

# **A Project Report**

**On**

## **Healthcare Optimization Solution**

**Submitted In accordance with the requirement for the degree of**

**BACHELOR OF TECHNOLOGY**

**INFORMATION TECHNOLOGY**

**Under the Esteemed Guidance of**

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# HOSPITAL OPTIMIZATION SOLUTION

## Project Overview:

Healthcare Optimization Solution is a comprehensive solution designed to enhance the patient experience and streamline administrative tasks within a healthcare facility. The app aims to provide admin and patients with easy access to information about doctor availability, bed availability, and use for appointment booking, improving overall patient care and track all the operational efficiency.

## Objectives:

- Real Time Salesforce Project
- Data Modelling
- Creating an application
- User Interface Customization
- Object & Relationship in Salesforce
- Formula fields and Validation rules.
- Conditional formatting.
- Reports & Dashboards.
- Apex.
- Visualforce.

## Salesforce Key Features and Concepts Utilized:

- **Creation of Object:**

Salesforce objects are database tables that permit you to store data that is specific to an organization. What are the types of Salesforce objects

Salesforce objects are of two types:

1. **Standard Objects:** Standard objects are the kind of objects that are provided by salesforce.com such as users, contracts, reports, dashboards, etc.

2. **Custom Objects:** Custom objects are those objects that are created by users. They supply information that is unique and essential to their organization. They are the heart of any application and provide a structure for sharing data.

- **Fields and Relationships:**

Fields represent the data stored in the columns of a relational database. It can hold any valuable information that you require for a specific object. Hence, the overall searching, deletion, and editing of the records become simpler and quicker.

Types of Fields

1. **Standard Fields:** Standard Fields are the predefined fields in Salesforce that perform a standard task. The main point is that you can't simply delete a Standard Field until it is a non-required standard field.
2. **Custom Fields:** Custom Fields are highly flexible, and users can change them according to requirements. Moreover, each organiser or company can use them if necessary. Hence, the final decision depends on the user, and he can add/remove Custom Fields of any given form.

- **Apex and Visualforce Page:**

Apex is a strongly typed, object-oriented programming language that allows developers to execute flow and transaction control statements on the Lightning platform server in conjunction with calls to the Lightning Platform? API. Using syntax that looks like Java and acts like database stored procedures, Apex enables developers to add business logic to most system events, including button clicks, related record updates, and Visualforce pages. Apex code can be initiated by Web service requests and from triggers on objects.

- **Tabs:**

A tab is like a user interface that is used to build records for objects and to view the records in the objects.

**Types of Tabs:**

1. **Custom Tabs:** Custom object tabs are the user interface for custom applications that you build in salesforce.com. They look and behave like standard salesforce.com tabs such as accounts, contacts, and opportunities.

2. **Web Tabs:** Web tabs make it easier for your users to quickly access content and applications they frequently use without leaving the salesforce.com application.
3. **Visualforce Tabs:** Visualforce Tabs are custom tabs that display a Visualforce page. Visualforce tabs look and behave like standard salesforce.com tabs such as accounts, contacts, and opportunities.
4. **Lightning Component Tabs:** Lightning Component tabs allow you to add Lightning components to the navigation menu in Lightning Experience and the mobile app.
5. **Lightning Page Tabs:** Lightning Page Tabs let you add Lightning Pages to the mobile app navigation menu. Lightning Page tabs don't work like other custom tabs. Once created, they don't show up on the all tabs page when you click the Plus icon that appears to the right of your current tabs.

- **The Lightning App:**

An app is a collection of items that work together to serve a particular function. In Lightning Experience, Lightning apps gives users access to sets of objects, tabs, and other items all in one convenient bundle in the navigation bar. Lightning apps let you brand your apps with a custom color and logo. You can even include a utility bar and Lightning page tabs in your Lightning app. Members of your org can work more efficiently by easily switching between apps.

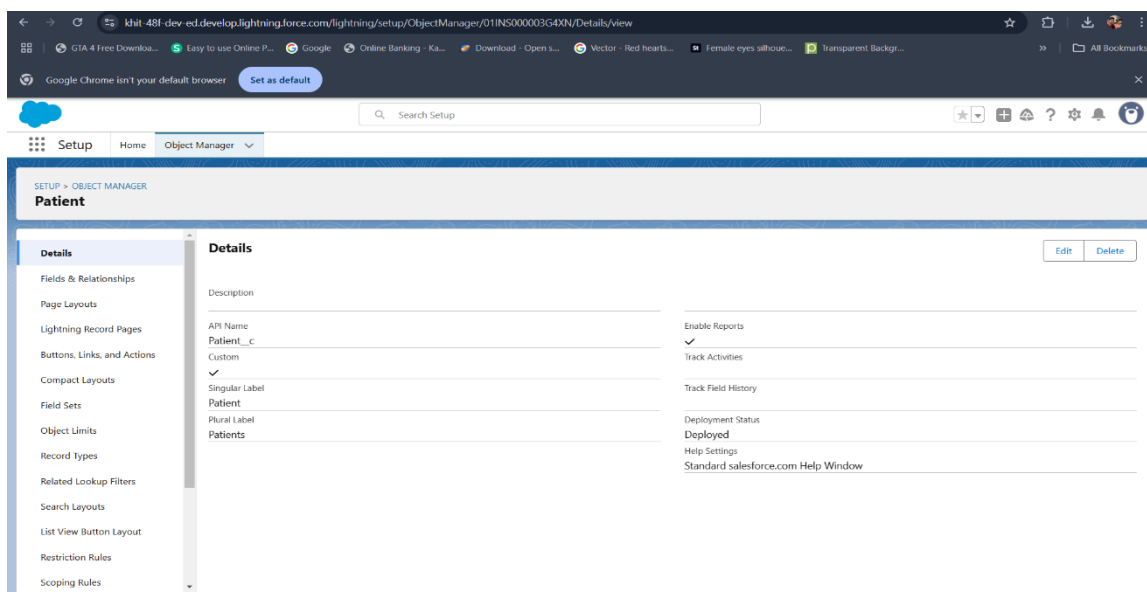
- **User Adoption:** As a new Administrator, you perform user management tasks like creating and editing users, resetting passwords, granting permissions, configuring data access, and much more.
- **Report:** Reports give you access to your Salesforce data. You can examine your Salesforce data in almost infinite combinations, display it in easy-to-understand formats, and share the resulting insights with others. Before building, reading, and sharing reports, review these reporting basics.
- **Dashboards:** Dashboards help you visually understand changing business conditions so you can make decisions based on the real-time data you've gathered with reports. Use dashboards to help users identify trends, sort out quantities, and measure the impact of their activities.

