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Health Care Management using Cloud Computing

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Healthcare Management Using Cloud Computing

by

Rohila Malgari

A Starred Paper

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

for the Degree

Master of Engineering Management

May, 2016

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Abstract

Cloud Computing is a crowd/group of unknown resources that are giving for a specific purpose to the user. The Hospital Management System (HMS) is intended for Any Hospital to switch their current manual, paper based system. The proposed new structure is to control the patient information, room availability, staff and operating room schedules, and patient invoices. These facilities are to be provided in a well-organized, cost effective manner, with the objective of reducing the time and resources currently required for such tasks.

An important part of the process of any hospital involves the acquirement, management and timely renewal of great volumes of information. This information usually involves; patient individual information and medicinal history, staff information, room and ward arrangement, staff arrangement, operating theater scheduling and various facilities waiting lists. All of this data must be achieved in a capable and price wise manner so that an organization's properties may be effectually utilized HMS will automate the administration of the hospital making it more well-organized and error free.

All the service industries in modern world are highly dependent on the quality of the data, defining objectives from available data (historical data) and utilizing the same to achieve those objectives. Our mission here was to understand and gather the requirement for an enterprise level quality dashboard for a hospital client, so that the business and executives get an overall understanding of the Hospital management growth to help them take high level decisions based on the data represented on this Dashboard.

Acknowledgements

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Finally I would like to thank my family and all my friends for constantly encouraging and supporting me in this endeavor. It is with their help that I have successfully completed my Master's Program in Engineering Management.

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Chapter 1: Introduction

Cloud Computing is a crowd/group of unknown resources that are giving for a specific purpose to the user. It is a concept of pay per use of each IT service and concept of accessing infrastructure, platform and software as a service over the internet by paying the each use of the IT services. There are three services provided in Salesforce Technology and they are called Cloud Services.

- Infrastructure as A Service (IAAS): Accessing infrastructure such as Application server, storage server over the internet is called IAAS.
- Platform as A Service (PAAS): Accessing a platform such as any programming language on which an application is built provided as service over the internet is called PAAS.
- Software as A Service (SAAS): Accessing a software application over the internet is called SAAS.

Many big organizations will have their own customer relationship management (CRM) system which plays a vital role in the development of the organization. CRM system helps the organization to monitor each and every department individually. CRM's are commonly used by an organization to evaluate its success or the success of a particular activity or a particular group engaged and also used to set goals or rules, to objectively assess the achievement of these goals, and to provide feedback on any unwanted variance between achievements and goals.

This project is about generating an enterprise Hospital Management System (HMS) CRM application which provides the benefits of streamlined operations, enhanced

administration and control, superior patient care, strict cost control and improved profitability. This HMS provides Patient Administration, Billing and Pharmacy Management functions for the hospital. The major functions of Patient Administration module included Allocating Registrations, Recording Personal Details, Handling Hospital Admissions, Assigning Insurance Details, and Recording Transfers within the hospital and Creation of Discharge Summary. The Billing module allowed Billing and receivables, looked into multiple modes of Payment and Rates Definition for Services. Pharmacy module included Consumables management, Maintenance of Drug Composition, Batch-wise Stock of Drugs, and Drug Categorization for Reporting.

Problem Statement

There are various technologies to develop a CRM application like Microsoft CRM, Sugar CRM etc. But these technologies are not so feasible to develop a CRM application due to the following drawbacks

- Price and TCO
- Flexibility of choice
- User Adoption
- Platform Advantages
- Data Base
- Out-Of-Box functionality

The above mentioned drawbacks are resolved in Salesforce CRM that makes everything we need to transform our business into social enterprise making the CRM application reliable and automation. Salesforce CRM is used to set goals or rules, to

objectively assess the achievement of these goals, and to provide feedback on any unwanted variance between achievements and goals. The aim of Salesforce CRM is to eliminate inconsistency and improve traditional values by providing out-of-box functionality and automation.

For a huge organization like ABC Hospital Management System Center which holds the data of many diverse fields, it is a backbreaker for the higher personnel to monitor petty level tasks to transaction level tasks. Heedlessness in monitoring the progress and funds usage is depreciating organizations discipline and advancement.

Nature and Significance of the Problem

With this Salesforce CRM personal can monitor the growth of every department and research. By comparing their performance to previous years, special attention can be provided to those respective weak departments for its betterment in current and fore coming years. For any organization like medical center with diverse fields monitoring the progress and funds usage is the most important thing for the organizations discipline and advancement.

For the above significant problem the main intentions of Salesforce CRM are:

- Categorize and follow progress with respect to the executive goals.
- Making the business totally automated
- Determine the opportunity for improvement.
- Comparing performance against both internal and external standard

Objective

The main objective of this project is to develop an enterprise level Salesforce CRM application to monitor the progress of all fields with respect to other departments and also to

their own previous year's progress for better and faster decision making and understanding of the problems.

Objectives of this project are:

- To provide extensive marketing management which includes campaign management, lead management, search management, contact management.
- To provide extensive customer support management.
- To provide visibility and a scoreboard for people to monitor their own department performance level.
- To provide standards for establishing comparisons of Current progress with their previous fiscal years progress.
- To highlight quality problems and determine areas for priority attention.

Project Questions

The following questions will be answered at the end of the project:

1. How the automation is done between the various objects or departments in Salesforce CRM?
2. Where can the spending of budget be controlled while comparing to the previous year's spending?
3. Which department in the medical center is performing efficiently and effectively?

Limitations

- Plug-in and integrations are still lacking compared to some of the larger CRM vendors out there.
- During testing, we noticed with issues of speed and overall reliability.

Summary

Effectively engage with the customers regardless of device and it also has to automate; optimize even the most complex business practices and highly customizable CRM platform based on the open technologies.

Chapter 2: Background and Review of Literature

Introduction

This chapter will explain the background related to the project and research area where the project is conducted. Literature related to project problem and literature related to methodologies used to conduct the project is discussed in detail. This chapter will provide readers, a complete and broader aspect of the project.

Review of Literature

Salesforce is a Cloud Computing technology used to develop a customer relationship management (CRM) application over the internet for a type of performance measurement and automation (Shrivastava, 2014). Salesforce CRM offers everything we need to transform our business into Social Enterprise, so we can connect to customers and employees like never before, with no software or hardware to install. It is popular for its pace and dynamic user interface, which is the key for better analytics.

Benefits in using Salesforce CRM are:

- Allows extensive business automation.
- Data is much secured.
- Allows Multi –tenant architecture.
- Increased storage capacity.
- Flexibility as there is no need of installing any software and can access from any location
- Use of an in-memory data model.
- Allows instant, in memory, manipulation of massive datasets.

- Does not require high cost hardware.
- Automated data integration and a graphical analytical environment attractive for customers.
- Fast and powerful visualization capabilities.
- Ease of use—end users requires almost no training.
- Highly scalable—near instant response time on very huge data volumes.

CRM is model used to manage an organizations interactions:

- Phone calls
- Emails
- Meetings
- Social media

With customer and prospects pertaining to:

- Sales
- Marketing
- Support

Common goals of CRM:

- Increase sales revenue
- Increase visibility between departments
- Decrease operating costs
- Streamline business processes.

