A Mobile Service Delivery Platform for Web Classifieds

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A Mobile Service Delivery Platform for Web Classifieds

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I would also like to mention the name of my advisor, Mr. György Dán, without which this acknowledgement is not complete. He has guided me throughout and has helped me in any manner he can. His kindness is praise worthy.

In the end, I would also pay my thanks to my friends and colleagues including Sahar and Zohaa.
ABSTRACT

The Mobidoo Mobile Service Delivery Platform (MSDP) provides opportunity to the service providers to add online services by creating classifieds and advertising them to end users. These services can either be provided free of cost or with cost. Users can facilitate from these services by showing their interest and can get that particular service from service provider via ADMIN authentication or can also just surf through the services available on mobile web application. Main users of the application are ADMIN, SERVICE PROVIDERS AND PUBLIC USER.

Graphical User Interface was developed by HTML5, CSS3 and PHP5. Moreover, the facility of geo-location filter is also added. This application is web based and specifically designed for Mobile phones but it also runs on Desktop PCs. In short, this is an application that has made online shopping easier.
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<tr>
<td>API</td>
<td>Application Programming Interface</td>
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<td>ASP</td>
<td>Active Server Pages</td>
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<td>CSS</td>
<td>Cascading Style Sheets</td>
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<td>Denial of Service</td>
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<td>HTML</td>
<td>Hyper Text Mark Up Language</td>
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<td>IDE</td>
<td>Integrated Development Environment</td>
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<td>MSDP</td>
<td>Mobile Service Delivery Platform</td>
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<td>MSSQL</td>
<td>Microsoft Structured Query Language</td>
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<td>MT</td>
<td>Mobi Trade</td>
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<tr>
<td>PHP</td>
<td>Hypertext Preprocessor</td>
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<tr>
<td>SFTP</td>
<td>Secure File Transfer Protocol</td>
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<tr>
<td>SDK</td>
<td>Software Development Kit</td>
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<tr>
<td>SMS</td>
<td>Short Message Service</td>
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<tr>
<td>SQL</td>
<td>Structured Query Language</td>
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<td>SSL</td>
<td>Secure Sockets Layer</td>
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<tr>
<td>UI</td>
<td>User Interface</td>
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<tr>
<td>UMTS</td>
<td>Universal Mobile Telecommunications System</td>
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<td>UTF</td>
<td>Unicode Transformation format</td>
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Chapter 1: INTRODUCTION

1.1. Background

The internet has enabled new ways to do business through the opportunity of universal information distribution. The third generation wireless networks provide new business opportunities and new market segments to the existing and traditional telecommunication market (UMTS- forum, 2000). Mobile internet market is emerging from the Internet and mobile communications market. The firms operating in this highly competitive global environment seek continuously new business opportunities.

Mobile auction industry has been seen as one of the growth areas. It includes applications that allow users to buy or sell certain items using multicast support of wireless infrastructure. These applications require that group membership not be adversely affected by wireless disconnectivity or intermittent connectivity as observed in many wireless networks of today. In Europe and especially Scandinavia, the mobile auction industry has already been successful. This same development is now believed to happen in Asia and on a global scale.

Electronic commerce (E-commerce) services need several companies that all have their own role in delivering the services to customers. E-commerce firms often form for example alliances, coalitions or value webs, where every actor has competitive advantages that support each other.

1.2. Motivation

With this ever growing market of mobile internet, people can resolve large number of their routine issues using mobile - minicomputer. People are getting online jobs, market statistics, news updates and any kind of information regarding their business, family or social issues etc. using their mobiles. Children and students nourish themselves via internet. Actually life is depending on the software industry to a greater extent than before. From these things one can easily reach to a conclusion that as soon as people are growing older, they are demanding a life that is full of leisure, faster and comfortable than before. In this thesis the target is the same i.e. proving products dealing services in hands using MSDP and a computer or a mobile phone.

Shopping involves activity where customer search for his/her specified need by searching different retailers to get suitable purchase. It can be leisure or economic activity. If on one side one can buy products sitting at home why not he may be able to sell them too and get handsome amount. The goal is to shift this physical activity to mental one. This can resolve one of major issues i.e. time consumption.

1.3. Methodology

Mobitrade is location based mobile classified Web app that will be used for selling and buying goods/items/services in several worldwide geographical areas. To make this system, it was planned about what has to be done, what has to be used and what has to be delivered as end-product. The
already present systems were observed; the problems in those systems were found and hence a framework was developed for the system that overcame all the problems in the existing systems. Then, it was planned to use HTML5, CSS3, Aurigma API, PHP5, jQuery and its plug-ins, twitter bootstrap, light box etc. All such technologies were used because they provide object oriented approach, concept of reusability, compatible with most of the browsers, advantage of geo-location, rich media compatibility such as for audio and video, security, efficiency, reliability, ease of uploading picture (using Aurigma) etc. which previous versions did not provide. A modular approach was followed which provides maintainability, scalability, reliability and flexibility for effective implementation.

Databases were designed and for their implementation MySQL was used, which is helpful in creating relational databases, occupies very less disk space and is very secure. The concept of geo-location was also used which automatically analyzes the location of user and displays the advertisements of the products available in that geographical location.

After developing each and every module, unit testing, component testing and system testing were performed and hence tested the overall behavior of the system. After these, beta testing was performed in which the system was made available to the users and they were allowed to use the system and experiment it according to their own needs and will, and then inform about the deficiencies and weaknesses they had found in the system. After obtaining the positive results from testing step, the next step was to make this system online and available to the common people for use. For this purpose, a top-level domain name i.e. .net was obtained, second-level domain name i.e. mobidoo.net and then the host name i.e. www.mobidoo.net. After it, a web server space was used and finally the system got published.

1.4. Problem Statement and Objectives

“Development of an Online Shopping and Advertising Service Web Application for general public specifically targeting mobile users where search is filtered according to the region specified.”

The system is going to be a prototype of a MSDP (mobile service delivery platform) ready to be available for the mobile end user and will try to reuse as much as possible for the production roll-out ready application. The MSDP will be designed to accelerate introduction and provide to adding a long tail of snazzy and smart location based mobile web services and Mobile Merchandise Classifieds to the end-user.
This thesis has the following core objectives:

- To build a prototype of an MSDP with a backend UI. In this context, also have to analyze how to in the most effective way, both performance wise and reliable, deliver this across to the end user.
- To develop and conclude how to make the UI as intuitive and usable as possible.
Chapter 2: MOBILE WEB DEVELOPMENT

The basic concept used in this project is MSDP (Mobile Service Delivery Platform). It enables the application to be readily available for the mobile end user. The service deployment scenarios involve services/applications that are running outside of the CSP datacenter, i.e., on third party servers. These services access network capabilities via Web APIs through an MSDP that exposes these capabilities. These services can also be developed by “long tail” of third party developers. The intention is through mobidoo, consumers/producers anywhere across the globe can buy/sell products securely from their mobile handset. In a simple, user friendly menu, users are able to transact with many partners across several service sectors.

Service providers register the services they want to have indexed by the MSDP through an online registration form. After completion of the form, the registered service is either accepted as is or the service provider is contacted to facilitate the process. The technical concept of the MDSP is that platform redirects user service request through a well-defined interface. This means that before a service is accepted the interface contract must be fulfilled and verified. Furthermore some auxiliary services are provided to the service providers.

2.1. Basic Concept

The project supports three types of users, geo filter and search facility. Three different users are: public user, publisher and administrator. Public user is simply a person who uses this system to find the products according to his requirements and makes purchases by interacting with the one who publishes the classifieds of the products. The publisher is one who publishes the classifieds of his products so that users can view them and show interest if they want to buy them. Publisher is required to send his classified to the administrator for approval. Administrator checks all the classifieds and publish those automatically that fulfill the specific criteria and if any classified is not according to the described policies, administrator does not publish it; instead the publisher is required to remove that illegal content.