## **Detailed Steps to Solution Design:**

### **1. Creation Of Objects:**

#### **i. Patient Object:**

- From the setup page >> Click on Object Manager >> Click on Create >> Click on Custom Object.
- Enter the label name >> Patient  
Plural label name>>Patients
- Enter Record Name Label and Format  
Record Name >>Patient name  
Data Type >> Text
- Click on allow reports.
- Allow Search >> Save.



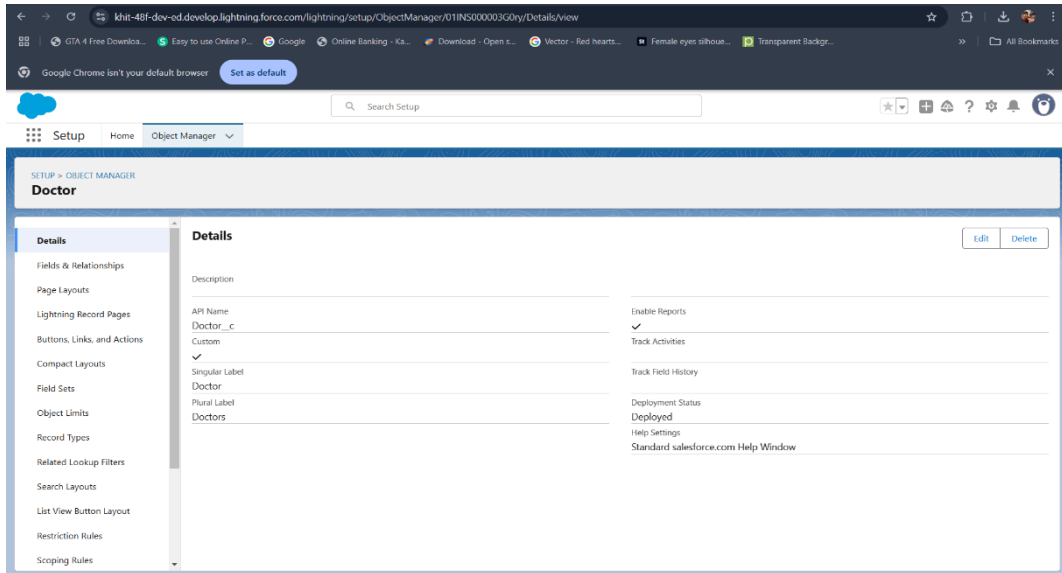
**Fig: Patient Object**

#### **ii. Doctor Object:**

- The purpose of creating a doctor object is to store and manage information about Patients. From the setup page >> Click on Object Manager >> Click on Create >> Click on Custom Object.
- Enter the label name >>Doctor
- Plural label name >> Doctor
- Enter Record Name Label and Format

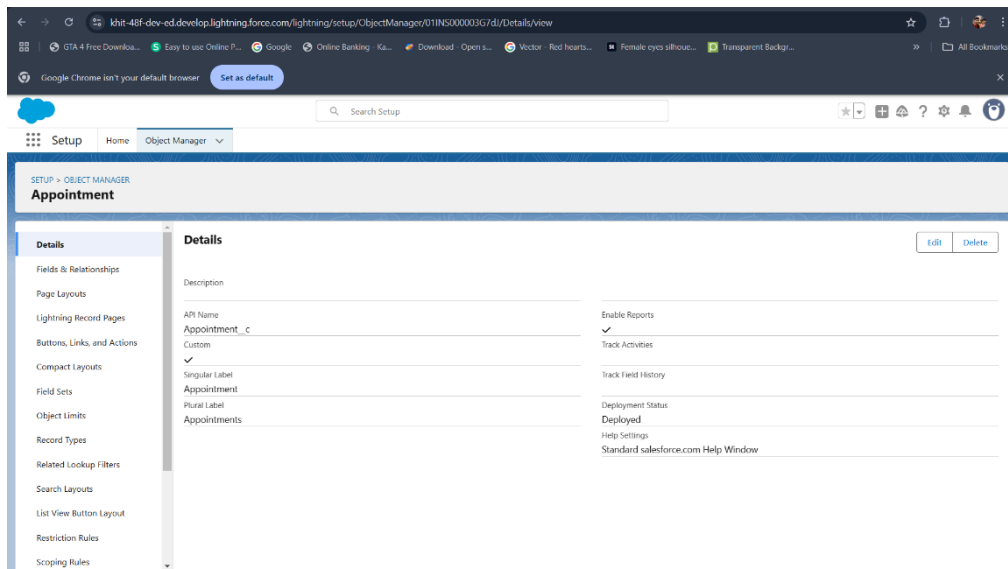
Record Name >> Doctor Name, Data type >> Text

- Click on Allow reports.
- Allow search >> Save.



