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Extensive Medical Application Using Windows Phone

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ABSTRACT

Developing applications for Windows Phone these days has become more captivating. Till date, people have been using Visual Studio and Expression Blend to implement Windows Phone applications. By using these two Software Development tools developers used to develop mobile applications with great achievement. Accordingly, Microsoft used to take some great changes to improve the Developer and end user experience on the Platform of Windows Phone. Additionally, Windows Phone App Studio is such a great initiative. In other hand Microsoft has recently introduced Project Siena to design Metro Application in WP. All these great tools have results windows phone app creators excited because of their greatness but user friendly features. In this Project we are going to develop an application based on exploring our medicine products with facility of order products from app.

In this windows phone application, we are maintaining list of medicine products like tablets, ear and eye drops and etc. Each product contains unique name with different combination of medicines that are measured in Mg (Milligrams).

This application derived in 5 tiles i.e. Order Products, Price Estimator, Ask Question, Information and Feedback. In Order Products tile, customers can able to scroll the list of all products and they can order by selecting products. Price estimator allows user to estimate the cost by selecting the product and quantity. Ask Question tile, allows user to ask any question or required information to know the information from administrator. Information tile, allows users to know the contact details of organization by clicking on contact us and partners to get supporting business partner’s information. In Feedback tile, users can write the review to organization regarding products and application.
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1 Feature Description

In this application, we have two major modules that are Administrator and User. Administrator can add new products to database as well as admin can remove or modify existing products in database. User need to register in order to enter the application then after user can scroll all the products and also order products by using application. User can ask Questions, give feedback on products and also able to calculate the price before ordering products.

To develop app in Windows Phone we use C#.Net as front end technology and XAML as a User Interface Design. To retrieve and save the data we consume WebServices in our application. To implement WebServices we use C#.NET, ASP WebApi and SQL Server 2012 as a backend. Before deploying application into Microsoft App Store, we test application using Windows Phone Emulator or a mobile Device.

Modules of Project:
1. Administrator
2. User

1.1 Competitive Information

Windows phone application competes with multiple commissary software products like apple, google and other devices. Windows try to give tough competition, as it is not so easy to use. Titles in the phone is unique and update in real time, whereas other products are not designed with tiles. It is effective in flexibility, compatibility and security.

1.2 Relationship to Other Applications/Projects

There are many different kind of applications related to the medical field in the market. Some Mobile Medical applications helps to track symptoms of disease, to check the blood pressure etc., and some will help us to know the information of the drug which is required for patients, clinicians or medical professionals. Extensive medical application provides the concise prescription and drug information. Sometimes it’s difficult to get the product of the same brand customer prefers to buy. This feature makes our app different from others where customers can buy medicines which is manufactured by particular company.

1.3 Assumptions and Dependencies

This application works on, products available in medical company in which customers can view products, order, estimate the price, even ask question regarding products and give feedback on products and requirements. As per our research, we didn’t find any similar application on windows phone market place.
Extensive medical application doesn’t depend on any other applications, it is quite unique and new. But the main aim of application is well known, that representing medicine of an organization with medicine combinations. This application helps customer in finding specific product with all aspects like medicine combinations, price with expired dates.

1.4 Future Enhancements

Current version of our application doesn’t contain any Shipping features, online payment facility, online/offline chat functionality and social media integration.

For the next version, we are planning to integrate PayPal payment gateway, USPS and FedEx shipping configuration, online chat feature and Social media integration to login with Facebook or Google account with social share features.

1.5 Definitions and Acronyms

API- Application Program Interface
XAML- Extensible Application Markup Language
MVC- Model View Controller
HTTP- Hypertext transfer Protocol
SRS- Software Requirement Specifications

2 Project Technical Description

Technically, this application consists of new service technology MVC WebApi, entity framework and SqlServer developer 2012 for backend support. In the front end, it contains XAML for the user Interface and coding language C#.Net. To consume services, it uses Serialization to synchronize and asynchronies the data.
2.1 Application Architecture

Figure 1. Architecture of Extensive Medical Application

Architecture description:

Back-end support:

Initially data base is designed then created stored procedures and used entity framework, also used services (web api) to get data and post data in database. In order to connect, connection string is used to connect with database that is generated by entity framework. Rest Web api service is used to connect to database. Service adaptor is defined in WebApi Configuration class with routemap to access controller with controller actions. As it is MVC application, i.e., Model View Controller Architecture View and models placed in views and models folder respectively. Business Objects are stored in models folder.

Front-end:

User Interface is designed using XAML and WPF. C# is used for coding.
2.2 Application Information flows

Below medical application architecture diagram describes mainly flow of data from database to mobile and users uses the application. In this process, overall application is designed in three layers called presentation layer, business logic layer and data link layer.