Another important feature is geographic filter. This facility helps the people search the classifieds that are available at their own location by automatically detecting the position of the user using the technology of automatic geographic location. This facility is available in HTML5 compliant browser, otherwise user has to specify his location by himself.

People can search the classifieds by specifying the category and sub-category. It makes the search easy and quite relevant. So, in this way user does not have to go through all the classifieds to search the product of his interest. He just has to select the category and the system will automatically search and display all the classifieds for that specified category. Hence, the system is quite efficient, reliable and time saving.
2.2. State of the Art

State of the art defines the development of new techniques and procedures. The state of the art of mobidoo is that new ideas and technology are applied to business by making the sales and purchases online and the tools such as HTML5, CSS3, PHP5, Aurigma Up, twitter bootstrap etc. The idea is to use the up to date knowledge on the existing systems and make everything according to the current age and modern technology.

The state of the art of mobile application is to provide up-to-date and currently used frameworks for mobile platforms. The platform Mobidoo requires is Apple iPhone and Android. The input method is touch which uses sensors to sense the finger touch; sometimes it can be virtual buttons as well. This platform supports a multi-page application.

I have used powerful development tools. Aurigma Up is used which can be easily integrated with any application. It is very useful for uploading images and videos on user’s mobile browser. HTML5 presents the content for WWW. It is helpful in developing complex web applications. CSS3 is used as it provides advanced options for designing the application using different fonts, shadows, padding, alignment, spacing, tables, margin, colors, layouts, border, and other multimedia. PHP5 is more secure, faster and easier to use and code with. It provides the object oriented approach which gives the advantage of reusability such that it’s objects can be reused throughout the program easily. PHP5 provides improved error handling facility. JQuery makes documents navigation easier. It is helpful in creating animations, plug-ins, dynamic web pages and abstraction. It makes the application compatible with almost all the mostly used mobile browsers.

Mobidoo provides the facility of identifying the current location of the user by geographic location ability which filters all the classifieds according to the identified location instead of displaying all the classifieds. In this way user can easily view the products and classifieds of his own area and hence can make purchases accordingly.

2.3. Tools Identification & Project Prerequisites

Let’s us discuss in detail why the need for using HTML5, PHP5, CSS3, JQuery, Aurigma UP & Twitter Bootstrap was felt.

2.3.1. HTML5

HTML 5 being a hypertext markup language is used for presenting the content on World Wide Web. It is the 5th revision of HTML [Wikipedia]. Web is the synonymous with internet for many people. This application also demands heavy use of internet facilities. It provides upload and download facilities.

For this reason, target was always to provide a proper GUI and interface to users for convenient and effective communication and Feedback between people with themselves and with administration. MSDP focuses on readability and consistency issues in provided information on website. HTML5
supports this core objective. It provides latest multimedia support and keeps information readable for humans. It keeps information in such a format that is consistently understood by web browsers and computers.

Moreover, the side target was to run this Mobile based web application on energy constrained devices like Smart phones and tablets etc, HTML5 provides this facility. It is also used for cross-platform mobile applications, providing ease at each and every step. It provided syntactic features which include canvas, video and audio elements as well as scalable vector graphics. These features provide the facility to handle and include graphical content on website without having to resort to proprietary plug-in and APIs.

2.3.2. PHP5

PHP is designed for web development and is server side scripting language. Since MSDP wanted to create a mobile application, this has to be light weight to not suppress or overuse limited number of resources available on mobile phones. That’s why preference was for PHP5. It includes object oriented approach. Its PHP Object Database Extension (PDO) provides such techniques which retrieve, update or populate the database with quite light weight procedure or commands and does not load the device.

2.3.3. CSS3

CSS is designed for controlling the layout and looks of web pages. It provides presentation semantics. Any application, no matter how much good it is in accuracy and working, cannot provide an appealing look to its users. Users prefer a good looking application over an ugly one. MSDP also wanted to overcome this issue with ease. Moreover, it also wanted to handle the looks equally both for Mobile users and desktop users so that with the maximization and minimization of screens, CSS is not destroyed or corrupted.

CSS3 provides modular approach for handling style sheets, backgrounds and borders, layouts and other widgets etc. Because of modular approach each component is quite stable in itself. This provides stability in MSDP structure and design techniques. This also helps in the reduction of support issues in browsers.

2.3.4. AURIGMA UP

Use of mobile phones, smart phones, iphones and android etc has increased to a greater extent. Users of these devices demand capturing, storing, upload and download of images in easier ways as much as they can become. However, it is not easy except for MAC and PC. Aurigma UP is the solution to the problems for such devices which lack built-in support for images in their web-browsers. It is an application that helps us in an easy upload from iOS (iPhone Operating System)/ Android with a simple touch button, inside the mobile phone, to any website.
Since MSDP is classified/ads creating website, it requires from people to upload three images per advertisement. This is a constraint for the upload of images. To handle efficiency and timing problems Aurigma Up was selected. Images upload can easily be done with this application without any difficulty.

2.3.5. **Twitter Bootstrap**

Bootstrap is a collection of tools that is used to create websites and web applications. This tool already contains HTML and CSS-based design templates which provide buttons, forms and other such components for interfaces. It also contains JavaScript extensions as an option. Bootstrap has comparatively deficient support for HTML5 and CSS 3, but the advantage is that it is compatible with all major browsers. It contains the basic information of compatibility of websites and other applications for all devices and browsers. [1]

2.3.6. **JQUERY**

JQUERY is designed to simplify client-side scripting of HTML and is a multi-browser JavaScript Library. It is open source software that’s why using it for navigation of documents and handling events etc for MSDP is preferred. It also helped in the creation of plug-ins. Moreover it created abstractions for low-level interaction. This helps in the creation of **dynamic web pages** and web applications. The website has dynamic pages because different parameters are being changed by the user or admin with the passage of time. For example let’s say user creates a classified. It updates the information on web page and causes it to move to another page with different web content.

MSDP is based on dynamic web pages whose content changes by the parameters provided by the user. It also depends on **client-side-scripting** which helps to change interface behaviors because of an action in response to the stimulus i.e. mouse or keyboard actions or some timing events. [2]

![Figure 2.1: Dynamic web page: Example of server-side scripting (PHP and MySQL)](http://en.wikipedia.org/wiki/File:Scheme_dynamic_page_en.svg)
2.4. Summary

Mobidoo Application has covered major fields of web structure. It has gracefully utilized all the present utilities in web architecture for providing users a better output. In this chapter all prerequisites of the application has been discussed. How this system is better than the previously created systems and why new languages and tools were required for this project, how they can improve the performance and efficiency than old HTML & PHP. All such things have been discussed in detail.
Chapter 3: PROJECT SPECIFICATIONS & REQUIREMENTS

3.1. Project Details
Mobidoo is a small research oriented company currently investigating possibilities with platform for end user delivery of mobile services. The Mobile service delivery platform (MSDP) is an ongoing project. In short the MSDP will allow service providers the possibility to publish mobile services and a framework to support this action. This project will produce a prototype of a classifieds service that will be published through the MSDP called MobiTrade (MT).

Mobidoo allows users to publish their classifieds. The main difference between MT and other online classifieds services is that on the creation of classifieds MT does not require payment instead a publisher only has to pay, to see the list of users who have shown interest for his classified. The other main difference between MT and other classifieds services is that prime target user group of MT is mobile users, and still allow non-mobile devices to access the service, the mobile user experience must be the main focus to achieve this.