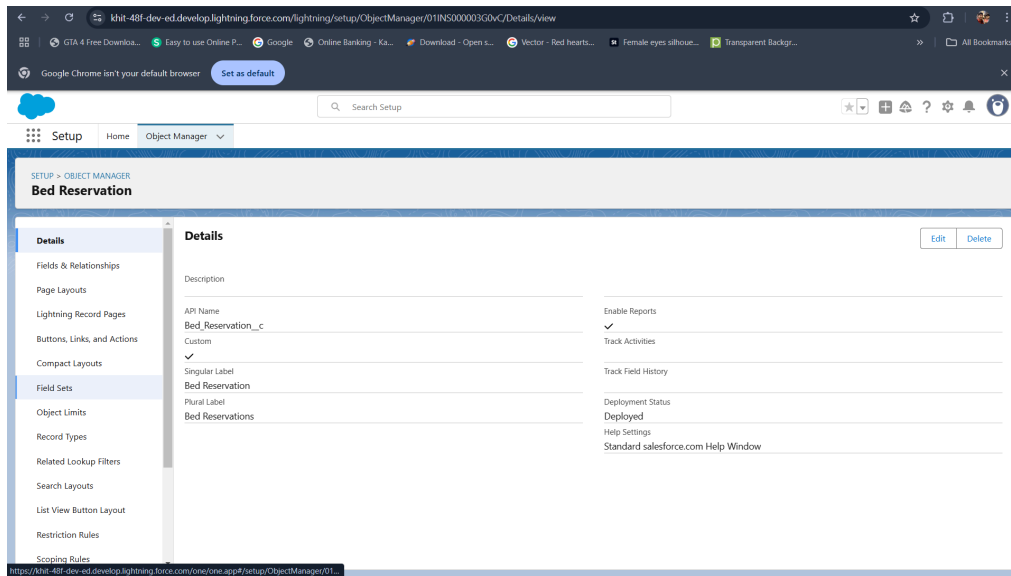
**Fig: Doctor Object**

### iii. Appointment Object:



**Fig: Appointment Object**

### iv. Bed Reservation Object:

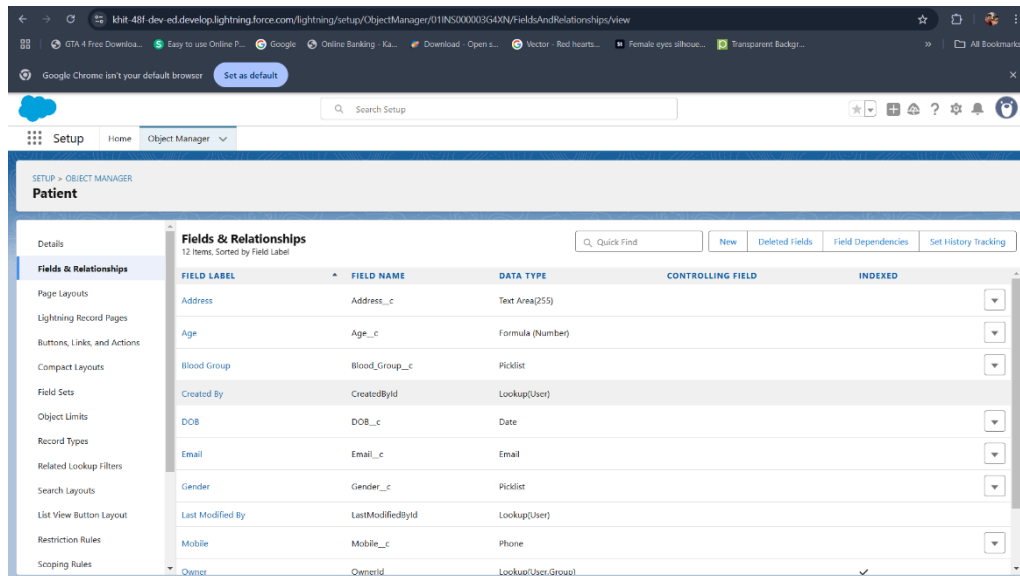


**Fig: Bed Reservation Object**

## 2. Fields & Relationships:

### i. Patient Fields & Relationship:

Object Name	Field Name	Data Type
Patient	Address	Text Area
Patient	DOB	Date
Patient	Age	Formula
Patient	Blood Group	Picklist (A+,A-,B+,B-,AB+,AB-,O+,O-)
Patient	Email	Email
Patient	Mobile	Phone
Patient	Gender	Picklist ( Male, Female, Other)
Patient	Patient ID	Auto Number (Display format : p-{000}, Starting number : 1)



**Fig: Patient Fields & Relationships**

ii. **Doctor Fields & Relationship:**

Object Name	Field Name	Data Type
Doctor	DOB	Date
Doctor	Age	Formula (FLOOR((TODAY()-DOB__c)/365))
Doctor	Blood Group	Picklist (A+,A-,B+,B-,AB+,AB-,O+,O-)
Doctor	Doctor ID	Auto Number
Doctor	Email	Email
Doctor	Gender	Picklist ( Male, Female, Other)
Doctor	Mobile	Phone
Doctor	Specialization	Picklist(Multi-Select)



FIELD LABEL	FIELD NAME	DATA TYPE	CONTROLLING FIELD	INDEXED
Age	Age__c	Formula (Number)		
Blood Group	Blood_Group__c	Picklist		
Created By	CreatedById	Lookup(User)		
DOB	DOB__c	Date		
Doctor ID	Doctor_ID__c	Auto Number		
Doctor Name	Name	Text(80)		✓
Email	Email__c	Email		
Gender	Gender__c	Picklist		
Last Modified By	LastModifiedById	Lookup(User)		

**Fig: Doctor Fields & Relationships**

### iii. Appointment Fields & Relationship:

Object Name	Field Name	Data Type
Appointment	Appointment Date	Date
Appointment	Doctor Name	Lookup (Doctor)
Appointment	Start Time	Time
Appointment	End Time	Time

FIELD LABEL	FIELD NAME	DATA TYPE	CONTROLLING FIELD	INDEXED
Appointment Date	Appointment_Date__c	Date		
Appointment Name	Name	Text(80)		✓
Created By	CreatedById	Lookup(User)		
Doctor Name	Doctor_Name__c	Lookup(Doctor)		✓
End Time	End_Time__c	Time		
Last Modified By	LastModifiedById	Lookup(User)		
Owner	OwnerId	Lookup(User,Group)		✓
Patient Name	Patient_Name__c	Lookup(Patient)		✓
Start Time	Start_Time__c	Time		

