staff data store. And the staff is informed about their deregistration along with the detail.

9. Design Specification

9.1. Structure Chart

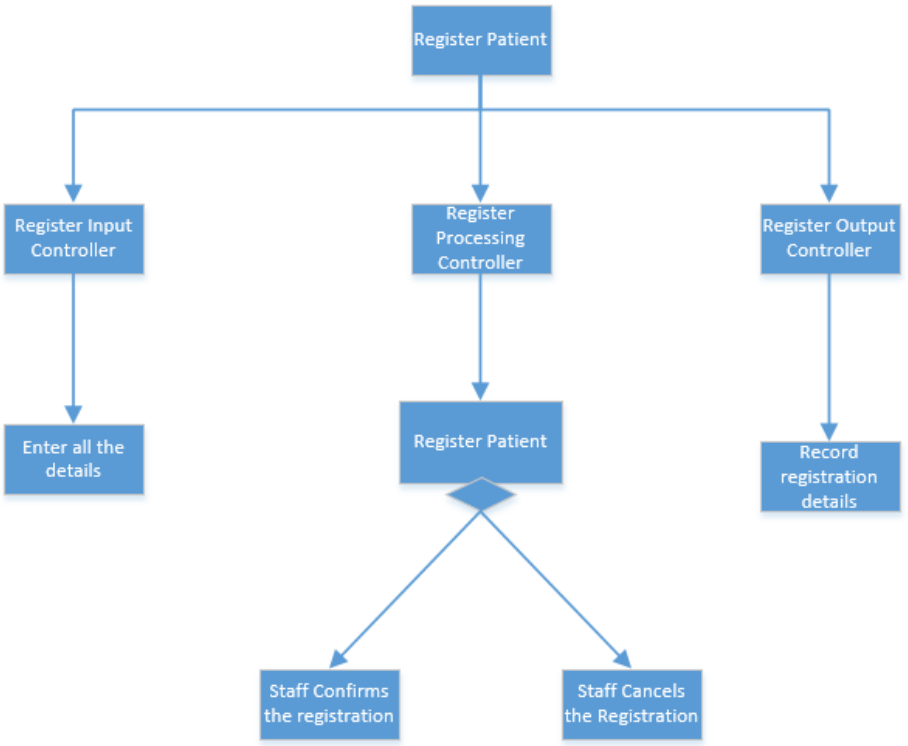


Figure 54: Structure chart of register patient

The structure chart of the function 'register patient is shown above in the figure. Here the function is carried by three sub-function register input controller, register processing controller and register output controller. Register input controller gets the registration detail like username, password, name, address, date of birth, register processing controller registers a patient if staff confirms the registration else it is canceled and the register output controller records the registration detail in a data store.