A database model is present. In the backend part of the system platform, there is less focus on performance and more on UI, interaction design and usability issue. The MT service is a web-application. Mobidoo is developed to achieve the aim that it is fully automated process, Mobidoo requires for a human action in the process and this is to validate a classified before it is being published on the platform. The main objective for this is to reduce the illegal and forbidden content that otherwise might get published through this service.

3.1.1. Technical Specifications
The project has following technical specifications:

**HTML5:** All pages must be HTML5 compliant. As it is compatible with a large number of browsers so it will facilitate the users of multiple browsers. UTF-8 encoding is used to represent every character in Unicode character set.

**I18n Support:** To adapt computer software to different languages etc. the concept of internationalization and localization is used. Internationalization makes the software adaptable to various languages and regions and does not involve engineering changes. Internationalized software is made adaptable by adding locale specific components and translating text by the process called Linearization. I18n is used for this purpose.

**Text in images:** Images should not contain any text on them. This can affect the visibility of images as well as text can be sometimes not clearly visible on images.
Default Language: Default language throughout the system is kept English. Further works include the translation of the entire system to other languages as well.

3.1.2. Tools Requirements
The range of frameworks defined below as tools for creating the prototype:

Data Layer: For data layer MySQL is used which is implemented in Visual Studio. Moreover, .net is also used for this purpose.

Back office/Backen/d/Web Service: For backend PHP5 is used. It helps in producing the dynamic pages. Eclipse for PHP is used because it provides better graphical user interface applications, web services etc. It allows code editor and debugger that support any programming language.

Front view: For the front end of this application lightbox is used. It is a JavaScript technique which is used to display images and other web content using modal dialogs. For front end framework, compass and sass is used. Compass can be termed as a real CSS framework. Sass is an intermediate language. It allows the extension to the facilities provided by standard CSS which involves the opportunity of defining variables and reusable blocks of code.

Client app frameworks: HTML5 was used as it is good for structuring content for World Wide Web. It keeps the language easy and readable for humans. Moreover, it also includes latest tags which are compatible with almost all the famous browsers. CSS3 is also used as it provides efficient modularization. It is used for the presentation of web pages by including colors, layouts, font styles, images and other multimedia.

As it is a mobile application, Twitter Bootstrap is used for mobile web application development that partially supports CSS3 and HTML5. It provides a framework for mobile development. It facilitates the programmers to build mobile applications using JavaScript, HTML5 and CSS3. Twitter bootstrap provides consistency, faster development and is responsive. Hence, it gives mobile compatibility. So, it is very useful for Android devices and iPhones.

JavaScript framework for UI (window/toolbars etc): Mobile JQuery was used and it is specifically for mobile web. It is used to develop user interfaces and produces native like experience inside a browser. It is optimized for touch input such as tap, swipe, scroll etc.

Development environment: SQL Server Management Studio is used for configuring, managing and administering all components. It provides script editors and graphical tools. Its central feature is the Object Explorer allowing user to browse, select and act upon objects within the server.

3.2. External Interface Requirements

External Interface requirements give information about the graphical user interface of mobile web application. GUI (Graphical User Interface), being the most important part of the application must have good looks, should be easily comprehensible and user friendly. ADMIN, USER and PUBLISHER demand their separate profile pages for extensive communication and user friendly requirements. Therefore they are separately considered. Following pages and files were required for proper processing.
• DDL (Data Definition Language) statement files for the creation of the database schema to support MT
• Interface is developed on WEB therefore web languages like HTML5, JQUERY, PHP and CSS etc are required
• A HTML user interface where a PUBLIC user can search for classifieds, either by category or by region (requested by the MSDP API geo ip method)
• A HTML user interface where a PUBLIC user can register interest in a classifieds. This interface must allow the PUBLIC user to declare contact information (email or text/sms)
• A HTML user interface where a PUBLIC user can register as publisher. This interface must allow the user to declare contact information to allow the MT admin establishing contact; a valid email address is the single option for this. As an option, billing information can be stored through this interface if the publisher wishes so. Furthermore the user must declare if he wants to interact with future interested users by mail only, text only, telephone only, mobile only etc or any combination of them. This feature allows the PUBLIC user to filter a search in case the PUBLIC user doesn’t have an email, mobile phone etc.
• A HTML user interface where a PUBLIC user can login to prove himself as a PUBLISHER
• A HTML user interface where a logged in PUBLISHER user can create a classified advertisement. This interface allows the user to upload maximum 3 images, enter some text (heading, body), select a main and subcategory for the ad, and post the ad
• A HTML user interface where a logged in PUBLISHER user can see the status of his classifieds. This interface is the default interface and the first one that is produced when the PUBLISHER user performs a successful log in. The interface is a basic list of all classifieds entered by the user both accepted and those awaiting acceptance. Each row consists of four html links. The first is a link to the ad, if the admin has requested a modification then this link will allow the publisher to update and re submit the ad for validation. Once the ad has become validated and published, no more updates shall be possible. The second link is indication of status, (submitted, modification or accepted), if the status is modification then this link will bring up the reason and suggested solution of the admin. The third column is a counter of the number registered interests that has been submitted. This column is not a link. The fourth column displays the billing status for the classified.
• If there are no registered interests in the ad then this column is left blank. If there are registered interests but the publisher has not yet paid to see them then this column is a link to a billing interface. If there are registered interests and the publisher has paid to get access to it, this link generates a list of the interests and displays how the publisher can get in contact with the users. Finally the fifth column consists of a button where the publisher can remove an ad.
• A HTML user interface where a logged in PUBLISHER can perform a pay to get access to the interest user information. Preferably this will be done by credit card. The framework regarding this needs to be further examined.
• A HTML user interface where a logged in ADMINISTRATOR can get an overview of the classifieds in the system both validated and not. The interface must allow ADMIN to examine request and to either accept them, reject them with a comment or finally remove a classified.

3.3. Functional Requirements
The functional requirements describe the functionalities that a system can provide, involving inputs, behaviors and outputs of the system, what a system can deliver and what different interfaces are designed to do. This system has following functional requirements:
• Public user can see most viewed, recent and common classifieds at the main page
• Public user can search for classifieds of his interest by selecting categories and sub-categories (using filters) without registering into the system
• Public user can view the price of that classified
• Public user can login to prove himself as a Publisher
• Publishers create classifieds and request them to be published
• Publisher is required to provide some text (heading and body), interest, billing status, images and price for his classified
• Publisher is required to provide three images per classified
• Publisher can contact with users who show interest in his classifieds by declaring contact information (email or text/sms)
• Publisher can adjust his classifieds according to the feedback provided by the administrator in the status tab. If the classified has no abuses and is perfect according to the specified criteria, then classified will be published without informing the publisher about the status
• Publisher can view the users interested in his classified and the amount of products available, to check if number of users has not exceeded the amount of products
• Publisher can receive the list of users interested in his classified after paying a specific amount
• Publisher can see how many viewers have shown interest in his classified
• Public users and Publishers are required to give geographical location (longitude and latitude) which is auto detected in case of HTML 5 compliant browser
• Administrator can review a classified submitted by a publisher
• Administrator can filter the classifieds based on User, Status, Registration and Expiration date of the classified
• Administrator can ask for modifications, remove or accept to publish a classified submitted by a publisher
• Mobidoo offers the content providers some administrative services such as USER_SMS, USER_EMAIL, USER_BILLING through a WEB-API

3.4. Non-Functional Requirements
Non-functional requirements are used to judge the operation of a system. It does not describe the behavior of system. Non-functional requirements of the system are as follows:

• System must be a web application
• Default language is English
• Although Mobidoo aims for a fully automated process, it has identified a need for a human action in the process
• The web API of the MSDP will be used, especially the integration of geo ip and user information
• The technical concept of the MDSP is that platform redirects user service request through a well-defined interface
• The system must be available 24/7
• I18n support must be implemented
• The system must guarantee that public user’s sensitive data is transmitted securely
• The system must be able to handle multiple classifieds, categories, sub-categories, currencies, public users etc.
• Mobidoo uses MySQL and PHP5 environment for development
• The system must be easy to use i.e. user-friendly and compatible with all the major browsers
• All pages must be HTML5 compliant, encoding must be UTF-8
• The system should be fast enough to cope up with various internet connection speeds
• Advertisement space should successfully catch the publisher’s attention to add his classifieds to the system and public user’s attention to find the classifieds of his interest in this system as a source of revenue

3.5. Entities / Players Identification
After detailed analysis of this mobile-web application, its functional and non-functional requirements following entities of the systems were identified.