**Fig: Appointment Fields & Relationships**

iv. **Bed Reservation Fields & Relationship:**

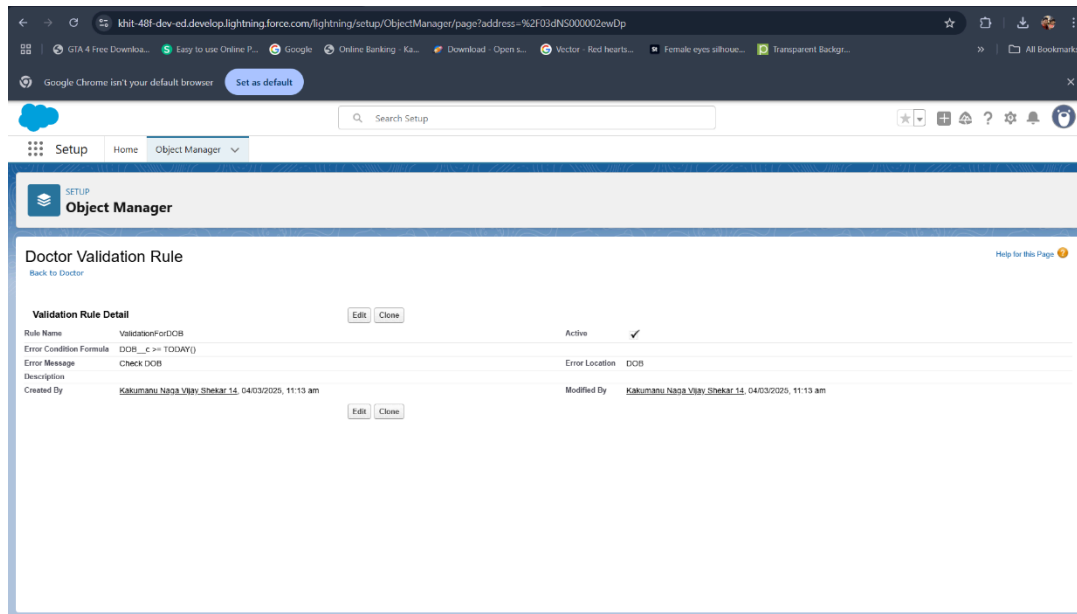
Object Name	Field Name	Data Type
Bed Reservation	Bed Type	Picklist (Regular, Healing, Paediatric, Maternity, Surgical)
Bed Reservation	Bed Number	Picklist (R1,R2,H1,H2,P1,P2,M1,M2,S1,S2)
Bed Reservation	Reservation Date	Date
Bed Reservation	Start Time	Time
Bed Reservation	End Time	Time
Bed Reservation	Patient	Lookup (Patient)
Bed Reservation	Booking Status	Picklist (Available, Booked)

Field Label	Field Name	Data Type	Required
Bed Number	Bed_Number__c	Picklist	
Bed Reservation Name	Name	Text(80)	✓
Bed Type	Bed_Type__c	Picklist	
Booking Status	Booking_Status__c	Picklist	
Created By	CreatedById	Lookup(User)	
End Time	End_Time__c	Time	
Last Modified By	LastModifiedById	Lookup(her)	
Owner	OwnerId	Lookup(User,Group)	✓
Patient	Patient__c	Lookup(Patient)	✓
Reservation Date	Reservation_Date__c	Date	
Start Time	Start_Time__c	Time	

**Fig: Bed Reservation Fields & Relationships**

v. **Creation of Field Dependencies:**





**Fig: Doctor Validation Rule**

### 3. APEX and Visualforce Page:

#### i. Patient Object:

- a) Creating Apex Controller Class for Patient object
- b) Creating Visualforce Page for patient object

#### ii. Doctor Object:

- a) Creating Apex Controller Class for Doctor object
- b) Creating Visualforce Page for Doctor object

#### iii. Appointment Object:

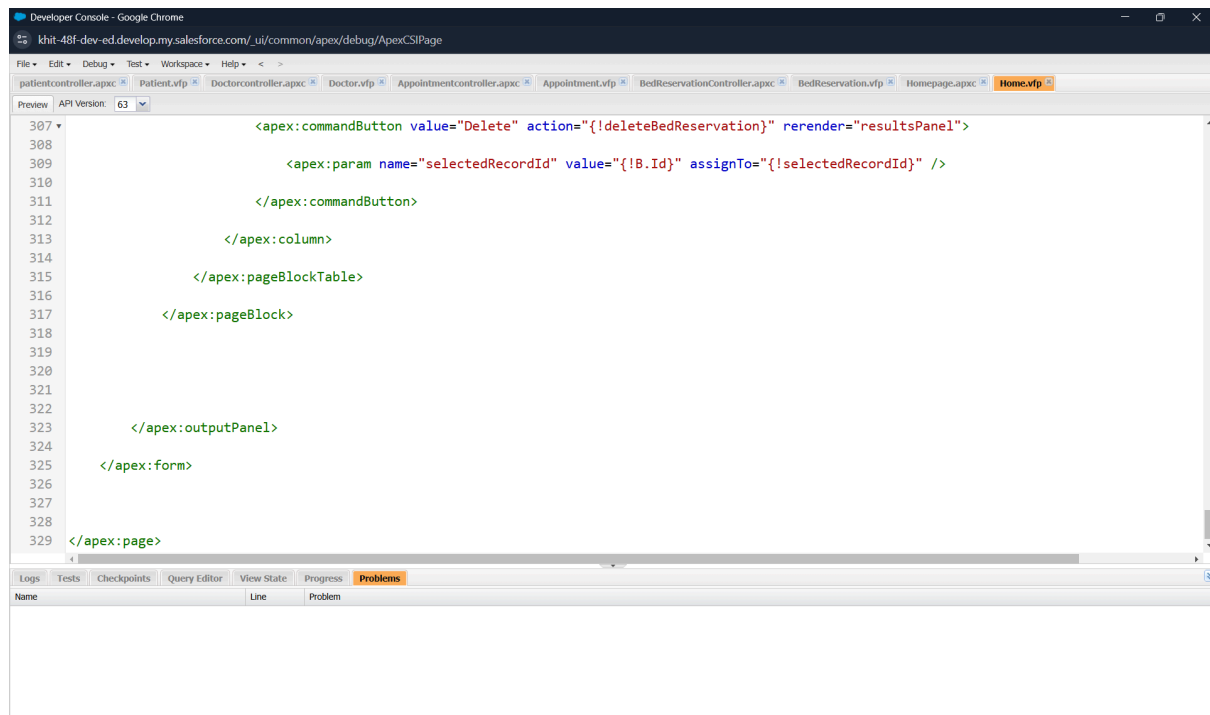
- a) Creating Apex Controller Class for Appointment object
- b) Creating Visualforce Page for Appointment object

#### iv. Reservation Object:

- a) Creating Apex Controller Class for Bed Reservation object
- b) Creating Visualforce Page for Bed Reservation object

#### v. Home Tab:

- a) Creating Apex Controller Class for Home Page Tab
- b) Creating Visualforce Page for Home Tab