User features:

- Chatter
- Search
- Reports and dashboards

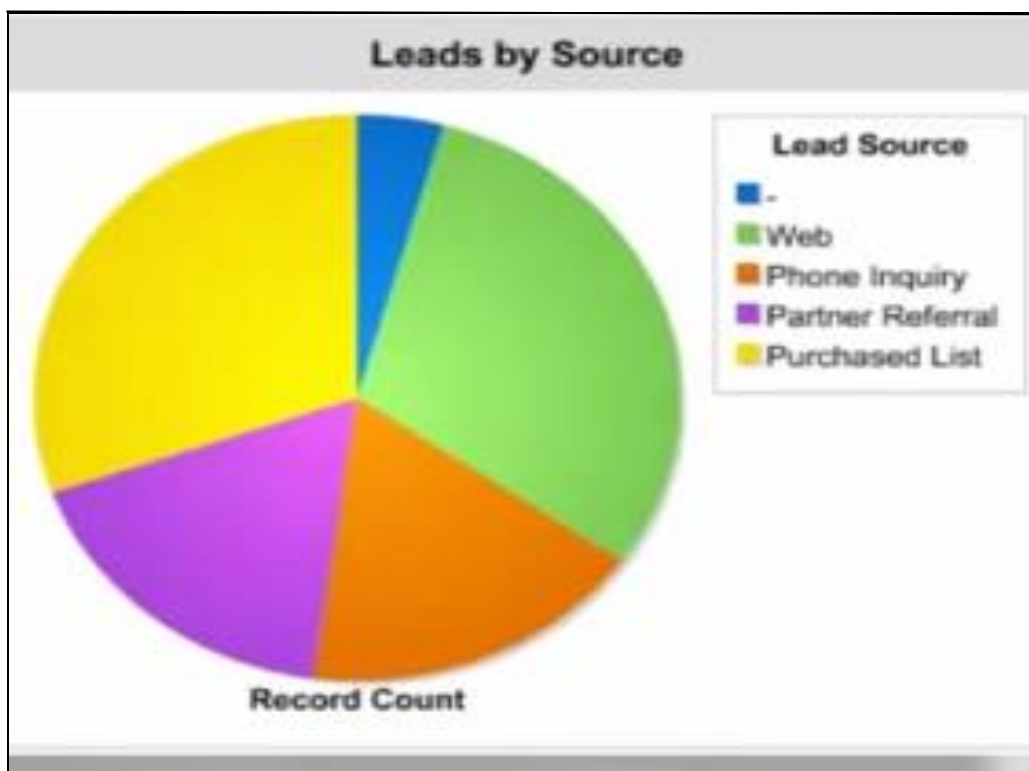


Figure 1: Leads by Source

- Social

Figure 2: Salesforce on social

- Mobile
- Email integration

Configuration features:

- Page layouts
- Custom fields and objects

- Validation rules
- Workflow & approval processes
- Robust security
- Multi-currency
- Multi-lingual

Development features:

- Visual force
- Apex
- API
- Sites
- Sandboxes
- Change sets
- Sales force IDE

Other functionality:

- Site.com
- Database.com
- Salesforce for Twitter & Facebook
- Marketing cloud
- VMForce
- Heroku

Non-profit:

- 1-1-1model
 - ❖ 1% people
 - ❖ 1% technology
 - ❖ 1% resources
- Free & discounted licenses
- Non-profit starter kit

Salesforce.com is a company that sells a software platform to manage CRM and applications.

It is awesome because it is hosted in the cloud and provides a unique features. Goals:

- Create real-time reports and dashboards on any CRM metric.
- Monitor the effectiveness of marketing programs, sales opportunities and support cases.
- Share/restrict access to reports and dashboards across teams.

Salesforce CRM Reporting.

Issues:

- Lack of understanding on how marketing impact sales.
- Poor visibility into business performance.
- No understanding of why customers are defecting.

Solution:

- Track results of marketing leads to closed-won deals and also have the measure ROI programs of across channel.
- Dashboard identifies win/loss rates, competitive deals and lead source and we can also have review and revise rep and team forecasts.

- Consumer reports on service requirements, bugs, case resolution and response times.

Impact:

- Understand how leads are generated and which marketing programs work.
- Gain the insight needed to drive the business.
- Identify small problems before they become large ones.

Dashboards:

- Users can create any number of custom dashboards based on variable within Salesforce (Greenberg, 2004).
- Dashboards display real-time information.
- Charts can be shared across individuals, teams, or the entire company.

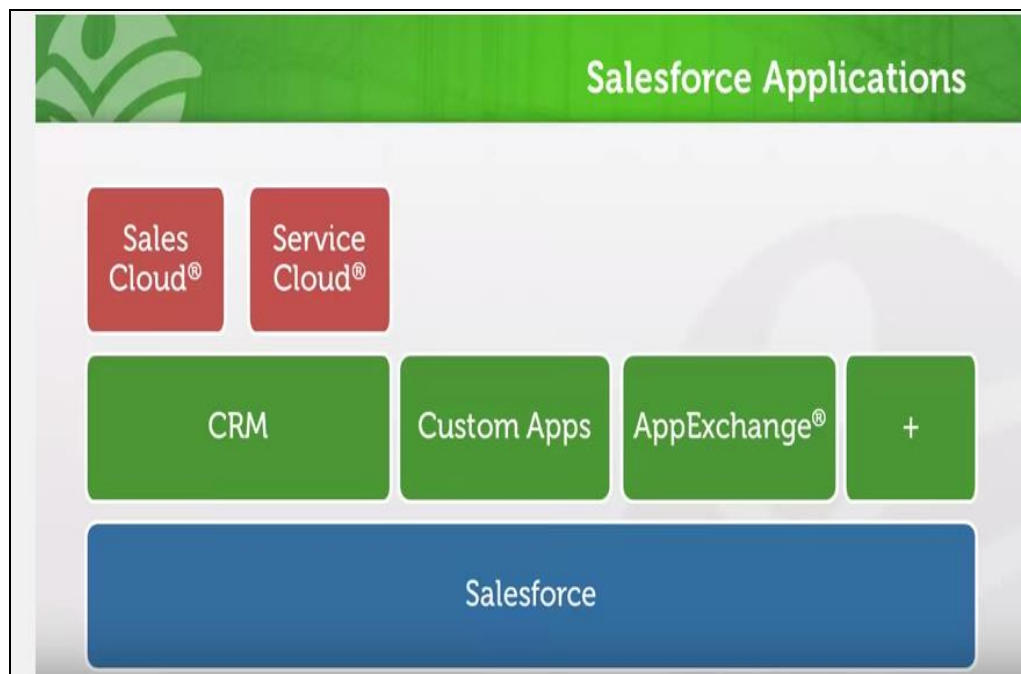


Figure 2: Salesforce Applications Architecture



Figure 3: Types of Services

Types of clouds:

SaaS:

- Software as a service
- Operating environment largely irrelevant, fully functional applications provided, e.g., CRM, ERP, email.

PaaS:

- Platform as a service
- Operating environment included, e.g., windows/.NET applications of choice deployed.

IaaS:

- Virtual platform on which required operating environment and application are deployed.
- Includes storage as a service offerings.

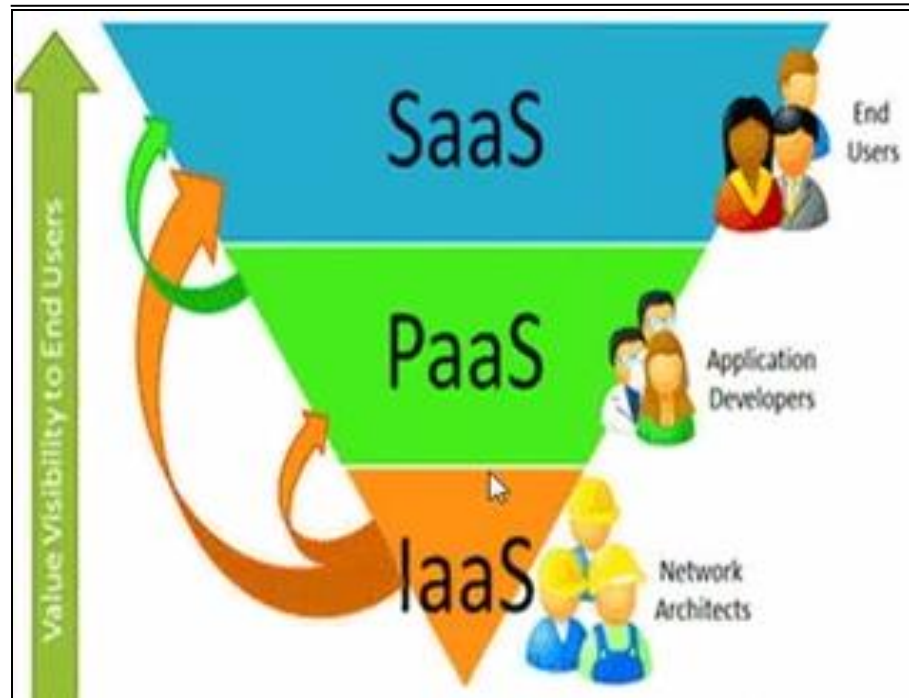


Figure 4: Value Visibility to End Users

Benefits of cloud computing:

- Pay as you use
- Lower TCO
- Reliability, scalability and sustainability
- Secure storage management
- Lower capital expenditure
- Frees up internal resources
- Highly automated
- Utility based
- Review of Literature



Figure 5: Diagrammatical Representation of Cloud Computing Benefits

Sales force is a software as a service (SaaS) company that distributes business software on a subscription basis .It is best known for its Customer Relationship Management (CRM) products.