1. ADVERT
2. CATEGORY
3. SUB-CATEGORY
4. USER
5. ROLE
6. USER_INTEREST
7. PUBLICATION
8. STATUS
9. ADMIN REQUEST
10. CURRENCY
11. COM_TYPE
12. USER_COM_TYPE
13. BILLINGINFO

3.5.1. ADVERT
Advert is short term used for the classifieds i.e. advertisements. Its attributes include its specific ID, description, summary, currency, price, contractor’s ID and images of the classified.

3.5.2. CATEGORY
Classifieds are classified under category. This is used for efficient search.

3.5.3. SUB-CATEGORY
Sub-category is developed to support CATEGORY. It is useful in classification, efficient and fast search.

3.5.4. USER
At a conceptual level, the MT has three different user roles

Public role: These users don’t need to register as a user in the MT system. This is the default user. The main behavior of this user is to search for interesting classifieds and to register interest if the user wants to get in contact with the publisher.

Publisher: These users do need to register in the MT system. These users create classifieds and request them to be published in MT. If a classified is validated it will be published, if not the publisher will
receive a request to adjust his classified accordingly. When a classified has been validated and published, a publisher might want to get in contact with the users that has registered interest in his/hers ad. The publisher then request MT to send him/her the list of interested users and after payment, the publisher receives the list. If more users register interest after the publisher as requested the interest list, the registered interests are sent automatically.

**Administrator:** This role is held by a user that has control of the content published by MT. The main tasks for this user is to review and validate classifieds submitted by publishers and either accept the ads or contact the publisher for modification.

However all of these users have following attributes in common: ID, NAME, EMAIL, PHONE, ADDRESS, USERNAME for identification, PSW i.e. password for security and authorization, BILLINGINFO for transactions and ID_ROLE identifies the type of user.

### 3.5.5. ROLE
As defined above, ROLE entity tells us about the type of user i.e. PUBLIC, PUBLISHER AND ADMIN.

### 3.5.6. USER_INTEREST
This entity gives information about interest of the user in the classified. This has its own identification number i.e. ID.

### 3.5.7. PUBLICATION
Entity giving information about the published ad and its status to publisher i.e. submitted, modified or in waiting status for approval by the ADMIN.

### 3.5.8. STATUS
It tells us if the ad is accepted or needs modification or waiting for submission.

### 3.5.9. ADMIN REQUEST
It provides feedback to user and information about some particular ad that needs to be changed, deleted or modified.

### 3.5.10. CURRENCY
As name shows, maintains list of currencies along with their abbreviations of countries all over the world for proper transactions.

### 3.5.11. BILLINGINFO
Company requires credit card and bill type info from publisher for his bill payments.

### 3.6. System Constraints
The goal of this system is to provide a platform to the users where they can get quick access to desired products. However in transaction involving applications several security issues like spam, password and account number protection etc poses constraints on the system.
The following list sums up the constraints placed on system.

**Central Load bearing body:** For avoiding spam, a central body has to be made that can check the content of the classified, ask publisher to modify the content if required and can even cancel the application of publisher for classified. This puts the autonomous system to question because of total dependence on central body.

**Helping tool:** Since application is for the host bodies that have touch systems, helping tool cannot be provided to the users.

**Minimum Content Space:** Provide limited space to the publisher for classified description and content because the average user spends little time in reading the extravagant details.

**Incorporate World’s Currencies:** For transactions between different countries, this web app has to have data about the currencies of the world.

**Third Party Interaction:** A third party is required between publisher and Mobidoo administration for money transactions.

**Overhead Limitations:** This application is designed for mini PCs or palmtops and these devices have space and memory limitations. Application should have ease of integrated data.

**Responsive:** Application designed for mini PCs has to be quite responsive and fast enough to tackle speed constraints.

**Interface limitations:** As there are multiple host bodies, application interface should be flexible to handle the screen size complexity of both mobile and a desktop computer.

### 3.7. Additional System Requirements

Additional system requirements include the following:

#### 3.7.1. Security Requirements

For any system to be successful, one of the most important questions is how much the system is secure. Hence, security plays a vital role for any system to be popular and make good business. All the personal information given by the User or Publisher, at the time of logging into the system, should be kept safe and secure. Illegal access to any kind of information should be fully denied. Only administrator can access this information but not for personal use. The system should also be secure from viruses and other internet threats such as hacking. Some important security steps that are applied to this website are briefly given below.

The source code of the system should be hidden from public so that no one can copy it and use such ideas in his own system which involves piracy and plagiarism. So, Mobidoo is also kept secure by hiding its HTML source from others. There are several HTML protection softwares which are used to hide the
source code. There are also other ways to protect the source code but the major problem is that most of them can be easily dodged [3].

It should be kept in mind that website or system must be protected from hackers. Websites are threatened all the times. Security breaches often try to access the servers of the website to generate spam mails or files of illegal content. A very major step to keep the website safe is to regularly update the software. Moreover, all the data given through the forms must be ensured to encode in HTML.

Much care should be taken while generating error messages. It is quite important that how much information is displayed in error messages, e.g. for login error message generic messages such as: “Incorrect username or password” should be used by not specifying exactly what component is wrong. In this way hacker can’t get the idea of whether the username is incorrect or the password otherwise he is left with the task of concentrating only on the other field. Furthermore, passwords should be stored in encrypted form.

A very important issue which can be with the website is of uploading classifieds. A person can upload a simpler file but unfortunately it could contain some script that when executes on the server can completely open up the website. This issue is common with the images as files with such extensions can easily carry malicious or fake data. One way to prevent this issue is to avoid executing the files with extensions such as .jpg, .gif etc. However the recommended solution is by preventing the direct access to the files that are uploaded. Hence, these files will be stored as a separate folder outside the database as a blob which can be accessed later as delivered to the browser.

For own server, there must be a firewall setup and should block all unimportant ports. This is not possible if there is no access to the server from internal network because ports are needed to allow users to upload files by logging into the system. For secure transport methods SFTP (Secure File Transfer Protocol) should be used. It is also useful to have the database running on different server from that on which the web server is running. In this way the outside world cannot directly access database server providing the advantage that the data will not be exposed. In Mobidoo, the physical access to the server is also limited.

Furthermore, SSL protocol was also used that provides internet security and website can be optimized through it. It is a helpful idea to use a security certificate which is helpful when personal and confidential information has to be passed between website and database. Meanwhile hackers could sniff this important information. Hence if the communication medium is not secure then attacker could capture this data and ultimately can use it to reach the accounts of users and make use of their personal data [4].