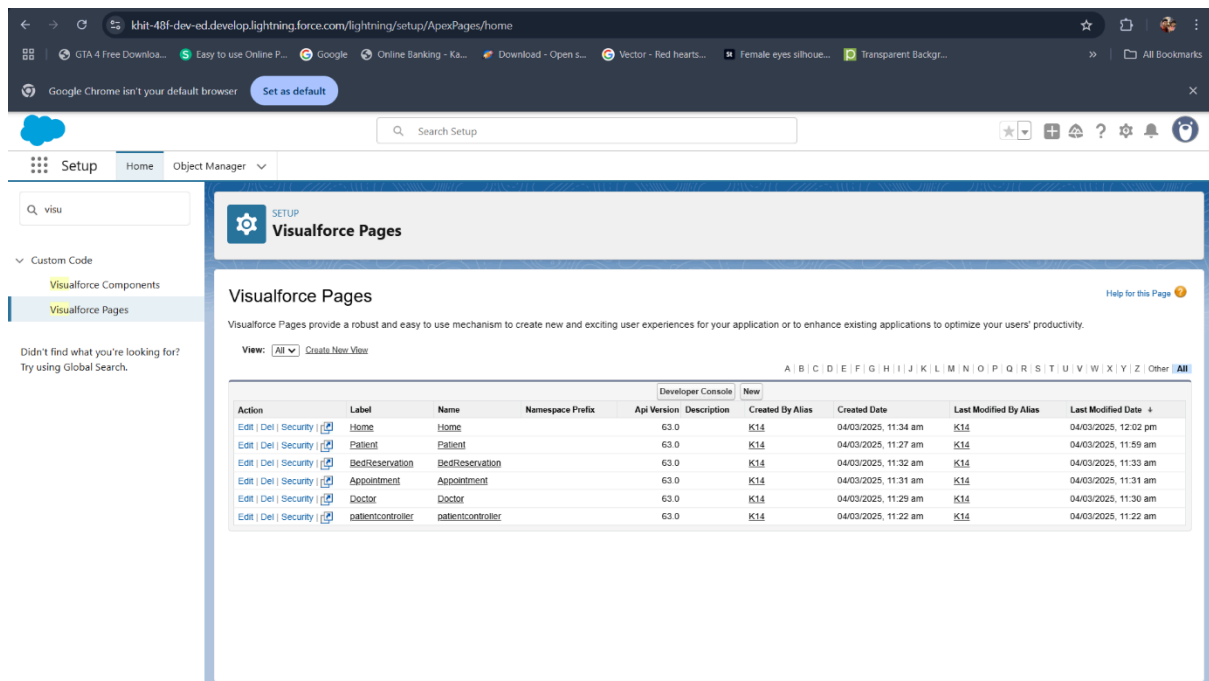


**Fig: Patient, Doctor, Appointment, Bed Reservation for Apex code and Visualforce Page**

## 4. Creation Of Visualforce Tabs:

### i. Creating a Visualforce Tab:

- Go to setup page >> type Tabs in Quick Find bar >> click on tabs >> click New (Visualforce tabs)
- Select Visualforce Page as Patient>> Tab Label as Patient >>Tab Name (Auto Fill)>>Select any tab style >> Next (Add to profiles page) keep it as default >> Next (Add to Custom App) keep it as default >> Save.
- Create 4 more tabs with Doctor, Appointment, Home page and Bed Reservation.

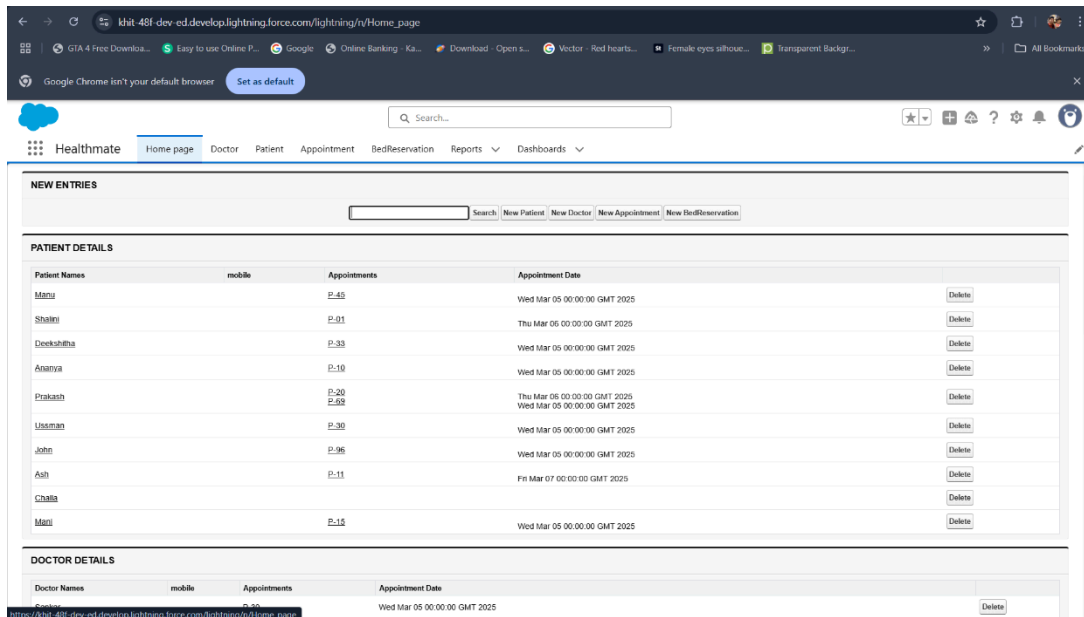


**Fig: Patient, Doctor, Appointment, Bed Reservation, Home Page For Visualforce Tabs**

## 5. The Lightning App

### i. Create a Lightning App:

- Go to setup page >> search “app manager” in quick find >> select “app manager” >> click on new lightning App.
- App Name: Healthmate  
Developer Name: This will auto populated  
Description: Enriching patients care  
Image: optional (if you want to give any image you can otherwise not mandatory) Primary colour hex value: keep this default.
- Then click Next >> (App option page) Set Navigation Style as Standard Navigation >> Next.
- keep it as default >> Next.
- To Add Navigation Items: Search for the item in the (Patient, Doctor, Bed Reservation, Appointment, Reports, Dashboard) from the search bar and move it using the arrow button >> Next >> Next.
- To Add User Profiles: Search profiles (System administrator) in the search bar >> click on the arrow button >> save & finish.



**Fig: Healthmate Lightning App**

## 6. User Adoption

### i. Create a Record (Patient):

- Click on App Launcher on the left side of the screen.
- Search HealthMate & click on it.
- When you're in the HomePage click on the New Patient button which will open the Patient Page.
- Fill the Details and click on Save.