Literature Related to Methodology

Salesforce Developers is a community of who build applications which run in the cloud and built with the platform. By applying S.A.F.E (Simplifying Analysis for everyone) methodology based on the requirement we were able to create Patient and related dashboards which gave the performance summary of each area in their respective department.

These developers have access to a range of resources, including sample code for an online developer. The Developers website has an online version of this book and the information about the Dream force event that we hold every year for Sales force platform developers.

Use of sales force:

- Proven—More than 100,000+ companies trust sales force, including many industry leaders. They've built apps that run in accredited, world-class data centers with backup, failover, and an uptime record exceeding. You can see real-time system performance data at trust sales force (Goodey, 2013).
- Agile—sales force requires minimal coding. Assemble the apps in block fashion using our illustration tools and records of components. Streamline development with sandbox environments will integrate the apps using open APIs.
- Social—Work more efficiently with your contemporaries using your own secure social system. Sales force includes pre-built components for feeds, conversations, and file sharing. All mechanism are available through REST APIs that can be easily integrated into any convention app.
- Mobile—Run your business from your touchtone phone using the mobile app. Build native mobile apps mechanical by a secure cloud database, with rock-solid APIs. Or construct mobile-optimized browser apps, by our UI framework and HTML5 to support any device with one code base.

Or mix native and HTML in a amalgam cocktail that gives you the best of together worlds. Sales force has what you need to securely transport apps on mobile devices.

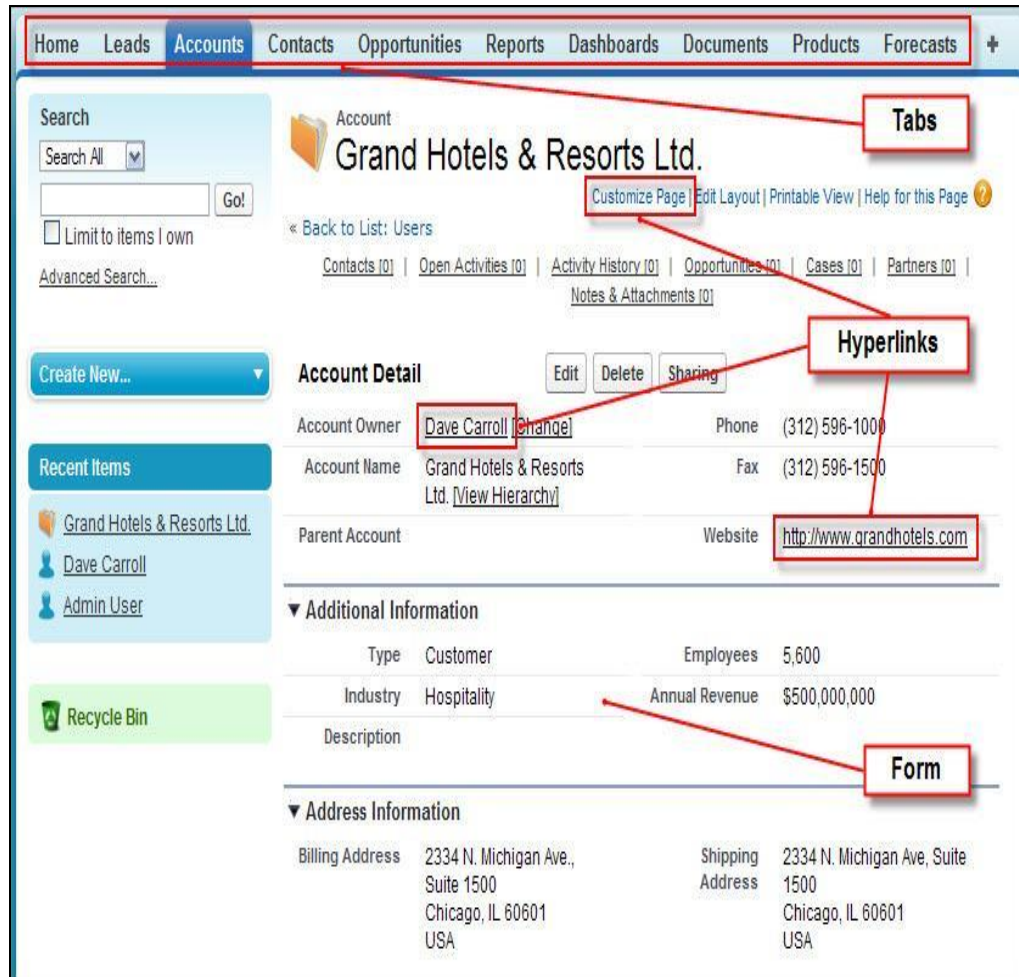


Figure 6: Platform Apps Include Tabs, Forms, and Links

Tabs. Across the peak of the app is a set of *tabs* that section the app into different parts. Each tab correspond to a type of objective, such as an account or contact, and a tab you can perform actions on meticulous records of that tab's type. For example, when you click on the Accounts tab, you can generate a new record for the “Acme” account. You can also check over existing accounts, or use a *list view* to sift lists of accounts by certain criteria. Most app progress work revolve around create tabs and crucial the data and behaviors that support them.

Fields. Display within each record is a selection of *fields*, which is how the Sales force platform houses and organize information. For example, a make contact with record includes fields such as Last Name, Home Phone, Reports To, and Account. When mounting a new app, you can modify which fields appear for a given type of record—such as for contact records—as well as how they are organized. In a Sales force platform app, users enter in sequence with writable fields on and prepare for publication page and view that in sequence with read-only fields on a detail page.

Links. Finally, because Sales force platform apps are delivered in a Web browser, they use *associations* to provide map-reading to related data. For instance, on an account detail page, there are associations to related records, such as the links who belong to the account and the sales user who manage the account. Other associations take you to recently visit records and to areas of the app where users can set special preferences. Associations provide navigation within an app and to external Web sites. Now let's appear at how these elements emerge in a mobile context, like Salesforce. We still see collection of fields, and patter links navigates us to the indicated record or external website.

Menu Items. Instead of tab, mobile user access objects from items in the *direction-finding menu*. Like a tab, each list of options item in the recent section correspond to a sort of object, such as an explanation or contact. Objects are surface based on which objects you've viewed or work with recently. Tapping **Show additional** displays all the objects available based on your outline and permissions (Venkata Josyula, 2011). When you tap one of these items, such as balance sheet, you can create a new documentation or look

your recently visited records. To edit an existing record, you first need to tap the record to open it.

Menu items also include things like Tasks, and the Feed, most of which we will talk about later in this guide.