I have implemented most of the steps to make system secure and followed the steps to test the security. This is done by using the security tools. For this purpose many commercially or freely available products will be used which will check for all security exploits. Hence, anyone can safely use the system without worrying about his personal data and other threats.
3.7.2. Maintenance Requirements

Another important requirement of the system is that it should be maintained regularly. The system is maintained by the administrator and the team under his supervision. It includes the maintenance of physical environment, databases, user interfaces, classifieds, records of publishers and users. It also focuses on how the classifieds are organized and managed at the back end. Maintenance also refers to how efficient the system is. The system should be updated frequently in order to accommodate more classifieds to facilitate users. The classifieds and their search are maintained by dividing them into categories and sub categories.

All websites should be maintained so that the current content is present at the site. It also ensures integrity of the website. A complete and regular backup of the site should be kept at the local computer. It is used for quick restoration of the original site if it crashes. Website publishing activity should be used to ensure that the content of the website is current and up-to-date. Website Quality Assurance is also implemented to ensure that website is operationally sound and conforms to the current age and standards. The quality data should be collected for this purpose.

Moreover, the website has a feedback monitoring system under Contact tab. The purpose is to collect the feedback about the website from common user or visitors of the site. There should be a mechanism to respond to these views and feedback of users regularly and in a controlled manner. Hence, website should be monitored from time to time. A website should also be able to manage with the changes made to the site and should have the positive impact of the integrity of the site.

Website style has to be maintained as well, such as using modern font styles, border layouts, improved formatting etc. and for this purpose CSS3 is used in Mobidoo which provides us with enhanced features that improve the visibility and appearance which helps in attracting the viewers towards the site. Hence, Mobidoo is maintained by applying most of such techniques.

3.7.3. Defense against Traffic Spikes

Different web applications have different traffic. High ranking websites have many visitors per day and hence have a high traffic whereas low ranking websites have relatively low traffic. The traffic of website is predicted and hence as it is a prediction so at any instant of time it can be wrong and some arrangements should be made to overcome the issues caused by wrong prediction of traffic. A website should be able to cope up with high predictable traffic and imbalance in unexpected traffic. If a website is designed properly, it can easily handle any degree of both expected and unexpected traffic.

When traffic of website is predicted, it cannot be assured that the traffic will increase or decrease. So, the problem of traffic spikes is likely to occur when the predicted peak traffic increases and hence some parts of the website become viral. Scott Galloway, a clinical associate professor of marketing at NYU, gave three elements of viral content such as:

- Authenticity
- Humor
- Social Database
Similarly in Mobidoo, these features are visible mostly when viral content attract visitors surprisingly. This spike is caused when the website is not ready to handle such high traffic and hence problem occurs for developers as well. Initially, the developers or owners of the website will become delighted by the increased number of visitors, but the problem occurs as the website becomes mostly unavailable or too slow to access hence it proves to be a worst incident. So, to handle such situation i.e. of content becoming viral, website and system should be developed to hold more than 30 times of the average predicted traffic.

Moreover, spikes can also occur in normal days apart from being viral. These spikes are more common than viral traffic spike. So, while developing a website one should take care of spikes either by normal visits or by viral content.

Finally, developers should use the load testing tools to find the capacity or traffic of their website. It will be helpful in understanding how can the website perform better under high traffic and also adjust the performance of the website when peak traffic or spikes in traffic occur. Moreover, data can be noted when at any time previously the spike occurred and then applying changes to the system to avoid such circumstances again [18].

### 3.8. System Attributes

Mobidoo system has the attributes such as reliability and availability.

#### 3.8.1. Reliability

The system is reliable in such a way that data of users is secure, publisher can publish his classifieds easily and there is a reliable communication between publisher and user, when a user shows interest in any classified of a specific publisher. Moreover, there is a reliable buying and selling procedure. The system does not allow anyone to post illegal content or any violent material. The system also ensures the reliable browsing.

Reliability includes that the website is self-explanatory, maintains integrity and is persuasive. It checks for validity of a website such as author of website and his credentials, contact information of author for he is answerable for his work, the web address (URL) having appropriate domain extensions which tells about the institution or publisher of the site.

The main purpose of the website should be given mainly on the home page such as for education, marketing a product, public services etc. As this website is for marketing purpose, so the home page is designed to convince visitors to buy the products by viewing attractive classifieds. The audience is the general public for this website. Moreover, website is reliable in such a way that it has avoided the biases [5].

The content displayed is legal and depth of the content is average i.e. neither too little nor too much. Everything provided at the site is relevant to the subject matter. All the links provided in the site are reliable and up-to-date. Moreover, the content is not overpowered by any irrelevant material. The website should also tell that when it was initially launched which is helpful in finding out that how stable
a website is. This is given in ABOUT US tab of this site. The site is frequently improved and made up-to-date by deleting previous and old classifieds and adding new ones. Hence, these steps are followed to make the site reliable.

### 3.8.2. Availability

The system is guaranteed to be available 24/7 constantly. As it is a mobile application so it facilitates the users in such a way that they can access it anytime and from anywhere. Users are just required to provide their geographical location (automatically detectable in HTML5 compliant browsers) so that they can easily browse the items available in their area and hence can make efficient purchases.

Websites should be available for 100% of the time but it is a big challenge for the service providers. There is always a chance for something to go down or wrong. Hosts or service providers do their best in this regard and often spend a lot of money on it but still they are not able to provide complete 100% availability.

There are several factors that affect the availability of a website such as the failure of hardware such as RAM, Hard disk etc., most importantly software failure, system infection by some virus, DOS attack by interrupt in services, access by a hacker or any unauthorized person, internet backbone is crashed or temporarily unavailable, commonly power cutoff, any natural calamity such as flood, earthquake etc. and many more. So, a good service provider should have an alternative system to lessen these threats.

Fault Tolerance is used that makes sure that the resources and network is available even in the worst scenarios. It must be ensured that there must be two devices of the same type keeping one of them as a backup. Redundancy is used in such case that is having an exact copy of network resource which can be used when the other one goes down or fails. The switching between such two systems does not let the user even know what has happened at the back end [6]. Mobidoo system has used some of the features that ensure availability but not all as it is quite expensive.
CHAPTER 4: INTERFACE MODEL

4.1. Host Bodies
This mobile web application is targeted for mobile especially IPhone users. It is also compatible with other machines like desktop PC etc. However, performance, efficiency, screens and GUI etc. is affected if target body is changed. There is a tradeoff between screen size and GUI.

Idea was to create application for low powered hand held devices and forced to have lengthy array of screen sizes, configurations and hardware specification to match present needs of different machines and competition basics.

Following host bodies can run this mobile web application.

- Desktop Computers
- Laptops
- Mobile Phones (or simply mobiles)

4.1.1. Desktop Computers/ Laptops

Advantage
While running this application on PCs, screen size is increased due to which user feels comfortable while surfing and developing ads. Application can also run easily on such machines.

Disadvantage
Application running on the PC is not user friendly. It does not support proper GUI for users. They do not feel good within stretched screens. Moreover it does not look as graceful as it does on mobile phones.

4.1.2. Mobile Phones
Several types of mobile phones are available in market with different models by different companies. There is so much diversity spread all over. Some mobiles are very small with net facility and some without internet facility. Same is the case with medium-sized bodies. Their size affects the GUI of application. As said before tradeoff lies between size and GUI of application.

Application was designed and targeted mainly for IPhone therefore its graphical user interface, performance, efficiency and screen modeling etc. shows its best while running on target machine. Application can also run on android mobiles with almost same functionality as provided on IPhones.

Disadvantage
In IPhone, due to availability of touch screens, one cannot provide TOOLTIP functionality. User can hover over anything but cannot see any kind of help text.
4.2. Main Interface

4.2.1. Homepage

Home page of mobile web application is the main area where user can interface with administration and other users and also get an overview of this application. Here he can navigate different ads and can also opt for guest user, buyer, seller or as admin (restricted).