The screenshot displays the Healthmate Lightning App interface, specifically the 'NEW PATIENT DETAILS' form. The form is titled 'NEW PATIENT DETAILS' and has a 'Save' button at the top right. The form fields are as follows:

Field	Value
Patient ID	
Patient Name	
Email	
Mobile	
Blood Group	--None--
Address	
DOB	[04/03/2025]
Age	
Gender	--None--

At the bottom of the form, there are three buttons: 'Save', 'Save & New', and 'Cancel'.

**Fig: Patient Record Cration**

## ii. Create a Record (Doctor):

The screenshot shows the 'NEW DOCTOR DETAILS' form in the Healthmate application. The form is located at the URL `khiti-48f-dev-ed.develop.lightning.force.com/lightning/n/Doctor`. The form fields include: Doctor ID, Doctor Name, Email, Mobile, Gender (dropdown), DOB (date field), Age, and Specialization (dropdown). The Specialization dropdown is open, showing 'Available' options: Cardiologist, Dermatologist, and Endocrinologist. The 'Chosen' dropdown is empty. The form has 'Save', 'Save & New', and 'Cancel' buttons at the bottom.

Fig: Doctor Record Cration

## iii. Create a Record (Appointment):

The screenshot shows the 'Appointment DETAILS' form in the Healthmate application. The form is located at the URL `khiti-48f-dev-ed.develop.lightning.force.com/lightning/n/Appointment`. The form fields include: Appointment Name, Appointment Date, Doctor Name, Patient Name, Start Time, and End Time. The form has 'Save', 'Save & New', and 'Cancel' buttons at the bottom.

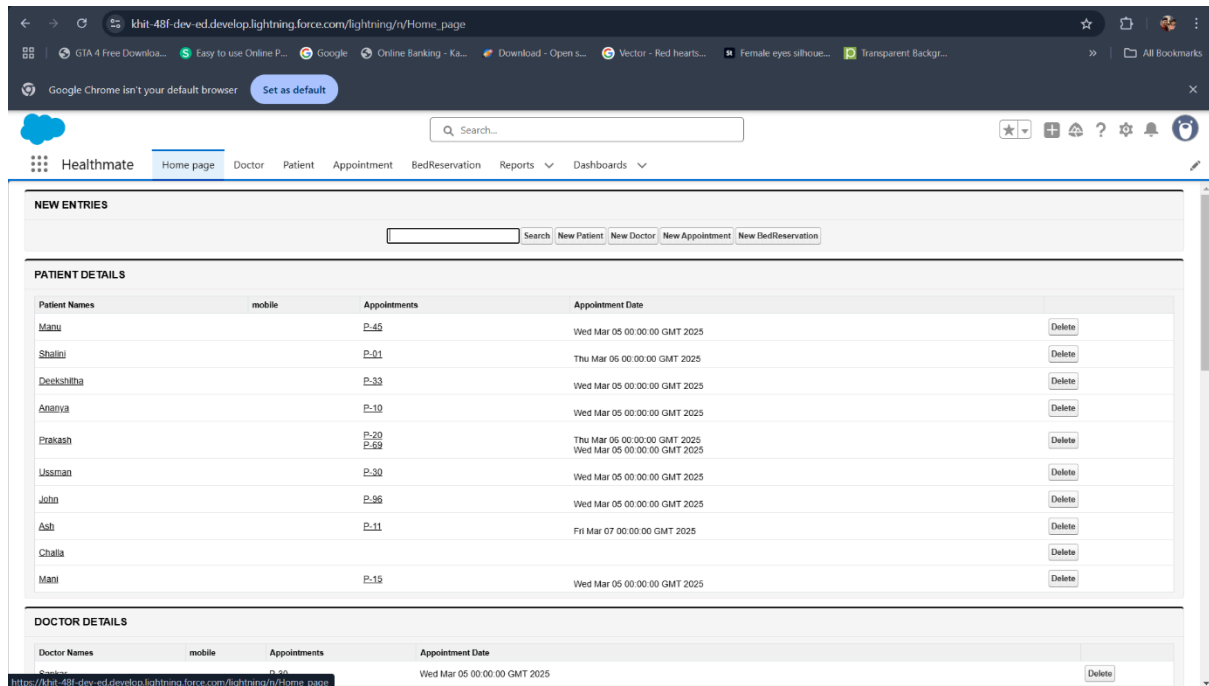
Fig: Appointment Record Cration

## iv. Create a Record (Bed Reservation):

The screenshot shows the 'Bed Reservation' form in the Healthmate application. The form is located at the URL `khiti-48f-dev-ed.develop.lightning.force.com/lightning/n/BedReservation`. The form fields include: Bed Type, Bed Number, Reservation Date, Start Time, End Time, and Patient. The form has 'Reserve Bed', 'reserveandnew', and 'Cancel' buttons at the bottom.

Fig: Bed Reservation Record Cration





**Fig: Home Page**

## 7. Report:

### i. Create Report:

- Go to the app >> click on the reports tab.
- Click New Report.
- Select report type from category or from report type panel or from search panel >> click on start report.
- Customise your report  
From top on the left side click on report dropdown and select Joined Report and apply. Add fields from the left pane as shown below.
- Save or run it and give the report name and save it.

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**Fig: Joined Report of Patient, Doctor, Appointment, Bed Reservation  
(Healthmate Report)**

