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Cellular Phone Billing System Using WAP

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Dedication

To all the lovers of Palestine who died for it or still waiting…

To our supervisor Mr. Wisam Shamroukh for his intelligent editorial supervision and attentive production; for teaching us how to be creative…

And to all who are not cited and whose names may be inadvertently not mentioned…

To the pure soul of my father which inspired me all through his absence...

To my beloved mother whose heart beat with every notion flashed in my mind and every single letter I wrote down...

To the candle which lighted and guide me through darkness and frustrating moments; to my brother Tawfiq...

To my siblings who inspired and propped…

Mohammad

To my parents

To my brothers and sister

To my best friend Abed, to my teachers

Anas

To my eyes mother and father…

To all persons my heart beat with their love …

To the Islamic Block in PPU…

Yosri

Acknowledgment

In this stage when the project come into light, many names in mind, supervisor Mr. Wisam Shamroukh for his time and efforts and his intelligent ideas.

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Abstract

Cellular systems Subscribers experience a problem in receiving and paying bills on time. Many solutions were developed to overcome this problem. One of them was to get and pay the bills online, but this solution demands that the Subscriber should have a desktop computer with an Internet access and of course armed with the necessary knowledge of using it. In addition to that, the Subscriber should be right there on his desk

This system comes into sight to take the advantage of the WAP[1] service available in the cellular phones to enable the subscriber to view their bills and provide them with payment procedures as well as to view a variety of announcement and advertisements any time and anywhere; all what is needed is WAP service enabled cellular phone.

The System consists of two main parts: One part is for the System Administrator with the purpose of managing the system. The other one is the WAP system for the Subscriber.

The first phase is the system requirements definition and locating the system specification, the outcome of this phase is that the system should provide the Subscribers with the ability to get their bills and providing payment procedures, also to view their announcements, based on their service type, but previously authenticated. In addition, cellular provider can make use of it by advertise on this WAP service.

The system has been designed using UML[2] 2.0. This methodology was selected to serve the Object Oriented Implementation of the system; in this phase classes and many UML diagrams are developed.

Based on this design an Object Oriented programming language (visual C#) is used for writing the code, Microsoft Visual Studio 2005 has been used as a developing environment.

Finally all required tests were performed on the system. And a special type of testing was also performed using the mobile emulators to ensure that the system work across the Varity of cellular phones brands and mobile generations.

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[1] Wireless Application Protocol.
[2] Unified Modeling Language.

Chapter 1

Introduction

Chapter One Introduction

1.1 Initiation

One of the novel Technologies that emerged in the recent few years is the WAP technology, which walks in bold steps into providing the internet capabilities into the mobile devices, this technology's main implementation became the M-commerce and M-Business.

This Project comes to take the advantages of the WAP technology and as an implementation of the M-commerce concept, to provide Billing system for the Cellular phone users. Enabling users to access and manipulate their cellular phone bills and other information such as announcements and advertisements.

The idea of the billing system for the cellular phone users is selected from dozens of ideas, that's because most cellular service providers in the area provide the WAP service via GPRS[3] for the bill users and do not provide the service for the pre-paid users at this time, so the idea will take a higher chance to implement, and it is expected that the Subscribers will have WAP service in their cellular phones.

1.1.1 Advantages of the system

The advantage of this system will cover both the cellular service provider and the Subscriber; the cellular service provider will increase the probability for the subscribers to see the bill at the convenient time and avoid the classical problems of the bill delay, in addition to announcements, promotions and advertisements that will be viewed by the subscriber.

Conversely subscribers will access their bills and other information via cellular phone at any time, specially those subscribers with limited computing capabilities.

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[3] General Packet Radio Service.

1.2 M-Commerce

M-Commerce which is the mobile devices and wireless networking environment necessary to provide location independent connectivity.

M-commerce covers many fields, for example: information based service, purchasing goods and online trading, Entertainments, Billing and Financial services, and this field of implementation is the most success because of its nature of no need for high bandwidth and graphics like the other fields, and this system can be categorized under it.

This system tries to take the advantages of the M-commerce over the traditional E-commerce i.e. service focused, wireless access.

1.3 WML and System Development

From the set of the available technologies for developing such systems, WML was selected. WML stands for "The Wireless Mark-up Language." A software language associated with the WAP architecture that enables contents to be delivered to mobile phones.

The system is developed using Visual Studio.NET 2005 and code was created using Visual C#, these pages were then parsed into xHTML when the page is requested.

xHTML is a development language based on XML and inherits advantages over WML that allows contents to be viewed in any WAP enabled phone.

1.4 Limitations

Development of such a system suffers from many limitations, during development and during the working environment. The development problems were solved by following the standards as described later.

In the working environment this system tries to coup with the following limitation:

1. Narrow Bandwidth.
2. Small cellular phone screen with low resolution.
3. Small memory capacity and computing capabilities.

4. Limited input capabilities

1.5 WAP

The WAP,is network architecture for wireless data communication designed to provide web-like contents to cellular phones.

In this System the WAP protocol is used because it is designed to carry the WML contents, in addition it is an open standard from the Open Mobile Alliance (OMA)

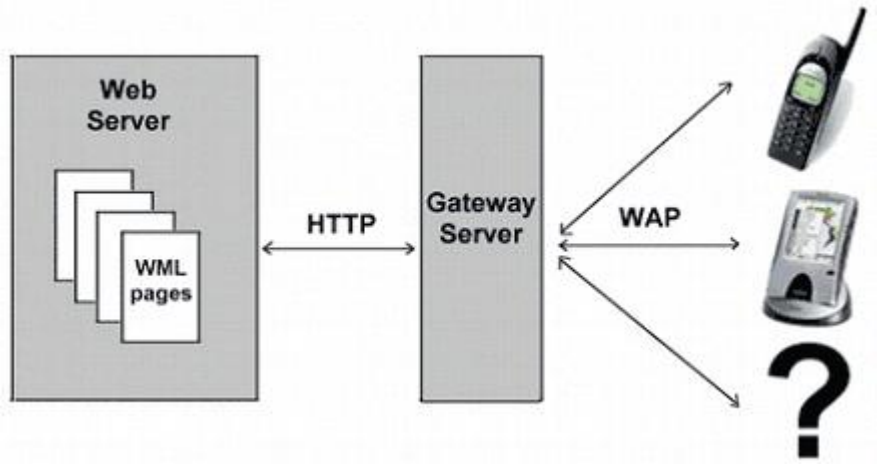


Figure 1 WAP System Architecture

1.6 Mobile Generations and Connectivity

WAP can be used to support a variety of radio technologies that belong to different mobile generations.

The following table summarizes and compares between the mobile generations and the radio technologies that are used in that generation:

	1G	2G	2.5G	3G
Technology	AMPS	GSM,TDMA,CDMA	GPRS,HSCSD,EDGE	UMTS,WCDMA
Bandwidth	Low	Low	Medium	High
Security	None	High	High	High

Figure 2 Mobile Generations

This system will work on the technologies that support the (WAP 2G and up) but not all of its features will work. The cost of these technologies is high compared to the next generations because of the limited bandwidth and capabilities.

What available today in the market from the cellular providers is 2.5G technologies especially GPRS, this technology (General Packet Radio Service) provide a narrow band for transmitting the data, it also will always provide the Subscribers with one connection with a fixed cost.

1.7 What is needed to make the system work?

This system needs following features, for cellular phone, service provider and the WAP servers:

1. WAP enabled phone that is connected to the cellular provider via one of the 2G or higher technologies described above.
2. The service provider should provide a connection to the WAP hosting servers.
3. A data enabled Subscriber Identity Module (SIM) to identify the phone and provide an identity to let the data be delivered to the correct destination.

1.8 The Standards

It is a problem to develop a system in such environment with a variety of cellular phones with different capabilities from different manufactures, also with a WAP service

from different providers with different speed; in addition there are many programming languages with different versions.

To solve this problem, a standard should be followed. This system follows the standards from the Open Mobile Alliance (OMA), which compromises a group of companies and organizations.

This alliance provides specifications for the WML and WAP, and to make sure that an application goes behind these specifications they provide a free testing tool called Openwave emulator, and using this tool the tested application can work fine at any cellular device supported from this alliance.

In the development process of this system all the systems WAP pages are tested using the Openwave emulator, so it true to say this system can work fine on any WAP enabled cellular phone.

Chapter 2

System Specifications

Chapter Two System Specification

2.1 Introduction:

In this chapter we will introduce specifications of the system requirements, which become as a result of studying the analyzing the system.

This chapter will include the following:

- The System objectives.
- The Functional requirements.
- The Requirements Specification
- The Non-Functional requirements.
- Allocation of roles of system developers.
- The Project's Constraints.
- The Feasibility study
    - Alternatives
    - Cost-Benefit analysis
    - Risk evaluation
    - Economical Study
    - Time Feasibility
    - Technical feasibility
    - Legal feasibility

2.2 System objectives:

This system intends to provide a new approach of the billing systems for the cellular phone users, by making it possible for the WAP service subscriber to view and pay their bills via the mobile phone. In addition, it will support the cellular service provider with a

new way of billing technique and collecting charge. All of these will be by the following sub objectives:

1. Billing the WAP system including the database that contains the billing data.
2. Enable subscriber to view his bill.
3. Providing accessible system with simple GUI.
4. Providing robust and secure system.
5. Providing efficient help and support.

2.3 Functional requirements:

1. To achieve the system objectives, the following functionality should be provided by the system:
2. Provide subscribers with authenticated tools and facilities.
3. Collect the needed information about subscriber.
4. Provide cellular users with the ability to view the bill information.
5. Provide cellular users with the ability to access the bank page to pay their bills.
6. Provide managerial tools for the system administrators.
7. Provide subscriber with help tools and facilities.

The following matrix shows the matching between the system objectives and the functional requirement of the system:

Table 1 Functions-Objectives Matching Table

	Objective1	Objective 2	Objective 3	Objective 4	Objective 5
Function 1	√		√	√	
Function 2	√				
Function 3		√	√		
Function 4			√		
Function 5	√		√		
Function 6					√

2.4 Requirements specifications:

This clause contains the specification of the functional requirements of the system:

2.4.1 Provide subscriber with authenticated tools and facilities:

- Subscriber registration.
- Subscriber login.
- Subscriber logout.
- Subscriber forgotten password.
- Unsubscribe account.

2.4.2 Collect the needed information for subscriber:

- View subscriber data.
- Modify subscriber data.
- Change subscriber password.

2.4.3 Providing cellular user with the ability to view the bill information:

- View previous bill.

- View current bill.

2.4.4 Provide cellular users with the ability to access the bank page to pay their bill:

- Where and how to pay.
- Bank login.

2.4.5 Provide managerial tools for the system administrators:

- Administrator login.
- Administrator logout.
- Administrator forgotten password.
- View administrator data.
- Modify administrator data.
- Change administrator password.
- View subscriber data.
- Modify subscriber data.
- Change subscriber password.
- New subscriber registration.
- Unsubscribe account.
- Modify bank-supported list.
- Manage bill information.
- Administrator help.
- Help editor.
- Update advertisements.
- Update service type announcement.
- Update subscriber announcement.

2.4.6 Provide subscriber with help tools and facilities:

- View subscriber help.
- View advertisements.
- View subscriber announcement.
- View service type announcement.

2.5 Non-functional requirements:

The following characteristics should be available in the system to achieve its objectives.

2.5.1 Security:

- Subscriber side: include secure and authenticated login.
- Server side security: include secure and authenticates login only for administrator.
- Bank account security: this related to the bank system.
- WAP environment security.

2.5.2 Robustness and reliability:

- supporting the expected number of users,
- Avoiding system failure due to any reason.

2.5.3 Speed and performance:

- Cope with WAP bandwidth limitation.
- High response to the user request.

2.5.4 Usability and friendly:

- By expecting all type of users with no or low computing skills.
- By asking the subscriber to enter the least amount of data because of the cellular phone keypad limitation.

2.5.5 Compatibility:

- The system should provide the service to the largest number of mobile phones available in the market.
- The system should support the largest number of the cellular phone built in browsers.

2.5.6 Appearance:

- Provide good Appearance cope with the limited screen size.
- The diminutions of the graphics, which target the cellular device, should be small due to small screen display.
- In addition, the graphics file size should be small, due to the bandwidth limitation.

2.6 Constraints:

This clause of the system specification describes the constraints that the systems adapts with or avoids:

- **User Resistance**: Because WAP service is very novel, we expect that most of users prefer the tradition billing methods, so we develop this system to work with the existing system.
- **Lack of Standards**: Because WAP is novel technology, there are no clear standards for development.
- **Cellular phone support**: the built in mobile browser.
- **Special site for Administrator Management**: due to the limitations of the cellular phone, system management cannot be done through the WAP, and this requires building specially Administration site for him.
- **Cellular phone service provider**:
    - Week WAP environment infrastructure.
    - The WAP service is not fully supported for many users.
    - Limited information about their system they provide for us.

2.7 Allocation and trade offs:

2.7.1 Allocation of roles of team leader:

- **Team leader**: responsible for
    - Project planning.
    - Scheduling and controlling flow of system development processes.
    - The integration of the team member's work.
- **Software engineer:** responsible for
    - Requirements collecting and analysis.
    - System design.
    - Documentation: writing, modifying and backup.
    - Development millstones: tracing and changing.
- **Graphic designer**:
    - GUI design of the WAP pages.
    - Documentation Formatting and Publishing.
    - Graphic Design of the Administrator site.
- **Programmer**:
    - The system programming.
    - Implementation.
    - Testing.
    - Must have enough experiences in the ASP.Net and WML development environment.

2.8 Feasibility study:

This clause will discuss the alternatives, resources, cost-benefit analysis and risk evaluation that may be occurring during the project development process.

2.8.1 Alternatives:

2.8.1.1 Topology:

- **Traditional topology**: getting and viewing the bill by visiting the subscriber support center or by the post office, this is a good and high security topology but suffers from the high cost and delivery problem like delays.
- **Web based topology**: a good alternative delivered because of its lower cost than the Traditional Topology but suffers from many weaknesses like, that not all users have the skills to use the internet and the subscriber needs to be on the desktop to use this service.
- **WAP topology**: In the WAP topology as one of the m-commerce, applications provide location independent service and low cost, in addition, that subscriber needs very low computing skills, and in most cases, the WAP service is available on their cellular phones.

2.8.1.2 Environments:

The environment of the project includes the cellular company subscriber who uses bill system.

2.8.1.3 Technical feasibility:

To develop such a dynamic system that manipulates database information only the ASP.NET technology with WML can be used and no other technology will be necessary.

2.8.1.4 Legal feasibility:

In the normal situation there are no limitations or policies on such business projects, so when we want to implement the project we do not need to take a license, and there are no illegal issues.

2.8.2 Economic feasibility:

This section discus the feasibility of the project:

2.8.2.1 Development cost:

- Hardware:

The following table lists the costs for the hardware that are needed to develop the system:

Table 2 Development hardware cost

Item	No. of unit	Unit cost	Available	Subtotal
PC(AMD 3000 MHz, 1GB RAM, 80GB hard disk)	3	$500	Yes	$1500
Cellular phone support WAP	3	$250	Yes	$750
Total				$2250

- Software:

The following table lists the software needed to develop this system and their costs:

Table 3 Development software cost

Item	No. of unit	Unit cost	Available	Subtotal
Microsoft visual studio 2005 professional edition with MSDN 2005 professional	1	$1219	Yes	$1219
Microsoft office professional 2003	1	$293	Yes	$293
Microsoft office Visio professional 2003	1	$120	Yes	$120
Mobile emulators	1	Free	Yes	$0
Adobe PhotoShop C S2	1	$285	Yes	$285
Microsoft windows XP professional with service pack 2	1	$96	Yes	$96
Magic Draw UML 10.5 enterprise edition	1	$1599	Yes	$1599
Total				$3612

- Human Resources:

The following table lists the costs for the human resources needed to develop this system:

Table 4 Development human cost

Team member	Number	Cost/Month	Available	Subtotal
IT students	3	$800	Yes	$2400
Supervisor	1	$1200	Yes	$1200
Total				$3600

The following table summarizes the development cost:

Table 5 Development cost summary

	Total
HW	$2250
SW	$3612
Humans	$3600
Others	$1000
Total	$10462

2.8.2.2 Running cost:

In this section, we list the costs needed to implement this system:

- Hardware:

The following table lists the cost for the hardware that is needed to put this project under production:

Table 6 Implementation hardware cost

Item	Number of unit	Unit cost	Available	Subtotal
Server computer	1	$3000	Yes	$3000
Total				$3000

- Software:

In this section, we list the cost of the software that is needed to implement this project:

Table 7 Software implementation cost

Item	No. of unit	Unit cost	Available	Subtotal
.Net Framework 2.0	1	Free(included with visual studio)	Yes	$0
Windows server 2003 standard edition	1	$595	Yes	$595
Domain Name(per month)	1	$8.95	Yes	$8.95
Internet connection(1024Kbps)	1	$100/month	Yes	$100
Total				$703.95

- Human:

This following table lists the employees and other humans needed to implement the project, and the cost of each.

Table 8 Human implementation cost

Member	Number	Cost	Total
Functional employee	2	$600	$1200
Administrator	1	$1200	$1200
Total			$2400

The following table summarizes the development cost:

Table 9 Implementation cost summary

	Total
HW	$3000
SW	$703.95
Humans	$2400
Total	$6103.95

2.8.3 Cost-benefit analysis:

This clause lists the benefits gained from implementing this system, and compares them to cost.

2.8.3.1 Cellular service provider benefits

- Decrease the managerial and employees cost.

- Improve the quality of service by avoiding the traditional system problems like the bill delivery delay.
- Increase the availability of the service to 24 hours a day 7 days a week , also the service will be available world wide from any WAP enabled phone.
- Increase the subscribers in the WAP service.

2.8.3.2 Consumer benefits:

- Reduce time and cost needed for viewing the bill and login to the bank to pay it.
- Facilities to subscriber to login bank system to pay his bill.

2.8.4 Evaluation of risk:

This section lists the expected risks that may face the system and system development process, here some producers are suggesting avoiding or minimizing the risks effects.

- **New system resistance**

This resistance may take two facts, first from the cellular provider stuff and to solve this problem we suggest to give them the sufficient training before running the system, the other fact of the resistance from the subscribers, here we suggest that the system work aligned with the existing system.

- **Cellular service provider weakness**

We expect that the subscribers of this service will increase, so the demand on the servers and the bandwidth will increase, this will reduce the quality of the service and affect the system robustness, here we suggest that the cellular service provider should study and expect the number of users and implement this on the system infrastructure.

- **Subscribers fear**

The system subscribers may fear from manipulating private data especially the banking information, here we suggest that the cellular provider promote for this new service, and implement the highest security procedures.

- **Cellular Network Reliability**

Problems may appear here because of problems of the GSM networks, which will affect the WAP service. We suggest that if the cellular provider expects this service to provide another alternative for the billing system like the traditional system.

2.8.5 Time feasibility:

In this clause we allocate the time available for the tasks needed for the system building process, this allocation depends on that the system building time is one semester period (15 weeks).

2.8.5.1 Time schedule:

The following table describes the tasks and the weeks we assign for them, also we notice here that some tasks can take place in parallel with other tasks; this parallelism is demonstrated in the Gantt chart

Table 10 Time schedule

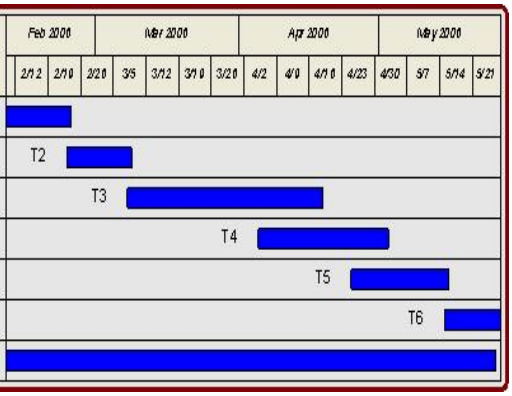
Task	Work	Time in weeks
T1	Information gathering and system specification.	2
T2	Software requirement specification	2
T3	System design	6
T4	Coding and implementation	4
T5	System testing	3
T6	System maintenance	2
T7	Documentation	15

2.8.5.2 Gant chart for time schedule:

The Following Gant chart shows the time allocation for each task:

Table 11 Gant chart for time schedule

ID	Task	Start	Finish	Duration
1	T1	2/10/2006	2/23/2006	2w
2	T2	2/23/2006	3/8/2006	2w
3	T3	3/8/2006	4/18/2006	6w
4	T4	4/5/2006	5/2/2006	4w
5	T5	4/25/2006	5/15/2006	3w
6	T6	5/15/2006	5/26/2006	2w
7	T7	2/10/2006	5/25/2006	15w



Chapter 3

Software Requirements Specifications

Chapter Three Software Requirements Specification

3.1 Introduction

The requirements were collected and analyzed in the previous chapter. In this chapter we discuss the functional details description and details for each validation and constraints. This chapter includes the data flow diagram, data dictionary, database requirements and database dictionary.

3.2 Functional details description:

In this part, we list the system function in each system requirements with some description for each one:

3.2.1 Provide subscriber with authenticated tools and facilities:

- *Subscriber registration:* each subscriber in cellular company is able to register in the WAP system to enable him to view his bill on his cellular phone.
- *Subscriber login*: this function is the only method for the subscriber to login to their account using cellular number and password.
- *Subscriber logout:* this function enables subscribers to end their sessions.
- *Subscriber forgotten passwords*: this function enable subscriber to remember his/her password by writing phone number then the secret question well appear and the subscriber types the answer and clicks button "ok" , finally the subscriber password comes out to the subscriber.
- *Unsubscribe account*: this function allows the subscriber to annulment his account.

3.2.2 Collect the needed information for subscriber:

- *View subscriber data*: this function enables subscriber to view his information which was recorded by him when registered to the service.

- *Modify subscriber data*: in this function the subscriber can change his data that is stored in the database by calling the administrator.
- *Chang subscriber password*: this function enables subscriber to change his password only when he login the service, this is do by typing old password , the new password and forget it, then click button submit.

3.2.3 Provide cellular user with the ability to viewing the bill information:

- *View previous bills*: this function well enable subscriber to view his last three bills.
- *View current bill:* this function will enable to subscriber to view his current bill.

3.2.4 Provide cellular user with the ability to accessing the bank page to pay his bill.

- *Where and how to pay*: this function viewing to the subscriber information about which bank he can use to pay his bill, and how he can pay.
- *Bank login:* this function enable subscriber to login bank account

3.2.5 Provide managerial tools for the system administrators:

- *Administrator login*: this function is the only method for the administrator to login to his account, login using administrator ID and password.
- *Administrator logout:* this function enables administrator to end his session.
- *Forget password:* this function enables administrator to remember his password by writing administrator number then the secret question well be appearance and the administrator typing his answer and click button "ok", finally the password well be appearance.
- *View administrator data*: this function enable administrator to view his data, which was save in the system.
- *Modify Administrator data*: this function enable administrator to modify his data that is stored in the database.

- *Change administrator password:* this function enable administrator to change his password.
- *View subscriber data:* this function enable administrator to viewing subscriber data, which is stored in the database.
- *Modify subscriber data:* this function enable administrator to modify subscriber data.
- *Change subscriber password:* this function enable administrator to changing the subscriber password.
- *New subscriber registration:* this function enable administrator to add new subscriber to the system by registering his data.
- *Unsubscribe account:* this function enable administrator to release account for the subscriber from the system.
- *Modify bank-supported list:* this function enable administrator to add and release bank from bank supported list.
- *Manage bills information:* this function enable administrator to manage bills information by modify, add, or release data.
- *Administrator help:* this function enable administrator to view directions about how to use the system.
- *Help editor:* These function enable administrators to modify subscriber help by add, delete, and update the directions.
- *Update advertisements:* this function enable administrator to changing the advertisement on the system by add new advertisements or delete previous advertisements.
- *Update service type announcements:* this function enable administrator to changing the service type announcements on the system by add new or delete previous announcements.

- *Update subscriber announcement:* this function enable administrator to changing the subscriber announcement on the system by add new or delete previous announcement.

3.2.6 Provide subscriber with help tools and facilities:

- *Viewing subscriber help*: the subscriber should get help to deal with the WAP system and using the system.
- *Viewing advertisements*: this function enable subscriber to see the advertisements.
- *Viewing service type announcement*: this function enable subscriber to see the announcements that about the type of his service.
- *Viewing subscriber announcement:* this function enable subscriber to see the announcement that about the subscriber

3.3 Functional details specification:

In this clause, we discuss the details of each system functionality, its description, inputs and outputs, source, destination, pre-condition, post-condition and what's required for it.

3.3.1 Subscriber functional specification:

- New subscriber registration specification:

Table 12 New subscriber registration specification

Function	New subscriber registration.
Description	Each Bill subscriber in The cellular company able to register in the WAP system to enable him to view his bill on his cellular phone.
Inputs	Cellular number, password, confirm password, secret question, answer.
Source	WAP form

Outputs	Confirm massage.
Destination	Database
Require	Subscriber WAP form
Pre-condition	The subscriber should visit welcome page.
Post-condition	Subscriber can sign in to his main page.
Procedure	this function will first request subscriber cellular number and password, then an expression validation will be applied on the inputs, if the validation does not succeed, an error message will be displayed, if not, the user will be authenticated by searching the database, and if the authentication does not succeed an error message will be displayed, if not, validation for the requested service will be performed by accessing the database so that no subscriber will have more than one profile, if the validation does not succeed an error message will be displayed, if not, the function will request the subscriber cellular number and login password, then an expression validation will be applied on the inputs if the validation does not succeed an error message will be displayed, else user profile will be created and sent to the database.

- Subscriber login specification:

Table 13 Subscriber login specification

Function	Subscriber login
Description	This function is the only method for the subscriber to login to their account login.
Inputs	Cellular number, password.
Source	WAP form
Outputs	Subscriber main page.
Destination	----------
Require	Subscriber WAP form
Pre-condition	Registered subscriber
Post-condition	User can view his page.
Procedure	this function will request cellular number and password, then the validation expression will be applied on the inputs, if the validation does not succeed an error message will be displayed, if not, the function will use the inputs to authenticate the user again, if the authentication does not succeed an error message will be displayed else subscriber main page will be drawn and sent to the user.

- Subscriber logout specification:

Table 14 subscriber logout specification

Function	Subscriber logout.
Description	This function enables subscribers to end their sessions.
Inputs	Selecting to logout link.
Source	WAP form
Outputs	Welcome page
Destination	----------
Require	----------
Pre-condition	An existing subscriber session.
Post-condition	Return to the welcome page
Procedure	This function will request phone number, then search in the database when find it the system logout the subscriber.

- Subscriber forget password specification:

Table 15 subscriber forgot password specification

Function	Subscriber forgot password.
Description	This function enable subscriber to remember his password.
Inputs	Cellular number, the answer secrete question.
Source	WAP form
Outputs	Secrete question, forgotten password
Destination	Cellular company database
Require	Login page
Pre-condition	Subscriber should have a valid account
Post-condition	Login page
Procedure	This function will return the password for the subscriber who forgot his password. This doing after the subscriber send his cellular number and asking the secret question.

- Unsubscribe account specification:

Table 16 unsubscribe account specification

Function	Unsubscribe account.
Description	This function allows the subscriber to annulment his account.
Inputs	Select unsubscribe link
Source	WAP form
Outputs	Call Administrator page
Destination	Cellular company database.
Require	Login page
Pre-condition	Subscriber should have a valid account
Post-condition	Subscriber cannot login
Procedure	When the subscribe select the link the call administrator page should be open and get the subscriber to connect to the administrator.

- View subscriber data specification:

Table 17 View subscriber data specification

Function	View subscriber data.
Description	This function able subscriber to view his information, which was recorded by him when registered to the service.
Inputs	Select view subscriber data link
Source	Cellular company database
Outputs	Viewing subscriber data page
Destination	Cellular company database
Require	Subscriber registration
Pre-condition	Subscriber login
Post-condition	View subscriber data
Procedure	The subscriber select view subscriber data link, then the system request to the database and give from him the subscriber data.

- Modify subscriber data specification:

Table 18 Modify subscriber data specification

Function	Modify subscriber data.
Description	In this function the subscriber can changes his data that is stored in the database by calling the administrator.
Inputs	Select modify data link.
Source	Cellular company database
Outputs	Modify subscriber data
Destination	Cellular company database.
Require	Subscriber registration
Pre-condition	Old subscriber information
Post-condition	Updates subscriber information
Procedure	The subscriber select modify subscriber data link then the modify page appear to him which tell him to call the administrator to modify his data.

- Change subscriber password specification:

Table 19 Change subscriber password specification

Function	Change subscriber password.
Description	This function able subscriber to changing his password only when he login to the service.
Inputs	Old password, new password, confirm password.
Source	WAP form
Outputs	Change password page
Destination	Cellular company Database
Require	Subscriber login
Pre-condition	Old password
Post-condition	New password
Procedure	The user asked to input his current password and then enter the new password and confirm it. The system validates the inputs value and then if it is true the password changed.

- View previous bill specification:

Table 20 View previous bill specification

Function	View previous bill.
Description	This function well enable subscriber to view his last five bills.
Inputs	Select viewing previous bills link
Source	Cellular company database.
Outputs	Previous bills page
Destination	Cellular company database
Require	----------
Pre-condition	Subscriber login the system
Post-condition	Can view the last three bills
Procedure	The subscriber choice view previous bills from the bill page, then system response by viewing the previous bills

- View current bill specification

Table 21 View current bill specification

Function	View current bill.
Description	This function well able to subscriber to view his current bill.
Inputs	Select view current bill link
Source	Cellular company database
Outputs	The current bill
Destination	Cellular company database
Require	Subscriber pay bill
Pre-condition	Subscriber login the system
Post-condition	Give current bill
Procedure	The subscriber choice view current bill from the bill page, the system request it from the database and appearance it.

- Bank login specification:

Table 22 Bank login specification

Function	Bank login
Description	This function enable subscriber to login bank account.
Inputs	Bank ID, password
Source	Bank database
Outputs	Bank page
Destination	Bank database
Require	Paying bill
Pre-condition	Subscribe in the bank
Post-condition	Can paying the bill
Procedure	----------

- Where and how to pay specification:

Table 23 Where and how to pay specification

Function	Where and how to pay
Description	This function view to the subscriber information about which bank he can use to pay his bill, and how he can pay.
Inputs	Selecting where and how to pay link
Source	Bank database
Outputs	Information about the bill payment procedures and the supported banks
Destination	Bank database
Require	----------
Pre-condition	Subscriber login bank
Post-condition	Subscriber know how to pay
Procedure	----------

- View subscriber help specification:

Table 24 View subscriber help specification

Function	Viewing subscriber help
Description	The subscriber should get help to deal the WAP system and using the system.
Inputs	Selecting Help
Source	Cellular company database
Outputs	Help page
Destination	Cellular company database
Require	----------
Pre-condition	----------
Post-condition	----------
Procedure	Subscriber select the help link then it request to the database and give the help page to him

- View advertisements specification:

Table 25 View advertisements specification

Function	Viewing advertisements.
Description	This function enable user to view advertisements
Inputs	Select advertisement link
Source	Subscriber
Outputs	Advertisements page
Destination	Cellular phone screen
Require	Main page
Pre-condition	Subscriber login
Post-condition	----------
Procedure	Subscriber select the advertisement link then the system give advertisements page.