However, the users of Mobidoo fall into three categories therefore interface will be different for each of them.

- Registered users (PUBLISHERS)
- Guest users (BUYERS)
- Administration (ADMINS)

![Figure 4.1: Mobidoo Homepage](image)

4.2.1.1. Services

FOR GUEST USERS

Home page of this website provides following services for guest users.

- Provides overview of the app.
- Classified search is available.
- Provides categories and sub categories of all available products for sale.
- Geo Filter is also provided. Results will be filtered according to geography if it is checked.
- Search Field is also provided where user can write his/her query
- User can navigate through the ads.
- It also shows most famous or starred classifieds among users.
- User can contact admin using a specified link.
- User can also provide feedback
- LOGIN facility is available
- User can REGISTER free.
4.2.1.2. Actions

➢ FOR GUEST USERS
Following mentioned services overlap between both guest and registered users.

SUBMIT: This query shows a page containing all the ads or classifieds that were demanded by user as search query. Related results can also be shown.

Figure 4.2: Mobidoo Search Page

CATEGORY AND SUB-CATEGORY SELECTION: This service causes better, efficient and related results.

Figure 4.3: Mobidoo Page Showing Categories

LOGIN: If user has account he can login using this service on a new page.
**REGISTER:** User can register using this facility and can opt for a seller who can create ads and post it on the web application.

**SHOW INTEREST:** User can show interest in some classified. He will be contacted by the publisher himself (if publisher wants).
SHOW INTEREST MAP: User can also add interest map to know about ads in the specified range.

Figure 4.6: Mobidoo Interest Pages
**SEARCH:** User can search specific classifieds by selecting multiple categories of items and services in his/her local geographical area.

![Figure 4.7: Mobidoo Category Search Page](image)

### 4.2.2. Service Providers/ Publishers Interface

This page is for registered users who are also called publishers.

#### 4.2.2.1. Services

- **FOR REGISTERED USERS**

  Home page of website provides following services for registered users.

  - All the above mentioned facilities for guest user are also provided to registered users.
  - Classified creation is available. User can create several classifieds.
  - User can wait for the response for his specific ads by administration. Administration can approve, disapprove and can demand for modification of classified.
  - She/he will be informed if some user showed interest in his classified.
  - Administration will only provide limited information. User will get response only after payment of bill to administration.
  - He can see status of his classified as accepted, rejected or waiting for approval.
  - She/he can also see his billing status.
  - She/he can sign out.
  - He can also change his password and can request for a new password if forgotten.
4.2.2.2. Actions

Same actions are provided for the services that overlap between guest and registered users.

LIST CLASSIFIEDS: This shows list of all the available classifieds. Classifieds can be classified as follows.

- Classified waiting for approval by the admin
- Classified approved by the admin

Following information can be deduced from this page:

1. If status indicates that admin has requested a modification of the ad, then this link will direct the user/publisher to the 'Create Classified' UI to adjust and resubmit his classified. If status indicates "Accepted" then this link allows the publisher to view his classifieds.
2. The status of the ad at submission time is "Submitted". If admin has reviewed the classified, then status can either be "modify" or "accepted", set by the admin.
3. Billing status, if no interest is registered for the ad, it is left blank.
   a. If there is some interest is registered but the publisher has not yet paid to access the information, this link will show the "Commit Billing" UI.
   b. If the publisher has paid and some interest is registered by the admin then the link will reveal the contact information of person who showed interest.
4. Button to the "Create Classified" User Interface.

**CREATE CLASSIFIED**: User can also create an ad and then can wait for its approval by administration. After successful creation of ads, classified will appear on the homepage of publisher.

Creating classified requires following information to proceed.

- Header – Name of Ad
- Text – Some Description about Ad
- Longitude – Longitude of user location
- Latitude – Latitude of user location
- Images – at least 1 and 3 maximum
- Category – Main field of Ad
- Sub Category – To specify search more

![Figure 4.11: Mobidoo Page for Creating Classified](image)

### 4.2.3. End User Interface – Admin Panel

End User Interface is the controller of the application. Here administration watches over all the working, transactions, classified creation, spam generations and feedback reports. This system was designed to introduce autonomous functionality. However for security reasons and to avoid spam, need for a centralized body aroused.

#### 4.2.3.1. Homepage

Admin can login through LOGIN PANEL especially created for ADMINS and welcome warmly on the website.
4.2.3.2. **Services**

- **LOGIN:** Admin can LOGIN using a special interface as shown below.

![Mobido Admin Login Page](image)

- Can LOGOUT to reach main interface.
- He can also see list of all available classifieds on the website.

4.2.3.3. **Actions**

- **LOGIN:** After login admin is welcomed warmly on his/her homepage as shown above in the image of admin main interface.
- **VIEW CLASSIFIEDS:** Admin can also view all of created ads along with their statuses of approval or disapproval. Here statuses of ads, their billing info and registration ids are also shown to admin. Admin can edit any classified.
Figure 4.14: Mobidoo Admin Home Page

**VIEW AD:** On any ad click, admin can see all details related to it.
Admin can see following things for an Ad.
- ID.
- Title.
- Description.
- Longitude
- Latitude
- Images
- Category and Sub Category
- Admin Comments for modifying the ad.

Figure 4.15: Mobidoo Classified View
**DELETE AD:** On any ad click, admin can click on remove to delete the ad permanently.
- This only happens if user/publisher fails to abide by the terms and conditions followed and designed for this application.
- Ad can also be deleted if user does not pay required dues.

**ACCEPT AD:** In the same fashion, he can submit the ad showing ad needs no improvement.

**MODIFY AD:** If user has not used proper language or has not provided enough information, admin can add comment about the problem and can then ask the user to re-submit the ad by modifying it. This facility is provided for customers so that they may not see unreliable information on this website.

### 4.3. Transactional Interface

Transactions provide some low-level interfaces. It performs the actions necessary to fulfill the target transaction. Transaction objects are used to perform a particular transaction. The transaction object is created to:

- Determine and enlist all the resources required by the application for a transition
- Record the transaction management call back
- Commit or rollback transaction
- Require the current status of the transaction

Transaction interface includes the following parts:

- **Application Server:** Depicts how to support the run-time environment of an application that involves transactions etc.

- **Transaction Manager:** Manages the functionalities required to control and support all the transaction activities. This interface is responsible for making the application server control the transactions by the application that manages them. This is implemented by creating a transaction object which is used to perform the specified role related to different transactions which are handled by multiple threads.

- **Resource Manager:** Provides the required resources to the application by making use of transaction resource interface.

**User Transaction**

This transaction interface enables the website application to control the transaction within the user boundaries. It consists of all the transactions such as creating accounts, creating classifieds, viewing classifieds and showing interest in them etc.
Suspending a Transaction

When any transaction is suspended, the application server frees up the resources and all the registers, memory, stack etc. that were allocated for the execution of a transaction at the time of its occurrence. Similarly a transaction can be resumed; in this case the resources and memory etc. will be reallocated to the transaction by the application server. In this case, the Transaction manager informs the Resource manager to reallocate its resources to resume its transaction.

Synchronization of Transaction

It is responsible for informing the application server about the completion of the transition. When a transaction starts, a callback is reserved for this purpose [8].
CHAPTER 5: THE NETWORK MODEL

5.1. Database Model
Database Model explains the logical structure of the database of the targeted system. It explains how data is stored, retrieved and manipulated. This is termed as backbone of Mobidoo system. In this system centralized database is being used. However in future for growing the business, database can be decentralized.

5.1.1. Required Database Qualities
Database has following qualities to become a part of MSDP family.

- **Storage:** Data can be easily stored. Classifieds are needed to be stored in the database. Data related to classified may include its ID, user name, location, price and images etc. It’ll also be used to store user and admin profile’s information.