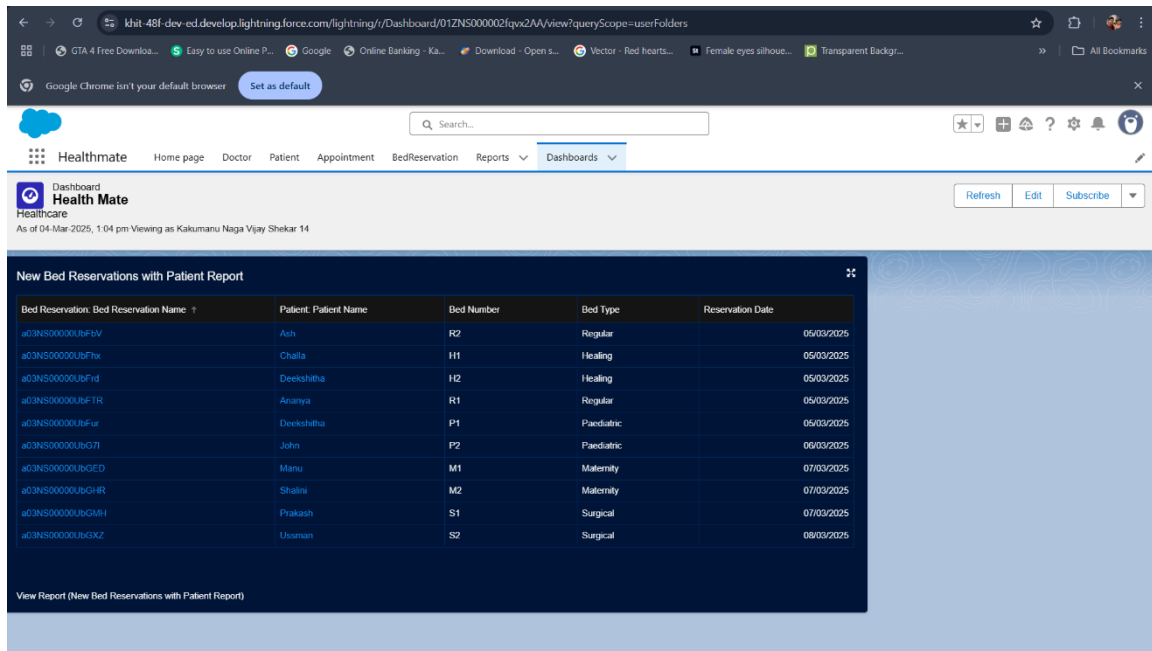
**Fig: Bed Reservations with Patient Report**

## 8. Dashboard:

### i. Create Dashboard:

- Go to the app >> click on the Dashboards tabs.

- Give a Name and click on Create.
- Select a Report and click on select.
- Select Legend position as bottom and component theme as dark.
- Click Add then click on Save and then click on Done.

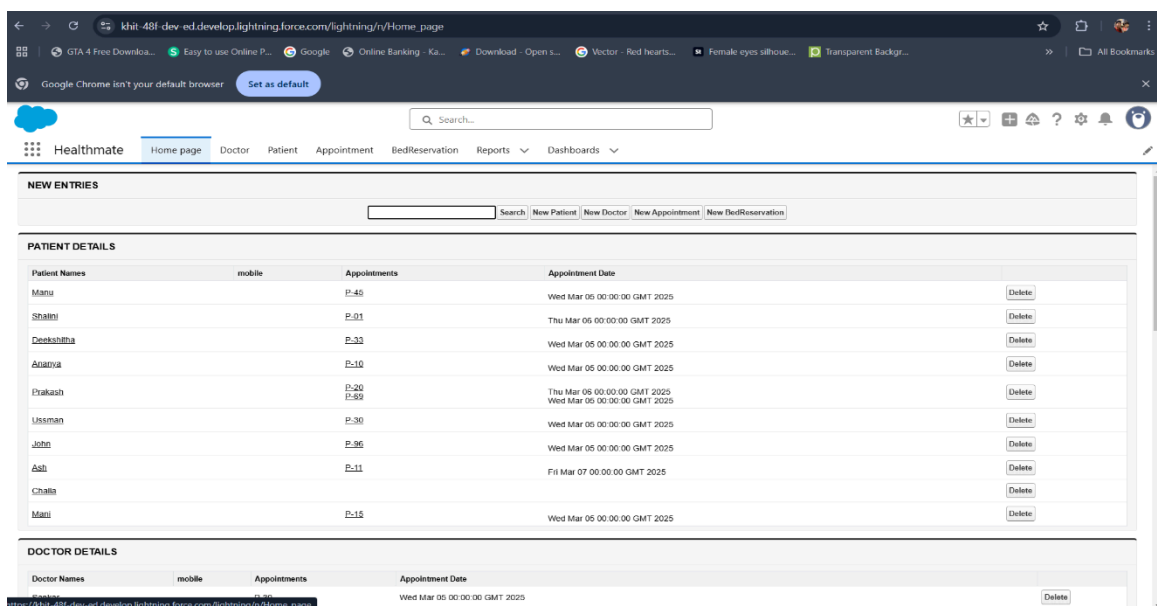


The screenshot shows the Healthmate Dashboard with a table titled "New Bed Reservations with Patient Report". The table has five columns: Bed Reservation, Patient, Patient Name, Bed Number, Bed Type, and Reservation Date. The data is as follows:

Bed Reservation	Patient	Patient Name	Bed Number	Bed Type	Reservation Date
a03NS00000Ubf5V	Ash		R2	Regular	05/03/2025
a03NS00000Ubf7x	Challa		H1	Healing	05/03/2025
a03NS00000Ubf7d	Deekshitha		H2	Healing	05/03/2025
a03NS00000Ubf7R	Ananya		R1	Regular	05/03/2025
a03NS00000Ubf7u	Deekshitha		P1	Paediatric	05/03/2025
a03NS00000Ubf7I	John		P2	Paediatric	06/03/2025
a03NS00000Ubf0ED	Manu		M1	Maternity	07/03/2025
a03NS00000Ubf0HR	Shalini		M2	Maternity	07/03/2025
a03NS00000Ubf0MH	Prakash		S1	Surgical	07/03/2025
a03NS00000Ubf0KZ	Ussman		S2	Surgical	08/03/2025

**Fig: Healthmate Dashboard**

## Testing & Validation:



The screenshot shows the Healthmate Home page with two main sections: "NEW ENTRIES" and "PATIENT DETAILS". The "PATIENT DETAILS" section contains a table with columns: Patient Names, mobile, Appointments, Appointment Date, and a Delete button. The data is as follows:

Patient Names	mobile	Appointments	Appointment Date	Delete
Manu		P-45	Wed Mar 05 00:00:00 GMT 2025	Delete
Shalini		P-01	Thu Mar 06 00:00:00 GMT 2025	Delete
Deekshitha		P-33	Wed Mar 05 00:00:00 GMT 2025	Delete
Ananya		P-10	Wed Mar 05 00:00:00 GMT 2025	Delete
Prakash		P-20 P-89	Thu Mar 06 00:00:00 GMT 2025 Wed Mar 05 00:00:00 GMT 2025	Delete
Ussman		P-30	Wed Mar 05 00:00:00 GMT 2025	Delete
John		P-96	Wed Mar 05 00:00:00 GMT 2025	Delete
Asli		P-11	Fri Mar 07 00:00:00 GMT 2025	Delete
Challa				Delete
Manu		P-15	Wed Mar 05 00:00:00 GMT 2025	Delete

The "DOCTOR DETAILS" section is partially visible at the bottom, showing a table with columns: Doctor Names, mobile, Appointments, Appointment Date, and a Delete button.