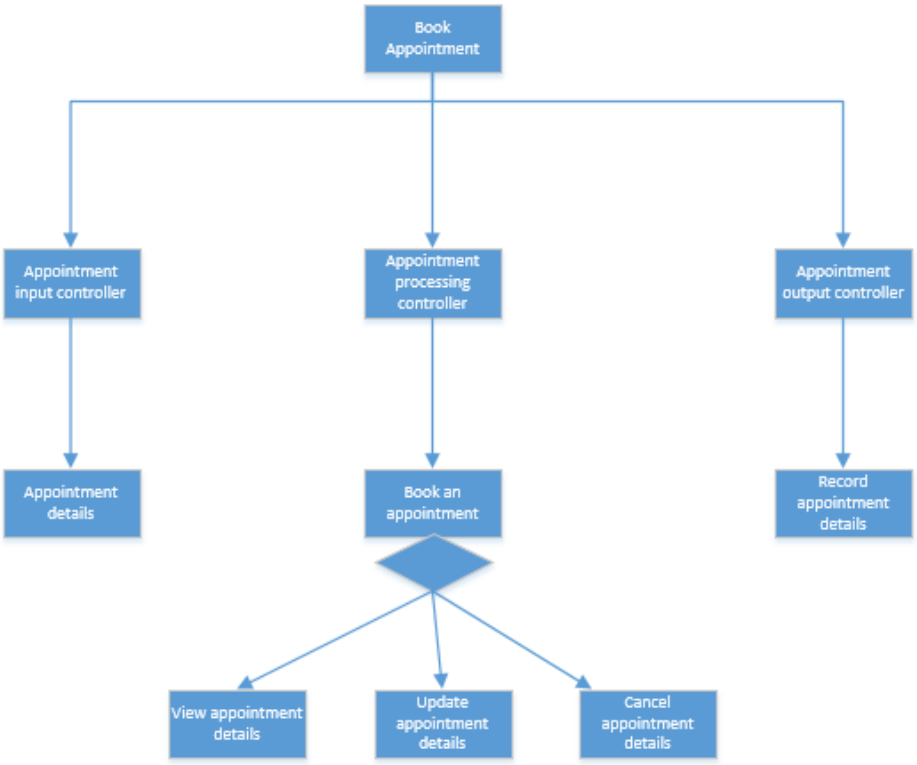


Figure 55: Structure chart of book appointment

The structure chart of the function 'book appointment' is shown above in figure. Here the function is carried by three sub-function appointment input controller, appointment processing controller and the appointment output controller. Appointment input controller gets the appointment details staff name, date of appointment, time and patient name, and in appointment processing controller the appointment is booked and appointment output controller records the data in a data store.

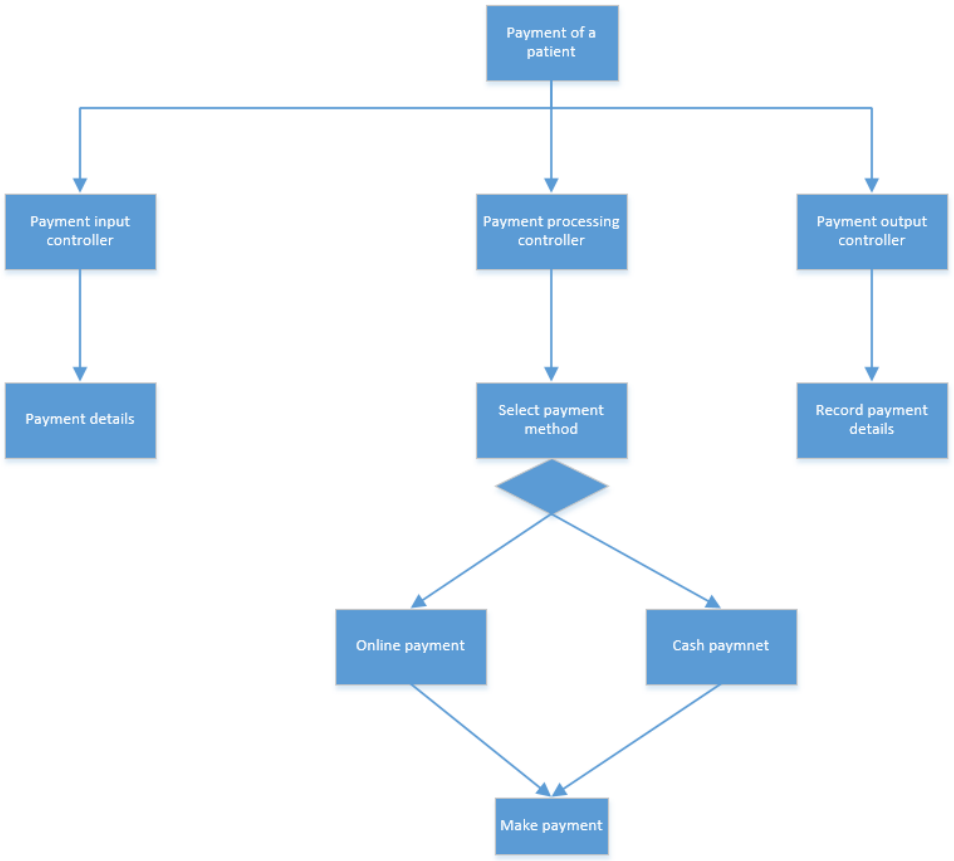


Figure 56: Structure chart of make payment

The structure chart of the function ‘payment of patient’ is shown above in the figure. Here the function is carried by three sub-function payment input controller, payment processing controller and payment output controller. Payment input controller gets the payment details like payment amount, payment type and in payment processing controller patient first selects the method of payment either online or cash payment. Then the payment output controller records the payment details in data store.