- **Retrieval:** Data can be easily retrieved within a fraction of seconds. If database is taking too long to retrieve data then this may cause problems on both admin and user side. Interaction may get slower and updating cannot be thus done at proper time causing serious problems. Moreover, beneficiaries of this application will not be satisfied with its performance.

- **Manipulation:** Data can easily be manipulated. This depends on the point discussed above. If data is retrieved on proper time then all the calculations on it should not take much time. This may cause loss of performance and efficiency of the system, adding a negative point.

- **Update:** Database should support update. It is one of the most important qualities of a database. In this case, if let’s say a user has paid his payment and database was unable to update this and thus his classified status still remains “Submitted” causing him a lot of trouble in seeing the list of interested candidates of the ad. Administration is to be blamed for this. This is a crucial issue and this has to be dealt by the database with great care.

- **Multiuser Requests:** Multi-user requests are permissible in Mobidoo database. As traffic may increase multiple users may join the web-application and they may request thousands in a fraction of seconds. Database is efficient enough to handle many user requests at a time.

- **Deletion:** Deletion of data is also important. For example, admin may require deleting the unauthorized content from the website that is totally violent to the terms and conditions of Mobidoo.

- **Interrupt Handling:** Database should be able to handle interrupts both caused by user or admin or due to some technical issue. For example let’s say if server is down, it should have a backup plan i.e. saving all the data before hand to prevent its loss.

- **Security:** This is one of the most major requirements of any database. Since in database of this system, user also enters his/her personal information like credit card etc., this has to be saved at proper location to avoid any kind of misuse. Otherwise catastrophic effects might take place for the user.
5.2. Selection of Database Model

As discussed above online shopping or advertising websites require great deal of security to keep the
data of their users in safe hands. For this main and other reasons discussed above, relational database is
chosen.

5.2.1. Why Relational Database for Mobidoo

In Relational Databases data is stored in a structural manner; i.e. in the form of tables. Tuples and
columns are used to extract data from relational database. Structured Query Language (SQL) is used to
extract information from relational database. Relational database is an excellent selection for businesses
where data increases on a regular basis. Even for large set of data, data insertion and deletion remains
quite easy.

Relational database of Mobidoo system takes care of the following for mobile web application.

- **Modularity**: Since relational databases store data in the form of rows and columns in a table,
information of different chunks can easily be placed in different tables rather than creating a DB
normalized information in one table. This setup decreases the interdependence and loss of
information. For example if information of classified and user is stored in same table then
information retrieval and update will require more resources and information deletion may
cause loss of data. A table can be assigned to each module thus providing independence. In this
system, different tables are created for user, his classified, his request, billing info and ads etc.

- **Layered Approach**: Use of different tables cause the information to be stored in layered
manner. Admin information is layered above user and user’s above classified. They all work
separately.

- **Security**: All tables are not available for everyone. Schema of the system takes care of this thing
that only related information is shown to related users. For example admin has complete access
to database while a user can only query database for his table and his classified. Also for such
demand “views” are created. View is part of the table that is shown to the user such that it
actually exists as an independent and separate table.

- **Easy and careful Update**: Updating data is quite easy with it. However, if you want to delete
some record and that has a Foreign Key to some other table then other table will be informed
about this. You cannot delete any record unless you satisfy FK rules. Let’s say it is possible for a
user to exist without a classified but it is not possible for a classified to exist without its owner.
So whenever a user is deleted then all classifieds created by him should delete or not will be the
question. Totally dependent on choice of foreign key. Similarly request for publication can only
exists if the classified exists. Relational Database takes great care about handling such
information that is dependent on the existence of parent entity.

- **Fast Search Using Index Approach**: Relational database can provide fast results using index
approach. You can create index on some attribute upon which search takes place let’s say
category of the ads. If index is properly created then a file will be made that will have all the
information about that category. It’ll thus get easy for the user to immediately get the results.
He will not wait for the results to first get retrieved and filtered from the database and then presented to him.

- **Addition & Deletion of records:** In relational database it is easy to insert new records in normalized tables. For example when a new user creates account, his information is easily inserted in the user table. In the same fashion a user can be deleted by himself or by the admin. All related classifieds of the publisher (user) will become irrelevant as he cannot be contacted if someone showed interest in his classifieds. In case of DE normalized tables loss of information occurs when some record is deleted and NULL values are entered in the columns in case of insertion. However, each table was normalized for avoiding such outcomes.

- **Inconsistency & Redundancy:** In this system, it is required no type of data inconsistency exists in any table. Relational DB takes care of this with the help of primary key and avoids duplication of data. Even if different users create same ad, both ads will be recognized by their respective users. It’ll not be confused with each other. DB is well managed so that different copy of same data does not exist at different locations. Data is updated successfully in each table.

- **Structured Query Language:** SQL is used for querying database. One of the advantages of the relational database is this language. It is quite easy and does not rely on arcane syntax. Details have been discussed in previous chapters.

### 5.3. Schematic Database Model

Following diagram shows relationship between different entities present in Mobidoo system.
Figure 5.1: Schematic Database Model of Mobidoo Application (Provided by Mobidoo Technologies Ltd.)

It can be seen that following main relationships exist between entities of this system.

- User of the system can have many roles like admin, publisher and general public.
- User can request admin for classifieds many times.
- User can publish many classifieds.
- A user can have only one BILLING_INFO per account.
- A category can have many sub categories.
- A sub category can have many classifieds.

All the entities are dependent on each other. They are holder by a relation. These relations are exactly implemented in the database with the help of foreign keys. So that, no ambiguity in the data takes place. This makes the system more safe and efficient.
5.4. MSDP and Application Connection

Service delivery platform consists of set of components that provide architecture for delivery of particular services. MSDP is helpful in development of improved and up-to-date services. MSDP is used to create a service layer which is apart from the core network elements. It improves the provision of services over a vast area.

MSDP attracts the operators and has the ability to manage large set of applications to manage the operator’s network. It uses open standards and communication network standards and maintains the integrity and hence provides security of the network. MSDP also handles the revenue sharing between several telecom services and application providers. Using MSDP application providers can develop new, useful and enhanced mobile applications. [9]

![Figure 5.2: MSDP and Application Connection](http://www.hp.com/products1/solutioncenters/pdfs/MSDP_blueprint.pdf)

5.4.1. MSDP and User Connection

MSDP provides user interaction by defining how applications acquire data and information from end user. It can also be used to get the information of user’s existence and availability; can also collect information about terminal that is used by end user. As user is a client so MSDP also involves here client-server communication.
In this scenario, MSDP is a server that provides the service and user is a client which generates a request to which server listens and responds to. In this way, a server can deal with several clients at a time. Mobidoo system has three types of users such as Administrator, Publisher and User or common public that views the classifieds. MSDP facilitates all types of users. It provides accessibility to administrator who has access privileges over all other users and can manage the website. Moreover, it provides publisher with the facility to contact administrator by submitting his classifieds and waiting for the administrator’s response regarding classifieds to get them published. Common user can view the classifieds and hence have to register if he wants to show interest in a classified to get in contact with publisher of that particular classified.