**Fig: Home: Patient Details**

**DOCTOR DETAILS**

Doctor Names	mobile	Appointments	Appointment Date	
Sankar		P-30	Wed Mar 05 00:00:00 GMT 2025	Delete
Raja		P-15	Wed Mar 05 00:00:00 GMT 2025	Delete
Sruithi		P-11	Fri Mar 07 00:00:00 GMT 2025	Delete
Jane		P-10	Wed Mar 05 00:00:00 GMT 2025	Delete
Teju		P-01	Thu Mar 06 00:00:00 GMT 2025	Delete
Vilava				Delete
Neha		P-33	Wed Mar 05 00:00:00 GMT 2025	Delete
Siva		P-20P-96	Thu Mar 06 00:00:00 GMT 2025 Wed Mar 05 00:00:00 GMT 2025	Delete
Ashya		P-69	Wed Mar 05 00:00:00 GMT 2025	Delete
Shekar		P-45	Wed Mar 05 00:00:00 GMT 2025	Delete

**Fig: Home: Doctor Details**

**APPOINTMENT DETAILS**

Appointment No	Patient Name	Appointment Date	Doctor Name	
P-11	Ash	Fri Mar 07 00:00:00 GMT 2025	Sruithi	Delete
P-01	Shalini	Thu Mar 06 00:00:00 GMT 2025	Teju	Delete
P-20	Prakash	Thu Mar 06 00:00:00 GMT 2025	Siva	Delete
P-45	Manu	Wed Mar 05 00:00:00 GMT 2025	Shekar	Delete
P-30	Usaman	Wed Mar 05 00:00:00 GMT 2025	Sankar	Delete
P-15	Mari	Wed Mar 05 00:00:00 GMT 2025	Raja	Delete
P-33	Deekshitha	Wed Mar 05 00:00:00 GMT 2025	Neha	Delete
P-96	John	Wed Mar 05 00:00:00 GMT 2025	Siva	Delete
P-10	Ananya	Wed Mar 05 00:00:00 GMT 2025	Jane	Delete
P-69	Prakash	Wed Mar 05 00:00:00 GMT 2025	Ashya	Delete

**Fig: Home: Appointment Details**

Patient ID	Name	Reservation Date	Doctor	Delete
P-45	Manu	Wed Mar 05 00:00:00 GMT 2025	Shekar	Delete
P-30	Ussman	Wed Mar 05 00:00:00 GMT 2025	Sankar	Delete
P-15	Mani	Wed Mar 05 00:00:00 GMT 2025	Raja	Delete
P-33	Deekshitha	Wed Mar 05 00:00:00 GMT 2025	Neha	Delete
P-95	John	Wed Mar 05 00:00:00 GMT 2025	Shiva	Delete
P-10	Ananya	Wed Mar 05 00:00:00 GMT 2025	Jane	Delete
P-59	Prakash	Wed Mar 05 00:00:00 GMT 2025	Ashua	Delete

Patient Name	Bed Number	Reservation Date	Start Time	End Time	Delete
Ussman	S2	Sat Mar 08 00:00:00 GMT 2025	09:00:00.000Z	01:30:00.000Z	Delete
Prakash	S1	Fri Mar 07 00:00:00 GMT 2025	10:00:00.000Z	10:00:00.000Z	Delete
Shalini	M2	Fri Mar 07 00:00:00 GMT 2025	10:00:00.000Z	04:00:00.000Z	Delete
Manu	M1	Fri Mar 07 00:00:00 GMT 2025	01:00:00.000Z	10:00:00.000Z	Delete
John	P2	Thu Mar 06 00:00:00 GMT 2025	01:00:00.000Z	04:00:00.000Z	Delete
Deekshitha	P1	Wed Mar 05 00:00:00 GMT 2025	11:00:00.000Z	03:00:00.000Z	Delete
Deekshitha	H2	Wed Mar 05 00:00:00 GMT 2025	12:00:00.000Z	03:00:00.000Z	Delete
Challa	H1	Wed Mar 05 00:00:00 GMT 2025	12:00:00.000Z	02:00:00.000Z	Delete
Ash	R2	Wed Mar 05 00:00:00 GMT 2025	11:00:00.000Z	12:00:00.000Z	Delete
Ananya	R1	Wed Mar 05 00:00:00 GMT 2025	10:00:00.000Z	01:00:00.000Z	Delete

**Fig: Home: Bed Reservation Details**

## Key Scenarios Addressed by Salesforce in the Implementation

### Project:

Salesforce has been instrumental in addressing various key scenarios in healthcare optimization projects. Here are some notable examples:

1. **Appointment Scheduling and Management:** Salesforce helps streamline patient appointment scheduling and management. Patients can book appointments through a portal, receive automated reminders, and check in via kiosks. This improves patient management and communication between healthcare providers and patients.
2. **Patient Medication Journey Management:** Salesforce Health Cloud integrates with various systems to manage patient medication journeys. This includes handling extensive patient records, ensuring data flow and integration, maintaining regulatory compliance, and addressing data quality issues.
3. **Physician Network Development:** Healthcare groups use Salesforce to capture more referrals from existing referring physicians and recruit new ones. This improves provider referrals and enhances patient care.

## **Conclusion:**

Salesforce has emerged as a powerful platform for healthcare optimization, offering solutions that enhance patient management, streamline workflows, and improve overall operational efficiency. The integration of Salesforce Health Cloud, Einstein Analytics, AI-powered chatbots, IoT, and blockchain has enabled healthcare providers to deliver personalized care, optimize resource allocation, and ensure data security.

### **Key Takeaways:**

- Real-time tracking improves efficiency
- Automated appointment scheduling enhances patient care.
- Reports and dashboards provide actionable insights.

Future research and developments should focus on cost-effective solutions, improved AI capabilities, and enhanced interoperability to maximize the benefits of Salesforce in healthcare optimization.