- View service type announcement specification:

Table 26 View service type announcement specification

Function	Viewing service type announcement.
Description	This function enable subscriber to view the announcement thats related to the type of the service.
Inputs	Select viewing service type announcements
Source	Subscriber
Outputs	Service type announcements page
Destination	Cellular phone screen
Require	Main page
Pre-condition	Subscriber must login
Post-condition	----------
Procedure	The subscriber select service type announcement to view the announcement that related to his service account in the cellular company.

- View subscriber announcement specification

Table 27 View subscriber announcement specification

Function	Viewing subscriber announcement.
Description	This function enable subscriber to view his announcement
Inputs	Select viewing subscriber announcements
Source	Subscriber
Outputs	Subscriber announcements page
Destination	Cellular phone screen
Require	Main page
Pre-condition	Subscriber login
Post-condition	----------
Procedure	The subscriber selects the subscriber announcement link to view his announcement, and then the system displays the subscriber announcement page.

3.3.2 Administrator functional specification:

- Administrator login specification:

Table 28 Administrator login specification

Function	Administrator login.
Description	This function well is the only method for the administrator to login to his account.
Inputs	Administrator ID, password.
Source	Web form
Outputs	Administrator main page
Destination	----------
Require	Login form
Pre-condition	Administrator registration
Post-condition	Administrator login the system
Procedure	The administrator inputs his id and password then the system send it to the database to validate it if it is true the system open the main page for the administrator.

- Administrator logout specification:

Table 29 Administrator logout specification

Function	Administrator logout.
Description	This function enable administrator to end his session.
Inputs	Selecting logout
Source	Web form
Outputs	Administrator login page
Destination	----------
Require	----------
Pre-condition	Administrator login the system
Post-condition	Logout the system
Procedure	The administrator select to the logout link then the system end his session and return him to the login page.

- Administrator forgot password specification:

Table 30 Administrator forgot password specification

Function	Administrator forgot password.
Description	This function enable administrator to remember his password.
Inputs	Administrator id , answer the secret question
Source	Web form
Outputs	Forget password page
Destination	Cellular company database
Require	Login page
Pre-condition	Administrator registration
Post-condition	Administrator take his password
Procedure	The administrator typing his id and then the secrete question appearance, then the administrator typing the answer, the system validate the answer then appearance his password.

- View administrator data specification:

Table 31 View administrator data specification

Function	View administrator data.
Description	This function enable administrator to view his data that is stored in the database.
Inputs	Select view administrator data link
Source	Web form
Outputs	View administrator data page
Destination	Cellular company database
Require	Administrator login
Pre-condition	Administrator registration
Post-condition	View administrator data.
Procedure	Selecting the view administrator data then the system request to the database and appear the administrator data on the web form.

- Modify administrator data specification:

Table 32 Modify administrator data specification

Function	Modify administrator data.
Description	This function enable administrator to modify his data that is stored in the database.
Inputs	E-mail, secrete question, answer.
Source	Cellular company database
Outputs	New administrator data
Destination	Cellular company database
Require	Administrator login
Pre-condition	Old administrator data.
Post-condition	Update administrator data
Procedure	The administrator select the modify administrator data link then the system view the page and the administrator add his new E-mail, secret question, answer. The system finally stores new record in the database.

- Change administrator password specification:

Table 33 Change administrator password specification

Function	Change administrator data.
Description	This function enable administrator to changing his password.
Inputs	Old password, new password, and confirm new password.
Source	Cellular company database
Outputs	New administrator password.
Destination	Cellular company data base
Require	Administrator login
Pre-condition	Old password
Post-condition	New password
Procedure	The administrator input the old password, new password, and confirms it then the system validates the information and if it is true then the new password should be saved in the database.

- View subscriber data specification:

Table 34 View subscriber data (for administrator) specification

Function	View subscriber data.
Description	This function enable administrator to view subscriber information, which was recorded by the subscriber when registered to the service.
Inputs	Select view subscriber data link
Source	Cellular company database
Outputs	Viewing subscriber data page
Destination	Cellular company database
Require	Administrator login
Pre-condition	Subscriber registration
Post-condition	View subscriber data
Procedure	The administrator select the link then the system request it to the database and give the subscriber data.

- Modify subscriber data specification:

Table 35 Modify subscriber data (for administrator) specification

Function	Modify subscriber data.
Description	In this function the administrator can changes subscriber data that is stored in the database only when he login to the system.
Inputs	Inputs new subscriber data
Source	Cellular company database
Outputs	New subscriber data stored
Destination	Cellular company database
Require	Subscriber register
Pre-condition	Old subscriber information
Post-condition	Updates subscriber information
Procedure	Administrator inputs new data about the subscriber and stored it in the database

- Change subscriber password specification:

Table 36 Change subscriber password (for administrator) specification

Function	Change subscriber password.
Description	This function able the administrator to changing the subscriber password only when he login to the service.
Inputs	Old password, new password, confirm password.
Source	Cellular company database
Outputs	Change password page
Destination	Cellular company database
Require	Administrator login
Pre-condition	Old password
Post-condition	New password
Procedure	The administrator input the current subscriber password, the new password and confirm it. The system validates the inputs ,if it is true the password changing.

- New subscriber registration specification:

Table 37 New subscriber registration (for administrator) specification

Function	New subscriber registration.
Description	This function enables the administrator to register new subscriber in the WAP system.
Inputs	Cellular number, password, confirm password, secret question, answer.
Source	Web form
Outputs	New subscriber register
Destination	Cellular company database
Require	Administrator login
Pre-condition	The administrator should be login.
Post-condition	Subscriber can sign in to his main page.
Procedure	This function will first request subscriber cellular number and password, then an expression validation will be applied on the inputs, if the validation does not succeed, an error message will be displayed, if not, the user will be authenticated by searching the database, and if the authentication does not succeed an error message will be displayed, if not, validation for the requested service will be performed by accessing the database so that no subscriber will have more than one profile, if the validation does not succeed an error message will be displayed, if not, the

	function will request the subscriber cellular number and login password, then an expression validation will be applied on the inputs if the validation does not succeed an error message will be displayed, else user profile will be created and sent to the database.

- Unsubscribe account specification:

Table 38 Unsubscribe account (for administrator) specification

Function	Unsubscribe account.
Description	This function allows the administrator to annulment the subscriber account.
Inputs	Select unsubscribe link
Source	Web form
Outputs	Relies subscriber account from database
Destination	Cellular company database.
Require	Login page
Pre-condition	Subscriber should have a valid account
Post-condition	Subscriber can not login
Procedure	The administrator select the unsubscribe account then the system request to the database and relies the account from the database

- Modify bank supported list specification:

Table 39 Modify bank supported list specification

Function	Modify bank-supported list.
Description	This function enable administrator to add and remove bank from bank supported list.
Inputs	Bank number, bank name
Source	Web form
Outputs	Supported banks list
Destination	Cellular company data base
Require	Administrator login
Pre-condition	Administrator login
Post-condition	----------
Procedure	The administrator select the modify bank supported list link then the system give the modify bank page. The administrator adds or update or delete from the bank list.

- Manage bill information specification:

Table 40 Manage bill information specification

Function	Managed bills information.
Description	This function enable administrator to manage bills information by modifies, add, or release data.
Inputs	Selecting Managed bills information.
Source	Web form
Outputs	Bill managements page
Destination	Cellular company database
Require	Administrator login
Pre-condition	Administrator login
Post-condition	The subscriber have new bill
Procedure	The administrators add new bill to the subscriber account by add the new entry to the bill form then the system validate it and then save it in the database.

- Administrator help specification:

Table 41 Administrator help specification

Function	Viewing administrator help
Description	The administrator should have a help requirement to know how to use the system
Inputs	Selecting Help
Source	Cellular company database
Outputs	Help page
Destination	Cellular company database
Require	----------
Pre-condition	----------
Post-condition	----------
Procedure	administrator select the help link then it request to the database and give the help page to him

- Help editor specification:

Table 42 Help editor specification

Function	Help editor
Description	This function enable administrator to modify subscriber help by add, delete, and update.
Inputs	Question ID, question, type, answer
Source	Administrator
Outputs	Subscriber help
Destination	Cellular company data base
Require	Administrator login
Pre-condition	Administrator login
Post-condition	The subscriber can view the new help
Procedure	The administrator select the help editor link then the editor page should be appear to him. He can add, modify and delete to the data in the subscriber help and then click ok to finish this operation.

- Update advertisement specification:

Table 43 Update advertisements specification

Function	Update advertisements.
Description	This function enable administrator to changing the advertisement on the system by adds new advertisements or deletes previous advertisements.
Inputs	Selecting update advertisements link.
Source	Administrator
Outputs	Advertisements
Destination	Cellular company data base
Require	Administrator main page
Pre-condition	Administrator login
Post-condition	----------
Procedure	The administrator select the update advertisement link then the system receive the update page and give to administrator to choices, first to add new advertisement and the second delete previous advertisement.

- Update service type announcement specification:

Table 44 Update service type announcement specification

Function	Update service type announcement.
Description	This function enable administrator to changing the service type announcements on the system by add new or delete previous announcements.
Inputs	Selecting update service type announcement link.
Source	Administrator
Outputs	Service type announcement
Destination	Cellular company data base
Require	Administrator main page
Pre-condition	Administrator login
Post-condition	----------
Procedure	The administrator select the update service type announcement link then the system receive the update page and give to administrator to choices, first to add new announcement and the second delete previous announcement.

- Update subscriber announcement specification:

Table 45 Update subscriber announcement

Function	Update subscriber announcement.
Description	This function enable administrator to change the subscriber announcement on the system by adds new or delete previous announcement.
Inputs	Selecting update subscriber announcements page
Source	Administrator
Outputs	Subscriber announcement
Destination	Cellular company data base
Require	Administrator main page
Pre-condition	Administrator login
Post-condition	----------
Procedure	The administrator select the update subscriber announcement link then the system receive the update page and give to administrator to choices, first to add new announcement and the second delete previous announcement

3.4 System context diagram

The following system context diagram represents the relationship between the system and other systems, here; relationship exists with the cellular provider database,

which contains user and bills information, this database also connected to the bank system.

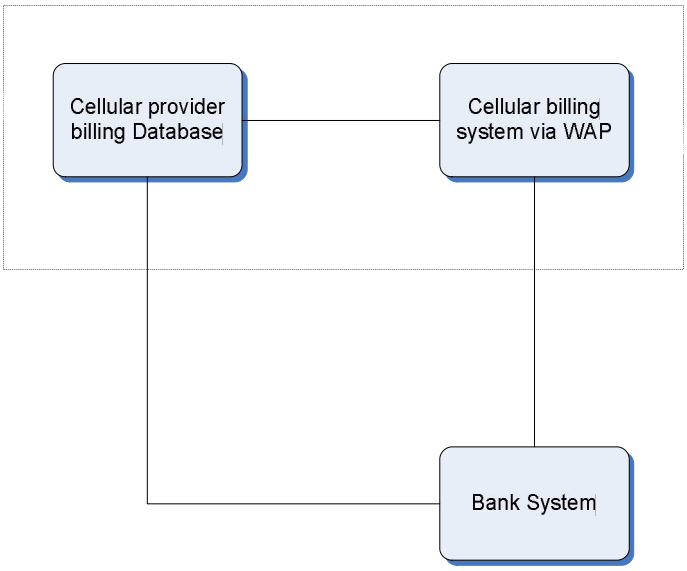


Figure 3 System Context Diagram

3.5 Information description:

This section convert the data and the information in the project with describe the data flow diagram and describe for each entity.

3.5.1 System data flow diagram:

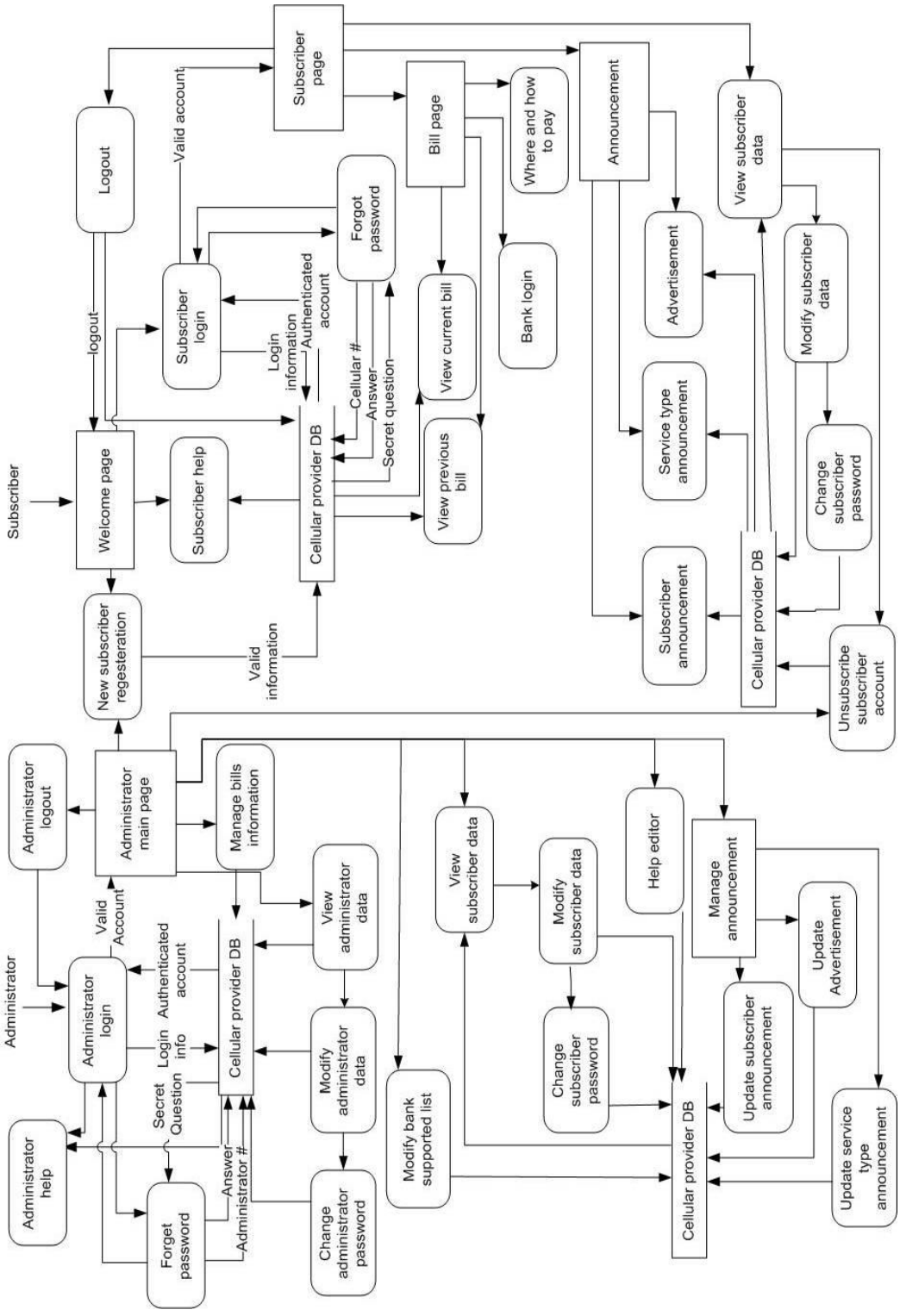


Figure 4 Data Flow Diagram

3.5.2 Data dictionary:

The Following Table shows the Data Dictionary for the system

Table 46 Data dictionary

Entity	Type	Description
Subscriber login	Function	Enable subscriber to login the system
Subscriber registration	Function	Each subscriber able to register in the service
Subscriber logout	Function	Enable to the subscriber to exit his account
Subscriber help	Function	Give subscriber information about how to use the service.
Subscriber forgot password	Function	Give subscriber his password when he forgot it.
View current bill	Function	Enable the user to see his bill.
View previous bill	Function	Enable to the subscriber to see his last there bills
Bank login	Function	Enable subscriber to login his favorite bank
Where and how to	Function	Give the subscriber

pay		information about the banks and how to pay by it.
View Subscriber announcement	Function	Enable subscriber to see his announcement.
View service type announcement	Function	Enable subscriber to see the announcement that related to the type of his service.
View advertisements	Function	Enable subscriber to see the advertisements.
View subscriber data	Function	Enable subscriber to see his data
Modify subscriber data	Function	Enable subscriber to modify his data.
Unsubscribe account	Function	Enable subscriber to remove his account.
Chang subscriber password	Stored procedure	Change the current password
Check password	Stored procedure	Check the correctness of password in the login process
Check current password	Stored procedure	Check the correctness of password in the change password process

Add subscriber	Stored procedure	Add new subscriber to the system
Check secret answer	Stored procedure	Check the correctness of the Secret Answer in the password recovery process
Get advertisement	Stored procedure	Return the path of the image in the Advertisement display process
Get password	Stored procedure	Return the password in the password recovery process
Get secret question	Stored procedure	Return the secret question in the password recovery process
Get service type	Stored procedure	Return the service type to be used in displaying the service type announcements process
Get service type announcement	Stored procedure	Return the service type announcements
Area menu	Stored procedure	Return the area information to fill the area menu
Secret question Menu	Stored procedure	Return the area

		information to fill the secret question menu
Service type menu	Stored procedure	Return the area information to fill the service type menu
Supported bank menu	Stored procedure	Return the area information to fill the supported banks menu
Update subscriber	Stored procedure	Used Update the subscriber information
getWAPhelp	Stored procedure	Return question and their answer
Administrator ID	String	A string that represent the ID for the administrator.
Administrator password	String	A string that represent the password that the administrator login the system by it.
Administrator login	Function	Able administrator to login the system
Administrator forgot password	Function	Able administrator to remember his password.
Administrator help	Function	Give administrator information about how

		to use the system
Manage bill information	Function	Administrator manage the bills information
Modify administrator data	Function	Administrator able to modify his data
View administrator data	Function	Administrator able to view his data
Change administrator password	Stored procedure	Change the current password
Manage bank supported list	Function	Able administrator to manage the banks which subscribed in the system
Help editor	Function	The administrator able to edit for the subscriber help.
Update service type announcement	Function	Able the administrator to update the service type announcement.
Update subscriber announcement	Function	Able the administrator to update the subscriber announcement.
Update advertisements	Function	Able the administrator to update the advertisement.
FAQ	Abbreviation	Frequently Asked

		Question
OMA	Abbreviation	Open Mobile Alliance
GPRS	Abbreviation	General Packet Radio Service
WAP	Abbreviation	Wireless Application Protocol
WML	Abbreviation	Wireless Markup language
GUI	Abbreviation	Graphical User Interface
Cellular number	String	A string that represent the number of the cellular
addAds	Stored procedure	Add new advertisements
addBank	Stored procedure	Add new bank in the supported list
addHelp	Stored procedure	To add new information in the help
addserviceTypeAnn	Stored procedure	Add new service type announcement.
addUser	Stored procedure	Add new subscriber
changAdminPass	Stored procedure	Change the administrator password
checkAdminLogin	Stored procedure	To check the

		Administrator Login by ensure that the password and user name is match
delAds	Stored procedure	Delete advertisement
delbank	Stored procedure	Delete bank from the supported list
delserviceAnn	Stored procedure	Delete service type announcement
delSubAnn	Stored procedure	Delete subscriber announcement
delsubscriber	Stored procedure	Delete subscriber from the database.
mangedBill	Stored procedure	To add new bill to the bills
passRecovery	Stored procedure	To recovery the password from the database.
passRequest	Stored procedure	To request secret Question from table to recovery forgotten password
stopsubscriber	Stored procedure	To stop subscriber by remove.
updateAdministrator	Stored procedure	Modify administrator data

updateBank	Stored procedure	Modify bank data
updatesubscriber	Stored procedure	Modify subscriber data
viewAdmin	Stored procedure	To view administrator data
viewbank	Stored procedure	View bank
viewdate	Stored procedure	View cellular number and date from bill table to be compared before add new table
viewhelp	Stored procedure	View administrator help.
viewSub	Stored procedure	view subscriber first name and last name and cellular number to be add new subscriber announcements
viewSubscriber	Stored procedure	View subscriber data
viewSubService	Stored procedure	View subscriber service type and the cost of service and the discount rate to used this information in add bill

3.5.3 System interface description:

When Subscriber interact with the system he can't directly interacted with component and subsystem or any function there should be a suitable way to enter data and use the system as a whole so the interface here well solve this and ensure that the user can enter the correct data to the system in correct way.

Interface should be simple and enter data as minimum as we can because the cellular phone display size in input screen and output the entering controls as textbox is minimum as we can.

According to the user interface, the System will support only Cellular User interface and Administrator interface.

3.5.3.1 Cellular User Interface:

- *Input:*

In input screen that one of interface using validation control in the WAP well decrease request in the network and increase the efficiency and ensure that the data entry match the data type in data base so the data arrived to the database must be the valid data only .

- *Output*:

The Output screen show user exactly what he won't and the actual data that coming from his request and display his data only this should be happen quickly and correctly.

- *GUI*

Graphical user interface should be simple and clarity to be uploaded quickly and tell user what to do and what the next step and provide user with help and to lead him to the correct use way.

3.5.4 Database requirement:

In this section, we will explain the needed data that we want to store it in the database.

3.5.4.1 Subscriber information:

- Cellular number: subscriber cellular number that is subscribe the service..
- First name: the first subscriber name.
- Last name: the family name for the subscriber.
- Password: the subscriber password that he can login with it to the system.
- Secret question: the secret question that the system ask the subscriber when forgot his password.
- Secret answer: answer the secret question.
- Bank name: the bank name that the subscriber by it pay his bill.
- Bank number: the number of the bank that the subscriber by it pays his bill.
- Account number: the number of the account in the bank.
- Service type number: the number of the type of the service that subscribe in.
- Area number: the number of the area when he lives.
- Area name: the name of the area when he lives.

3.5.4.2 Bill information:

- Bill number: the number of the bill.
- Cellular number: the subscriber cellular number that the bill for him.
- Date: the date of the day that the bill produced.
- Service type number: the number of the service that he subscribes in it.
- Service type cost: the cost that he pay instead of the service.
- Internal calls: the amount of the calls that dial to cellular phones that from the cellular company.
- Land line calls: the amount of the calls that dial to the phones land.
- External calls: the amount of the calls that dial to another cellular company.

- Rooming: the count instead of the rooming service.
- SMS: the amount of the SMS massage.
- GPRS: the amount of the GPRS service.
- Discount amount: the discount from the bill depends on the type of the service.
- Sum: the amount of the bill.

3.5.4.3 Administrator information:

- Administrator number: the number id to the administrator.
- First name: the administrator name.
- Last name: the administrator family name.
- Phone number: the administrator phone number.
- Password: the administrator password that by it login the systems.
- Secret question: the secret question that the system asked to administrator when he forgot password.
- Secret answer: the answer of the secret question.
- E-mail address: the e-mail address for the administrator.
- Area number: the number of the area when he lives.
- Area name: the area name when he lives.

3.5.4.4 Announcement information:

- Subscriber announcement number: the number of the announcement that related to the subscriber.
- Service type announcement number: the number of the announcement that related tot the type of the service.
- Advertisements number: the number of the advertisements that is replay.
- Cellular number: the cellular number for the subscriber that have the announcement.

- Service type number: the number of the service that the subscribers subscribe in it.
- Text: the text that the announcement contains.
- Graphic path: the path of the graph that replay in the advertisements.

3.5.4.5 Help information:

Question ID: the ID for the question that contains in the help.

Type: this includes the type of the service (WAP or web).

FAQ: this includes the questions in the help.

FAQ answer: this failed includes the answer of the questions.

3.5.5 Database data dictionary:

This dictionary describes the database fields, their names, type, and description.

Table 47 database data dictionary

Failed name	Type	Length
CellularNo	Varchar	10
firstName	Varchar	50
lastName	Varchar	50
Password	Varchar	10
PhoneNumber	Varchar	10
E-mail	Varchar	20
accountNo	Varchar	10
serviceTypeNo	Varchar	10
serviceType	String	50

Cost	Money	8
discountAmount	Money	8
billNo	Decimal	9
Date	Datetime	8
internalCalls	Money	8
landLineCalls	Money	8
externalCalls	Money	8
Rooming	Money	8
SMS	Money	8
GPRS	Money	8
Sum	Float	8
areaName	Varchar	50
areaNo	Varchar	10
bankNo	Varchar	10
bankName	Varchar	50
announcementNo	Varchar	10
Text	Varchar	100
subscriberAnnouncementNo	Varchar	10
advertisementNo	varchar	10
graphicPath	Varchar	80
secretQuestionNO	Varchar	10

secretQuestion	Varchar	50
secretAnswer	Varchar	50
QuestionID	Int	10
questionText	Varchart	50
Type	Varchar	50
FAQ	Varchar	50
FAQAnswer	Varchar	50

Chapter 4

System Design

Chapter Four System Design

4.1 Introduction:

In this section we want to describe the system design, we describe each method as a function by designing it in diagram chart. We describe the database model and the input output design. The following diagram represents that:

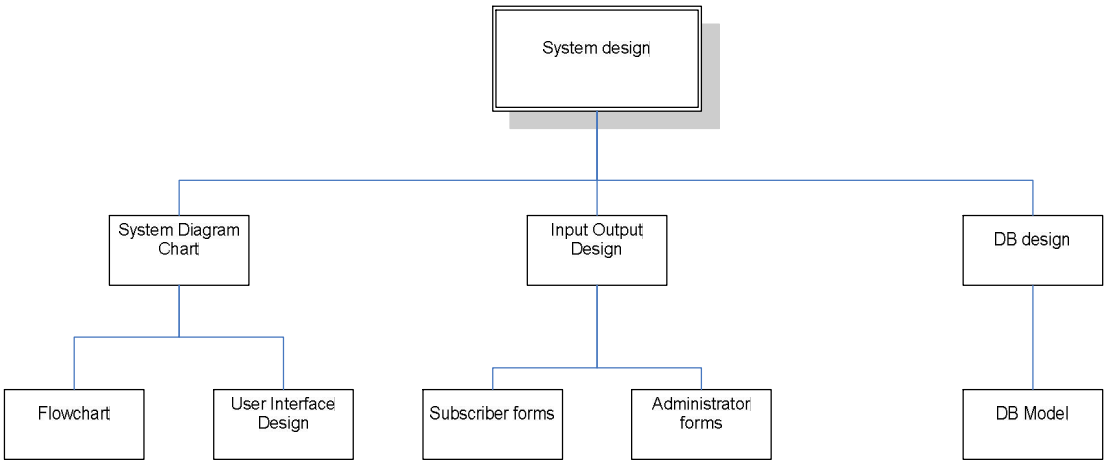


Figure 5 System design diagram

This section covers the following:

- System diagram chart.
- Input output design.
- DB design.
- Test plan

4.2 System diagram chart:

4.2.1 Subscriber registration:

- *Description*: each subscriber in the cellular phone company able to register in the WAP system to enable him to view his bill and pay it by login the bank system.