5.4.2. MSDP and Service Provider Connection

MSDP also facilitates the service providers in such a way that they can add online services and provides a single point of access to the end-users for uninterruptable services. Some of the services provided by Mobidoo are free of cost whereas some require payments. Mobidoo uses MSDP to present marketplace for service providers and also some administrative services through WEB-API. On the other hand, service providers register such services that they want to have indexed by MSDP. This is done through an online registration form. When the form is completed, the registered service is either accepted or the service provider is contacted to facilitate the process. The technical concept of MDSP involves that platform redirects user service request through a well-defined interface. This requires that before a service is accepted, interface contract must be fulfilled and verified. Moreover, some auxiliary services are provided to the service providers. Service providers also make available the global application services and defend against the decline of services. [10]
5.5. Transaction Model

Transaction model is such a model in which the interaction in both directions is considered together e.g. complete handshake such as from one system to another system and back. It includes the set of transaction functions to develop complex applications that involves how the website or any system actually works. It can be used to describe the flow of messages that completes a particular request or task. This model is suitable for business computing and web services environment. It is for simultaneous communication. In Figure 5, ellipses represent the communication environment and the most effective communication takes place in the area where ellipses meet.

Web transaction consists of series of operations performed on web objects e.g. to follow a link which is a web object, to submit a form (either to login or to submit a classified) which is a web object etc. are transaction operations. A transaction is said to be complete such that a publisher has submitted his classified and administration has published that classified then a user has shown interest in it and finally has bought the product. A transaction model represents the semantics of web transactions. [11]

![Figure 5.4: Transactional Model](http://www.uscb.edu/academics/undergraduate/communication_studies/)

5.5.1. Selection of Payment Model

Mobile Web applications require online payments. Online payments for mobiles refer to virtual money. This does not have physical existence and that is the plus point for it. No one needs to carry money in their pockets all the time for shopping. However online shopping system is a bit different term used then the shopping done in daily life. Online shopping implies that you are not physically present in the shop but yet have access to all the items and you are even paying virtually using your wallets usually
termed as mobile wallets. You even don’t need to use your credits cards, cash and checks to pay for a wide range of digital or hard goods and services.

Mobile payments play an important role in generating revenues for online businesses. Combined market of all mobile payments is expected to reach $ 600 billion this year. This is double of the amount expected in 2011 for the year 2013 i.e. $300 billion. [12]

Online Payments can be done using following:

- SMS based Transaction
- Mobile Web Payment
- Direct Mobile Billing
- Contactless

5.5.1.1. SMS Transactional Payments
It provides poor reliability because transactions can easily fail if message sent get lost. Its payment process is quite slow. Security breaches are high and are costly.

5.5.1.2. Direct Mobile Billing
On the other hand direct mobile billing is a better option than SMS transactional payments. It requires two-factor authentication with a PIN number and one time password. No debit or credit cards are required. It is quite popular in Asia. It is more secured, easy to use, fast and convenient. 70% of the digital contents are sold via this method.

5.5.1.3. Contactless near Field Communication
This type of communication is being used in transportation services. User is provided with a phone and a smart card which he puts near the reader and with or without authentication pays.

For this application mobile web payment is most suitable.

5.5.1.4. Mobile Web Payments
Third and main category that was chosen for Mobidoo is called Mobile Web Payments (WAP). Externally downloaded applications installed on mobile phones are used to make payments. All of them use WAP. User is satisfied with this technology because it is easy to use.

Web pages are available that are familiar to user. He can make quick payments via these links or URLs.

There are several ways to pay online using WAP.

1. Direct Operator Billing
2. Credit Card
3. Online Wallets
5.5.2. Google Wallet
Google Wallet for chosen for MSDP. It is used for money transaction between administration and user. They are used in web applications for buying virtual and digital goods. Google interface is designed for simplicity. An API of it is also available so that it can be easily integrated with applications. [13]

5.5.2.1. How to setup Wallet

- User registers himself. Give information about his phone number and provider sends them their PIN number using SMS.
- User authenticates the PIN.
- User validates the payment by entering his payment info like credit card etc.
- After this user can use PIN number to make payments.

5.5.2.2. Advantages & Disadvantages of Google Wallet

Advantages

- Easy to use
- Secure
- Fast
- Free
- No physical existence

Disadvantages

- If your mobile is lost, you lose a lot.
- Does not work with few credit cards.
- Encourage people to spend more than they have
- PIN number can be easily stolen by a third party

5.5.2.3. How Google Wallets works in Mobidoo system

Wallet for Google API is used in this system. This API helps us in accepting payments from users in web applications. Since it is natural and popular for users to make in-app purchases for virtual and digital goods, it is ideal choice to make.

Client and Server Side Addressing

- **Client-Side Code:** For each user both server and client side code is provided. Client initiates the purchase flow by using wallet for the goods API. Callback Handlers of JavaScript are called when purchase flow ends.
- **Server-Side Code:** Server codes create JSON Web Token (JWT) for each purchasable item. When purchase is to be made by the client, he calls wallet and uses JWT for that item.
When purchase is completed Google sends a HTTP POST message. Server acknowledges this message and transaction ends here.

Following figure shows the transaction model when Wallet for digital API is used by the application.

![Figure 5.5: Showing to Wallet for Google API flow](https://developers.google.com/commerce/wallet/digital/docs/)

Steps of purchase flow are shown. If item is to be purchased then

1. Server creates a JWT for that item.
2. When user wants to buy it, client side detects this and calls buy() method of API.
3. Purchase is confirmed by the user.
4. Google’s Server sends an acknowledgement i.e. purchases notification to the main server, using post back URL specified. Server sends a response to Google’s Server within 10 seconds and thus acknowledges the purchase.
5. Google charges for the ordered item and success handler of client is called.
6. Transaction is confirmed by both client and server and User interface is updated showing success or failure of the transaction.

5.5.2.4. **Purchase Flow**

Purchase flow happens in iframe because the user is always signed in when he makes any purchase.

1. Buyer has selected the product already. It clicks to buy it.
2. After this it clicks to **finish** this flow. After this control is returned to the system and failure or success callback handler is called. [14]
Figure 5.6: Google Wallet Transactions
(https://developers.google.com/commerce/wallet/digital/docs/purchaseflow)
Chapter 6: Recommendations and Conclusion

MSDP is a platform where user can enjoy the comfort and leisure of online shopping. Beneficiary of the application can also post advertisements of their digital goods. Any registered user can show interest in the classified and the composer of the ad is informed depending upon his bills and payments.

6.1. Future Recommendations & Remarks

However there is room of improvements for every application. Some of the improvements required for this application are as follows.

6.1.1. Host Machines

Host machines (mobile phones or desktop PC) are quite few. This application can only run on IPHONE and ANDROID phones. Support is also available for desktop PC but compatible mobile set is not satisfactory. In future to increase the revenue of this application, it has to be made compatible with other smart phones like blackberry, Samsung Galaxy Series and other mobile phones etc.

6.1.2. Payment Medium

Payment medium used for this application is Google Wallet. However Google Wallet is also not compatible with some mobile phones. This can cause nuisance for those mobile phones users where they are unable to make any kind of payment via this mode. There has to be some global payment method with which all mobile phone users can pay easily.

6.1.3. Filtered Search

Now, MSDP only provide location filter i.e. search of the user is narrowed on the basis of his location. Geographic location provides information on the interest of the users of that area. For example a person living in Lahore, Pakistan will in most cases want classifieds which are available in Lahore. Other filters like price of the product, guarantee of the product, location of the seller of the product etc. can be added to refine the search.

6.1.4. Video Description

However all written description about the ad is available, to add to its productivity and to reduce the chances of fakes, a video description related to the classified can also be added by the publisher.

6.2. Conclusion

In a nutshell, using MSDP, time-to-market speeds up. It can manage the network traffic efficiently. It can handle continuous stream of users who can access their data anytime anywhere they want. Physical activity performed and mental stress in surfing through whole shopping centers is greatly reduced.
Interest of user is targeted using location filters. User’s interest and choice is first priority of MSDP. It also combines several multimedia services, such as uploading images etc. In short it is a compact application developed for IPHONE and ANDROID.
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