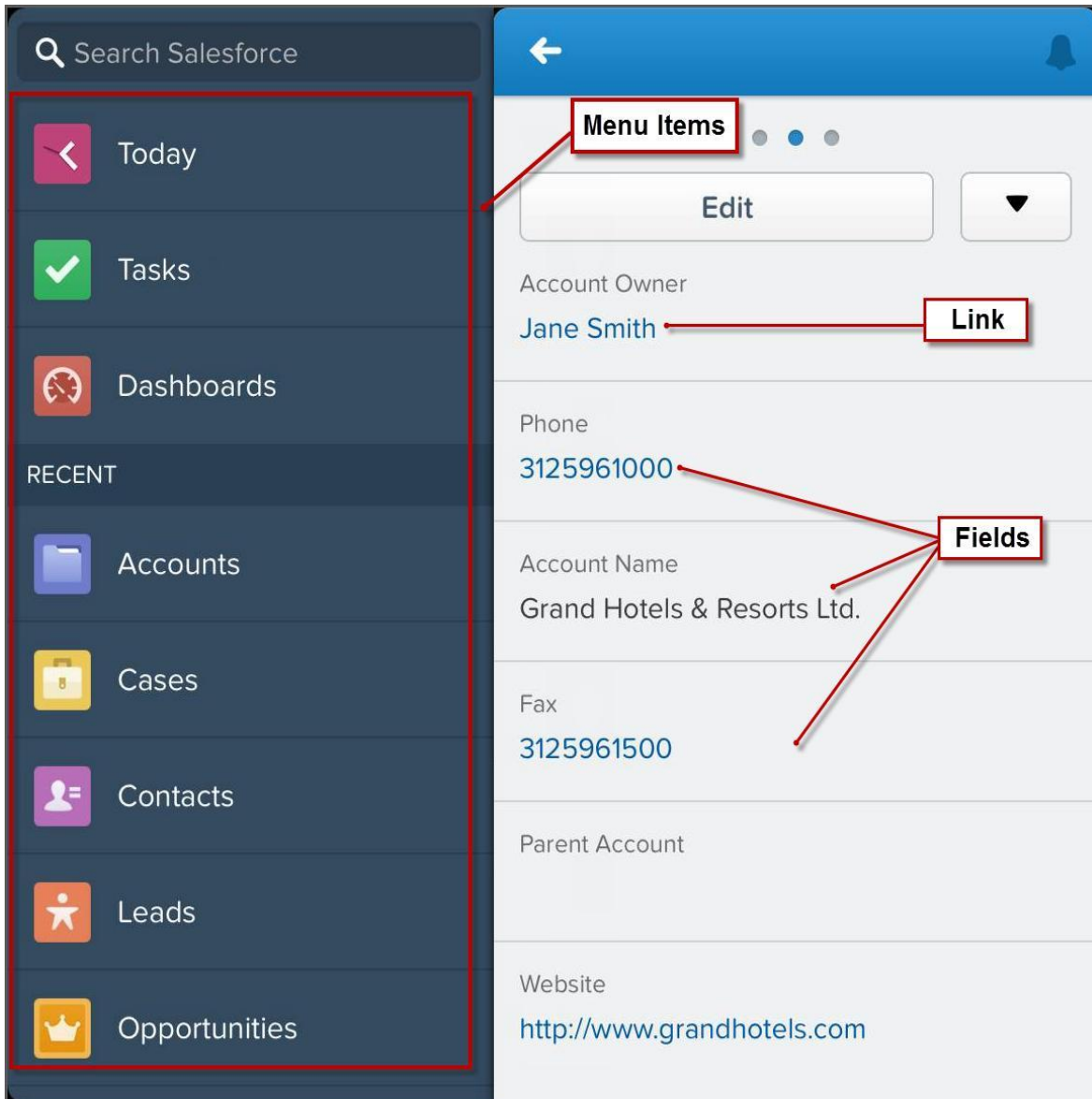


Figure 7: Salesforce Platform Apps in Mobile Include Menu Items, Forms, and Links

Summary

This chapter explained the issue behind the goal to implement the HRS–CRM project and also provided the literature review of the problem which included a detailed description of different terms involved (streamlined operations, enhanced administration & control, superior patient care, strict cost control and improved profitability), and the type of methodology also was discussed. The methodologies explained in literature review helped to get the better outputs compared to the existing process. It also increased the cost effectiveness of a project. Hence it proved the importance of S.A.F.E (Simplifying Analysis for Everyone) methodology in this company.

Chapter 3: Methodology

Introduction

This chapter focuses on implementing the agile methodology to design and identifying which method would be suitable for our current scenario. Each step is explained in detail along with limitations. Data is represented graphically and error percentage is calculated and by the end of chapter we can have a proper method to improve forecasting.

Design of the Study

A solid implementation plan will begin with a sound implementation strategy. S.A.F.E. (Simplifying Analysis for Everyone) methodology will provide adequate data for developing a successful Salesforce CRM application and implementation plan. The primary step is to understand the Organization Business required document (BRD) which will provide all the requirements of the organization. Analyzing the BRD of an organization includes the following process.

- Business logic.
- Number of objects to be created.
- Creating the mandatory fields.
- Creating relationship between different objects.
- The number of users and profiles to be created.
- Creating workflows for the business automation.
- Creating reports and dashboards.
- Providing security at the field-level and object level.
- Creating the permission sets.

- Creating Batch Apex and Schedule Apex.
- Writing test classes for the developed code.

After analyzing the BRD, developing process is initiated in the developing environment with the customization and apex coding language and once the coding is done, it is moved into the test environment and the developed code can be tested with the test classes. After that all the data from different data sources like excel, .csv files, etc., will be loaded into different unique tables. Extraction of the data from sources and load them in the form of schemas will be done, which involves intense data modeling. After the loading of data into unique tables they will be connected to each other relatively for the perfect flow of data and this can be done with using DATA LOADER. Data saved electronically in various forms like excel, MS Access, Oracle, Comma-Separated Values (.CSV files) are extracted into a single desired format without any inaccuracy, redundancy, inconsistency. These data files are queried using salesforce object query language (SOQL) for generating reports which dynamically indicates the performance till the transaction level by implementing complex formulae and different types of charts.

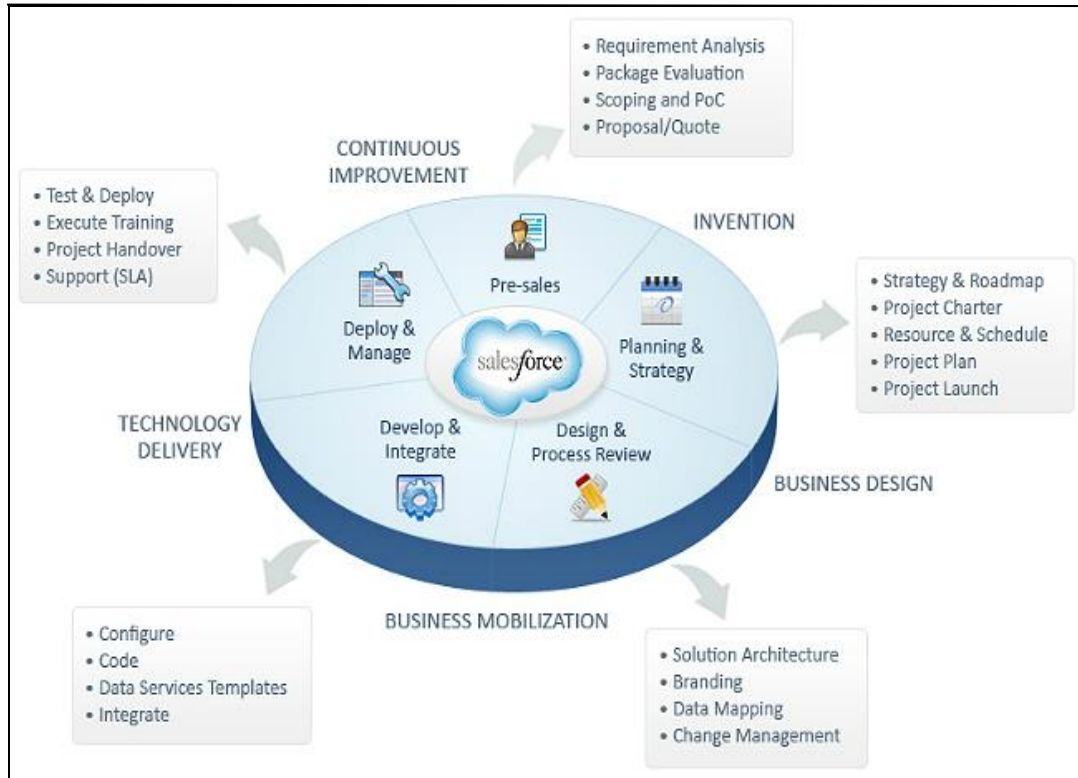


Figure 8: Transaction Level by Implementing Complex Formulae and Different Types of Charts

In the next step, the loaded data which has already gone through the transformation will be used to develop the reports with different types of appropriate charts, tables, and balance scorecards for the foundation of a meaning full Dashboard.

With the Salesforce developed in the dashboard anyone who can access the reports with a glance will find out for which category performance is poor and where can the performance be improved. Balance scorecard aligns key performance measures with strategy at all levels of an organization. Also facilitates with better communication and understanding of business goals and strategies at all levels of an organization. With these salesforce enveloped reports and dashboards improved Decisions, Processes and Better Solutions will be achieved.

Collaborative Apps. By Implementing the S.A.F.E (Simplifying Analysis for Everyone) every department has a details description of they are performing and can verify if they have to do any more improvements that can affect the Hospital Management to take decision. Because the display place can be accessed by multiple users at the same time, it allows you to write apps that are *joint*. A mutual app is an application with data and services that are shared by multiple users in different locations. different more traditional forms of software that are install on a single machine and are hard to access from a distance, mutual apps on the platform can be access from anywhere in the world with only a Web browser. This makes it simple for teams to work as one on activities like selling a product, managing a project, or hiring an employee.