- *Interface:*
    - Input: cellular number, first name, last name, and password, confirm password, secret question, answer, area, service type, preferred bank, account no.
    - Output: conformation massage
- *Constraints:*
    - All inputs must fail correctly.
    - The password must be at least 6 characters.
    - Password must equal conform password.
    - Password must not equal phone#.
    - The phone number does not duplicate.
- *User interface design:*

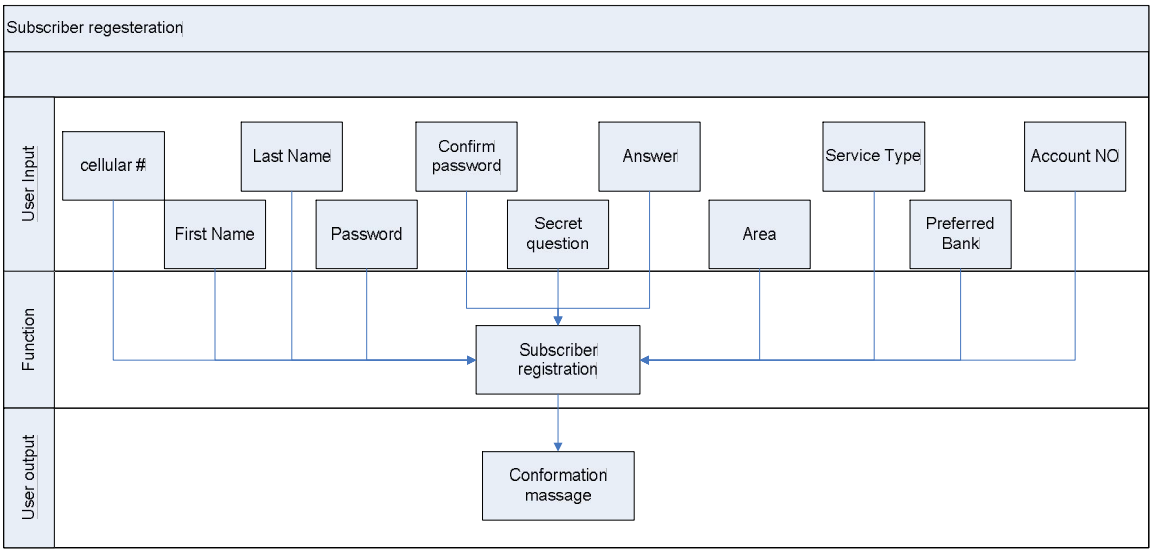


Figure 6 Subscriber regesteration user interface design

- *Flowchart:*

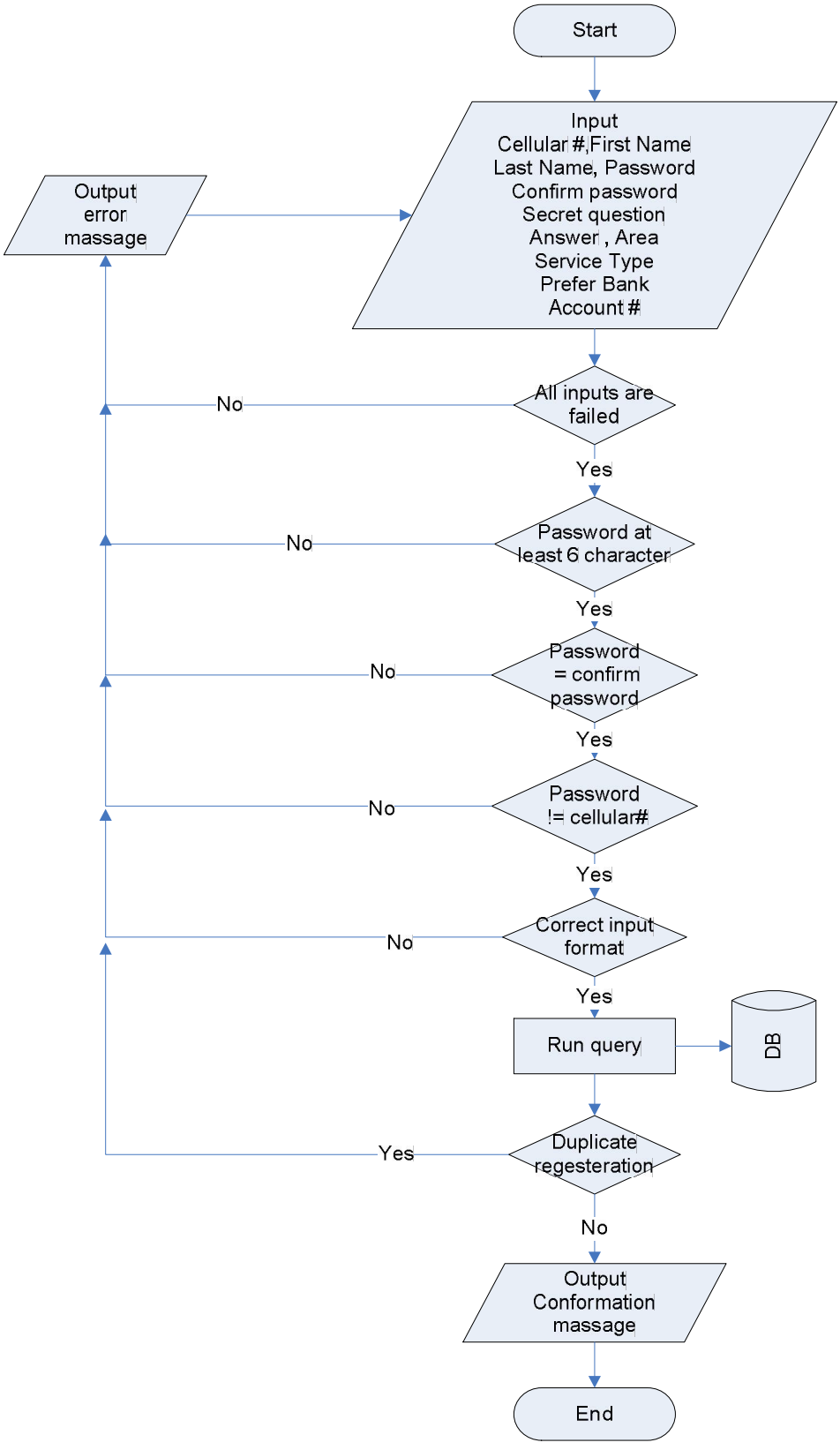


Figure 7 Subscriber regesteration flowchart

4.2.2 Subscriber login:

- *Description:* this is the only method for the subscriber to login to his account.
- *Interface:*
    - Input: phone number, password.
    - Output: subscriber main page.
- *Constraints:*
    - All failed should fail.
    - Phone number and password should be meeting the database.
- *User interface design:*

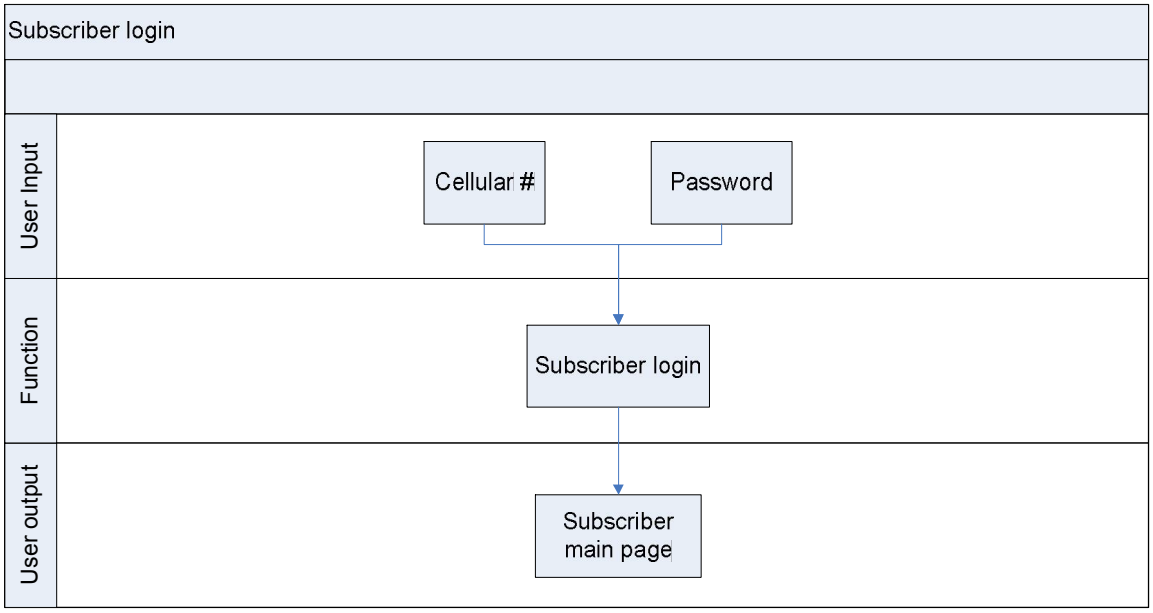


Figure 8 Subscriber login user interface design

- *Flowchart:*

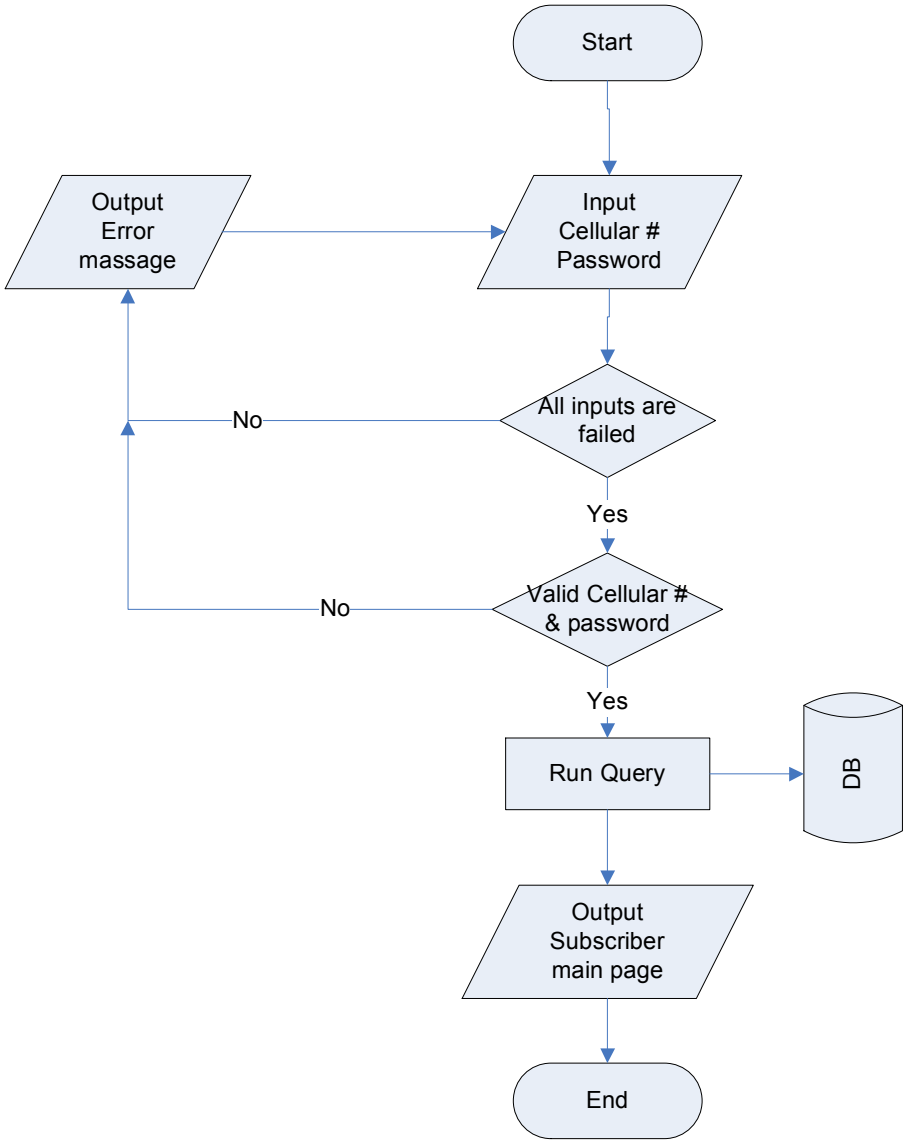


Figure 9 subscriber login flowchart

4.2.3 Subscriber logout:

- *Description:* this function enable subscriber to end his main page and back to welcome page.
- *Interface:*
    - Input: select logout link.
    - Output: welcome page.
- *Constraints:*
    - NON

- *User interface design:*

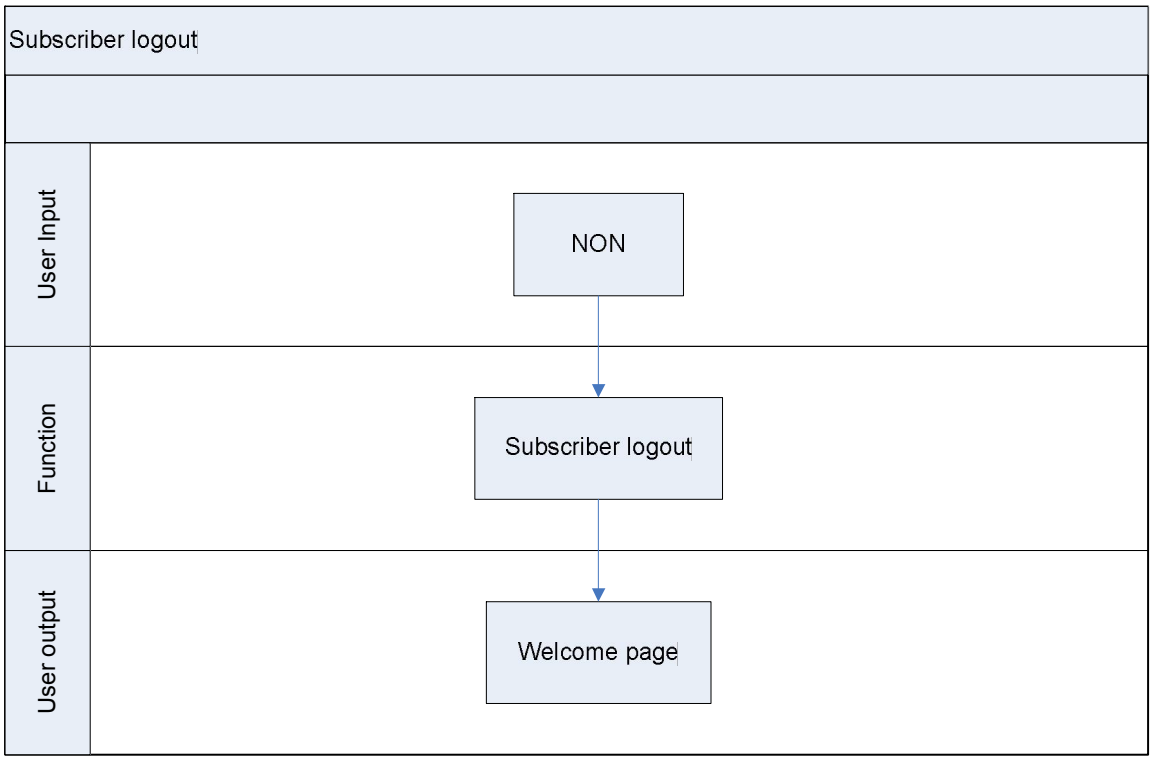


Figure 10 Subscriber logout user interface design

- *Flowchart:*

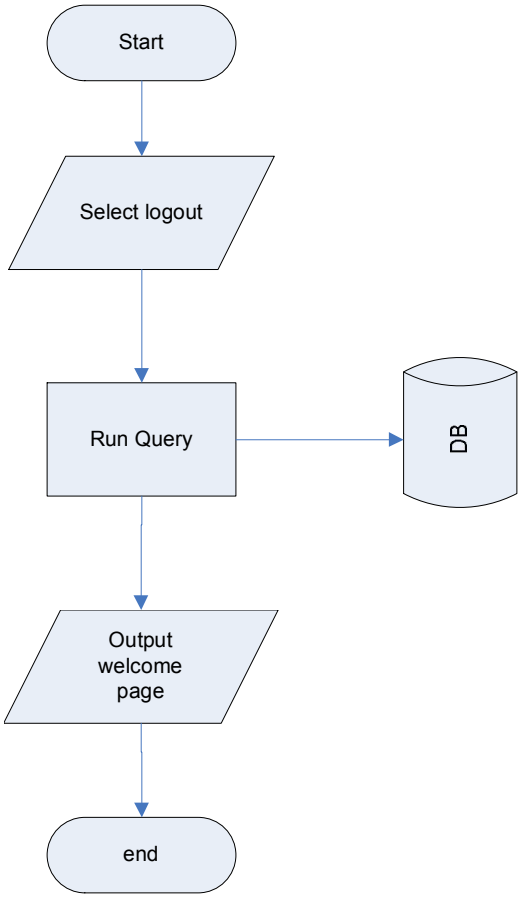


Figure 11 Subscriber logout flowchart

4.2.4 Subscriber forgotten password:

- *Description:* this function enable subscriber to get his password from the system.
- *Interface:*
    - Input: phone number and answer the secret question.
    - Output: forgot password.
- *Constraints:*
    - All failed should fail.
- *User interface design:*

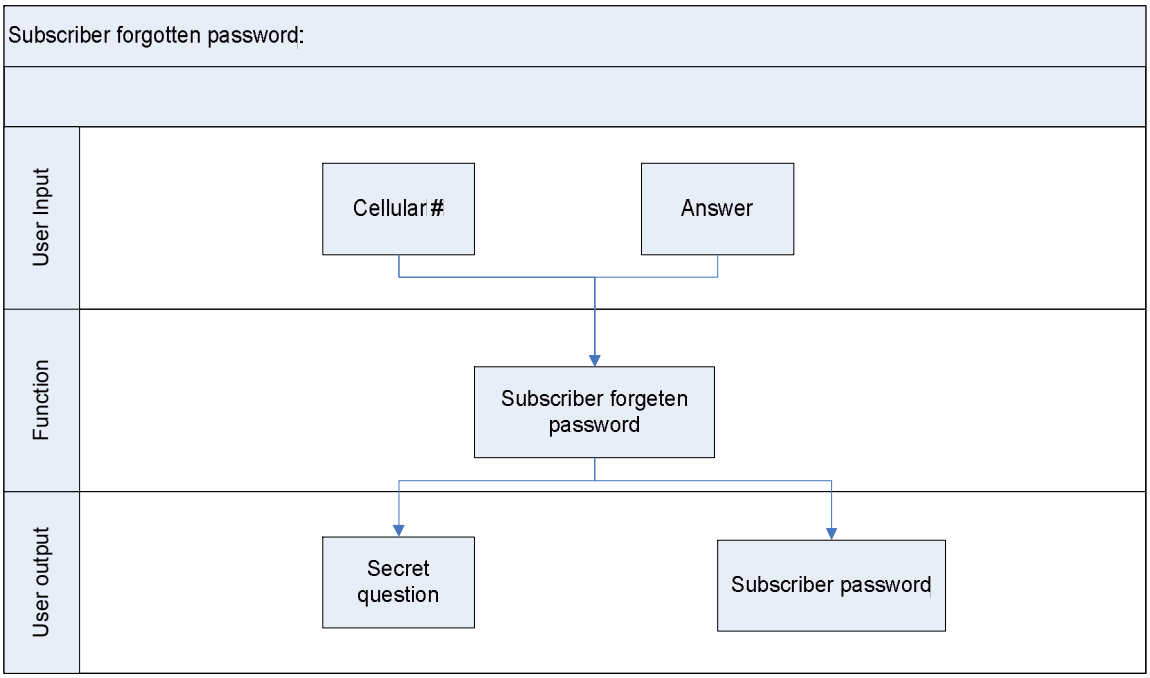


Figure 12 Subscriber forgeten password user interface design

- *Flowchart:*

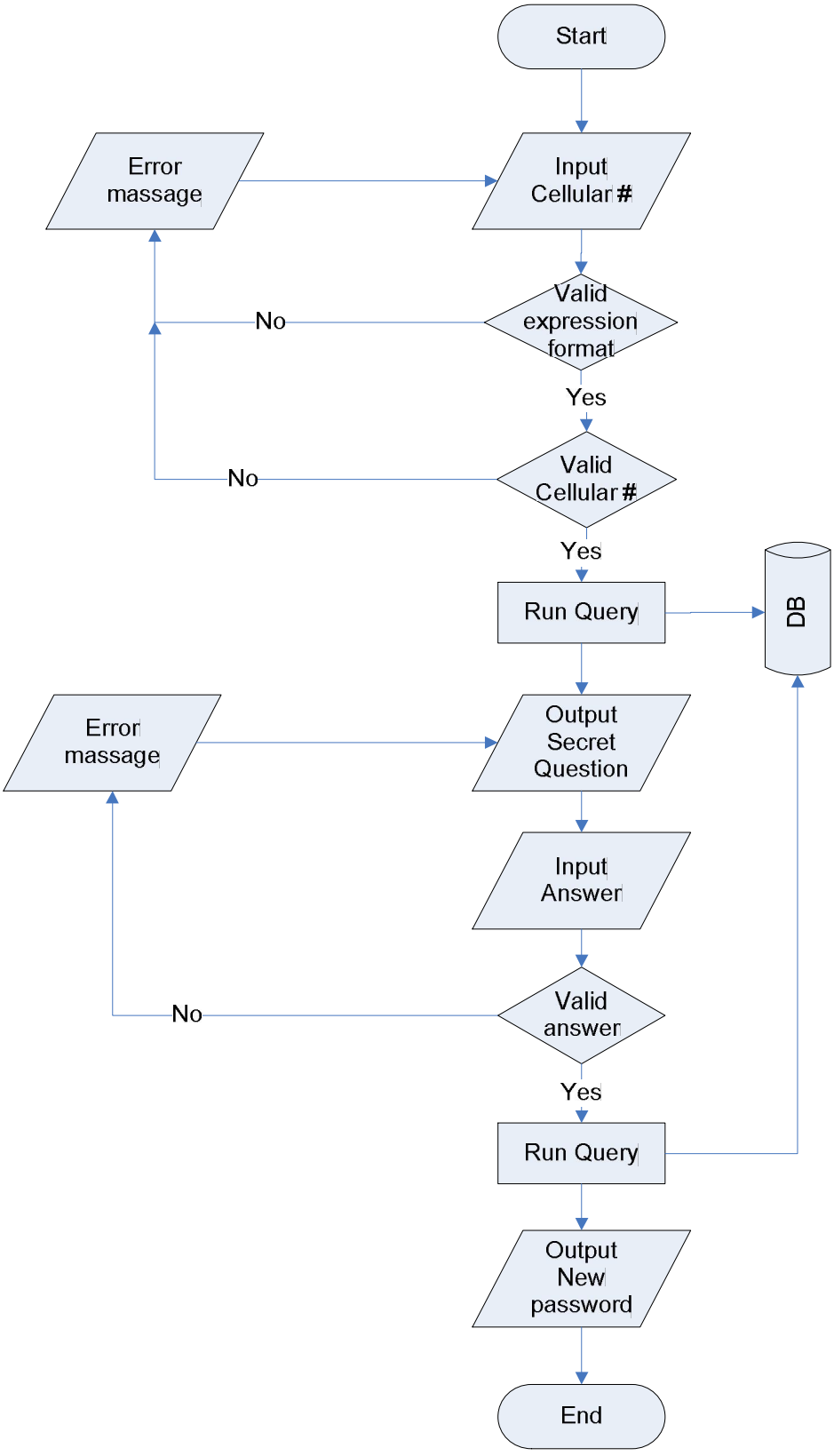


Figure 13 Subscriber forgotten password flowchart

4.2.5 Unsubscribe account:

- *Description:* this function allows user (subscriber or administrator) to Unsubscribe his account.
- *Interface:*
    - Input: select unsubscribe link.
    - Output: welcome page.
- *Constraints:*
    - Subscriber should be login his page.
    - Administrator should be login the system.
- *User interface design:*

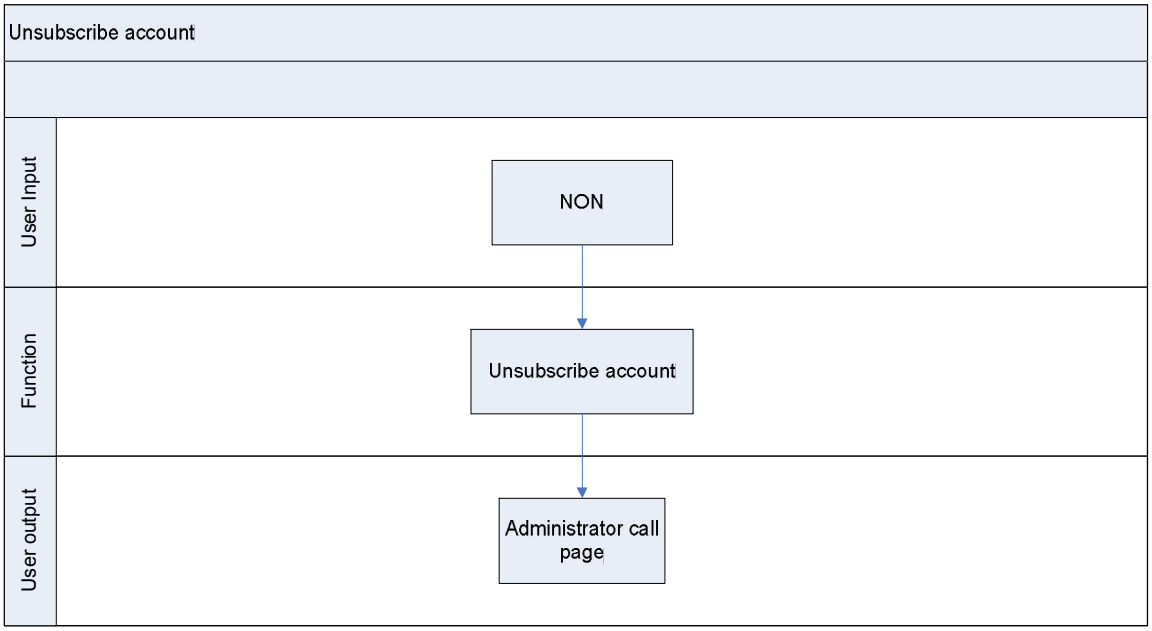


Figure 14 Unsubscribe account user interface design

- *Flowchart:*

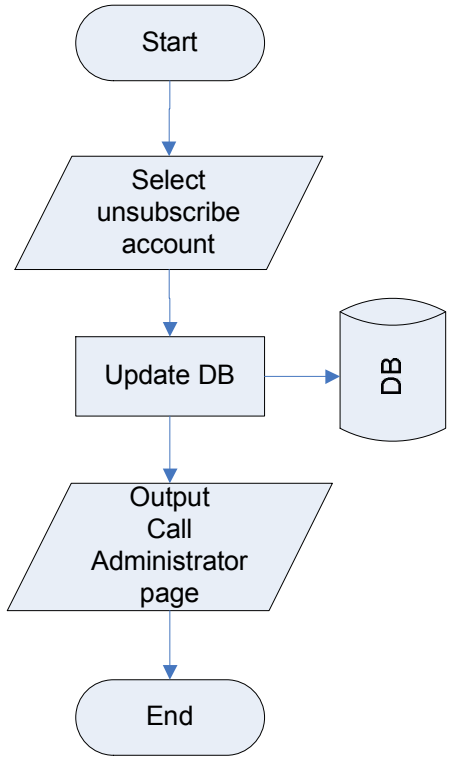


Figure 15 Unsubscribe account flowchart

4.2.6 View subscriber data :(by subscriber)

- *Description:* this function enable subscriber to view his data.
- *Interface:*
    - Input: select view subscriber data link.
    - Output: subscriber data page.
- *Constraints:*
    - Subscriber should be login his page.
- *User interface design:*

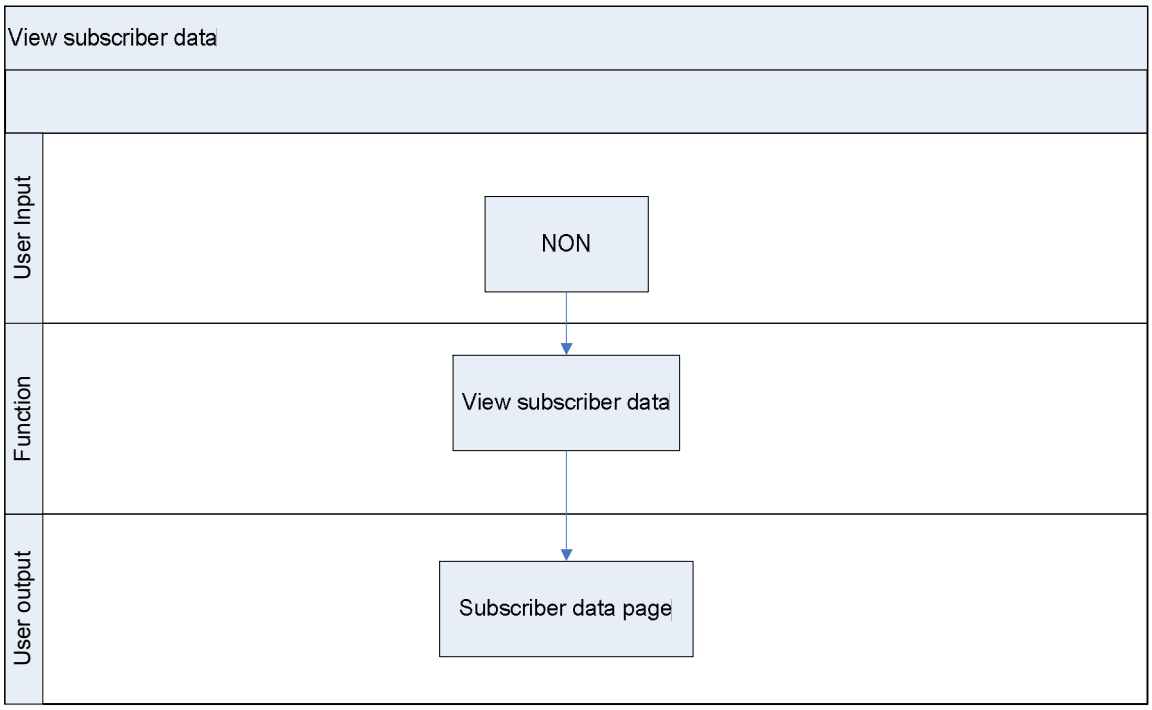


Figure 16 View subscriber data by subscriber user interface design

- *Flowchart:*

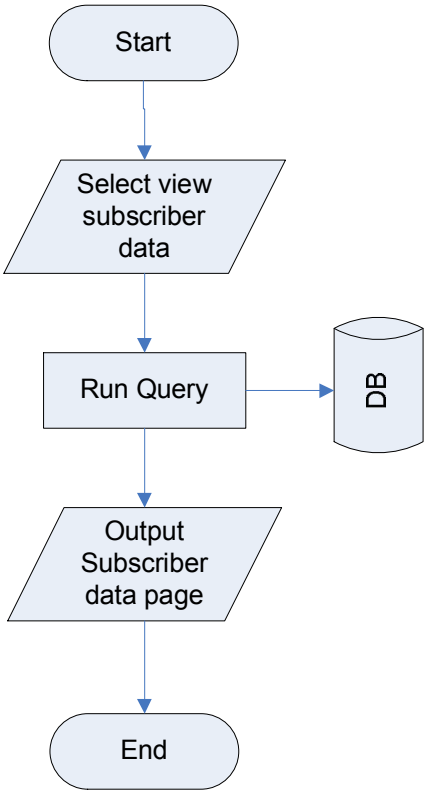


Figure 17 View subscriber data by subscriber flowchart

4.2.7 Modify subscriber data: (by subscriber)

- *Description:* this function enable subscriber to modify his data.
- *Interface:*
  - Input: select modify subscriber data link.
  - Output: Administrator Call Page.
- *Constraints:*
  - Subscriber should be login his page.
- *User interface design:*

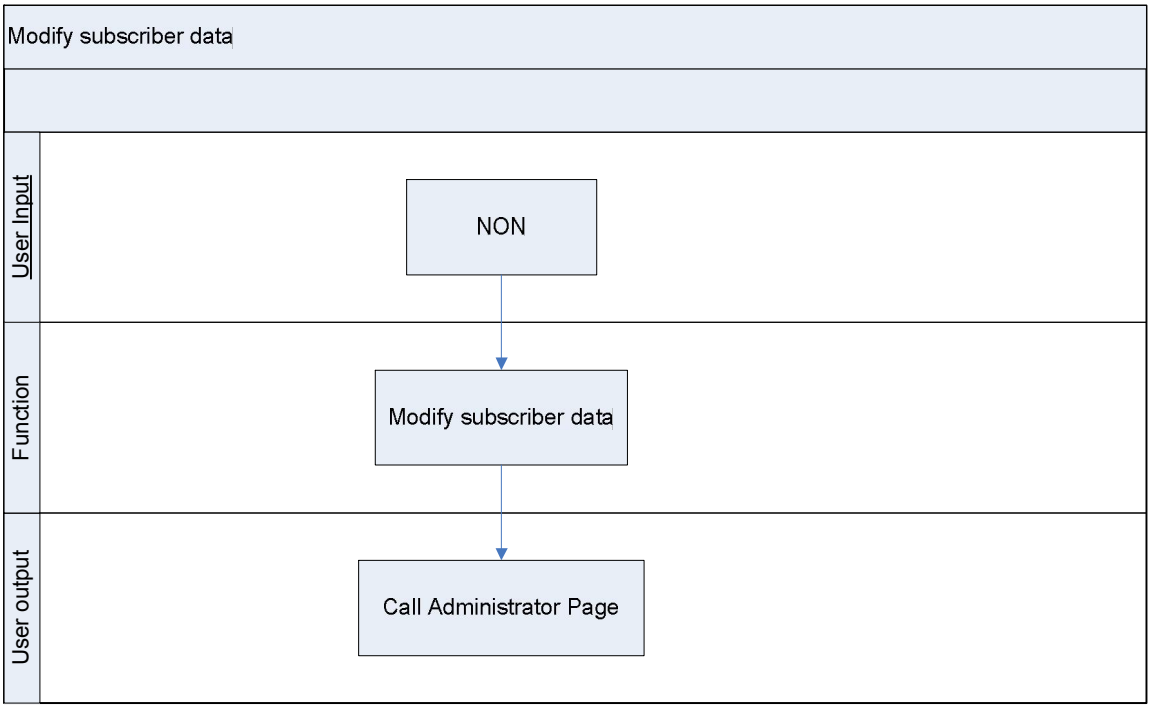


Figure 18 Modify subscriber data by subscriber user interface design

- *Flowchart:*

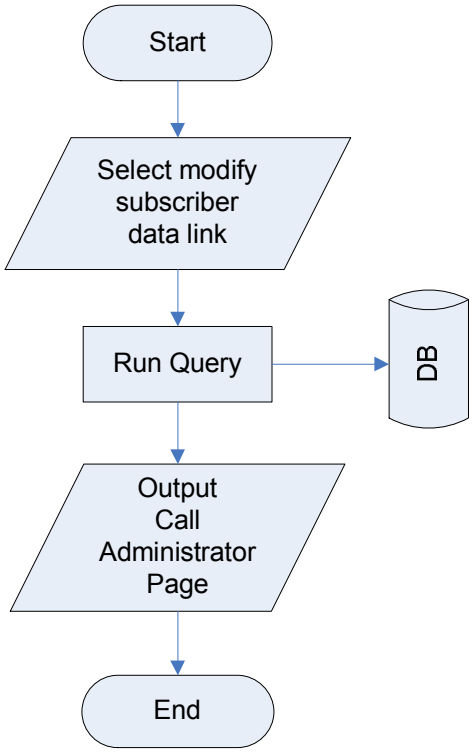


Figure 19 Modify subscriber data by subscriber flowchart

4.2.8 Change subscriber password :(by subscriber)

- *Description:* this function allow user (subscriber or administrator) to change subscriber password.
- *Interface:*
    - Input: old password, new password, confirm new password.
    - Output: new password confirmation.
- *Constraints:*
    - All input must fail correctly.
    - New password must be at least 6 character.
    - New password must equal confirm password.
    - New password should not equal cellular number.
- *User interface design:*