Figure 2. Application Information Flows
2.3 Interactions with other Applications
We Choose this application from basic windows medical application and thought of developing unique features for Windows phone. Until today, there is no Windows Application feature to order and buy medicines. This application is user friendly, customers can order, buy products online, ask any questions and also give feedback on the products. Admin plays a key role in adding new products and manages the questions and feedback.

2.4 Capabilities
This application is capable of different tiles like, Products, Price Estimator, Question, Feedback, Info and also Profile of Customer. Here, admin can manage product information like, adding and deleting new medical products and responds to questions, likewise views the feedback.

2.5 Risk Assessment and Management
In the Beginning of the application, it is a basic medical application with only products information and profile of user. Later, we managed to develop a great application with brand new features even it is risky. Below is Risk Management plan:

- Maintains products of the Mobile Application
- Estimates products price
- Manages questions and feedback
- Estimate Budget for the application
- To design Blue print
- Risk management is handled

3 Project Requirements

3.1 Identification of Requirements

The main requirement of the project based on Database design, User Interface, User and Administrator. These can be divided as requirement specifications:

Database design:
Initially, Database is designed with required tables and relationships.

User Interface:
In order to comfort user, User Interface must be well designed that helps user to scroll for titles in the application.
User:
User can check and order for the products and ask questions and give feedback based on requirements. This application is User-friendly. Customers can login the page using login ID and Password and view all the products and estimate the price and order for products.

Administrator:
Admin plays a major role, checks and update the products and information. Admin also reply to questions. He has overall authorities to control the application. Admin has unique Email ID and Password to update the product information.

3.2 Operations, Administration, Maintenance and Provisioning (OAM&P)

Most of the customers prefer buying drugs/medicines through the application. But when they buy products they should be very sure about the information of the products they are buying. Because in some apps you cannot find any feature which can support your decision or thought when you are making any purchases, and that tend to be very risky. So, when the information of the drug/medicine is incorrect or when customers randomly pick the product without consulting health professionals, that tend to be very dangerous. So, to overcome this situation we have provided two tiles Ask Questions and Information. With Ask Question tile customers will be able to ask questions regarding the product and also will get suggestions before ordering the product. And information tile will provide all the details of the product including ingredients, and manufacturer of the product which will help customer to purchase exact product what they are looking for and get benefited.

3.3 Security and Fraud Prevention

There is no chance to decrypt any information since we are providing Web Api services, services itself is a secured way to because it contains CSRF i.e., Cross Site Request Forgery. Authentication Filter is a in-built component of MVC WebApi, that’s authenticates an HTTP responses. Therefore, information is maintained with security.

Securing data with AZURE:

As our application is hosted in Azure, it is protected at host, physical, network and data layers so that it is very secured.

3.4 Hardware Requirements

<table>
<thead>
<tr>
<th>Processor</th>
<th>Intel I3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ram</td>
<td>2GB.</td>
</tr>
<tr>
<td>Hard Disk</td>
<td>80 GB.</td>
</tr>
</tbody>
</table>
Emulator : 8.1 WVGA 4 INCH 512MB with Hyper-V Enabled
or Windows Mobile with OS 8.1

**Software Requirements:**
- Operating System : Windows 8.1 Pro/Enterprise
- Language : C#.Net, XAML, Asp WebApi 2.0, Entity Framework 5.0
- Software : Visual Studio 2012/13 with Windows Phone 8.1 SDK
- Database : MSSQL Developer 2012

4 **Project Design Description**

In windows phone application XAML is used to design the interface. In this project User and Admin modules are divided into 6 Tiles are Products, Estimator, Question, Feedback, Info and Profile. Before module functionality user need to register and login to enter the application. Here the explanation of each tile and functionality of current version.

**Registration:**

For any application, weather web or mobile user need to register to access or benefit from the application. In this application Registration Window looks like,

![Registration Window]

User need to enter First name, Last name, Email and password in order to register with application. After registration window will redirects to Login page.

**Login:**
To verify the credentials and access confidential data from application user need to login with his credentials.

Here are the fields First name and password to login to application. We are using REST Service to check the user details are valid or not. If it returns success, then it will redirect to Home Screen.

Home Window:
Home Window represents all the major tiles involved in this application. It is one place to get all the information about application.

It displays major Tiles Are Products, Estimator, Questions, Feedback, Info and Profile.

Product Tile:
It Displays all the list of medicines to the user with price and combination. If admin logins to the application, it allows admin to add new product, Delete and Update at the same time it allows user to Order the products.

Estimator Tile:
It allows user to estimate the price of a product before order the product.