In addition to simple access over a Web browser, an integer of built-in platform features also facilitate productive group collaboration:

- Use the platform security and sharing model to control a user's access to different data (Greenberg, 2004).
- Workflow rules to repeatedly assign tasks, or send e-mail alerts when certain business events occur, such as the construction of a new documentation or a change in the value of a record field.

Approval processes to place up a sequence of steps essential for a record to be accepted, including who must approve it at each step.

Data Analysis

Technologies involved in salesforce are listed below.

Multitenant architecture:

- An application model in which the users share with a single infrastructure which consists of the code base.

Metadata-driven development model:

- The app model development which allows the apps to be defined declaratively such as blueprints which does not require any code.
- Data models and workflows are defined as metadata.

API Access:

- APIs provide direct access to all data stored in sales force from virtually platform.
- The SOAP API and REST API will integrate the company's data with applications mainly.
- The REST full of API loads the large number of records.
- The Metadata will customize the company.
- The streaming API will provide notifications reflecting data of company.

APEX:

- The world on demand programming language runs on the cloud of sales force platform servers.

Visual force:

- A framework which create feature rich interface for apps of cloud.

Mobile access:

- Salesforce mobile apps can access the custom apps which are built in use of salesforce platform development tools.

App exchange directory:

- A web directory of salesforce apps are available to customer for review and for install which submit their apps for the app exchange directory if they share with community.

A Multitenant Architecture. Besides the sales force platform, more than a few popular, consumer-based applications also use a multitenant architecture, including eBay, and Google Gmail. Multitenant architecture allows these application to be low-cost, and open to rapid innovation.

The platform's multitenant architecture also impact how developers use the platform to create new application. Specifically, it define a clear frontier between the platform and the application that run on it. A frontier is important because it allows applications to define their own mechanism without jeopardize the functionality of the core platform or the data stored by other users.

APIs. The platform metadata-driven expansion model allows app developers to quickly build a lot of functionality with tackle provided by the platform; however, app developers want to modify the real data in an app and use third-party services to generate more modified app behaviors (Goodey, 2013). To do this, they can use a number of APIs to put together with the platform. The core set of APIs include Sales force SOAP API the Bulk API, Streaming API, and Metadata API.

Setup area: The Setup area is a place to put up and customize application and to manage and monitor organizations and users, all in one. We execute almost every task we need to generate our app in the Setup area, sections are going to start with an instruction like “From Setup, Click **Create > Apps.**” This is a short way of saying:

- Depending on your association settings, you'll admission the Setup area in one of two ways. Look at the header at the top of the page.
- Formerly you're in the Setup area, you'll see a menu on the left side of the page. then click .

Create > Apps

Setup area:

The screenshot shows the Salesforce Setup interface for the 'Apps' section. The left sidebar contains a navigation menu with categories like 'Salesforce Setup', 'Force.com Home', 'Administrator', 'Build', and 'Customize'. The main content area has a search bar and a 'Patient Management' button in the top right. Below the search bar, there's a description of apps and a yellow banner about user profile tab visibility settings. The main table lists various apps with columns for 'Action', 'App Label', 'Console', 'Custom', and 'Description'. The 'Patient Management' app is selected, and its 'Custom' checkbox is checked. Below the main table, there are sections for 'Subtab Apps' and 'Connected Apps'.

Action	App Label	Console	Custom	Description
Edit	App Launcher	<input type="checkbox"/>	<input type="checkbox"/>	App Launcher tabs
Edit	Call Center	<input type="checkbox"/>	<input type="checkbox"/>	State-of-the-Art On-Demand Customer Service
Edit	Community	<input type="checkbox"/>	<input type="checkbox"/>	Salesforce CRM Communities
Edit	Content	<input type="checkbox"/>	<input type="checkbox"/>	Salesforce CRM Content
Edit	Marketing	<input type="checkbox"/>	<input type="checkbox"/>	Best-in-class on-demand marketing automation
Edit Del	Patient Management	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Edit	Platform	<input type="checkbox"/>	<input type="checkbox"/>	The fundamental Force.com platform
Edit Del	Project	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Edit	Sales	<input type="checkbox"/>	<input type="checkbox"/>	The world's most popular sales force automation (SFA) solution
Edit	Salesforce Chatter	<input type="checkbox"/>	<input type="checkbox"/>	The Salesforce Chatter social network, including profiles and feeds
Edit	Sample Console	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The out-of-the box console for users who work with multiple records on one screen
Edit	Site.com	<input type="checkbox"/>	<input type="checkbox"/>	Build pixel-perfect, data-rich websites using the drag-and-drop Site.com application, and manage content and published sites.

Action	App Label	Description
Edit	Profile (Others)	The tabs displayed when users view someone else's profile
Edit	Profile (Self)	The tabs displayed when users view their own profile

Figure 9: Setup Area

- The tab bar is prepared up of the identical tabs that emerge in the regular application. Just click on any one of the tab to exit the system area and go to that tab in the main application.
- The navigational sidebar include flexible lists of all the tools that are available in the Setup area. The tools include options for setting up, maintaining, and customizing and managing apps.
- The main window is where the navigational links or a chosen setup tool are actually displayed.
- Everything that appears as a tab must have an exclusive color scheme and icon. This color scheme is what identify the object, not only on its tab but also in different places in the user interface, such as in related lists and search results.

The screenshot shows the Salesforce 'New Custom Field' configuration page for a 'Hospital' object. The page is titled 'New Custom Field' and is in 'Step 2. Enter the details'. The 'Field Label' is 'Departments' and the 'Field Name' is 'Picklist'. The picklist values are: Internal Diseases, Surgery, Anesthesia, Sports Medicine, Emergency Room, Dental, and Pediatrics. There are checkboxes for 'Sort values alphabetically, not in the order entered. Values will be displayed alphabetically everywhere.' and 'Use first value as default value'. The left sidebar shows navigation options like 'Salesforce Setup', 'Administer', and 'Build'.

Figure 10: New Custom Object Tab

Budget

All the costs that were incurred during this project like licensing, server costs, equipment costs, database installation and handling costs, resources, maintenance and other miscellaneous costs were covered by the company.

Time Line

After an appropriate analysis of the organization and the necessities, time for this project might be from 4-5 months, where I could defend my project in fall 2015.

- April '15–April '15: Understand the organization structure and its BRD.
- April '15–May '15: Developing of the business logic, designing the database, creating objects, workflows etc.
- May '15–June '15: Testing of the developed code and developing of the reports and dashboards with different charts, tables, using the loaded data and import/export of is done by using data loader
- August '15–Documentation of the whole project.
- September '15–Final Defense.

Summary

The Hospital Management System (HMS) is intended for Any Hospital to switch their current manual, paper based system. The new structure is to control the following information; patient information, room availability, staff and operating room schedules, and patient invoices. These facilities are to be provided in a well-organized, cost effective manner, with the objective of reducing the time and resources currently required for such tasks.

An important part of the process of any hospital involves the acquirement, management and timely renewal of great volumes of information. This information usually involves; patient individual information and medicinal history, staff information, room and ward arrangement, staff arrangement, operating theater scheduling and various facilities waiting lists. All of this data must be achieved in a capable and price wise manner so that an organization's properties may be effectually utilized HMS will automate the administration of the hospital making it more well-organized and error free. It aims at normalizing data, merging data ensuring data integrity and reducing inconsistencies.

Reception: The reception module levers various investigations about the patient's admission and discharge details, bed registration, and the patient's schedules within the hospital. The organization can also lever secure-price package deals for patients as well as Doctor Meeting and Scheduling, Doctor Consultancy Fees and Time Apportionment.

- Doctor visit timetable
- Doctor Appointment Scheduling
- Enquiry of Patient
- Find History of Patient Enquired.

Administration: This module handles all the main entry details for the hospital prerequisite such as consultation detail, doctor specialization, consultancy fee, and package charges.

Employee

- Employee Detail Recording.
- Doctor Type.
- Doctor Master
- Referral Doctor

Pharmacy: This module deals with all medical items. This module helps in upholding Item Chief, Delivery of Drugs/consumables, issue, management of material return, generating retail bills, stock conservation. It also helps in satisfying the necessities of both IPD and OPD Pharmacy.