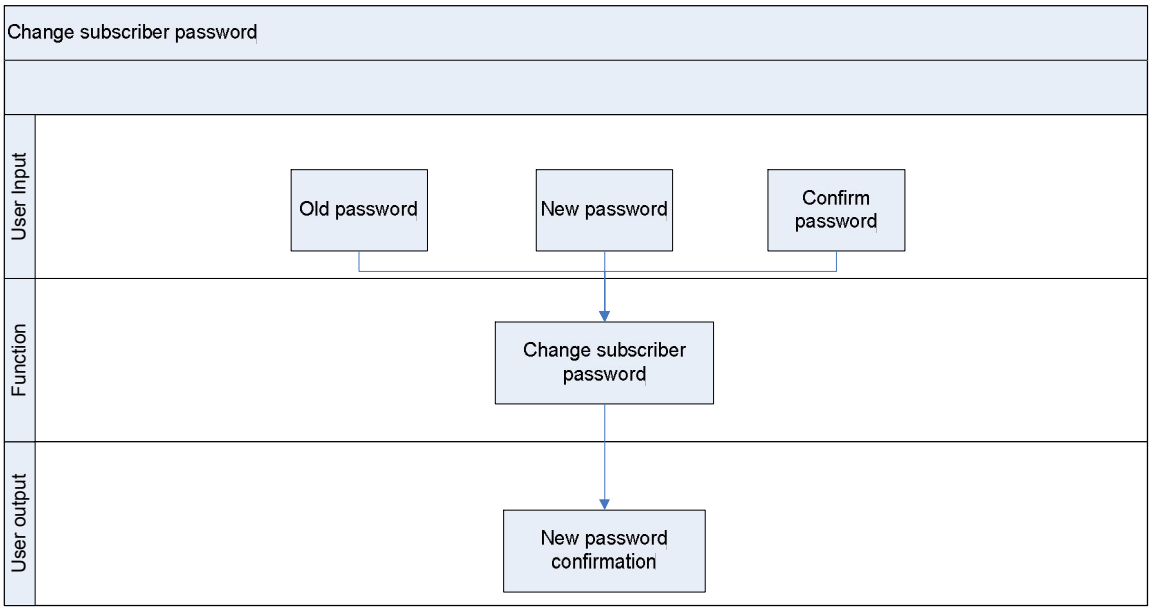


Figure 20 Change subscriber password by subscriber user interface design

- *Flowchart:*

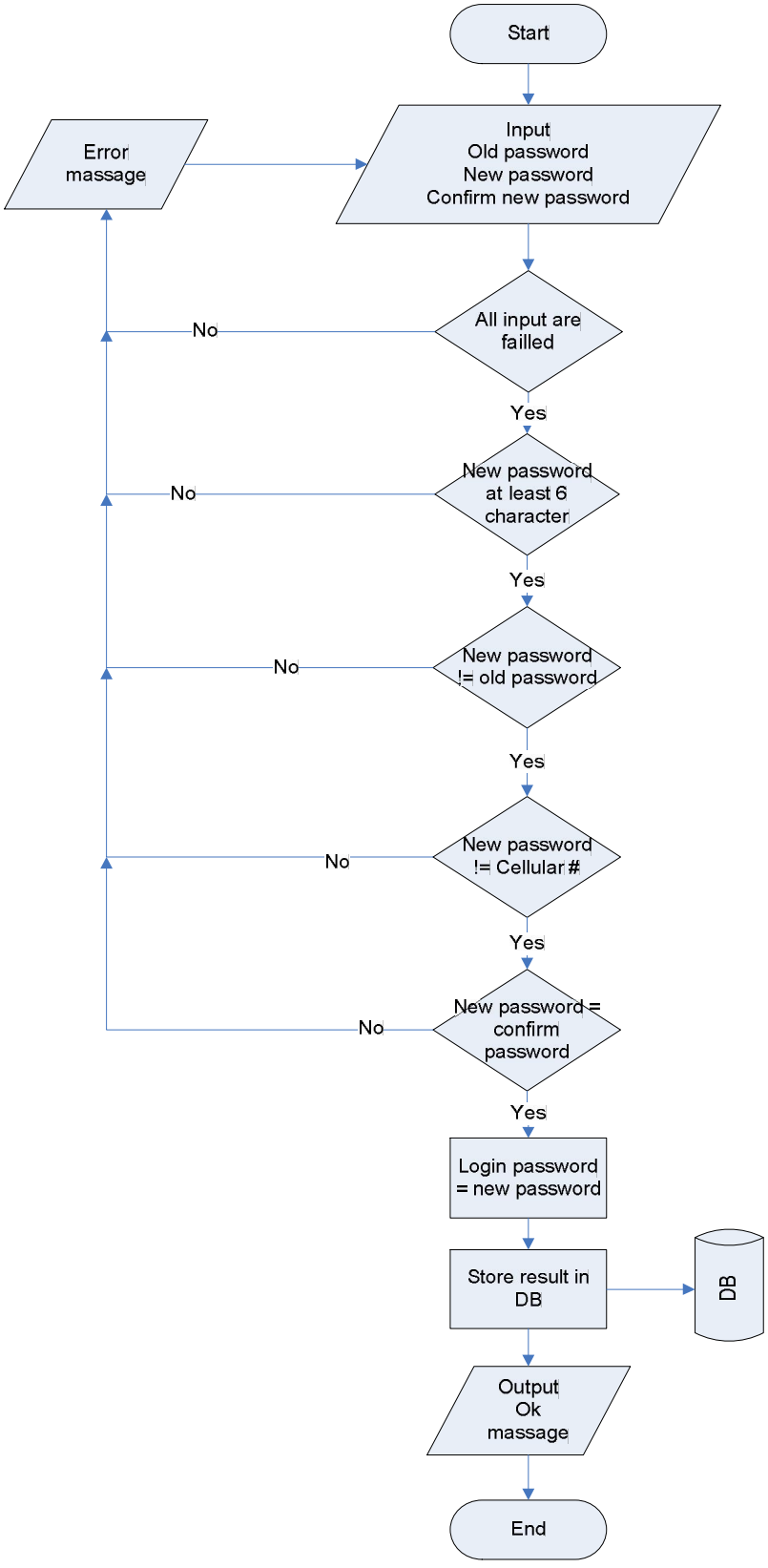


Figure 21 Subscriber change password by subscriber flowchart

4.2.9 View current bill.

- *Description:* this function enable subscriber to view his current bill.
- *Interface:*
    - Input: select current bill link.
    - Output: current bill.
- *Constraints:*
    - Subscriber must be login system.
- *User interface design:*

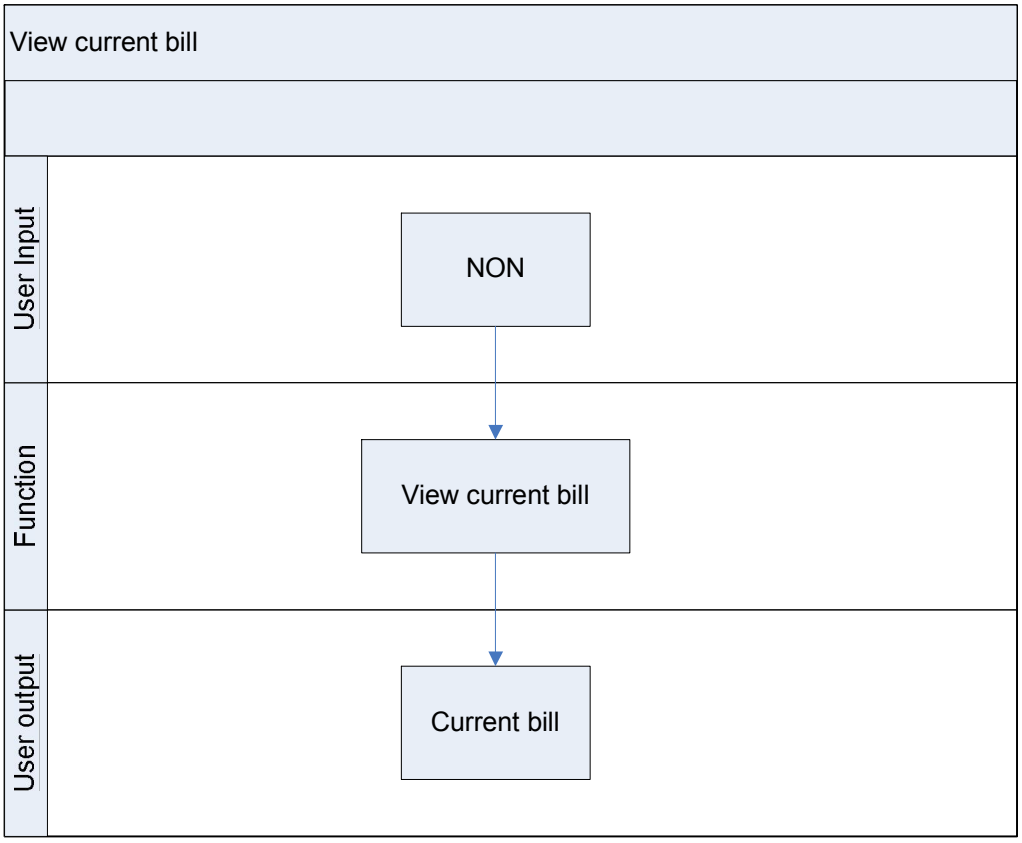


Figure 22 View current bill user interface design

- *Flowchart:*

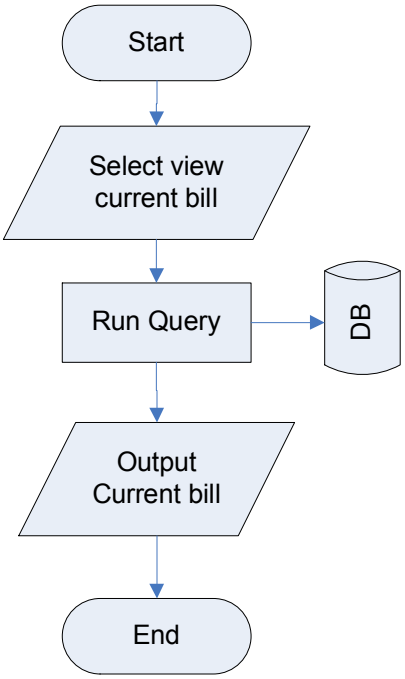


Figure 23 View current bill user interface design

4.2.10 View previous bill:

- *Description:* this function enable subscriber to view the last three bills for the subscriber.
- *Interface:*
    - Input: select view previous bill link.
    - Output: previous bill page.
- *Constraints:*
    - Subscriber must be login system.
- *User interface design:*

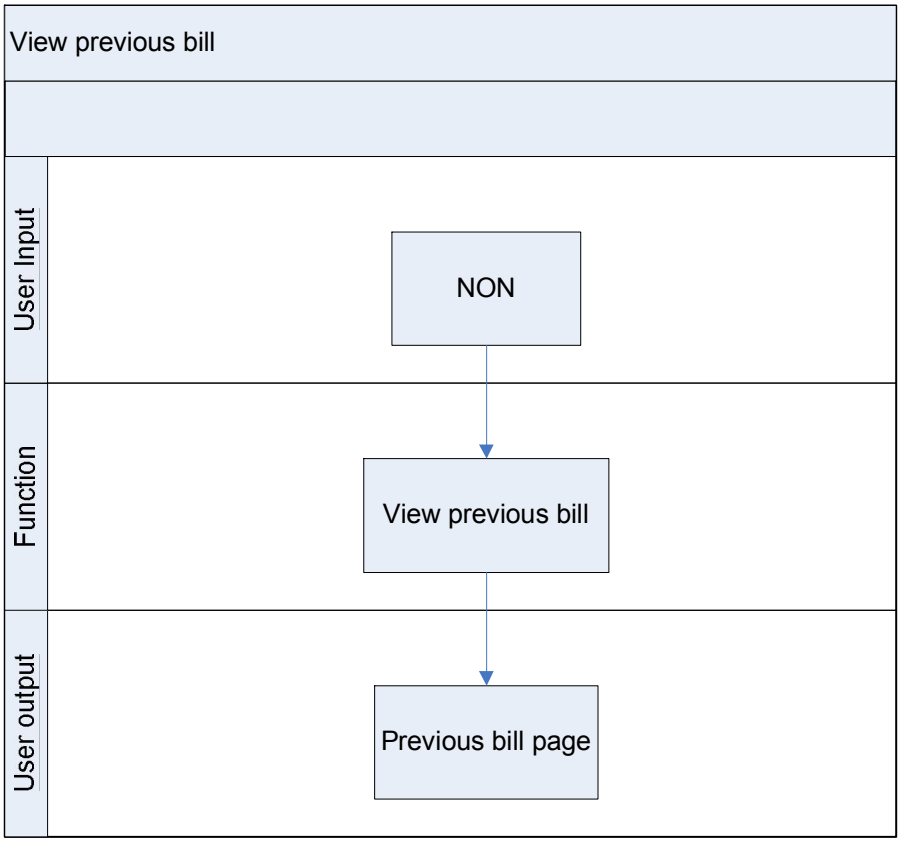


Figure 24 View previous bill user interface design

- *Flowchart:*

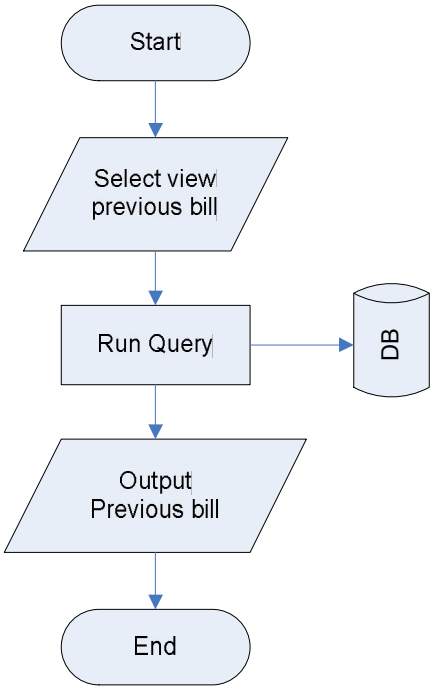


Figure 25 View previous bill flowchart

4.2.11 Subscriber help:

- *Description:* the subscriber should get help to know how to use the system.
- *Interface:*
    - Input: select help link.
    - Output: help page.
- *Constraints:*
    - NON.
- *User interface design:*

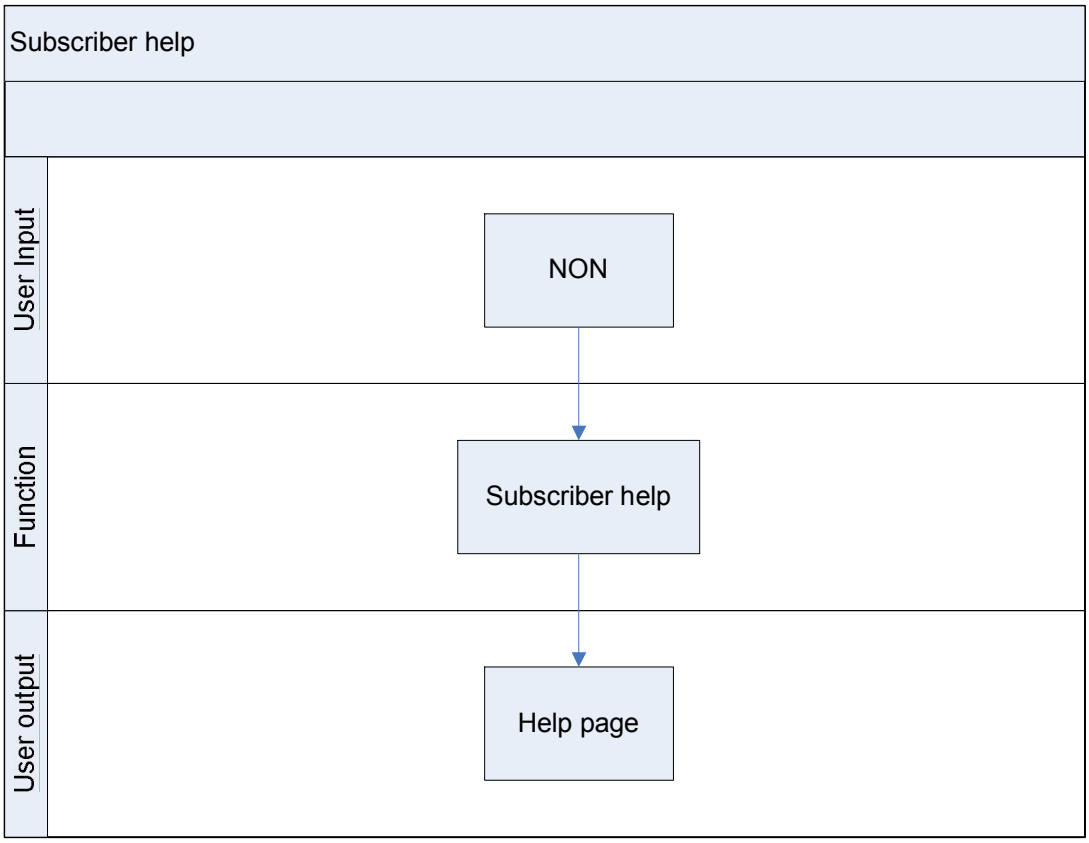


Figure 26 Subscriber help

- *Flowchart:*

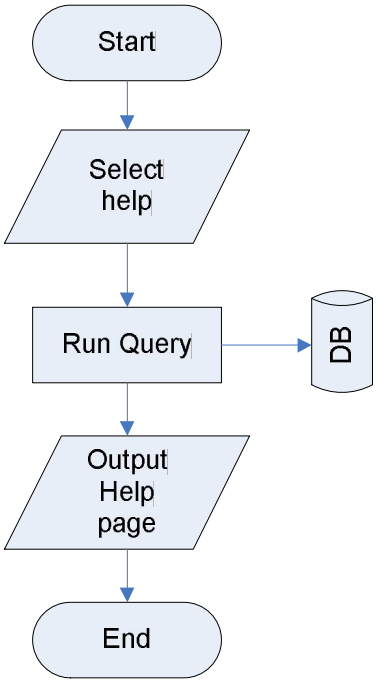


Figure 27 Subscriber help flowchart

4.2.12 View advertisements:

- *Description:* this function enables the subscriber to view the company advertisements that uploaded on the WAP system.
- *Interface:*
    - Input: select advertisement link.
    - Output: company advertisements.
- *Constraints:*
    - NON.
- *User interface design:*

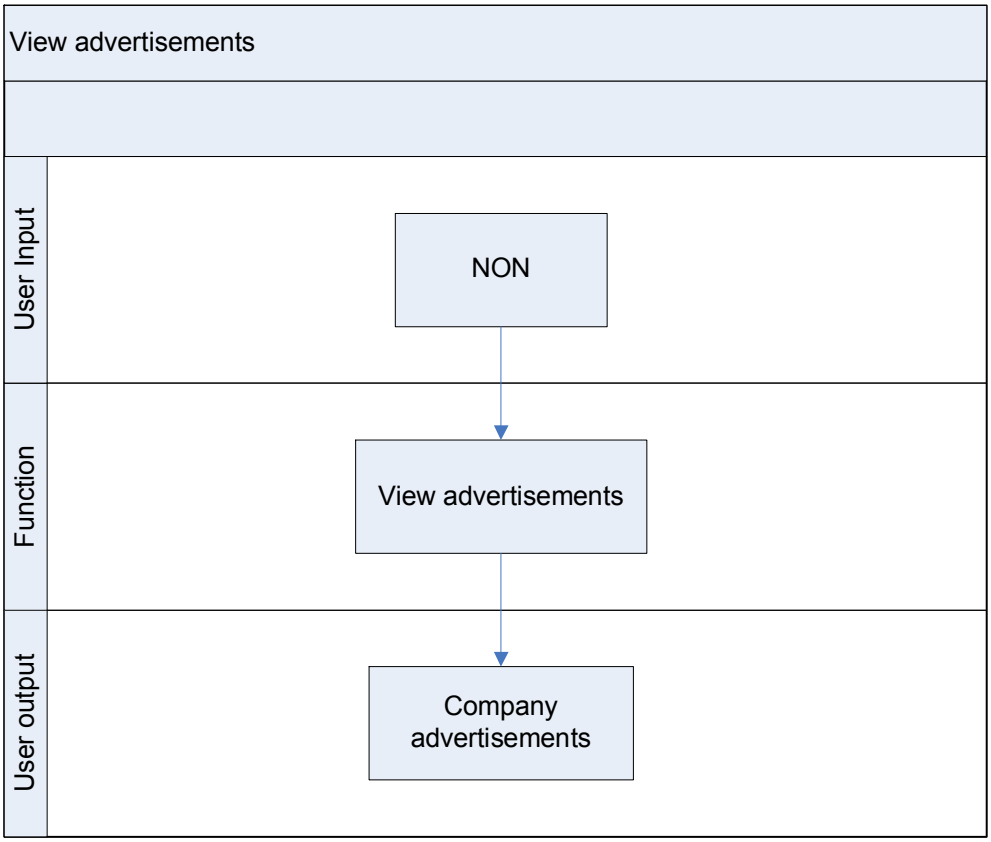


Figure 28 View advertisements user interface design

- *Flowchart:*

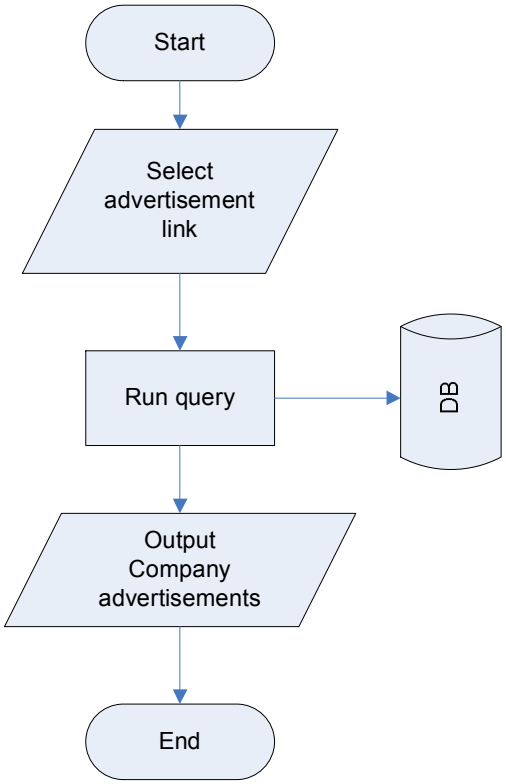


Figure 29 View advertisements flowchart

4.2.13 View service type announcement:

- *Description:* this function allows the subscriber to view the announcement that related to the type of the services that subscriber subscribe to it.
- *Interface:*
    - Input: select service type announcement link.
    - Output: service type announcement page.
- *Constraints:*
    - Subscriber should be login system.
- *User interface design:*

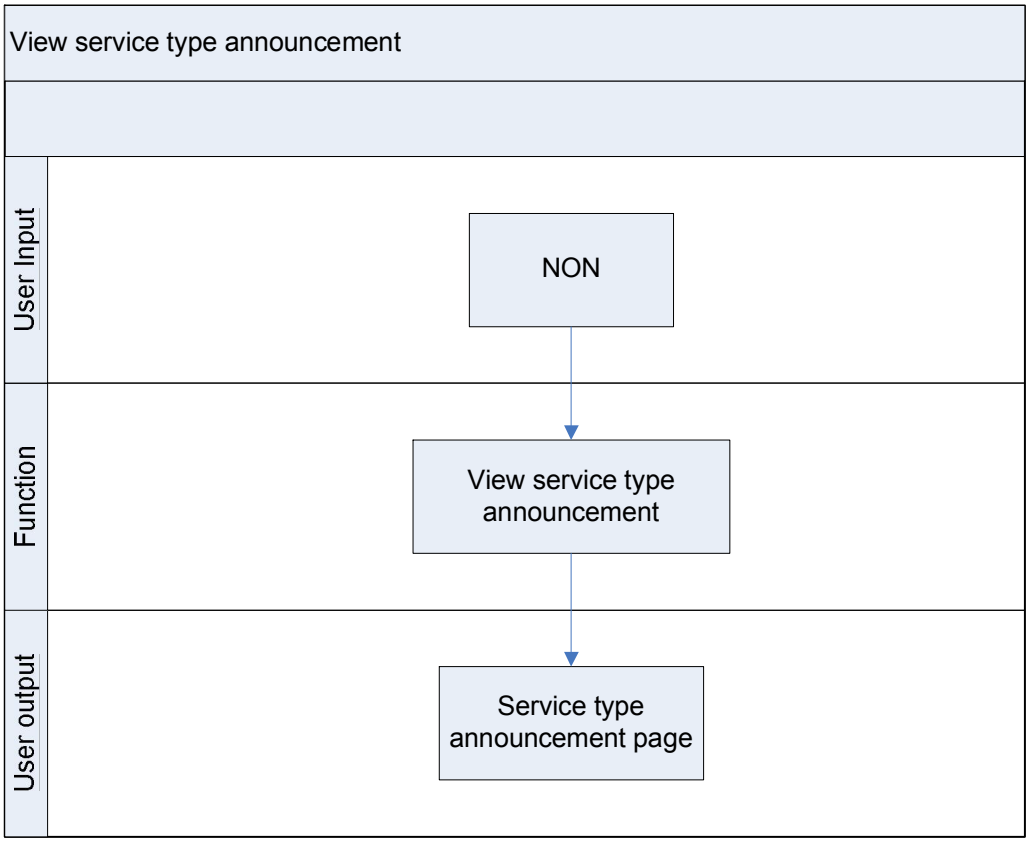


Figure 30 View service type announcement user interface design

- *Flowchart:*

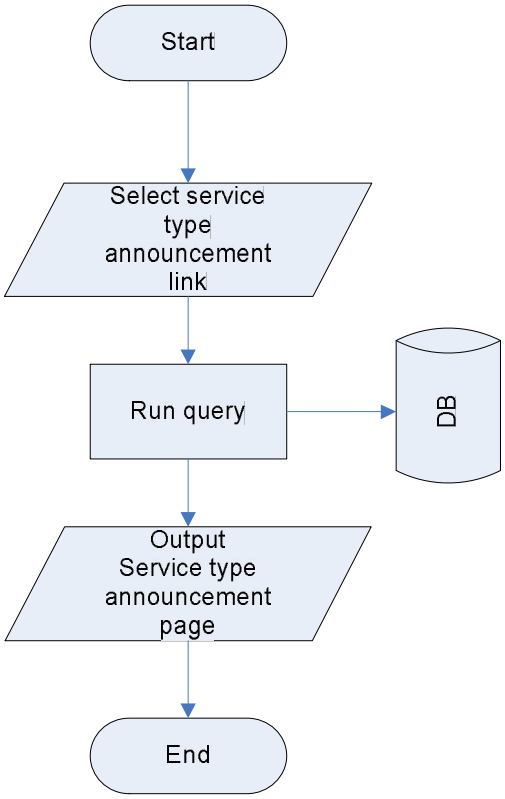


Figure 31 View service type announcement flowchart

4.2.14 View subscriber announcement:

- *Description:* this function enable subscriber to view his announcements.
- *Interface:*
    - Input: select subscriber announcement link.
    - Output: subscriber announcement page.
- *Constraints:*
    - Subscriber should be login the system.
- *User interface design:*