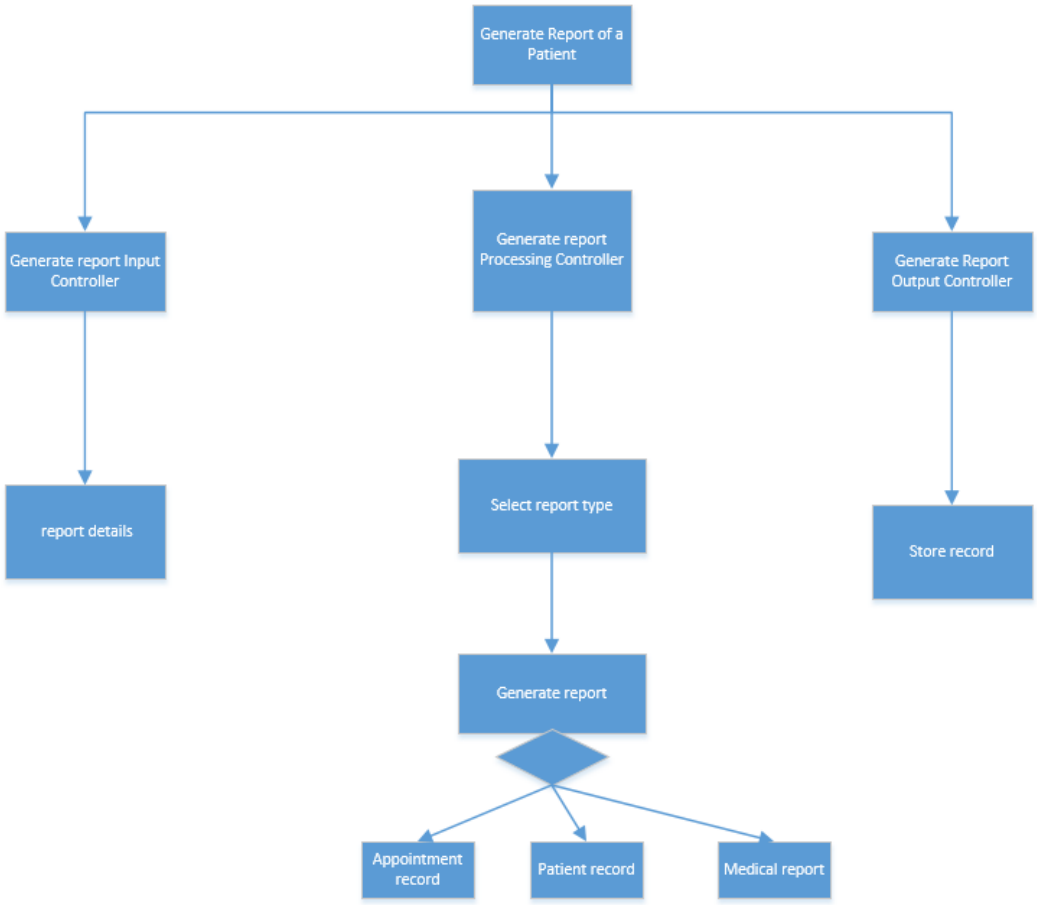


Figure 57: Structure chart of generates report

The structure chart of the function 'generate report' is shown above in the figure. Here the function is carried by three sub-function payment input controller, payment processing controller and payment output controller. Generate report input controller gets the report details and in generate report processing controller generates reoprt like appointment record, patient record and medical report. Then the generate report output controller records the generated report details in data store.

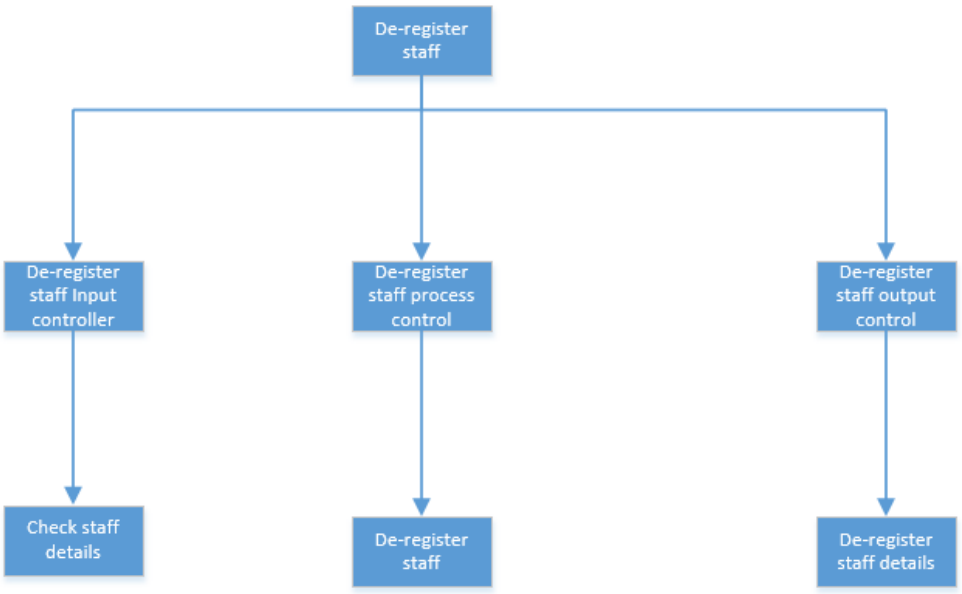


Figure 58: Structure chart of deregister staff

The structure chart of the function ‘de-register staff’ is shown above in figure. Here the function is carried by three sub-function de-register staff input controller, de-register staff processing controller and the de-register staff output controller. De-register staff input controller gets the detail of staff who are to be de-registered and in de-register staff processing controller de-redistration process is done and in de-register staff outpur controller the detail of de-registered is stored in data store.