Laboratory: This module enables the care of investigate on requests by the patient and generation of test results for the many existing facilities, such as clinical pathology, X-ray

and ultrasound tests. Requests can be made from several points, organized with wards, billing, sample collection and the laboratory delivery point. The laboratory module is cohesive with the in-patient/ outpatient registration, wards and billing modules.

Registration: This module helps in process data about patients and management both IPD and OPD patient's query. A unique ID is created for every patient after registration. This helps in executing customer relationship and also upholds medical past of the patient.

The project "hospital management system" is designed to uphold the day-to-day state of admission/discharge of patient's, list of doctors, reports generation, etc., it is designed to achieve the following objectives.

- To automate all particulars concerning patient details & hospital details.
- Forecast the appointment of patient with doctor to make it suitable for both.
- Scheduling the facilities of focused doctors and emergency accurately so that Services providing by hospital are fully employed in effective and efficient manner
- If the medical stock issues medicines to patients, it should reduce the stock status of the medical store and vice-versa
- It must be able to lever the test reports of patients conducted in the pathology Lab of the hospital.
- The record should be updated automatically whenever a transaction is made.
- The information of the patients must be kept up to date and there record should be kept in the structure for historical purposes.

Chapter 4: Data Presentation and Analysis

Introduction

This chapter focuses on the presentation and analysis of the reports and data that are developed in the App for easy data access, to improve visibility flow. As the organization dealt with the confidential data; the author was not authorized to use any real time data for this project.

The process, the method and any programming used was exactly the same. The data representation is just an example; which was gathered solely for the purpose of this project.

Data Presentation

The screenshots of Salesforce CRM application where the business user interface to login and use the built functionality. Also how the front end used makes the respective changes to the back end table are also shown in below screen shots.

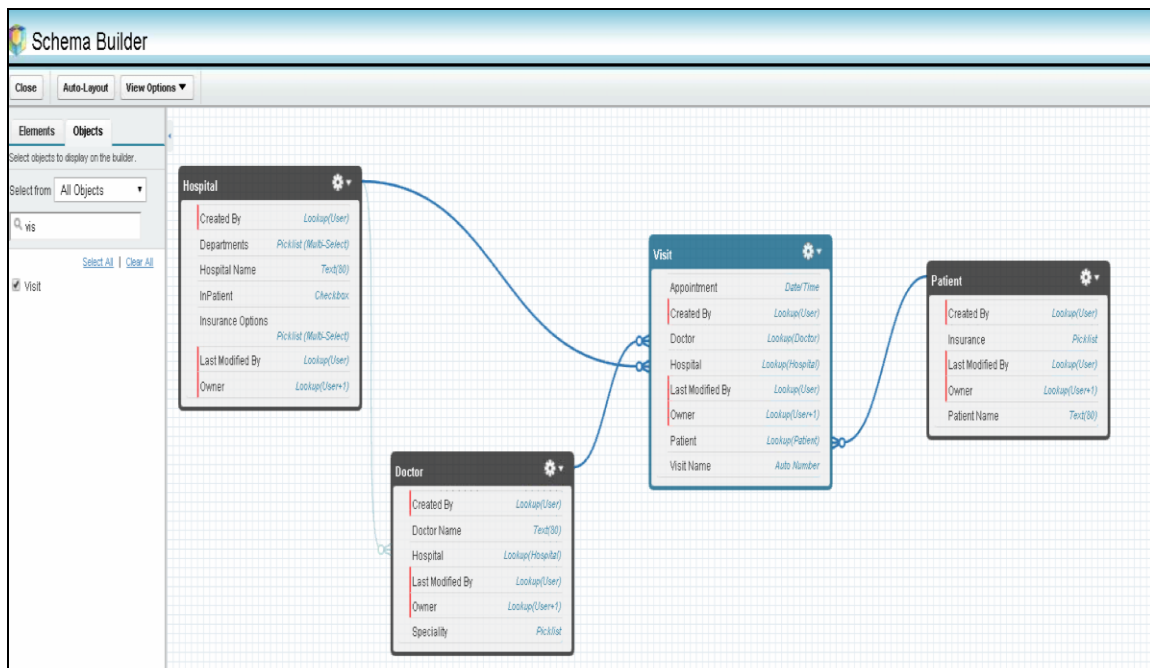


Figure 11: Schema Builder



Figure 12: Pie Chart Description

Data Analysis

There are different ways to organize data in a database but relational databases are one of the most effective. Relational database systems are presentation of exact set model to the problematic of effectually establishing data. When shaping data into tables, you can typically find many different ways to define tables. Relational database model defines a process, standardization, which confirms that the set of tables you define will organize your data successfully.

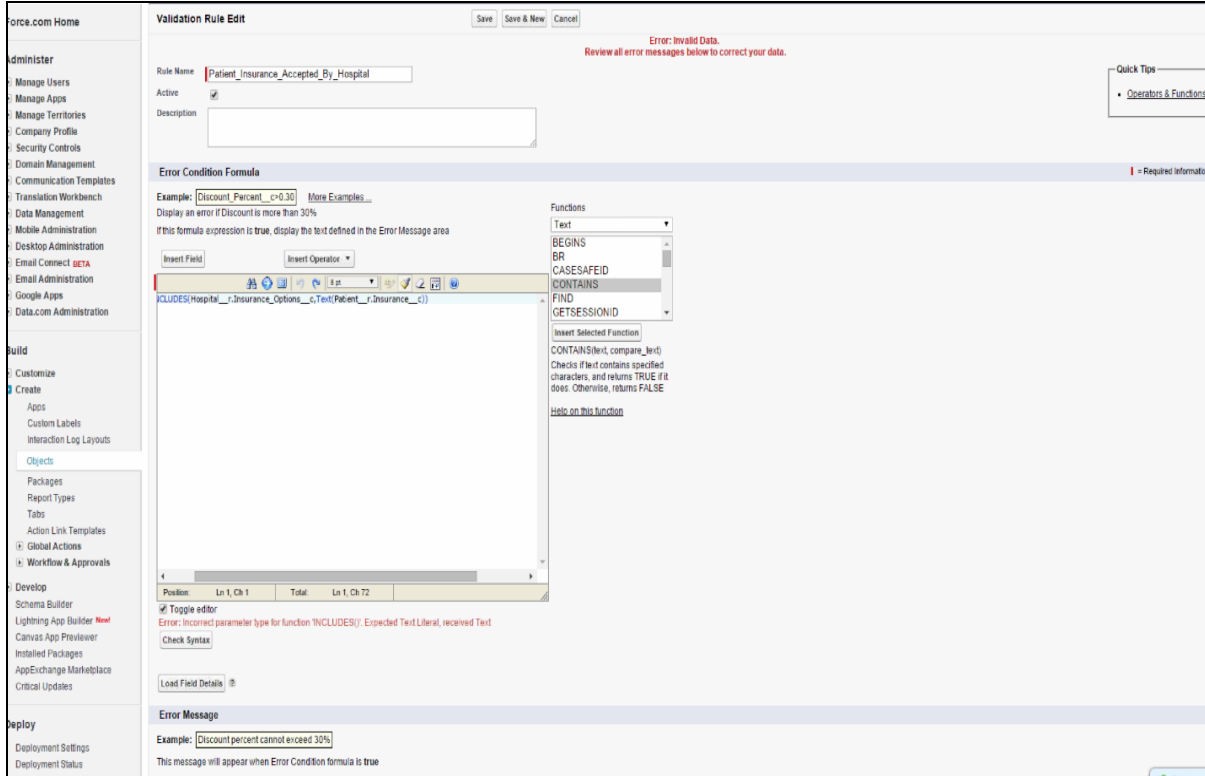


Figure 13: Dynamic SOSL

Client/Server: In a client/server system, the server is a comparatively large processor in a central location that manages a resource used by many people. When entities need to use the source, they attach over the system from their workstations, or clients, to the server.

In a client/server record planning, the database files and DBMS software reside on a server. A communications module is provided so applications can run on discrete clients and communicate to the database server over a system. The SQL Server communication component also allows communication between an application running on the server and SQL Server.

The screenshot shows the Salesforce 'New Custom Field' configuration page for a 'Hospital' object. The page is titled 'Step 2. Enter the details'. The 'Field Label' is 'Department', and the 'Field Name' is 'Picklist'. The picklist values are: Internal Diseases, Surgery, Anesthesia, Sports Medicine, Emergency Room, Dental, and Pediatrics. There are checkboxes for 'Sort values alphabetically, not in the order entered. Values will be displayed alphabetically everywhere.' and 'Use first value as default value'. There are also fields for 'Description' and 'Help Text'.