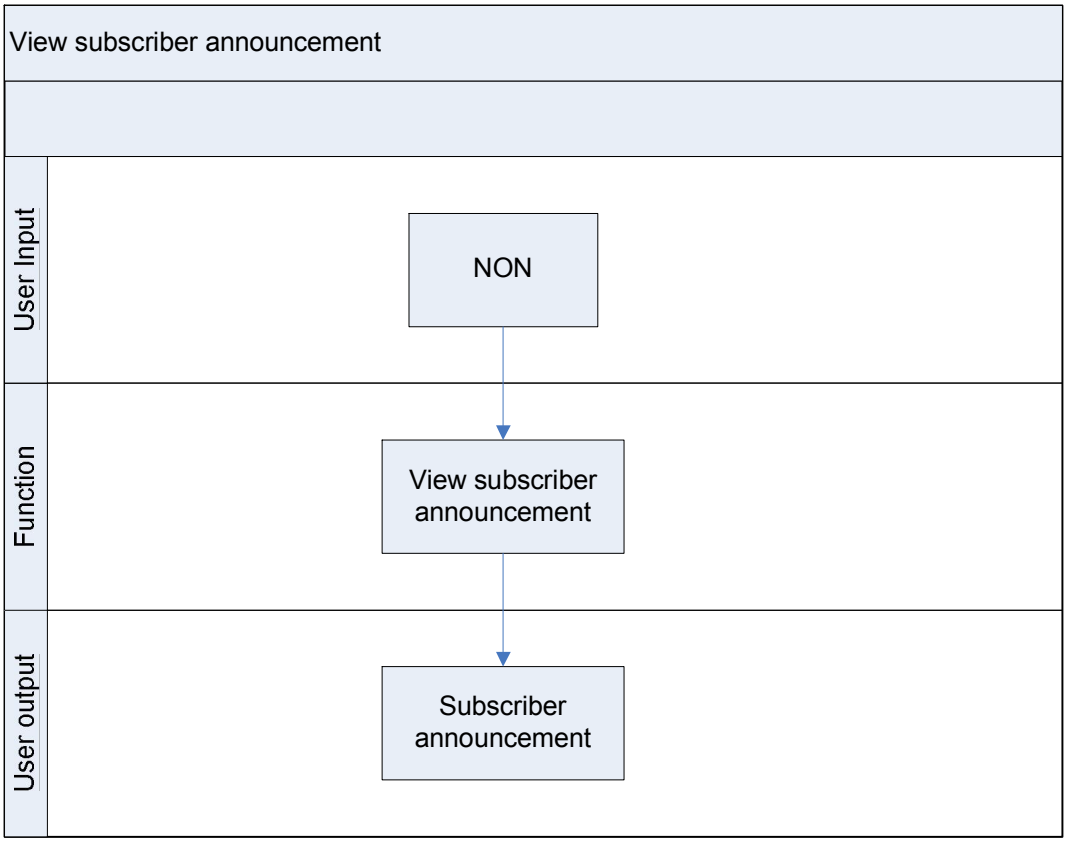


Figure 32 View subscriber announcement user interface design

- *Flowchart:*

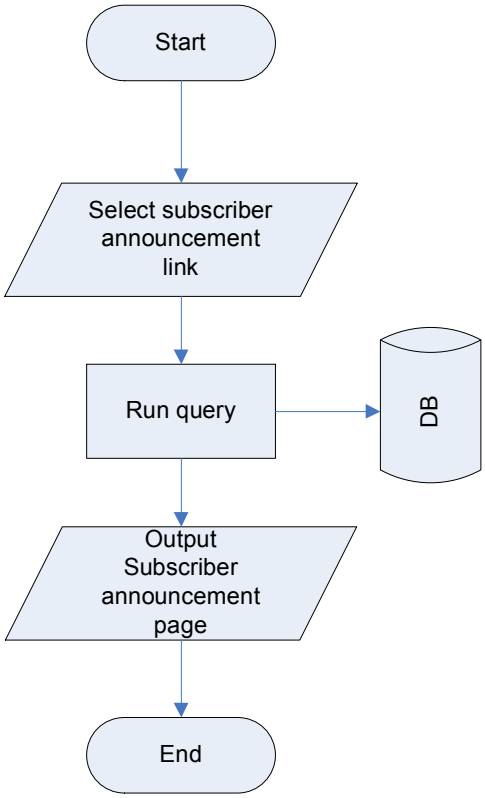


Figure 33 View subscriber announcement

4.2.15 Administrator login:

- *Description:* this is the only method to the administrator to login his main page.
- *Interface:*
    - Input: administrator ID, password.
    - Output: administrator main page.
- *Constraints:*
    - All input must fail.
    - Administrator ID and password should be meeting the database.
- *User interface design:*

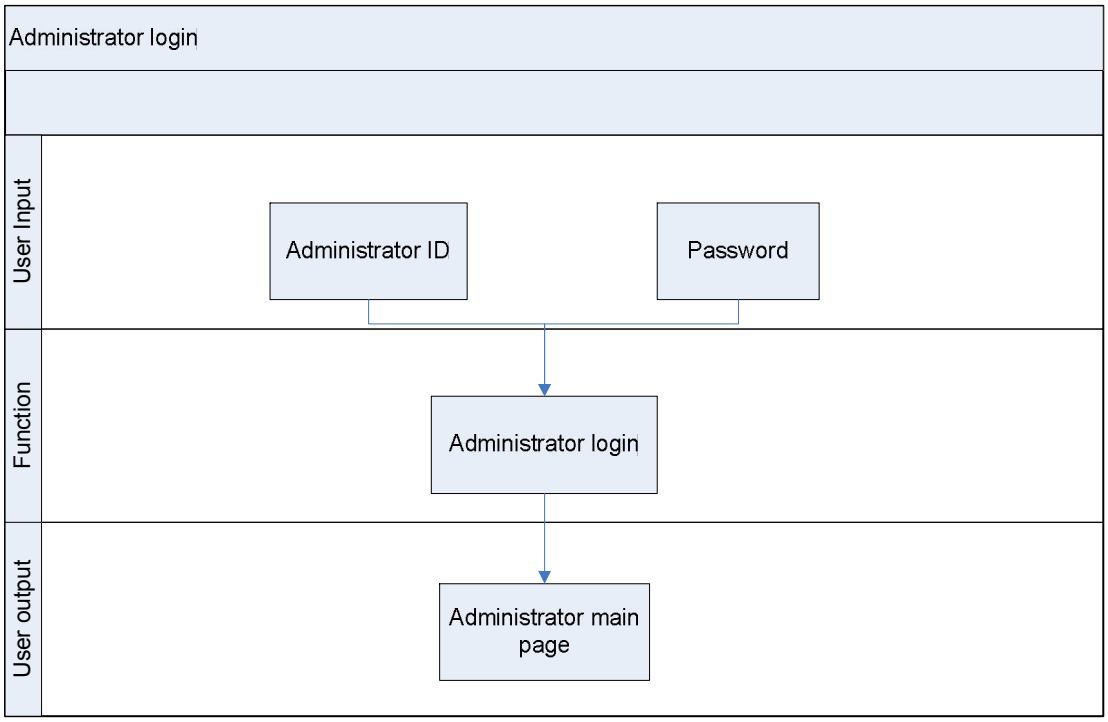


Figure 34 Administrator login user interface design

- *Flowchart:*

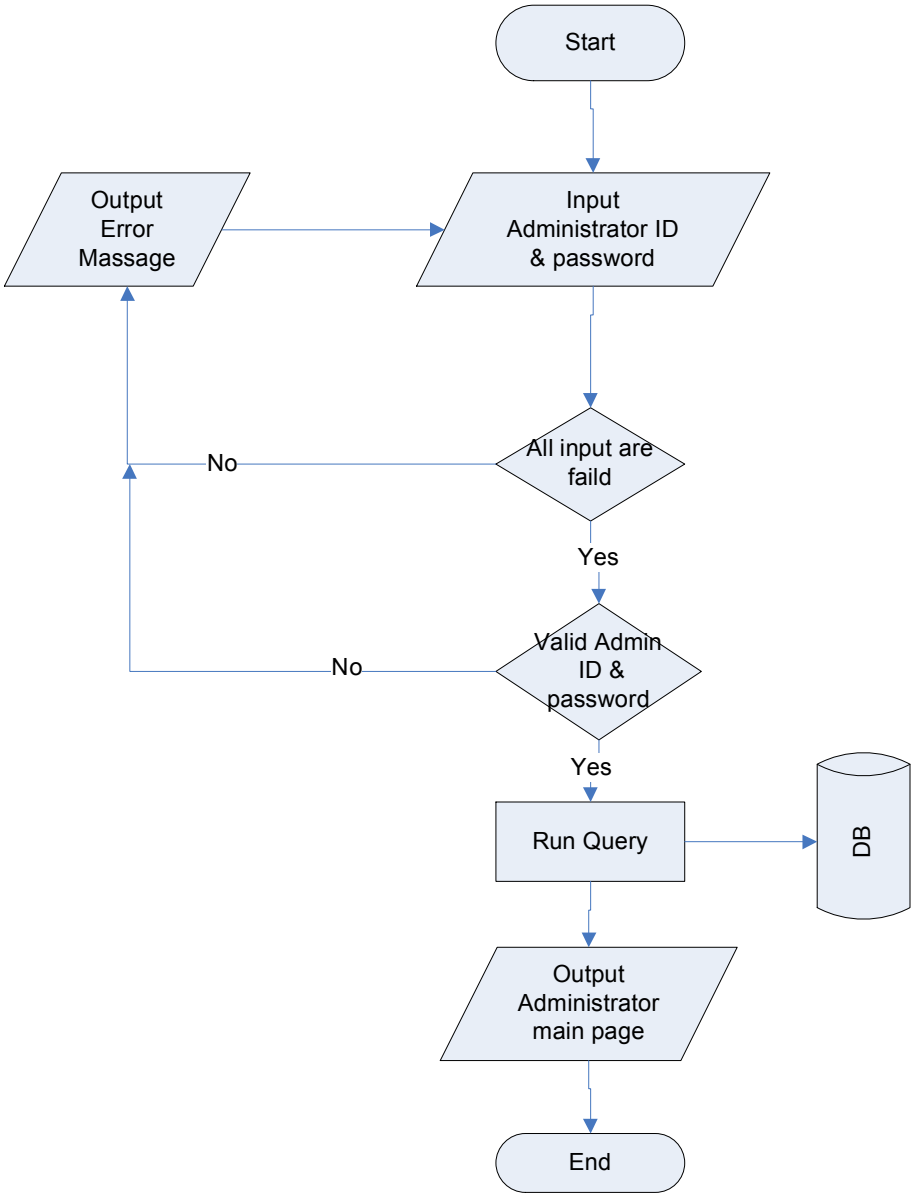


Figure 35 Administrator login flowchart

4.2.16 Administrator logout:

- *Descriptions:* this function enable subscriber logout from the system.
- *Interface:*
    - Input: select logout link.
    - Output: login page.
- *Constraints:*
    - NON.

- *User interface design:*

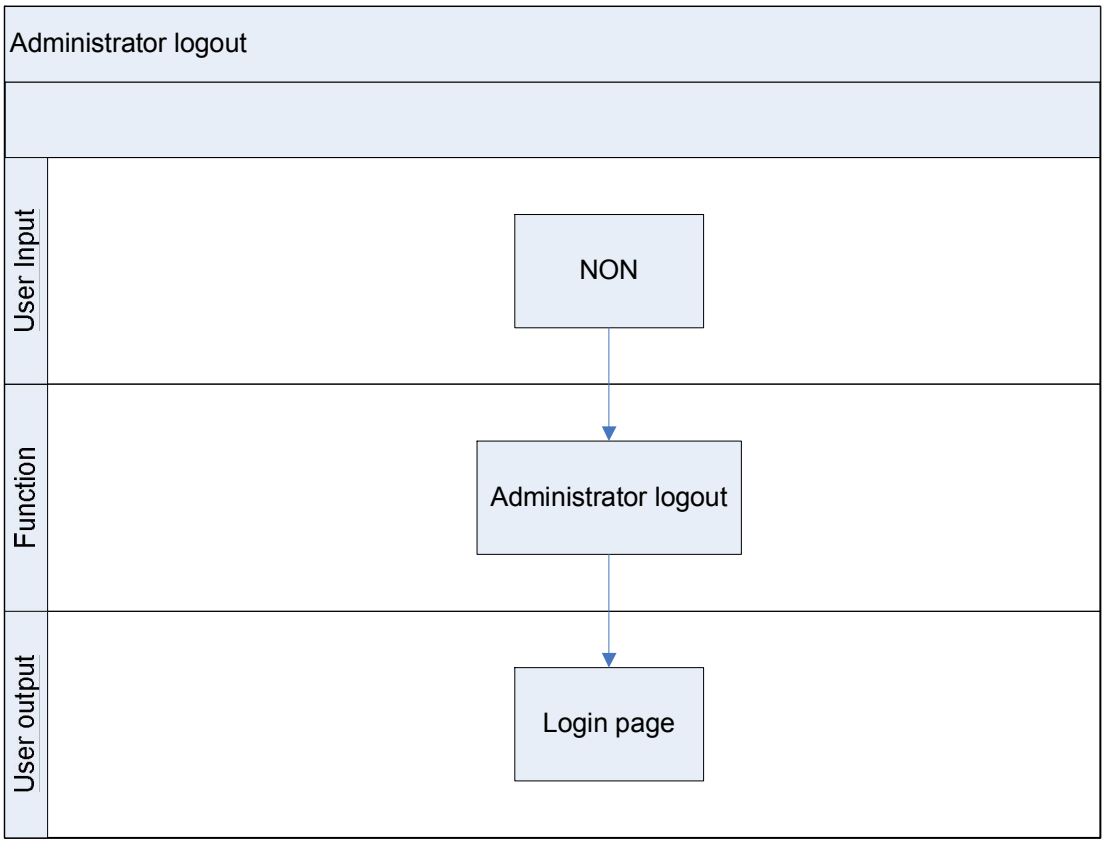


Figure 36 Administrator logout user interface design

- *Flowchart:*

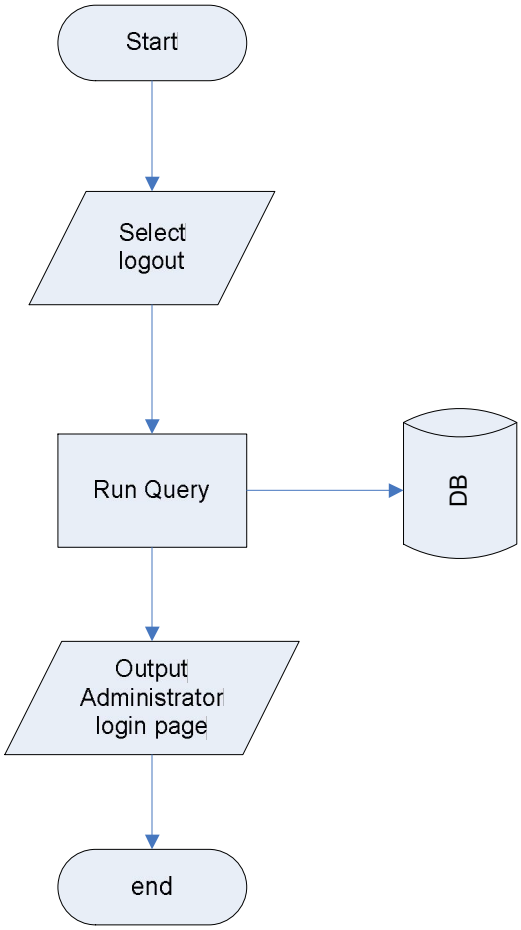


Figure 37 Administrator logout flowchart

4.2.17 Administrator forgotten password:

- *Description:* this function enable administrator to retrive his password from the system.
- *Interface:*
    - Input: administrator ID, answer secret question
    - Output: secret question, administrator password.
- *Constraints:*
    - All fields should fail.
- *User interface design:*

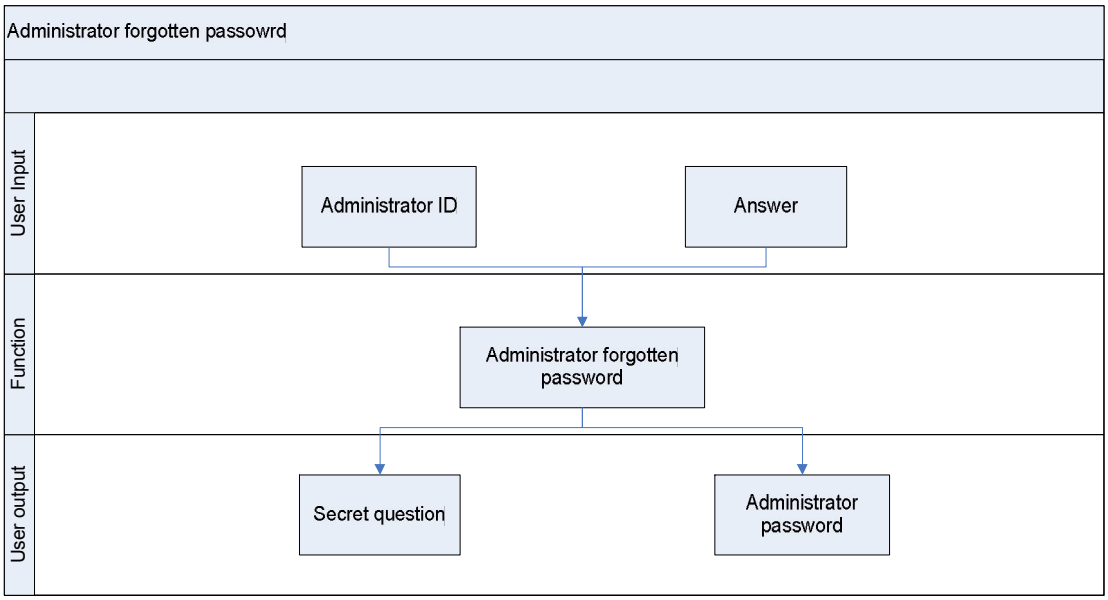


Figure 38 Administrator forgotten password user interface design

- *Flowchart:*

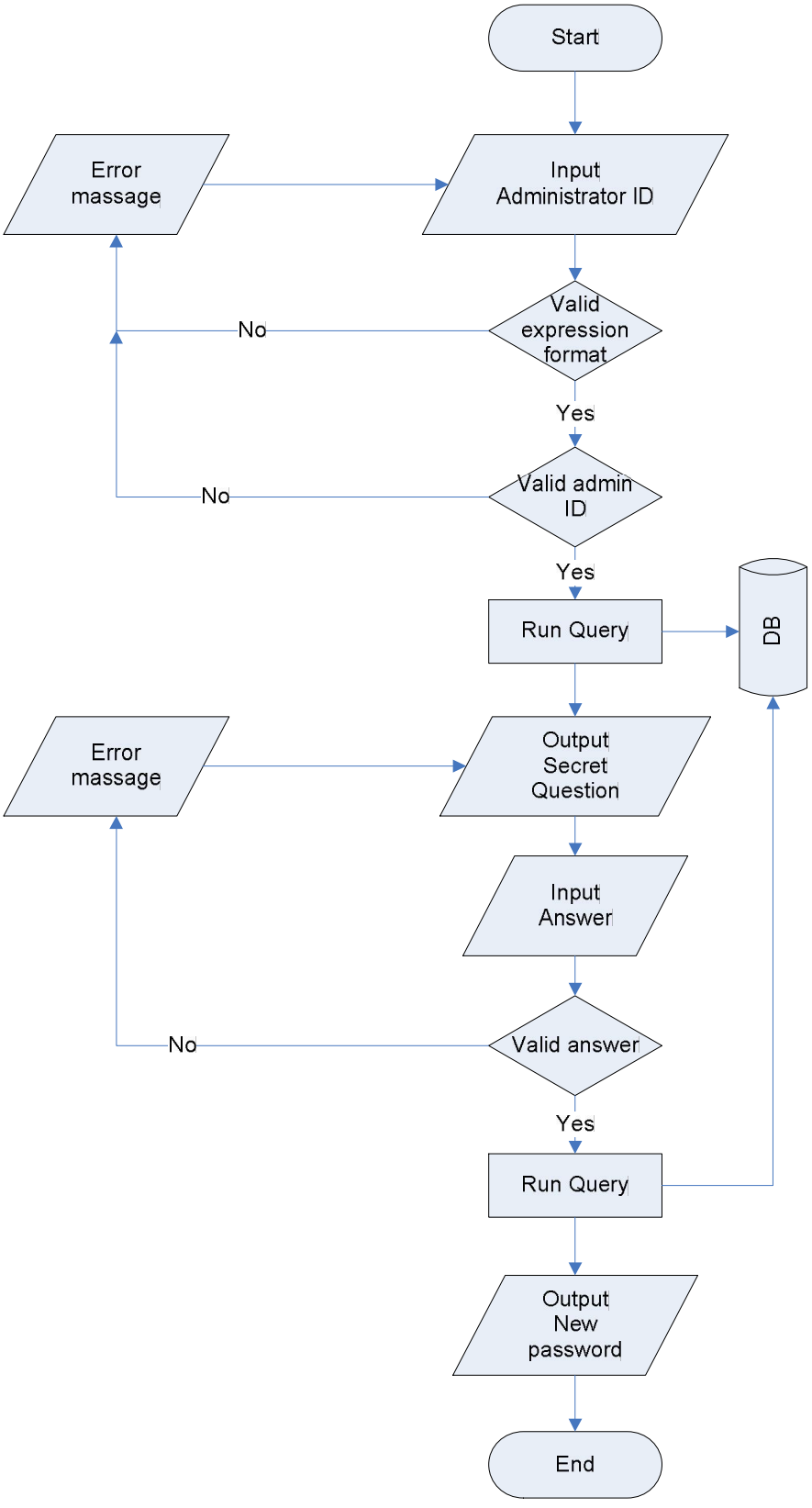


Figure 39 Administrator forgotten password flowchart

4.2.18 View administrator data:

- *Description:* this function allow administrator to view his data.
- *Interface:*
    - Input: select view administrator link.
    - Output: administrator data page.
- *Constraints:*
    - Administrator should login system.
- *User interface design:*

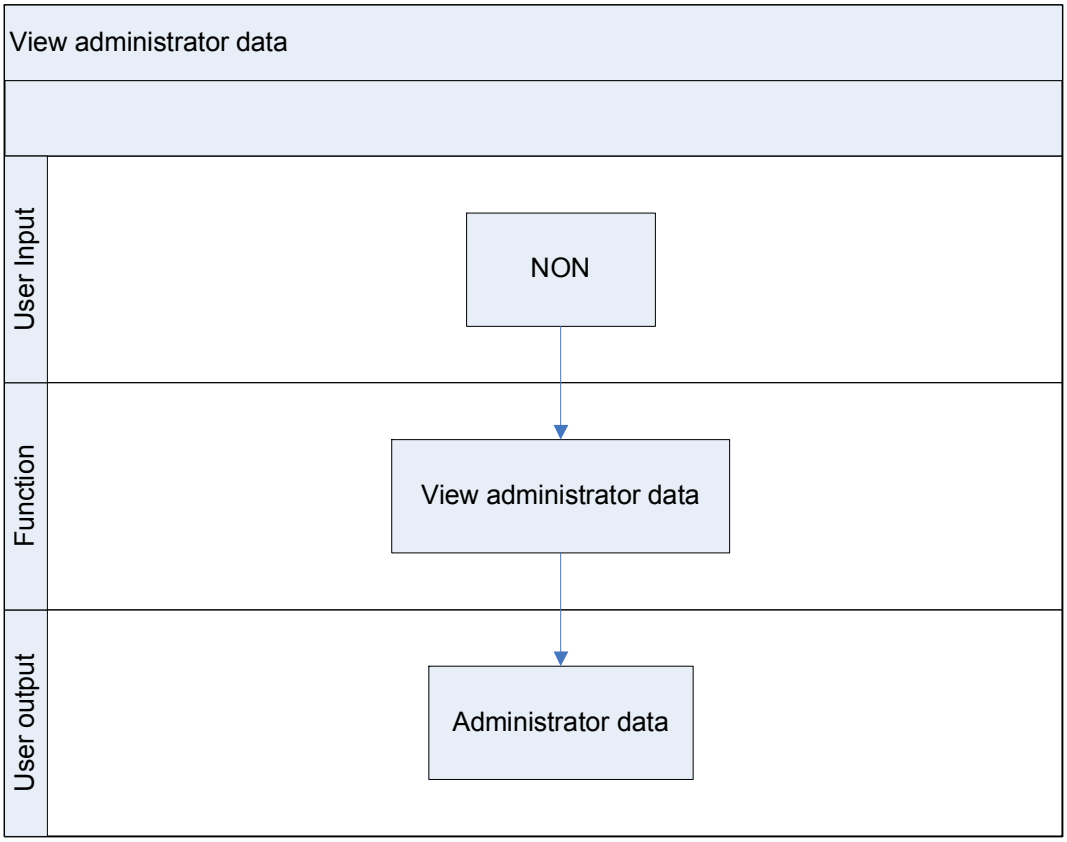


Figure 40 View administrator data user interface design

- *Flowchart:*

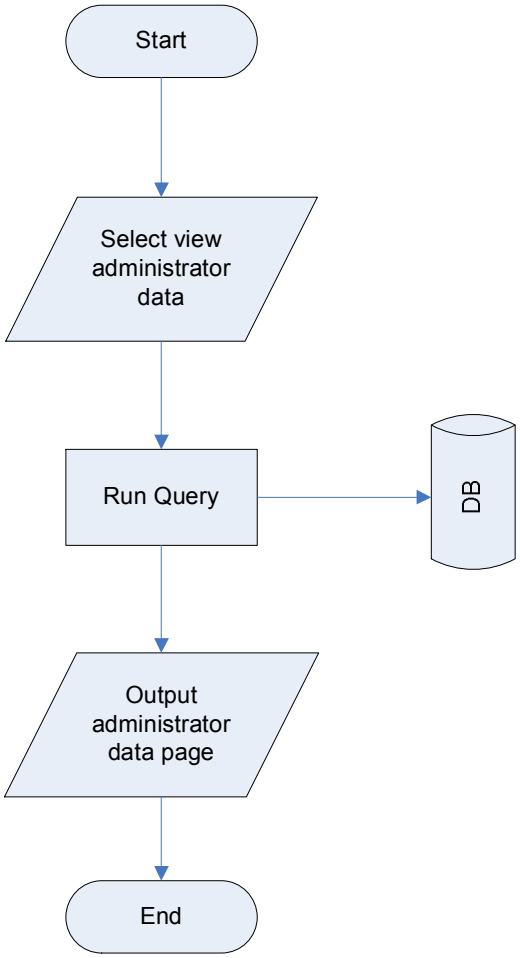


Figure 41 View administrator data flowchart

4.2.19 Modify administrator data:

- *Description:* this function enable administrator to update his data.
- *Interface:*
    - Input: select modify administrator data link, insert new data (E-mail, secret question, answer, phone number, address.).
    - Output: administrator data page.
- *Constraints:*
    - Administrator should login system.
    - All inputs should fail correctly.
- *User interface design:*

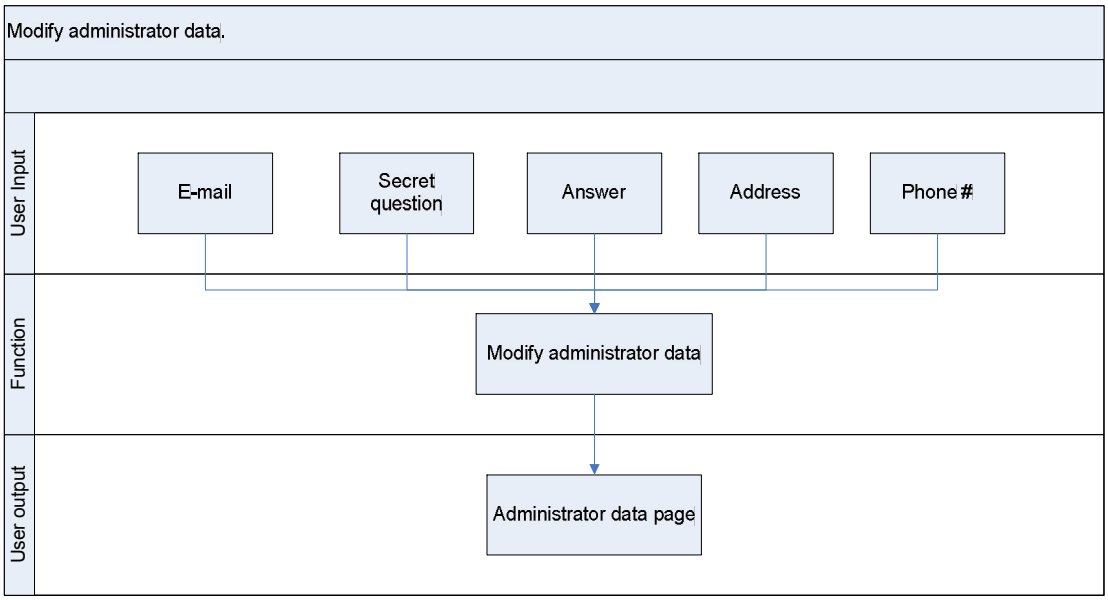


Figure 42 Modify administrator data user interface design

- *Flowchart:*

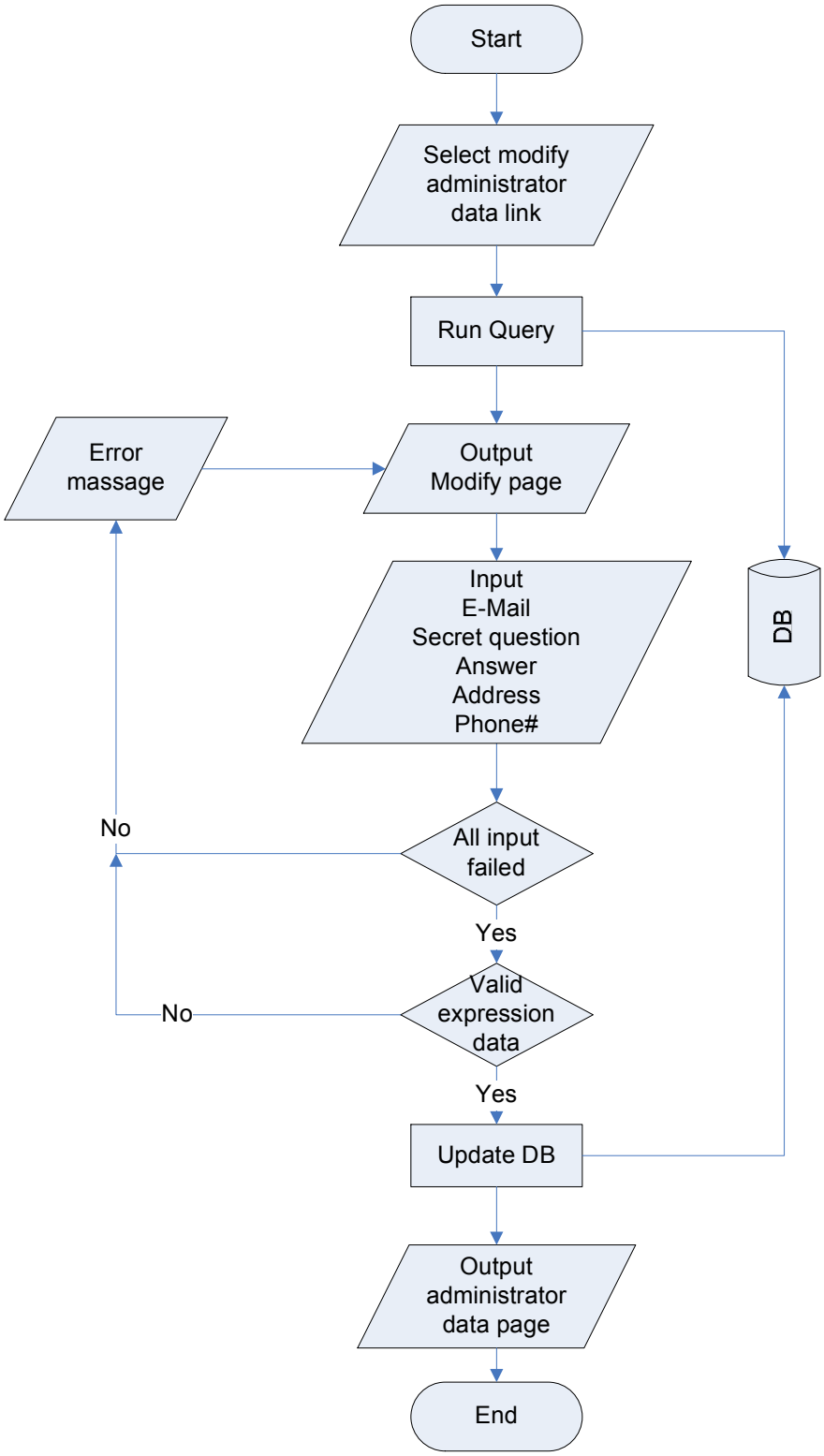


Figure 43 Modify administrator data flowchart

4.2.20 Change administrator password:

- *Description:* this function enable administrator to change his password.
- *Interface:*
    - Input: old password, new password, confirm new password.
    - Output: new password confirmation.
- *Constraints:*
    - All inputs should fail correctly.
    - New password must be at least six characters.
    - New password must equal confirm password.
    - New password should not equal administrator ID.
    - New password should not equal old password.
- *User interface design:*