9.2. Module Specification

Module No.	1
Module Name	Register Patient
Purpose	This module registers a patient and confirms the registration by the staff or admin

Pseudocode	GET Patient details
	Do
	IF register new patient
	Display “Verify register patient”
	Else If
	Display “Error message for register patient”
	End Else If
	End If
	End Do

Input parameters	Patient details
Output parameters	Register a patient
Global variables	None
Local variables	None
Calls	At first check the patient database whether the same input of customer register or not i.e. username and password then only register the customer.
Called by	Staff check all the registration details and store the details in register database.

Table 35: Module specification of register patient:

Module No.	2
Module Name	Book appointment
Purpose	This module is book appointment by patient for a given date and time for the specific staff.

Pseudocode	GET Book appointment
	Do
	IF book appointment by patient for given date
	Display “Verify book appointment for given date and time”
	Else If
	Display “Error message for book appointment”
	End Else If
	End If
	End Do

Input parameters	Book appointment details
Output parameters	Verify book appointment
Global variables	None
Local variables	None
Calls	At first check the appointment database whether the staff are free for the same given date and time so it was verify by the staff and admin then they confirm or cancel the book appointment.
Called by	Staff check all the appointment details and store the details in appointment database.

Table 36: Module specification of book appointment

Module No.	3
Module Name	Payment of patient
Purpose	This module is payment of patient for a book appointment for given date and time.

Pseudocode	GET Payment of patient
	Do
	IF payment of patient for book appointment
	Display “verify payment for the book appointment”
	Else If
	Display “Error message for payment details”
	End Else If
	End If
	End Do

Input parameters	payment details
Output parameters	Verify payment details
Global variables	None
Local variables	None
Calls	At first choose for the payment method and verify the payment details.
Called by	Staff check all the payment details and store the details in payment database.

Table 37: Module specification of payment of patient

Module No.	4
Module Name	Generate Report of a Patient
Purpose	This Module generates report of a Patient and report is generated by the Admin

Pseudocode	GET Generate report of a patinet
	Do
	IF Generate report details
	Display “Display the verification of generates report by the admin”
	Else If
	Display “Error message for generates report details”
	End Else If
	End If
	End Do

Input Parameters	Patient details
Output Parameters	Generate report of a Patient
Global Variables	None
Local Variables	None
Calls	At first, Admin checks all the details of the Patients in report database and then only generate report of a Patient.
Called by	Admin check all the details of Patients and store in report database.

Table 38: Module specification of generate report of patient

Module No.	5
Module Name	De-register staff
Purpose	This module de registers a staff by admin

Pseudocode	GET Staff details
	Do
	IF Staff inactive for more than 2 months
	Display “De register staff details”
	Else If
	Display “Error message for de register staff”
	End Else If
	End If
	End Do

Input parameters	Staff details
Output parameters	De register a staff
Global variables	None
Local variables	None
Calls	Staff details database check by admin and de register the staff
Called by	None

Table 39: Module specification of deregister staff

10. Summary

The project was about developing a ‘Darpan Dental Home Application’ system for a dental clinic. The system was developed to handle the record of patients and solve the current problems they are facing. The project was developed using the waterfall method of SDLC. The developed system can manage the different types of record like patient detail, staff detail, payment detail, appointment details etc. Patient can book an appointment through online or mobile application.

First, all the events were listed by analyzing the given scenario. Then the context diagram was prepared for highlighting the main event in the system with external entities involved in the system. Then the data flow diagram (DFD) fragment of event list was designed. And those DFD fragments were combined and complete level one data flow diagram of system was prepared. To describe the detailed flow of information in certain process the diagram was sub-levelled.

From user’ perspective, functional models like data flow model, context diagram, event list were prepared where as the data model like data dictionary, entity relation diagram were prepared to describe about the data objects, attributes. To develop database for the system ERD and data dictionary helped as a blueprint.

The individual tasks were done by utilizing the experience and information gained during completion of the group work. The design specification of function and model specification of individual task was also prepared that eases the work of developer while developing the system.

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