Figure 14: Salesforce Customize Fields Setup

Custom field as shown in the above figure is a sales force in built functionality providing developers an advantage of creating application specific fields. It can be pre-built values so that users can pick from the dropdown options. It can be an input field where users are given the independence to type in the field values. Also, these fields are documented with description for both user and developer understanding. These custom fields play a vital role in application development and architectural mapping.

The screenshot displays the Salesforce 'Visit' custom object configuration page. The left sidebar contains navigation options like 'Salesforce Setup', 'Force.com Home', 'Administer', 'Build', and 'Develop'. The main content area is titled 'Visit' and includes a breadcrumb trail: 'Standard Fields (6) | Custom Fields & Relationships (6) | Validation Rules (1) | Page Layouts (1) | Field Sets (2) | Compact Layouts (1) | Search Layouts (1) | Buttons, Links, and Actions (1) | Record Types (1) | Apex Sharing Reasons (1) | Apex Sharing Recalculations (1) | Object Links (1)'. Below this, the 'Custom Object Definition Detail' section shows fields like 'Singular Label', 'Plural Label', 'Object Name', and 'API Name'. A 'Description' section contains various checkboxes for features like 'Enable Reports', 'Track Activities', and 'Allow Sharing'. The 'Standard Fields' table lists 'Created By', 'Last Modified By', 'Owner', and 'Visit Name'. The 'Custom Fields & Relationships' table lists 'Appointment_c', 'Doctor_c', 'Hospital_c', and 'Patient_c'. The 'Related Lookup Filters' section is currently empty.

Figure 15: Entering Visit Details

After successful creation of all custom fields and default fields, custom objects are created. These custom objects are appropriately mapped to their relative fields, ensuring systematic approach to the functioning. These are typically UI enriching elements, providing various user-friendly options such as checkboxes, clear options, edit options, dropdowns, tabular views, and also various time based options such as created time stamp or modified time stamp. To make it user compatible, objects are provided with minimize and maximize functionality.

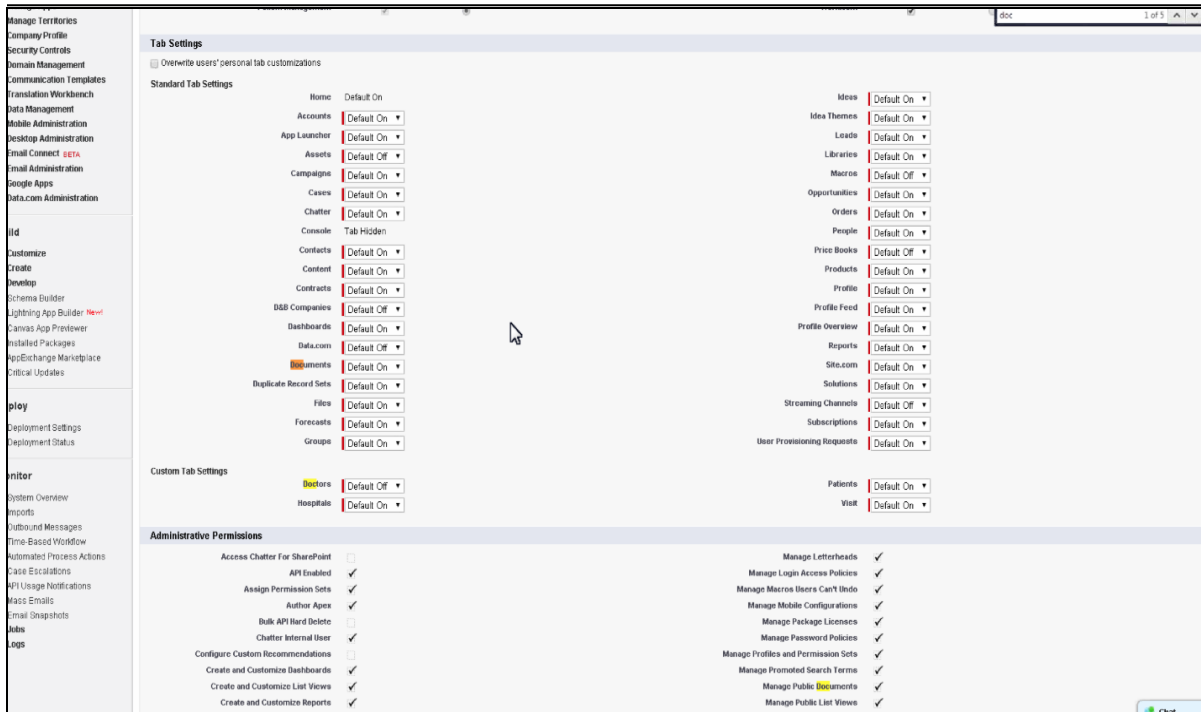


Figure 16: Administrative Permissions

The above image describes the customization of the data types by selecting the tab settings and also arranging the administrative permissions. These permission describes which person has the authorization of certain web page and who can access. By giving the permission there would not be nay unnecessary confusion and level of details each person or department can access.

These data files are queried using salesforce object query language (SOQL) for generating reports which dynamically indicates the performance till the transaction level by implementing complex formulae and different types of charts.

The screenshot displays the 'Hospital Details' page for Kaiser Permanente in the rprize system. The interface includes a top navigation bar with 'Home', 'Doctors', 'Hospitals', 'Patients', and 'Visit' menus. A sidebar on the left lists 'Recent Items' such as 'Kaiser Permanente', 'Dr. John', and 'VA-0001'. The main content area is divided into three sections:

- Hospital Detail:** Shows the hospital name 'Kaiser Permanente', owner 'rohila reddy (Change)', and various attributes like 'InPatient' (unchecked), 'Departments' (Surgery, Anesthesia, Sports Medicine, Emergency Room, Dental, Pediatrics), and 'Insurance Options' (Amerigroup, Aetna, Bcbx, United health, Humana, Medgo, CVC CareMark, Optum PPO, Kaiser Permanente, Sigma). It also lists creation and last modification dates by 'rohila reddy'.
- Visit:** A table listing visits with columns for Action, Visit Name, Appointment, Doctor, and Patient. One visit is shown for 'VA-0001' on '10/15/2015 7:13 PM' by 'Dr. John' for 'Mr. Adam'.
- Doctors:** A table listing doctors with columns for Action, Doctor Name, and Specialty. Three doctors are listed: 'Dr. Chandrabhaskar' (Dermatology), 'Dr. Choudhary' (Internal Medicine), and 'Dr. Chhabra' (Rheumatology).

Figure 17: Overview of Hospital Details

The above image describes the Hospital the provides the treatments to the patients, different types of insurance options it carries and after entering the details it show a clear picture of “doctor Name” and the area in which the doctor specializes called as “Specialty”.