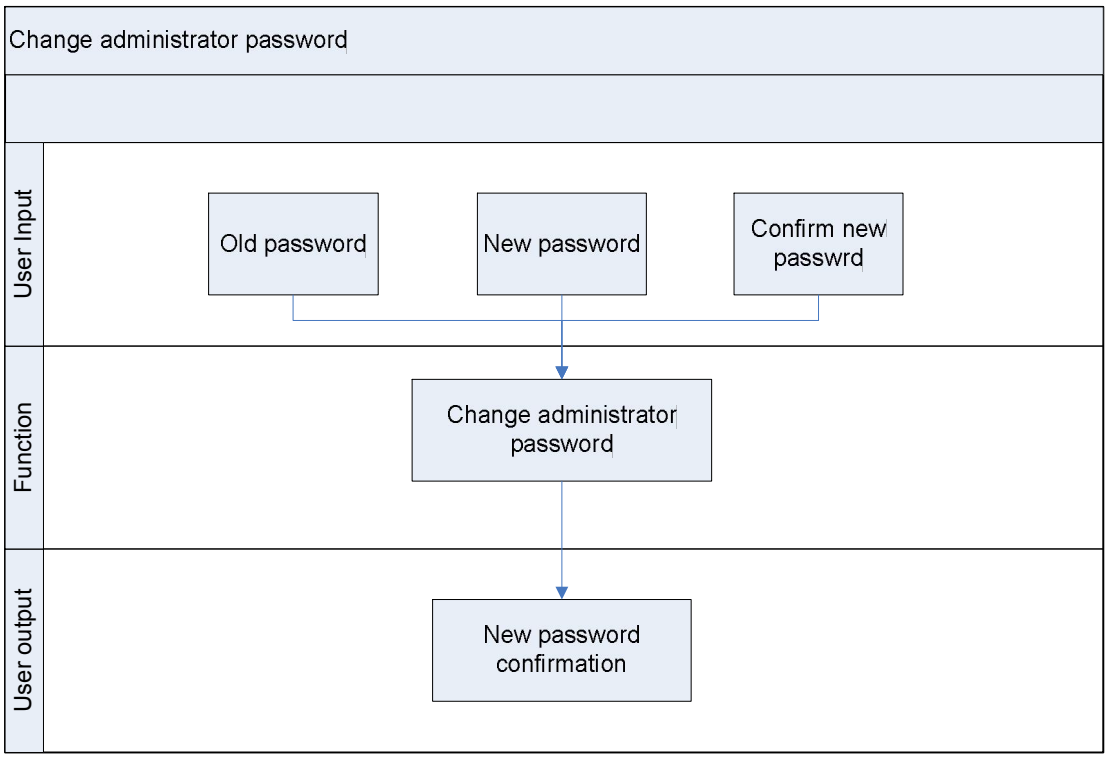


Figure 44 Change administrator password user interface design

- *Flowchart:*

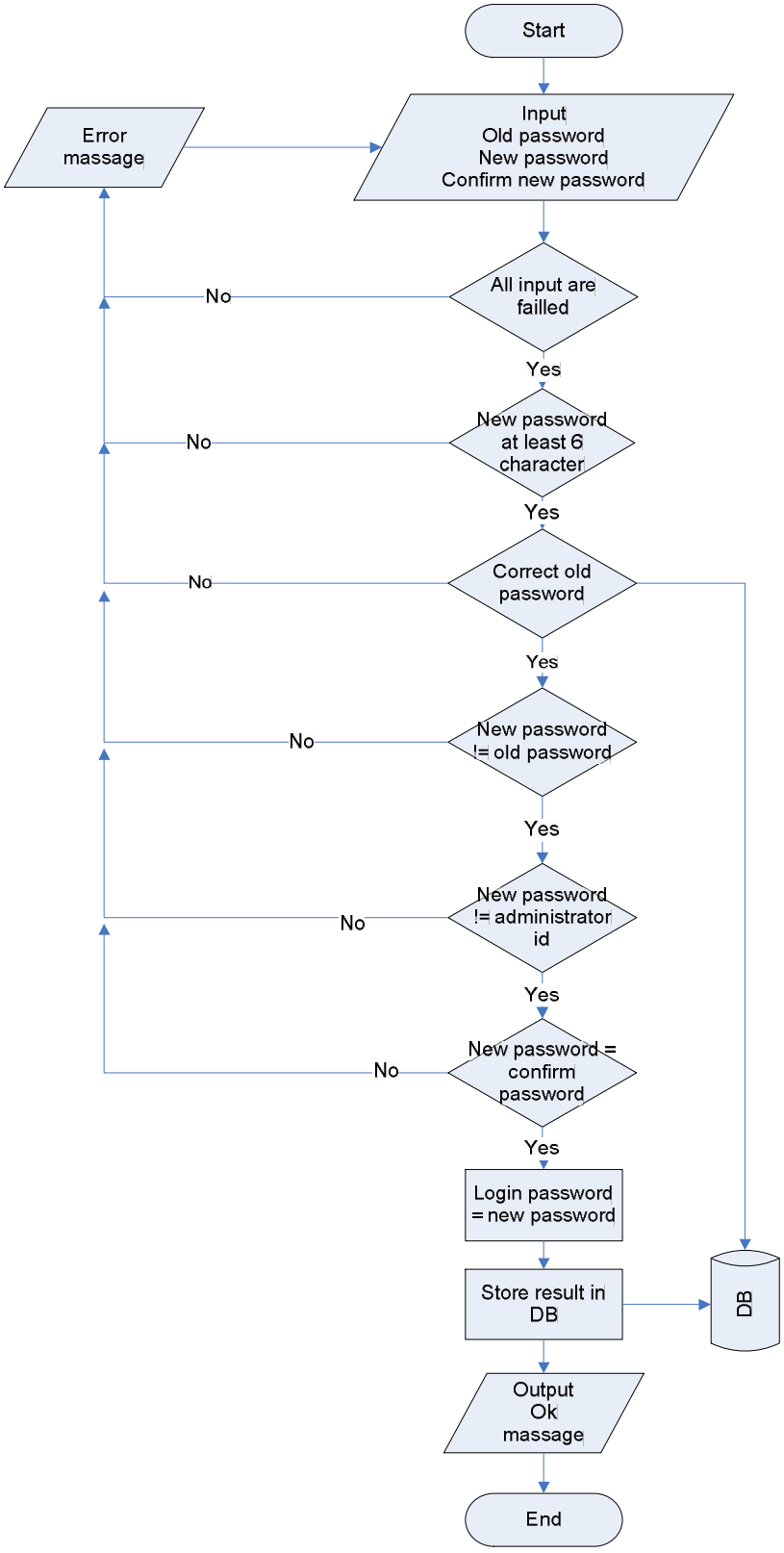


Figure 45 Change administrator password flowchart

4.2.21 View subscriber data: (by administrator)

- *Description:* this function allow administrator to view subscriber data.
- *Interface:*
    - Input: select view subscriber data, subscriber cellular number.
    - Output: subscriber data page.
- *Constraints:*
    - Administrator must login system.
- *User interface design:*

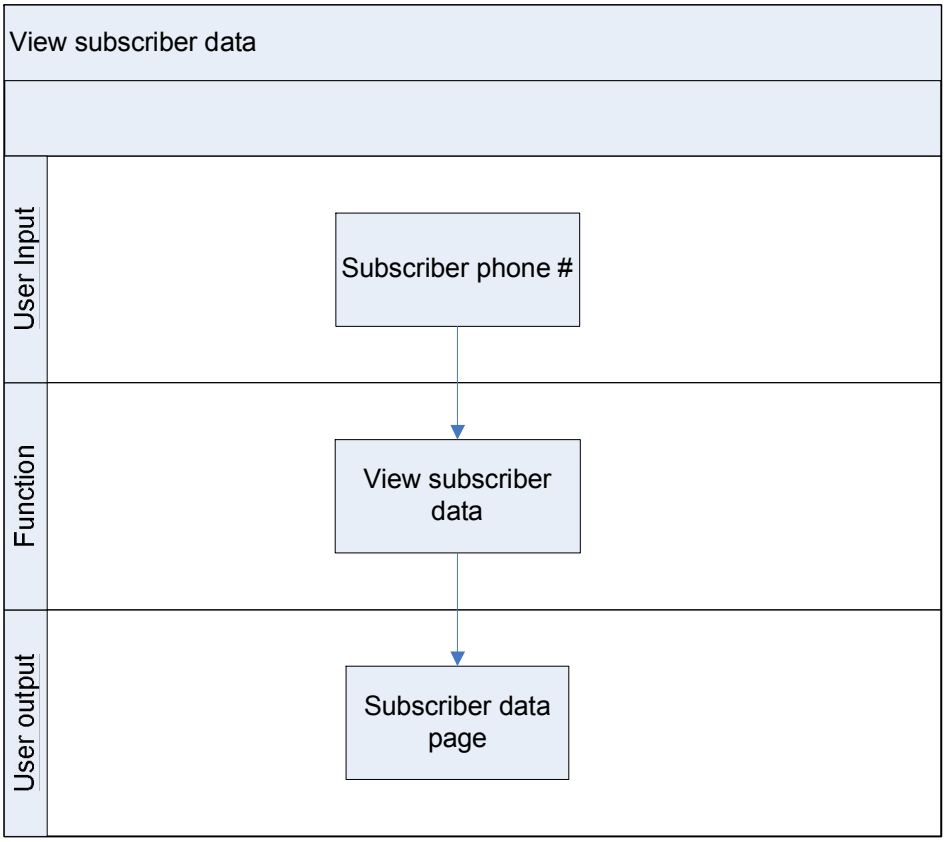


Figure 46 View subscriber data by administrator user interface design

- *Flowchart:*

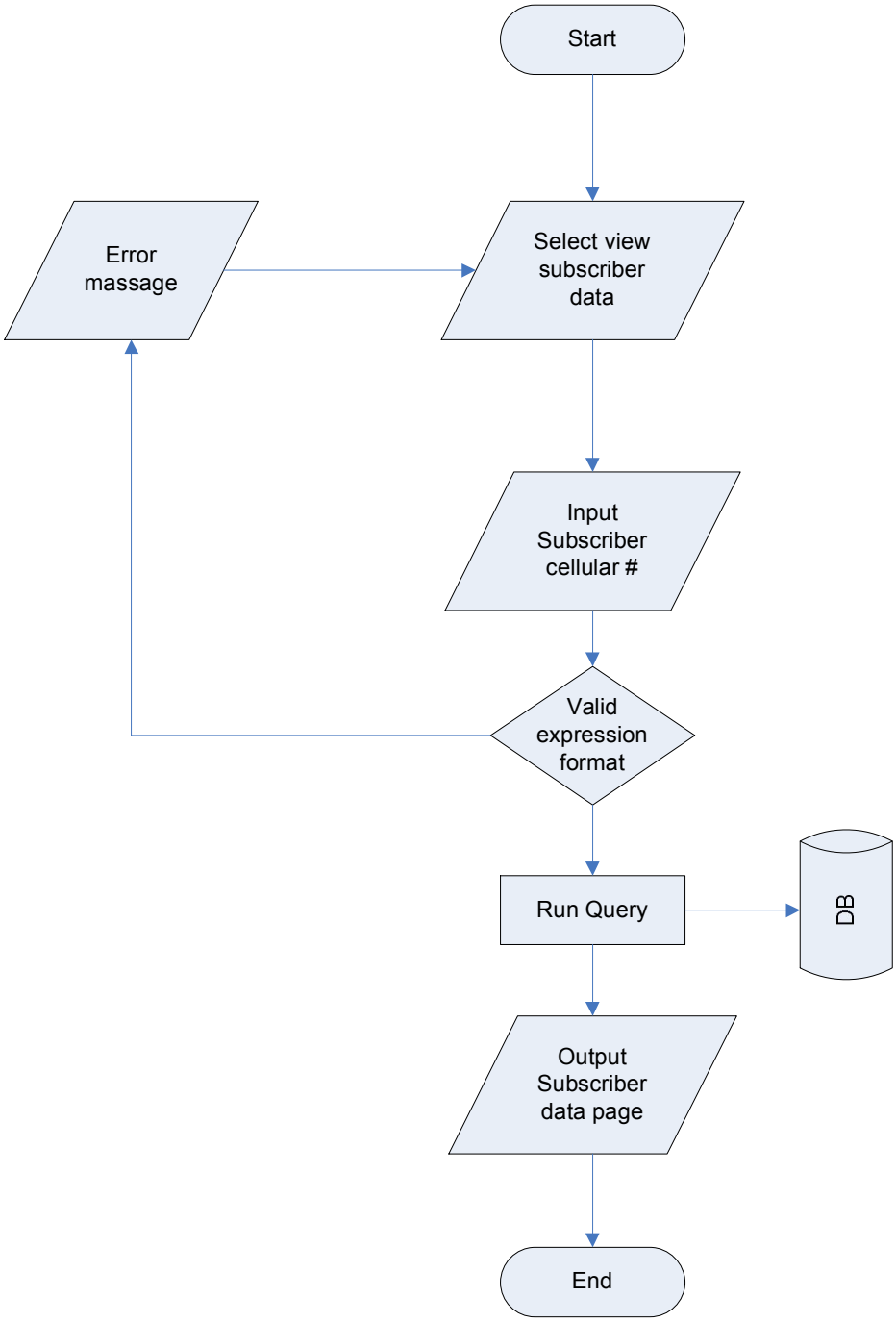


Figure 47 Viewsubscriber data by administrator flowchart

4.2.22 Modify subscriber data: (by administrator)

- *Description*: this function allow administrator to modify subscriber data using web system.
- *Interface:*

- Input: select modify subscriber data link, cellular number, secret question, answer.
- Output: confirmation massage

- *Constraints:*
  - Administrator must login system.
  - All inputs fail correctly.
- *User interface design:*

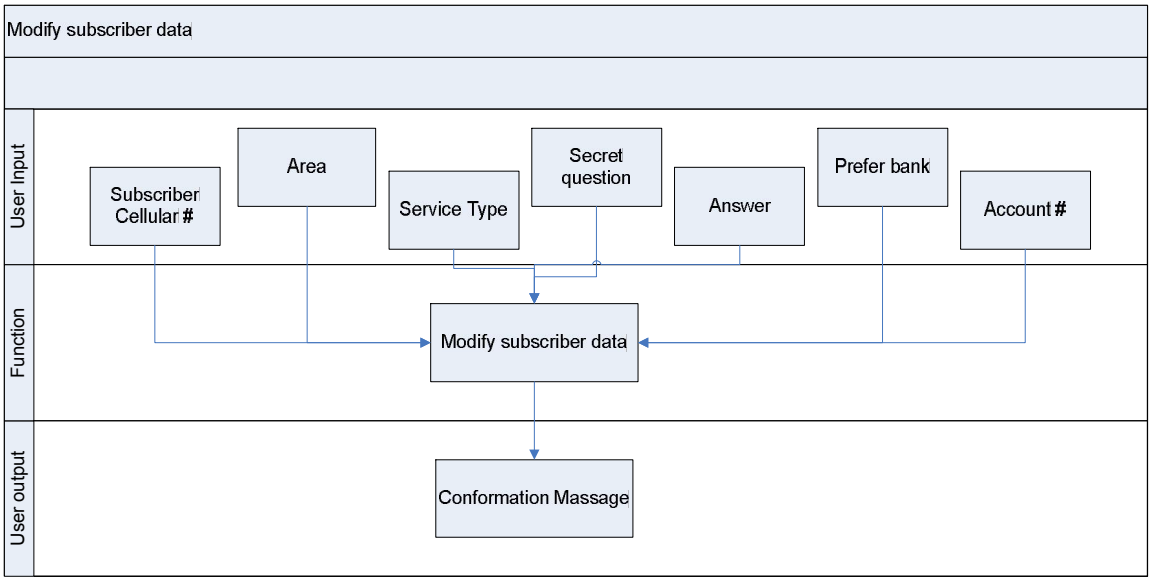


Figure 48 Modify subscriber data by administrator user interface design

- *Flowchart:*

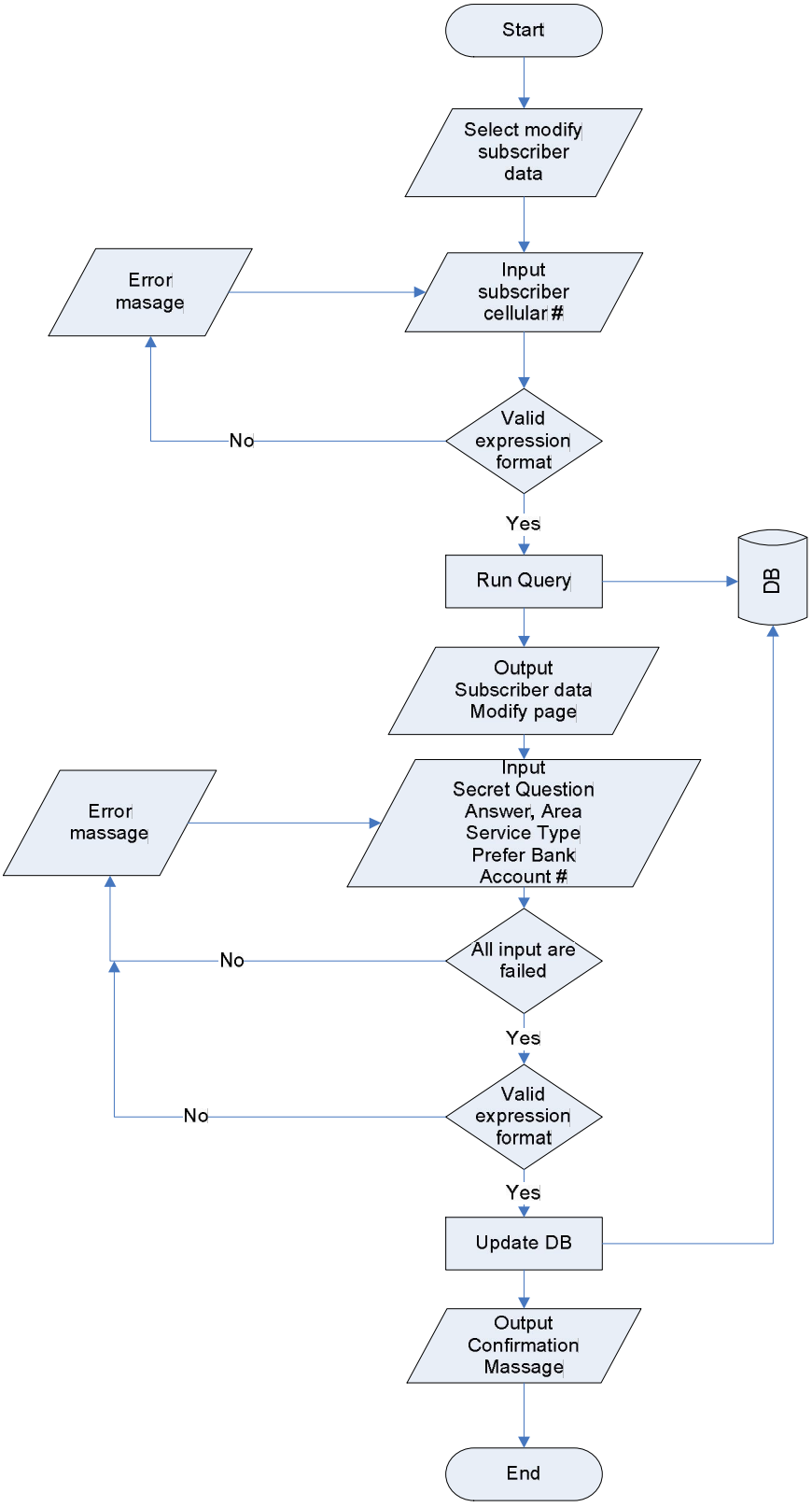


Figure 49 Modify subscriber data by administrator flowchart

4.2.23 Administrator help:

- *Description:* to enable the Administrator to get help.
- *Interface:*
    - Input: select administrator help link.
    - Output: administrator help page.
- *Constraints:*
    - NON.
- *User interface design:*

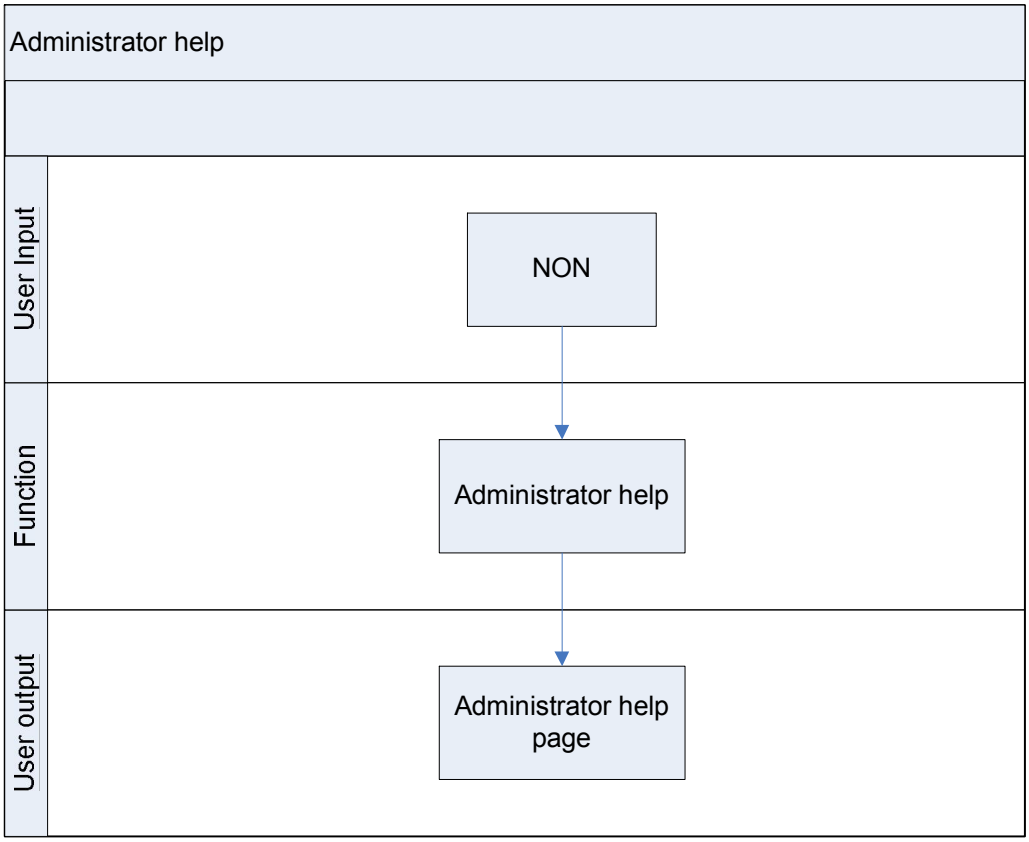


Figure 50 Administrator help user interface design

- *Flowchart:*

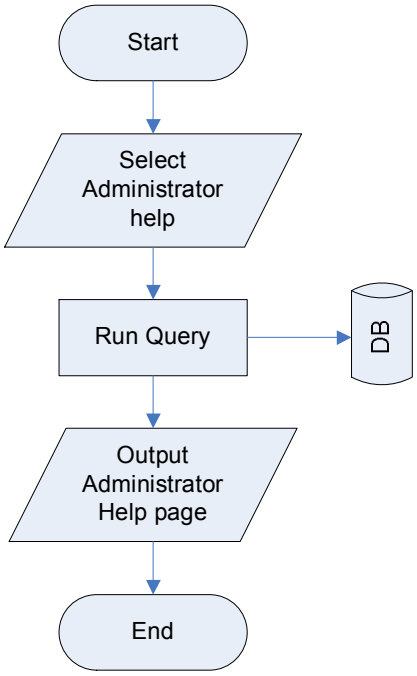


Figure 51 Administrator help flowchart

4.2.24 Help editor:

- *Description:* this function allow administrator to edit the subscriber help.
- *Interface:*
    - Input: question, answer, question ID, type.
    - Output: subscriber help.
- *Constraints:*
    - Administrator must login system.
    - All input fail correctly.
- *User interface design:*

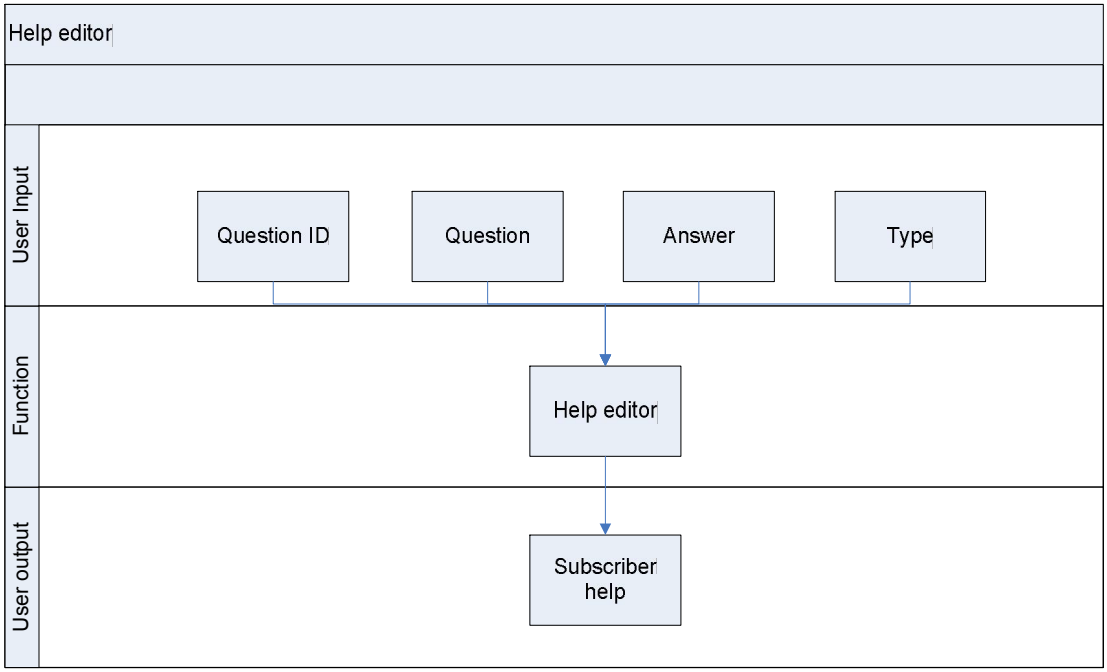


Figure 52 Help editor user interface design

- *Flowchart:*

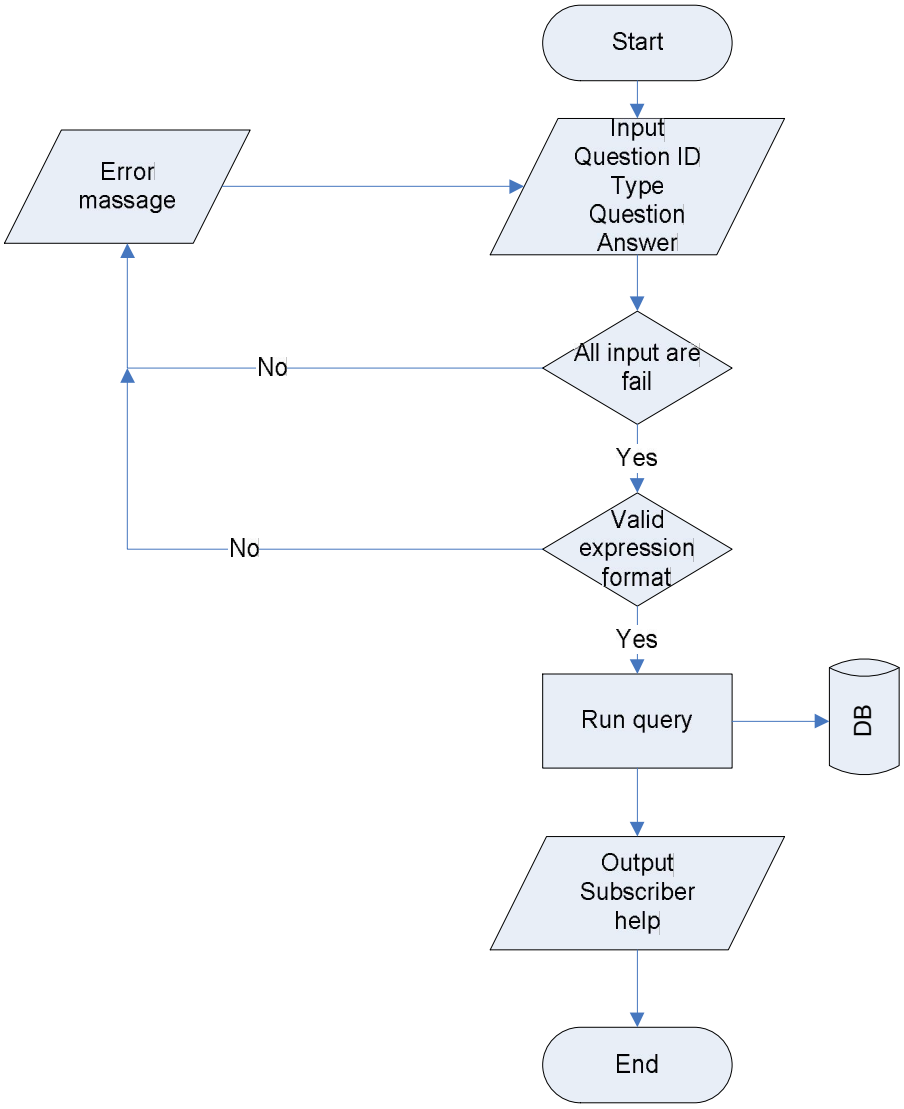


Figure 53 Help editor flowchart

4.2.25 Manage bill information:

- *Description:* this function enable administrator to managing bill information by add new data and create new bill.
- *Interface:*
    - Input: bill number, cellular number, issue date, due date, service type, calls amount, SMS amount, GPRS amount, other amount, tax percent.
    - Output: new bill.
- *Constraints:*
    - All input must fail correctly.