In the field of Select Product, user need to select the specific product and in enter the quantity in Quantity field and then user can get Estimation by clicking the Submit button.

Question Tile:
It allows user to write question to the administrator regarding the product or combination and whatever he needs.
User need to write the question in Write Question Text Field and hit the Submit button to ask a question.

Feedback Tile:
It is same as Question Tile, but user can give feedback about product or application if he wants.

User need to write the feedback in Write Feedback Text Field and hit the Submit button to submit a feedback.

Info Tile:
It represents the information of the Organization.
Profile Tile:

It allows user to Update his details, Logout from the application and Deactivate the account.

User need to give first name, last name, email and password to update his details and by clicking on Logout to logout from application and Deactivate button to deactivate the account.
5 Internal/external Interface Impacts and Specification

Database design:

To create and manage SQL database scripts MS SQL 2012 is used. Developed applications with visual studio .Net because of the tools available that made project to work easier and faster. The Visual Database tools allow us to view, design, modify, and test database objects (for example, tables, views, queries, stored procedures, and so on) quickly without having to jump from the Visual Studio environment to a different toolset. In some applications, a database project may be part of the actual application code, and in other applications, it may be part of a separate administration solution used to set up and maintain the application’s database.

In our database we are maintaining and storing the details of the customer which include first name, last name, email, address, mobile number, address, created date, status, role id, password. And the information of the product such as product id, name, quantity, combination, type, expiry date, status, price. questions asked by the customers include question id, user id, question, question date. and feedback given by the customers include feedback id, user id, feedback. And order database includes order id, product id, user id, order date, status, order price. And the role table include role id, role name.

In this application Microsoft Sql Developer 2012 is used to design and create database. The Extensive Medical Database contain 6 tables are, User, Role, Products, Order, Feedback and Question.

User Table:

User table contains user information with the columns are User Id, Firstname, Lastname, Email, Mobile Number, Role Id and Password. User Id is defined as Primary Key and RoleId as Foreign key.
Role Table:
It describes the registered person is Admin or User.

Products Table:
Product table is used to save new products and retrieve existing products details.

Order Table:
It is used to save Order details like what product was ordered by which user.

Question and Feedback Tables:
Question table used to save questions asked by Users from the application. As well Feedback table is used to save and retrieve feedbacks from the user.
Relationship Diagram:

Figure 4. Database Diagram
Entity Framework:

Entity Framework (EF) is an object-relational mapper that allows .NET developers to develop and work with relational data using domain-specific objects. It removes the main need for most of the data-access code that developers usually need to write.

By using entity framework we can access our database with stored procedures in our front-end application by following steps,

![Entity Data Model Wizard](image)

Figure 4. Entity Data Model Wizard

In above diagram, it displays Tables, Views and Stored Procedure expansions. It allows developer to select needed tables and stored procedures to add them to application. Entity framework will generate connection string and set it in Web.Config file automatically. By
creating Object for the entity developer can call Business Objects, stored procedures and functions created in database.

Model Browser:

It is used to manage and update Entity framework objects form the database. In above figure displays Tables, Stored Procedures, Function imports and Complex types with entity types. It helps developers to generate complex to the functions and stored procedures. Entity framework will generate relationship diagram of the tables to simplify the relations between the tables.
Figure 6 Entity Relationship Diagram

For developer flexibility EF will create a folder in Solution Explorer with existing Business Objects, Functions, Stored Procedure complex types with custom tool. It reduces lot of work to the developer by generating Business Objects from the database with constructors. It also generates return result functionality of the stored procedures as shown below image,

5.1 WebApi:
Web API has been around for many years. It is a very efficiently used and very lightweight technology to build RESTful web services in .NET. WebApi is almost equal as .NET MVC with its controllers and routing rules. Therefore, if we are familiar with MVC then it is not so difficult to get using with WebApi either.

In above image, to create a Web Api application developer need to check the WebApi and MVC in ASP.NET Project. If developer has an Azure account, then developer can check the Microsoft Azure Host in the cloud.

Before start writing the services developer need to set the RouteConfig and WepApiConfig settings in AppStart folder as shown below,

For the RouteConfig.cs,

```csharp
public class RouteConfig
{
    public static void RegisterRoutes(RouteCollection routes)
    {
        routes.IgnoreRoute("{resource}.axd/{*pathInfo}"");
        routes.MapRoute("
            name: "ProductsList",
            url: "Products",
            defaults: new { controller = "Products", action = "GetAllProducts", id = UrlParameter
            }
        };
    }
}
```

In RouteConfig file developer need to initialize the route of the service, for that he need to set parameters are name, URL with Controller name, controller action with supporting parameters of
an action in MapRoute method of Routes. It defines the route of a service and what are the controllers and actions need to be run.