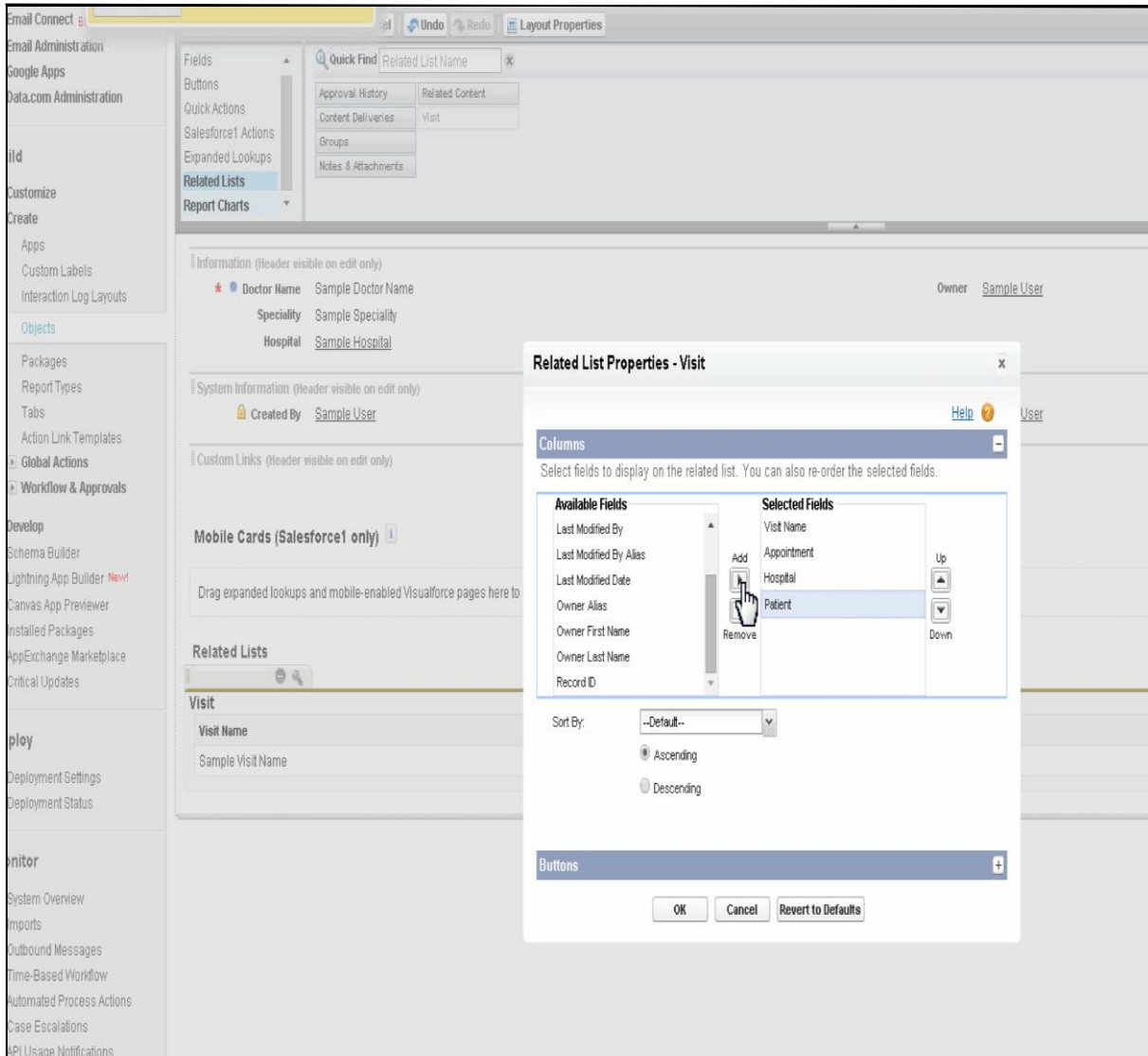


Figure 18: Related List of Properties to be Added

The above images describes an over view of the data entry for the patient, doctor and hospital details. There is an option of selecting the properties like (Last Name, First Name, department and Patient name, Hospital, Visit Name and many more). We can select any specified details that has to be present in our Salesforce web page.

The screenshot shows the 'New Visit' form in the rprize application. The form is titled 'Visit Edit' and 'New Visit'. It contains the following fields and values:

- Patient: Mr. Aizer
- Doctor: Dr. John
- Hospital: Kaiser Permanente
- Appointment: 10/13/2015 7:12 PM

A red error message is displayed: "Error: Invalid Data. Review all error messages below to correct your data. Insurance Provider Not Accepted By the Hospital". The form has "Save", "Save & New", and "Cancel" buttons.

Figure 19: Adding New Visit Details

The above image describes patient, doctor, hospital and Appointment details. Each one has to be entered separately and they will be linked to the main page so that the drop down shows and we can select whichever is needed. We can also select the data types.

The screenshot shows the 'Visit Detail' form for visit VI-0001 in the rprize application. The form displays the following details:

- Visit Name: W-0001
- Patient: Mr. Adam
- Doctor: Dr. John
- Hospital: Kaiser Permanente
- Appointment: 10/15/2015 7:13 PM
- Created By: rshila.reddy, 10/13/2015 7:13 PM
- Owner: rshila.reddy (Change)
- Last Modified By: rshila.reddy, 10/13/2015 7:13 PM

The form has "Edit", "Delete", and "Clone" buttons.

Figure 20: Adding Visitor Details

The above image describes how to add a visitor details in to the salesforce web. It gives the visitor name and ID for him/her so that helps for the next visit and can be retrieved whenever needed. The patient Id will be connected to the doctor he/she is visit, also mentioned the Insurance details and the Hospital he/she will be visiting. The appointment time will also me mentioned. This can be edited and saved whenever needed.

The screenshot shows the Salesforce interface for adding a new doctor. The top navigation bar includes the 'rprize' logo, a search bar, and user information for 'rohila reddy'. The main navigation menu has 'Home', 'Doctors', 'Hospitals', 'Patients', and 'Visit'. The left sidebar lists 'Recent Items' such as 'Kaiser Permanente', 'rohila reddy', and 'Grand Hotels Kitchen Generator'. The central form is titled 'Doctor Edit' and 'New Doctor'. It contains the following fields: 'Doctor Name' (Dr Kiletrick), 'Specialty' (Dermatology), and 'Hospital' (Kaiser Permanente). The 'Owner' is 'rohila reddy'. There are 'Saving...' buttons at the top and bottom of the form. A red exclamation mark indicates 'Required Information'.

Figure 21: Adding New Doctor Details

The image describes How to add doctor details into salesforce. It give details of Specialty and the Hospital he or she works. The information that we enter can be edited and can be updated whenever needed. This will be linked to the Visitor details so that they pop-up when we select the doctor. There might be different kinds of designations.

The screenshot shows the 'New Hospital' form in the rprize application. The form is titled 'Hospital Edit' and contains the following fields and options:

- Hospital Name:** Kaiser Permanente
- Owner:** rohila reddy
- Inpatient:**
- Departments:**
 - Available:** Internal Diseases
 - Chosen:** Surgery, Anesthesia, Sports Medicine
- Insurance Options:**
 - Available:** AlwaysCare
 - Chosen:** Amnrgroup, Aetna, Bcbs

Buttons for 'Save', 'Save & New', and 'Cancel' are located at the top and bottom of the form area. A mouse cursor is pointing at the 'Save & New' button at the bottom.

Figure 22: Adding New Hospital Details

The above image describes the New Hospital details. The name of the hospital, Inpatient and outpatient details. The different availability of departments can also be updated, they can be directly linked to the doctor details they pop up whenever we select the doctor in the drop down.

Summary

This chapter covered the data presentation of the HR module application developed and its representation. These data gathered are analyzed using different types of reports/charts like above. The author delivers a final summary of the project in the next chapter by explaining the results of data analysis in Chapter 4 and also providing answers to questions from Chapter 1.

Chapter 5: Results, Conclusion, and Recommendations

Introduction

In this chapter the author summarizes the whole project by discussing results and recommendations.

Results

How the automation is done between the various departments in Salesforce

CRM?

Automation can be done by setting the relationship between various objects.

- Reception
- Administration
- Pharmacy
- Laboratory
- Registration

Automation can be done by setting the relationship between various objects. A relationship allows each record of one object to be linked to multiple records from another object and vice-versa. So, that any changes that made to a record of one object will be automatically updated to the related record of another object.

Where can the spending of budget be controlled while comparing to the previous year's spending?

Depending upon the salesforce reports and the analysis it analyzes customer data, coming from various touch points, to get better insights about current status of organization.

So, that by comparing the previous reports and the latest reports budget allocation can be controlled on various departments to get the desired results.

Which department in the medical center is performing efficiently and effectively?

Reports also helps top management, sales department and marketing management to evaluate its success of a particular activity or a particular group engaged and is also used to set goals or rules, for objectively accessing the achievements and to provide feedback on any unwanted variance between achievements and goals.

Conclusion

Salesforce CRM is a dedicated tool that helps the insurance company stay competitive and updated. Salesforce CRM provides a very simple user interface. Features a robust combination of sales, marketing and support with expert collaboration functionality, so individuals across the business can get the crucial information they need right when they need it which helps in total cost reduction and reducing risk factor.

Recommendations

Though the project implementation was successful the main concern was about data migration. The team should be very focused regarding generating the security tokens, adding IP address, mapping the objects and migrating the data from one environment to another environment.

- Business users should get proper hands on the application. So, they can easily handle and analyze the reports.
- The jobs are to be properly aligned and related, where one would trigger after a successful completion of the prior jobs.

- Any questions with the application user can go to help provided in the applications. If any sever related issues contact salesforce support.

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