- Issue date should not equal due date.

- *User interface design:*

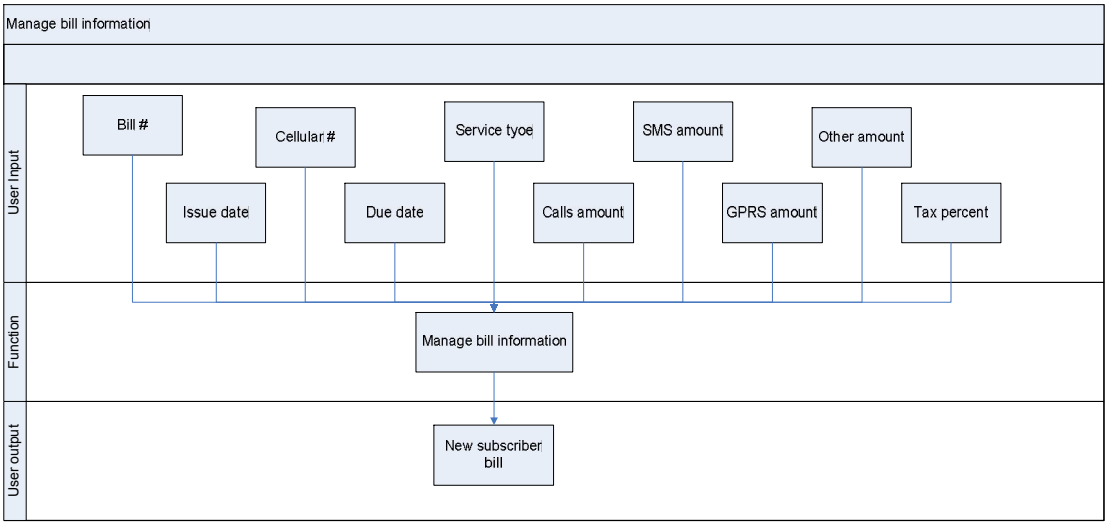


Figure 54 Manage bill information user interface design

- *Flowchart:*

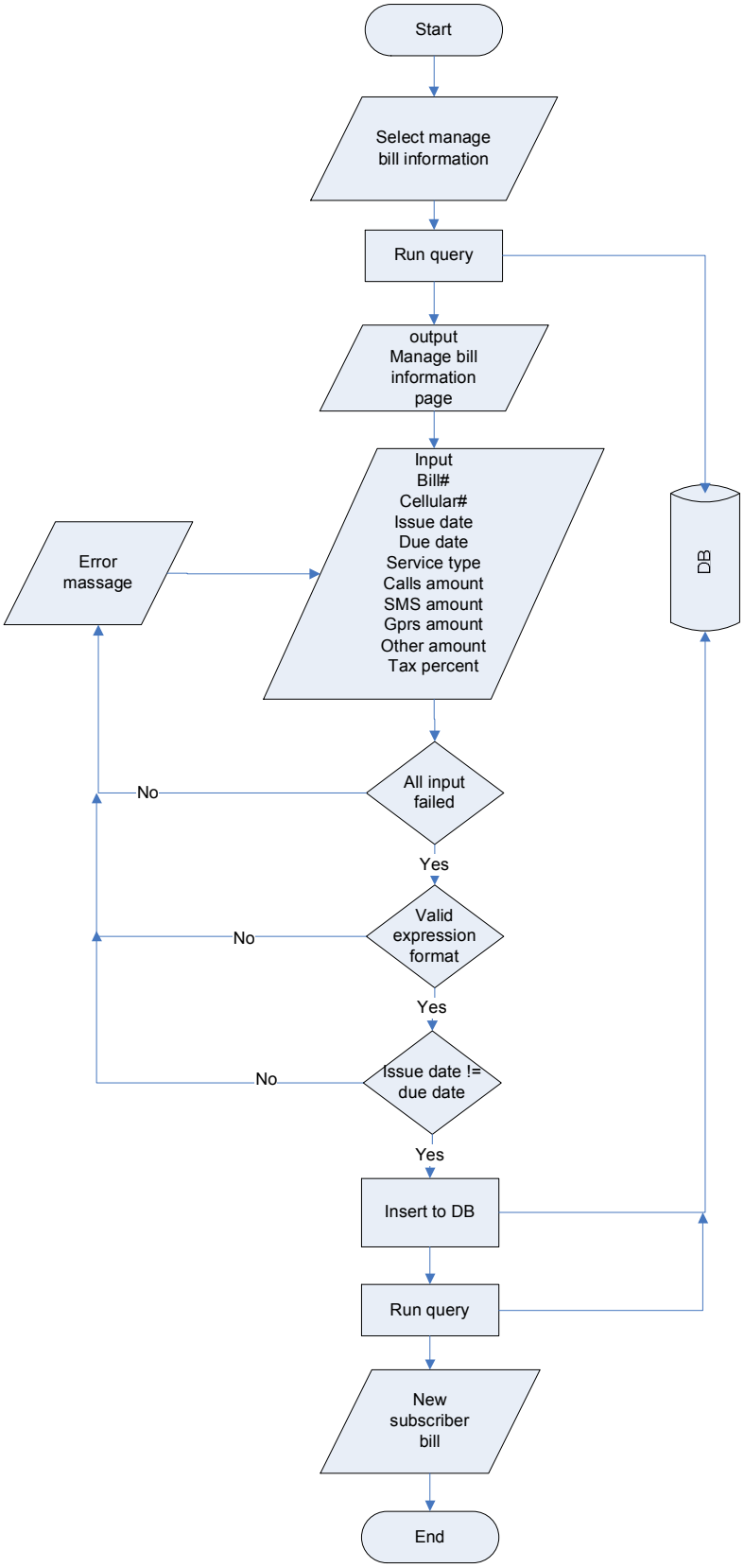


Figure 55 Manage bill information flowchart

4.2.26 Manage bank supported list:

- *Description:* this function allow administrator to add, delete, and update bank supported list.
- *Interface:*
    - Input: select manage bank supported list link, bank ID, bank name.
    - Output: ok massage.
- *Constraints:*
    - Administrator should login system.
    - All input must fail correctly.
    - Bank ID must not duplicate.
- *User interface design:*

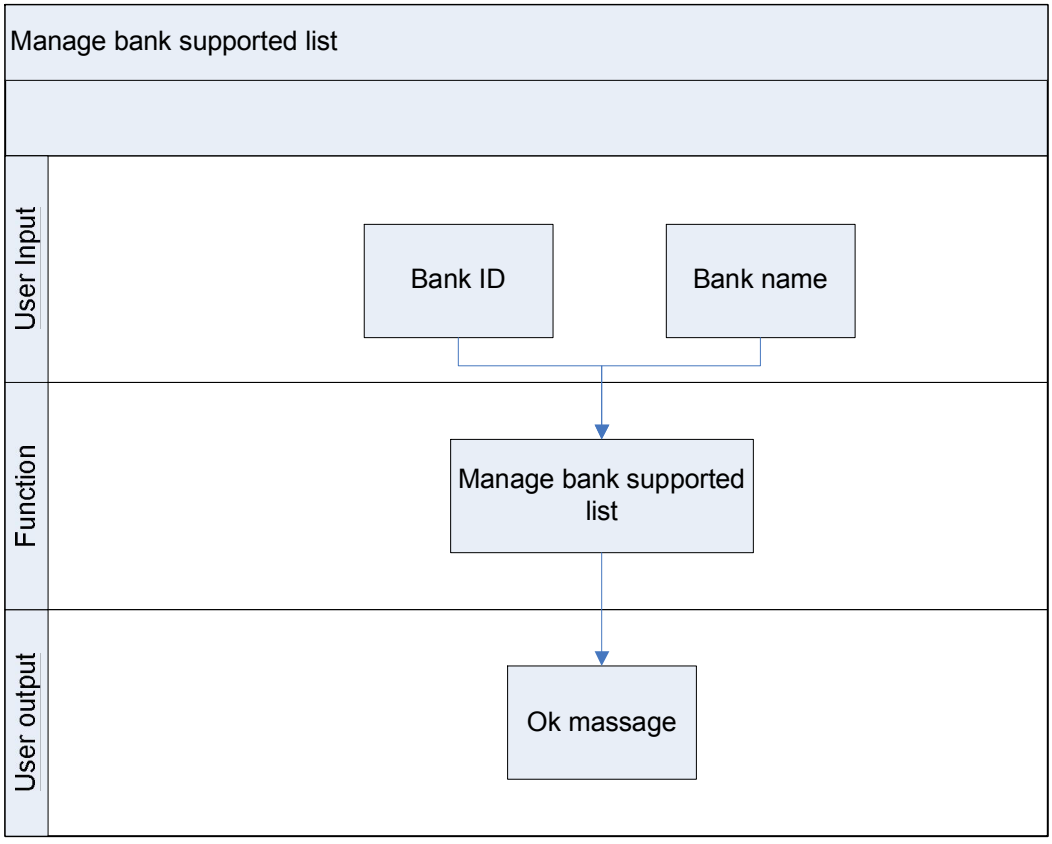


Figure 56 Manage bank supported list user interface design

- *Flowchart:*

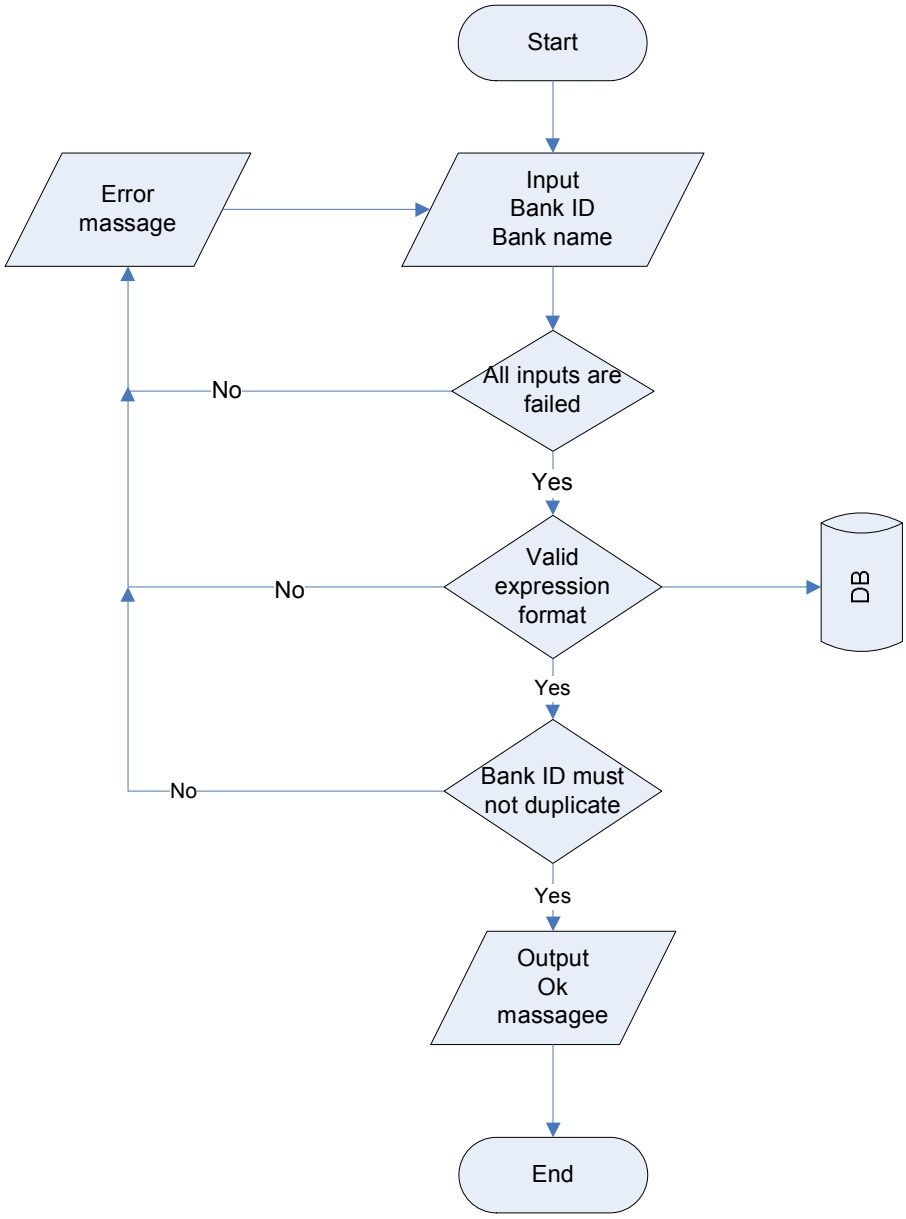


Figure 57 Manage banks supported list flowchart

4.2.27 Update advertisements:

- *Description:* this function enable administrator to manage the advertisements.
- *Interface:*
    - Input: graphics advertisements, announcement id, announcement text.
    - Output: new advertisements.
- *Constraints:*
    - Administrator should be login system.

- All inputs should fail correctly.
- Announcement id must not duplicate.

- *User interface design:*

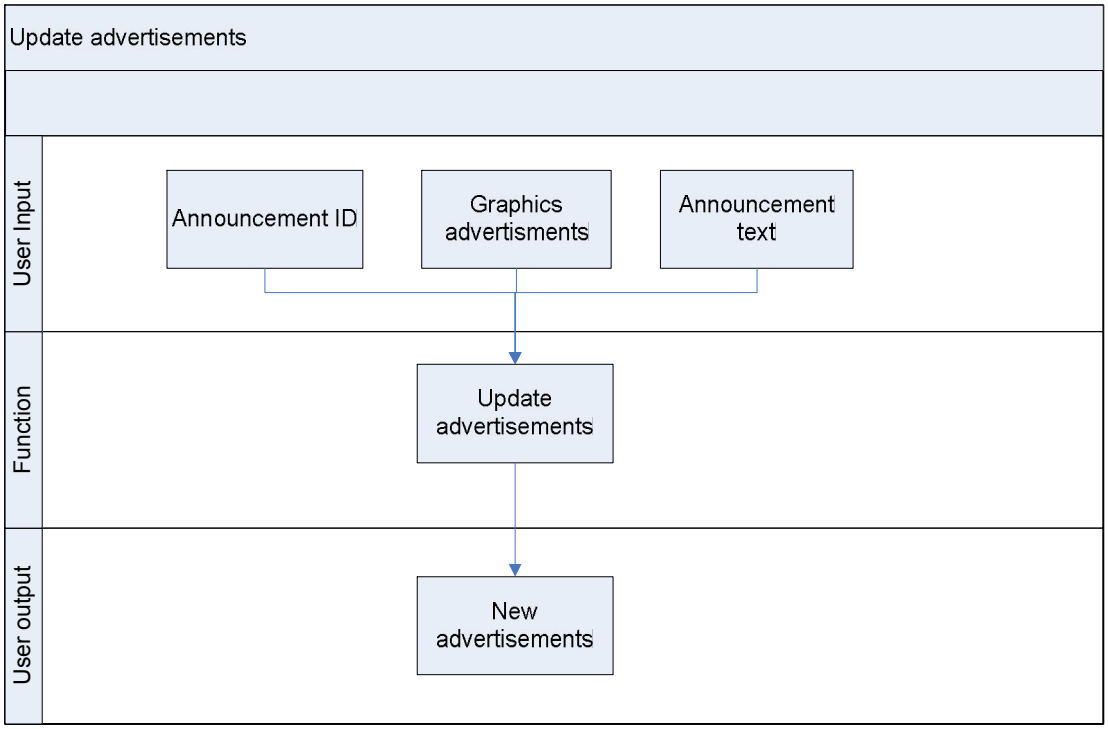


Figure 58 Update advertisments user interface design

- *Flowchart:*

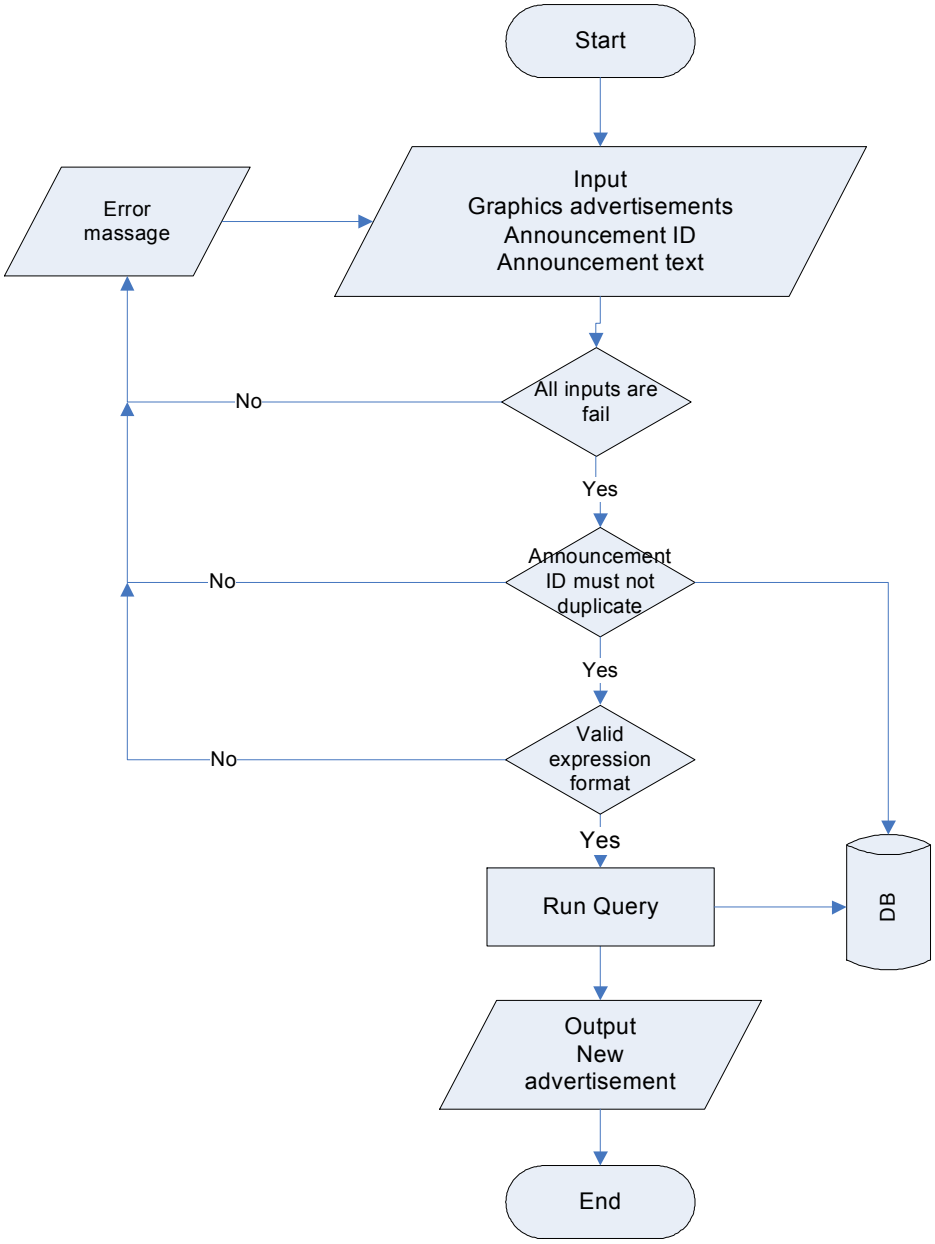


Figure 59 Update advertisments flowchart

4.2.28 Update service type announcements:

- *Descriptions:* this function enable administrator to add and modify announcements that related to the type of services that the subscriber subscribed in the cellular company.
- *Interface:*

- Input: service type, announcement id, announcement text.
- Output: new service type announcement

- *Constraints:*
  - Administrator should be login system.
  - Announcement ID must not duplicate.
  - All inputs should be failed correctly.
- *User interface design:*

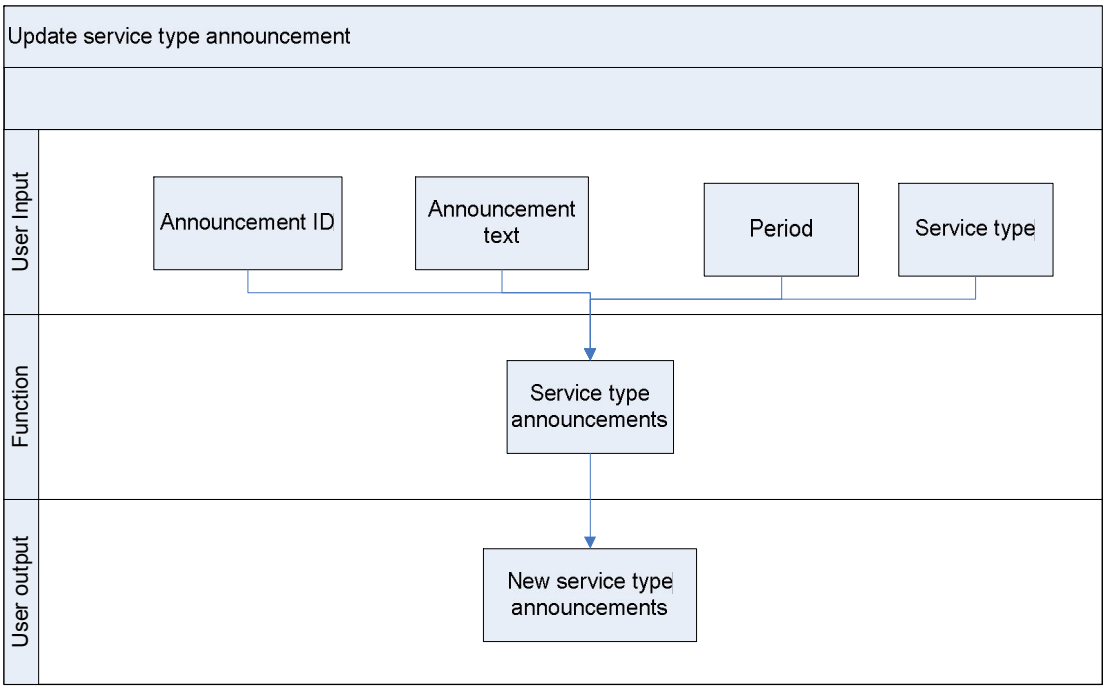


Figure 60 Update service type announcement user interface design

- *Flowchart:*

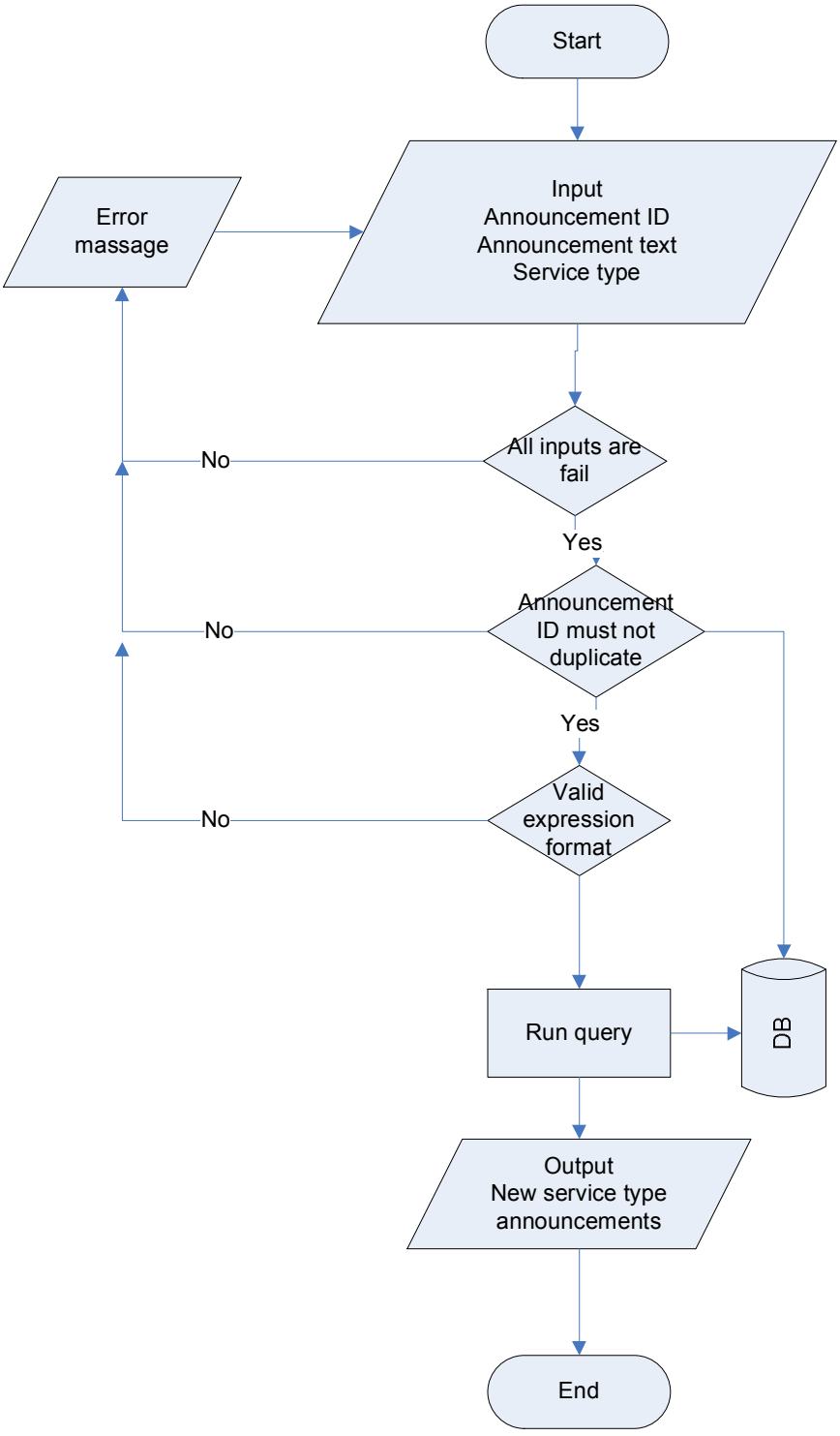


Figure 61 Update service type announcement flowvhart

4.2.29 Update subscriber announcements:

- *Descriptions:* this function enable administrator to add and modify announcements that related to the subscriber.
- *Interface:*
    - Input: subscriber phone number, announcement id, announcement text.
    - Output: new subscriber announcement.
- *Constraints:*
    - Administrator should be login system.
    - All inputs should be failed correctly.
    - Announcement ID must not duplicate.
- *User interface design:*

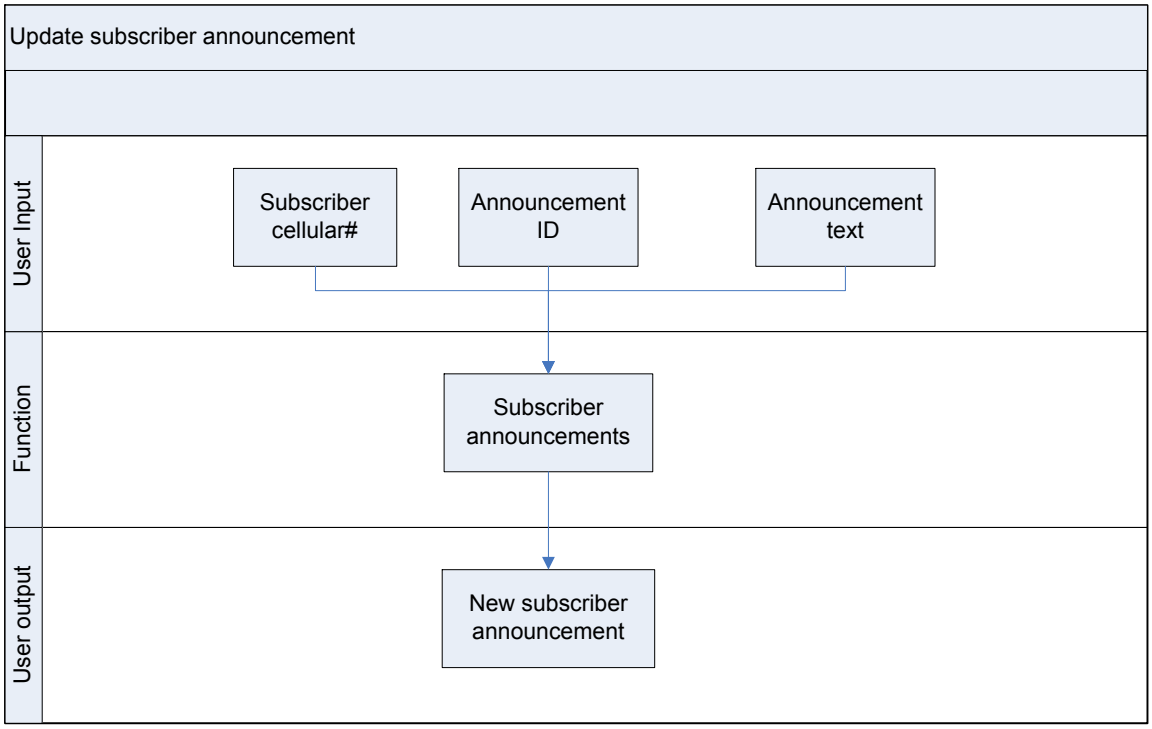


Figure 62 Update subscriber announcement user interface design

- *Flowchart:*

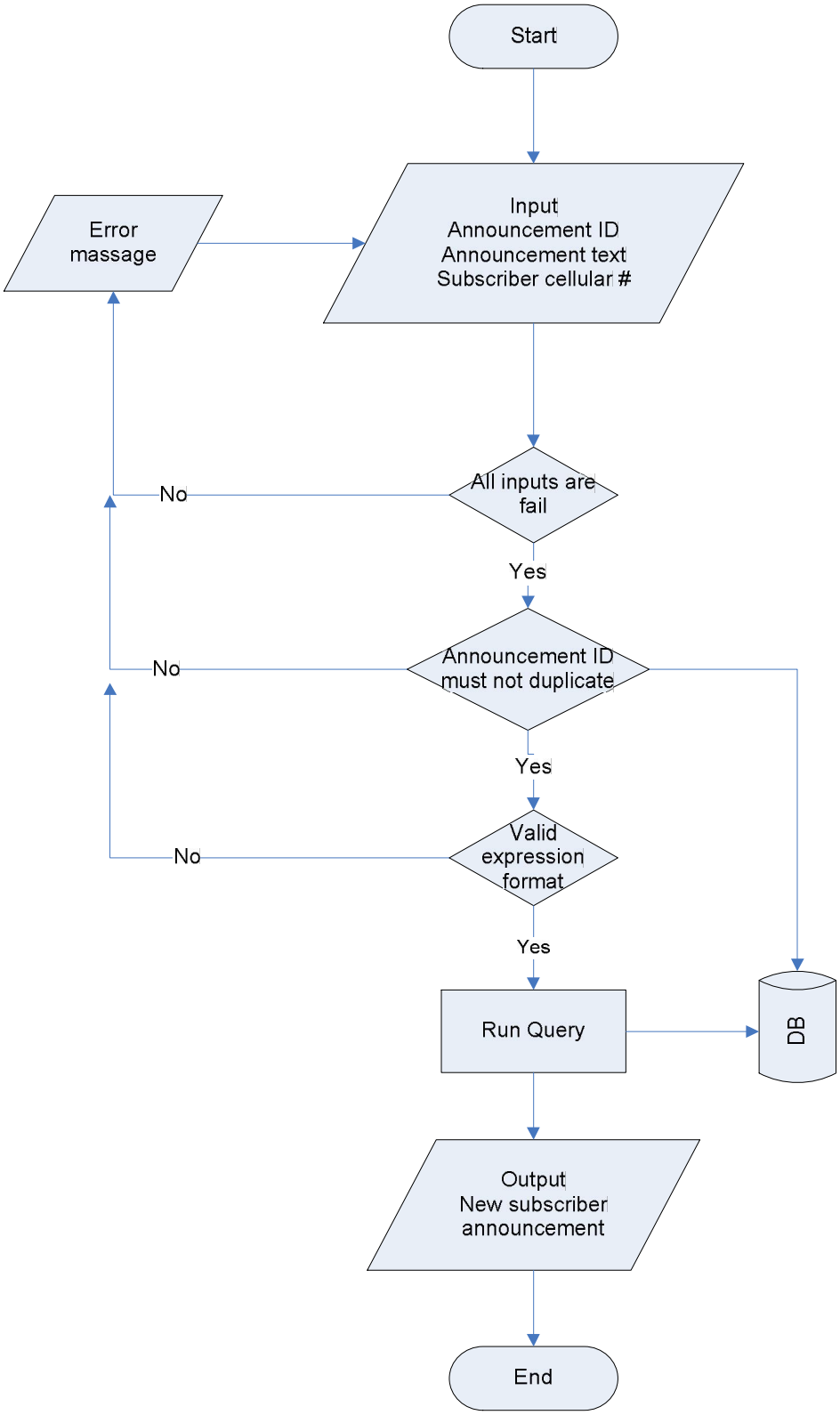


Figure 63 Update subscriber announcement flowchart

4.3 Input output design:

The system has twosubsystems; one for the subscriber which should be browsed in the WAP system and the other for administrator which should be browsed in the web system. In this section we describe the two forms.