For the WebApiConfig.cs,

```csharp
public static class WebApiConfig
{
    public static void Register(HttpConfiguration config)
    {
        config.Routes.MapHttpRoute(
            name: "DefaultApi",
            routeTemplate: "api/{controller}/{action}/{id}",
            defaults: new { id = RouteParameter.Optional }
        );
        config.EnableSystemDiagnosticsTracing();
    }
}
```

In WebApiConfig file developer need to initialize the Map Http route of the service controller, for that he need to set parameters are name, routeTemplate with supporting parameters. It defines the api configuration of route of a controller. In routeTemplate developer need to specify the order or Service form of URL like api/ControllerName/Action Name in a controller/ Parameters of an Action.

In this application, Product controller was created with actions to perform CRUD operations in database tables are User, Products, Orders, Feedback and Questions. The actions are described as Get and Post Services to perform CRUD Operations.

The Code as follows,
As per the above code snippet, Product Controller was created under Controllers Folder and it inherited from API Controller. After creating Controller developer created an object for the Data Entity like,

```
Extensive Medical Entity entity = new Extensive Medical Entity();
```

After creating Object for the entity, an action was developed and named as Add New User with the parameters fn, ln, email and password. These parameters are passed to stored procedure which was called using object of entity. After adding user using service the changes will be saved by entity.SaveChanges();.

After all the process if service returns success it will be saved to database or it will return exception. This will be exception handled by try catch block.

At the end, the service URL looks like,

```
api/Products/AddNewUser?fn=UserFirstName&ln=UserLastName&email=Username@gmail.com&pwp=UserPassword
```
as per the WebApiConfig routeTemplate Setting,

```
routeTemplate: "api/{controller}/{action}/{id}".
```

### 6 Project Design Description

#### System Design

Basically, UML is a Unified Modelling Language for describing the application architecture in detail using the blueprint. This method is used for modelling of large and complex systems. This has proved in many areas and succeeded. UML is used for developing objects oriented software. Graphical diagrams are used to design the software projects in UML. UML helps in using project teams communicate, explore potential designs, and validate the architectural design of the software. Communication in project team, exploration of potential designs and architectural design of the software uses UML for ease of project design.

#### Definition:

UML is a visual modeling language that is used for specifying, visualizing, constructing, and document the graphical of the software system.

#### UML is a language:

It provides specific vocabulary and rules for communications and functional on conceptual and physical representation.

#### UML Specifying:

Specifying means building models that are exact, accurate and complete manageable. Usually, the UML address the specification of all the important analysis, designing decisions that should be made in developing and displaying a software intensive system.
UML Visualization:

The UML is represented in both graphical and textual form. It makes easy to visualize the system and for better understanding.

Use-Case diagram:

A use case is a set of scenarios that describing an interaction between a user and system. Here is the display of two main components in use-case diagram, i.e., Actor and Use Case.

Use case Diagrams represents the function of the system from a user’s point of view. Use cases are used during requirements and analysis to represent the functional nature of the system. Basically, Use cases focus on the behavior of the system from external point of view. Actors are external entities that interact with the system.

Figure 7. Use-case diagram

Contents:
- Users
- Admin.
- Use cases

Figure 8. Activity Diagram
6.1 Functional Area A/Design Unit A

6.1.1 Functional Overview

Our application is derived in 6 tiles which are, Order Products, Price Estimator, Ask Question, Information and Feedback. In Order Products tile customers can able to see list of all products and they can order by selecting products. Price estimator allows user to estimate the cost by selecting the product and quantity. Ask Question tile allows user to ask any question or required information to administrator. In Information tile, to let users know the details of organization like contact us, partners. In Feedback tile, users can write the review to organization regarding products or application.

6.1.2 Impact

In our Windows Phone Project, we have majorly 2 modules are Administrator and User. Administrator can add new products to database as well as admin can remove or modify existing products in backend. User need to register in order to enter the application then user can scroll all the products and can order products by using application. User can ask Questions, give feedback on products and he can calculate the price before order products.

6.1.3 Requirements

As we are developing Windows Phone Application, we are using Microsoft Visual Studio with Windows Phone SDK with technologies are C#.Net, XAML and used SQL Server 2012 Database as backend. After developing application, we used to test application using Windows Phone Emulator or a Windows Device.

7 Open Issues

There are few Technical, Coding and Management issues, later that are solved using servers and with instructor suggestions.
8 Acknowledgements

I truly take this great opportunity to say my sincere thanks and deep regards to my guide Dr. Soon Oak Park for her exemplary support, monitoring and continuous encouragement throughout the course of this project. The help and guidance given by her each and every valuable time shall make me a long way in the journey of life on which I am about to embark.

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9. References