4.3.1 Subscriber forms:

- **Welcome page:**

This screen is the first screen appears for the subscriber. It contains a three links to start use the service, first link (login) if the subscriber registered before he click on it to login his main page.

The second link (new subscriber) if the subscriber does not registered in the service and he want to register in it. Finally the third link (help) to get the help about how to use the system.

Figure 64 Welcome page form

Subscriber login:

In this screen the subscriber login to the system by entering his cellular number and password in the text boxes shown below.

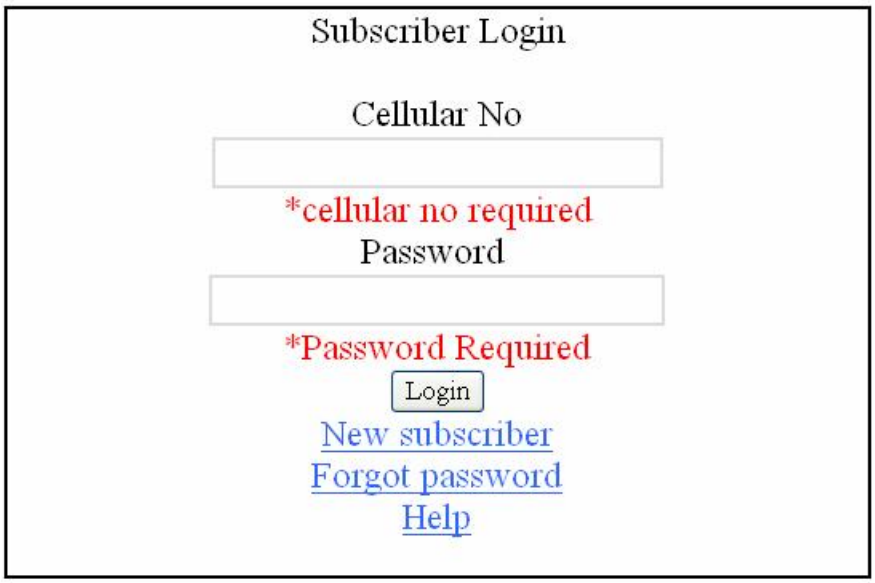


Figure 65 subscriber login form

New subscriber:

In this process the subscriber can register in the service through number of forms that appears on the cellular screen.

- **Form 1:**

In this form the subscriber input cellular no and then select the next button, if the subscriber doesn't enter the cellular number before select the button then the validation constraints should be appear.

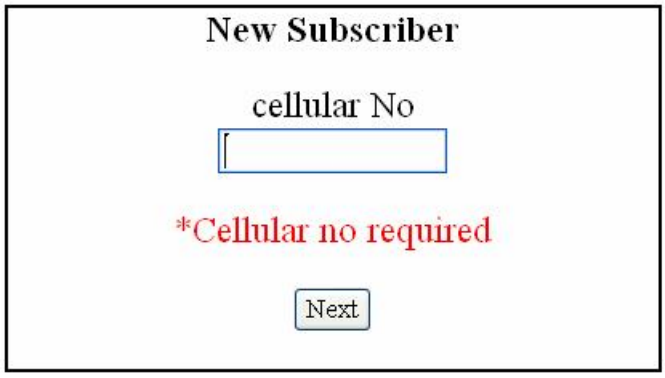


Figure 66 New subscriber form-1

- **Form 2:**

In this form subscriber Enter his first and last name in the text boxes and then selects the next button to continue, if the subscriber does not type it then the constraints should appear.

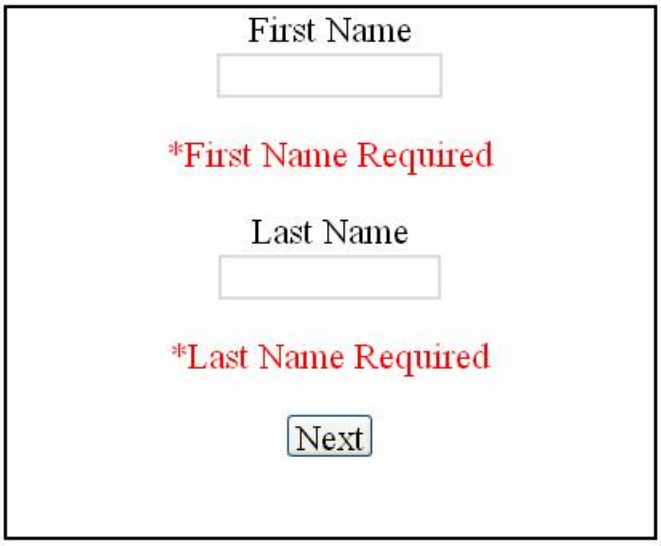


Figure 67 New subscriber form-2

- **Form 3:**

In this form the subscribers input his password and confirms it then select the next button, if the subscriber doesn't type it's the validation constraints should be appear. The password should equal the confirm password if not then the validation constraint should be appear.

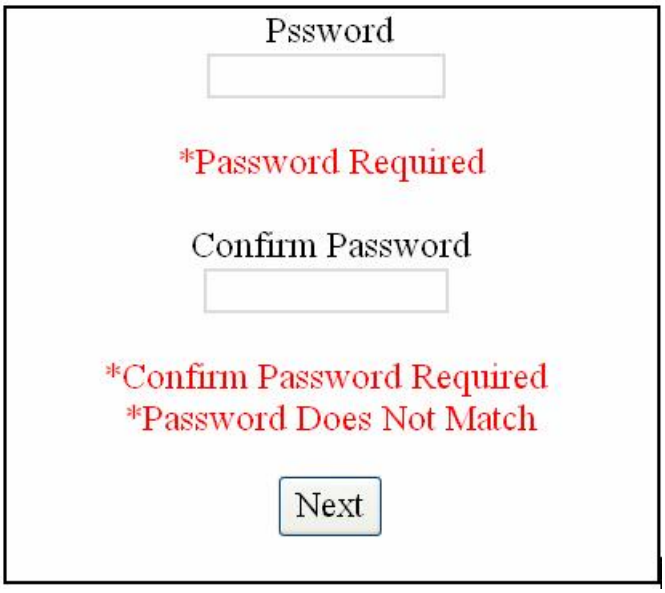


Figure 68 New subscriber form-3

- **Form 4:**

In this form the subscriber select from the list box the secret question and then answer it if he selects the next button before typing the answer the validation constraint will appear. After the subscriber select the button the next form should be appear.

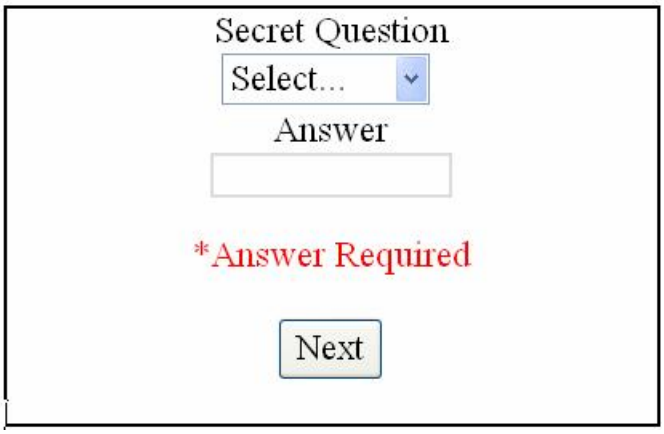


Figure 69 New subscriber form-4

- **Form 5:**

In this form the subscriber select the area he live in and select type of his account service. Then he selects the button to go into next form.

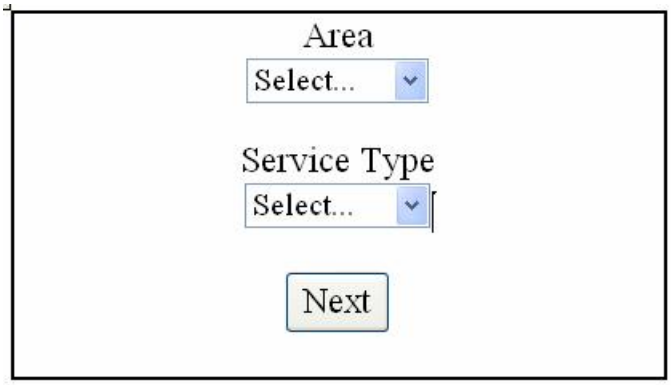


Figure 70 New subscriber form-5

- **Form6:**

In this form the subscriber select his favorite bank and type his account number in that bank then he selects the next button to continue. If he doesn't type his account no a validation constraints will appear.

Figure 71 New subscriber form-6

- **Form 7:**

In this form the subscriber select the submit button to register his data, and then the system shows the conformation massage.

Figure 72 New subscriber form-7

- **Forgotten password:**

In this process the subscriber recover his password by entering his cellular number then submit to the next screen.

- **Form 1:**

In this form the subscriber enter his cellular number and select continue button to go to the next form. If he don't type the cellular number a validation constraints should be appear.

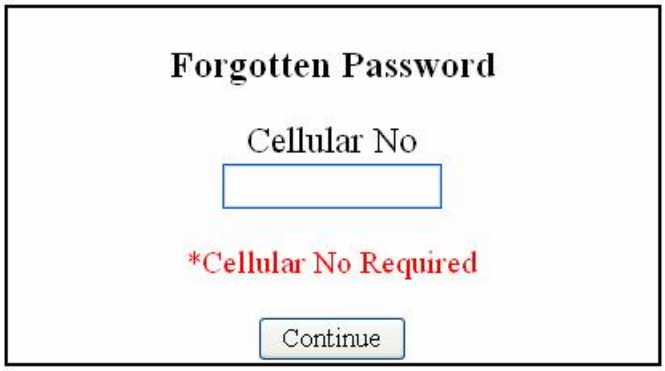


Figure 73 Forgeten password form-1

- **Form 2:**

In this form the secret question will appear, and then the subscriber input his answer and selects the get password button. If the subscriber enters the answer before select the button then the password should be appear to him if not then a validation constraints will appear.

Figure 74 Forgeten password form-2

- **Subscriber Main page:**

This form contains links to other form that the subscriber selects one of these links to go to the form for that process.

Figure 75 Subscriber main page form

- **Subscribe Data:**

This form contains number of links to others forms that related to the subscriber data. The subscriber must select a link to go to the form of that process.

Figure 76 Subscriber data form

- **View subscriber data:**

This form contains the subscriber data that is stored in the data base.

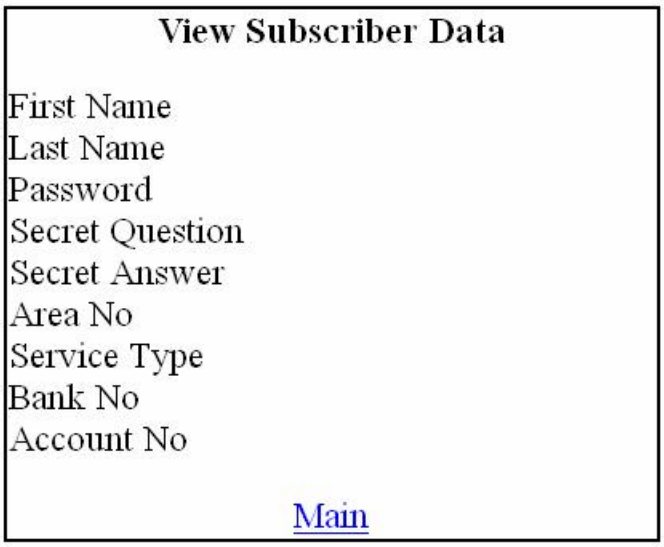


Figure 77 View subscriber data form

- **Modify Subscriber Data:**

This form informs the subscriber to call administrator to modify his data.

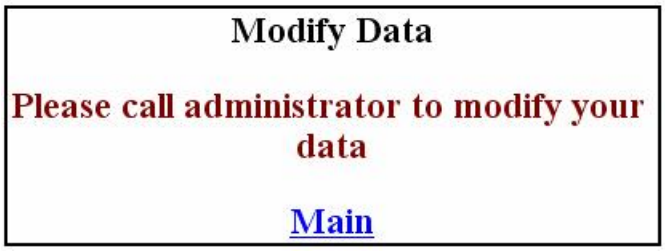


Figure 78 Modify data form

- **Change Subscriber Password:**

In this form the subscriber can change his password by typing the current password. New password, and confirm the new password, then select submit button to valid this data if an error occurred the validation constraint will be appear if not the conformation massage should appear.

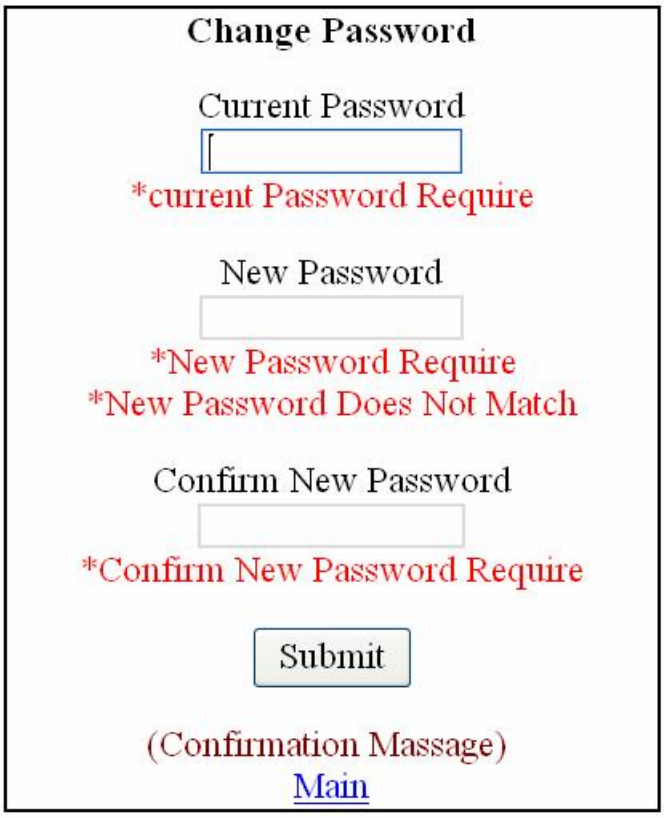


Figure 79 Change subscriber password form

- **Unsubscribe:**

This form tells the user to call the administrator to unsubscribe his account.

Figure 80 Unsubscribe form

- **Bill page:**

This form contains a number of links to other forms that related to the bill information and process.

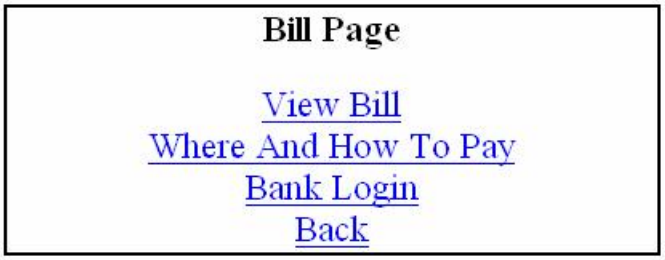


Figure 81 bill page form

- **Bill:**

This process contains the next form to view the bill:

- **Form1:**

This form contains then numbers of the bill and the subscriber select one of these links to view the details for that bill.

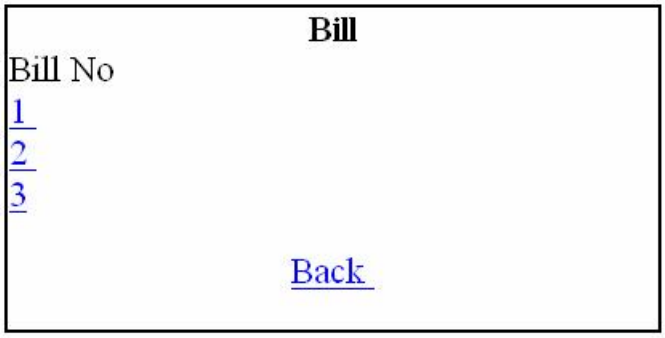


Figure 82 Bill form-1

- **Form2:**

This form contains the details data for the bill that selected in the previous form.

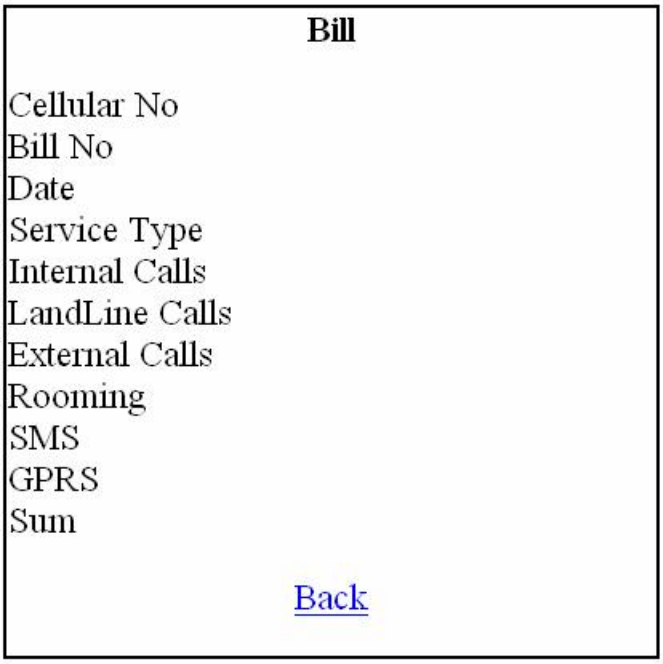


Figure 83 Bill form-2

- **Where and how to pay:**

This form tells the subscriber how to pay his bill.

Figure 84 Where and how to pay form

- **Bank Login:**

In this form the subscriber can login to the bank system to pay his bill by putting his ID and password.

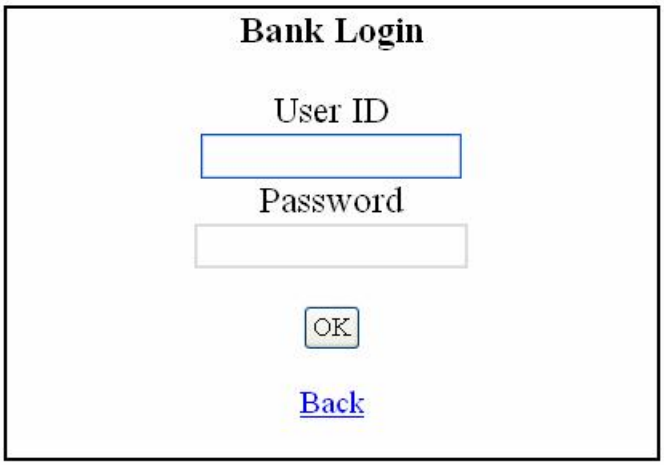


Figure 85 Bank login form

- **Subscriber announcement:**

By the next forms the user can view the subscriber announcement:

- **Form 1:**

This form contains numbers of the announcement that the subscriber selects one of them to view.

Figure 86 Subscriber announcement form-1

- **Form 2:**

This form contains the announcement that the subscriber select in the previous form.

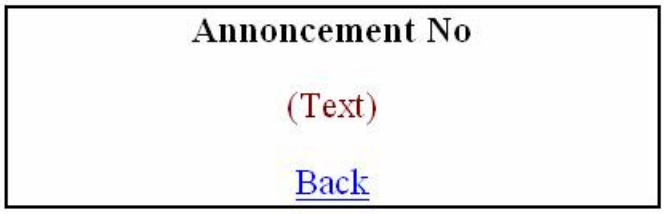


Figure 87 Subscriber announcement-form2

- **Service type announcement:**

In the next forms the user can view the service type announcement

- **Form 1:**

This form contains numbers of the announcement that the subscriber select on it to view the announcement.

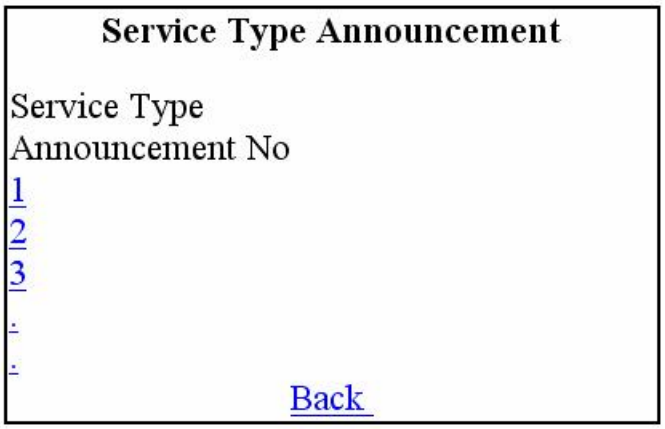


Figure 88 Service type announcement form-1

- **Form 2:**

This form contains the announcement that the subscriber select in the previous form.

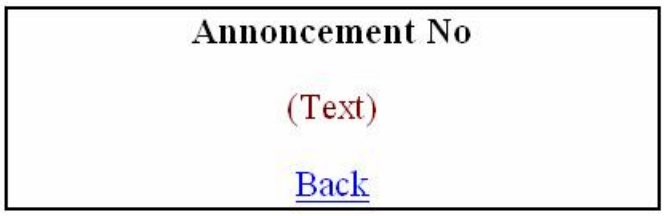


Figure 89 Service type announcement form-2

- **Advertisements:**

In the next forms the user can view the advertisements.

- **Form 1:**

This form contains numbers of the advertisements that the subscriber selects to view the advertisement.

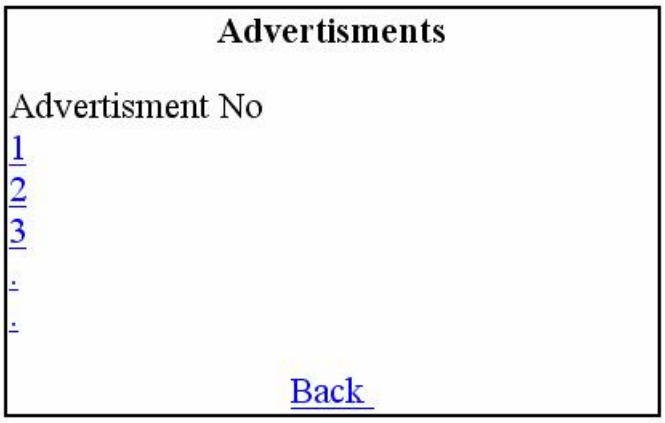


Figure 90 Advertismentts form-1

- **Form 2:**

This form contains the advertisement that the subscriber select in the previous form.

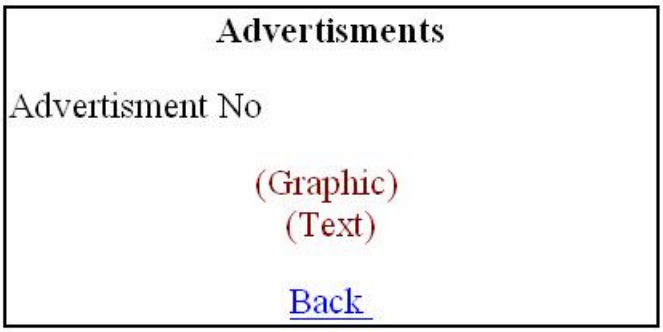


Figure 91 Advertisments form-2

- **Help:**

In this process we contain tow forms as shown below:

Form1:

This form contains a number of question (FAQ} to help the subscriber to use the system, the subscriber select one of these questions to show its form detail.

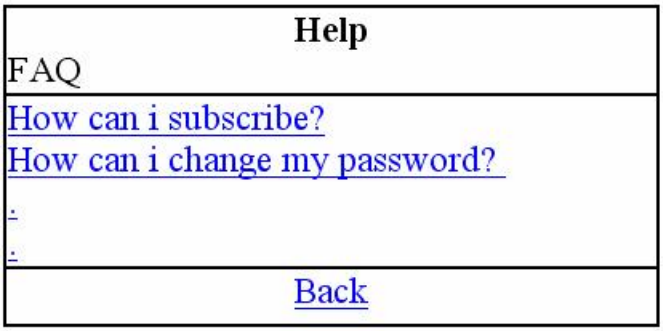


Figure 92 help form1

Form2:

This form contains the FAQ question that selected from the previous form and its answer.

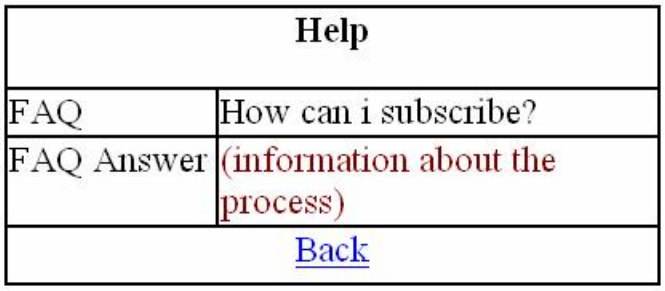


Figure 93 help form2

4.3.2 Administrator forms:

Administrator login:

This form contains the administrator ID and password. The administrator should input his ID and password to login the system. If the administrator forgot his password he should select the forgot password link to go to another form to recover his password.

Figure 94 Administrator login form

- **Administrator main page:**

From this form administrator can link to another forms in the system by select the button that refers to the process which he want to do.

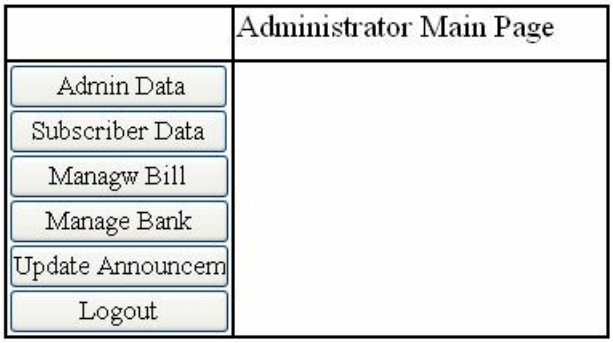


Figure 95 Administrato Main Page

- **View administrator data:**

This form contains the information about administrator which is stored in the database.

Figure 96 view administrator data form

- **Modify administrator data:**

In this form the administrator can modify his data; this is including changing the administrator. Only one administrator can login to the system.

Figure 97 Modify administrator data form

- **Change administrator password:**

In this form the administrator change his password by entering his current password, new password and confirming it. Then he selects the change button to change his password and a confirmation massage will appear. This process has a validation to ensure that the input data are correct.

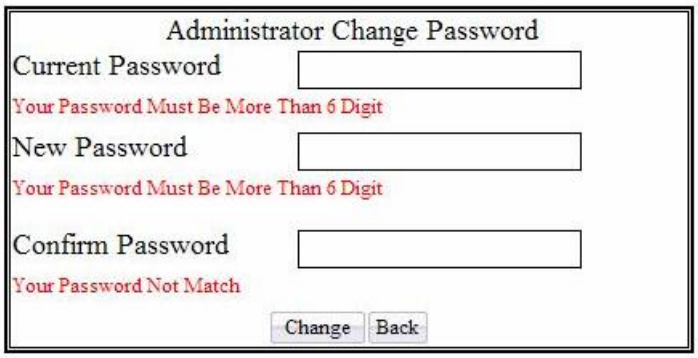


Figure 98 Change administrator password form

- **Forgotten password:**

In this form the administrator can recover his password if he forgets it by entering his ID then select request button to give his secret question, finally he input the answer and select recovery button to give his password and appear it to him.

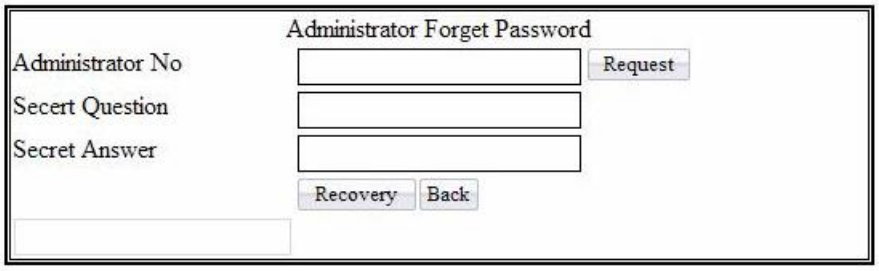


Figure 99 Forgeten password form

- **View subscriber data:**

The administrator enters the cellular number for the subscriber witch he wants to view his data and select the view button. The next figure show how the data for the subscriber will appear.

Figure 100 View subscriber data

- **Modify subscriber data:**

In this form the administrator modify subscriber's data by entering the new data in the text boxes.

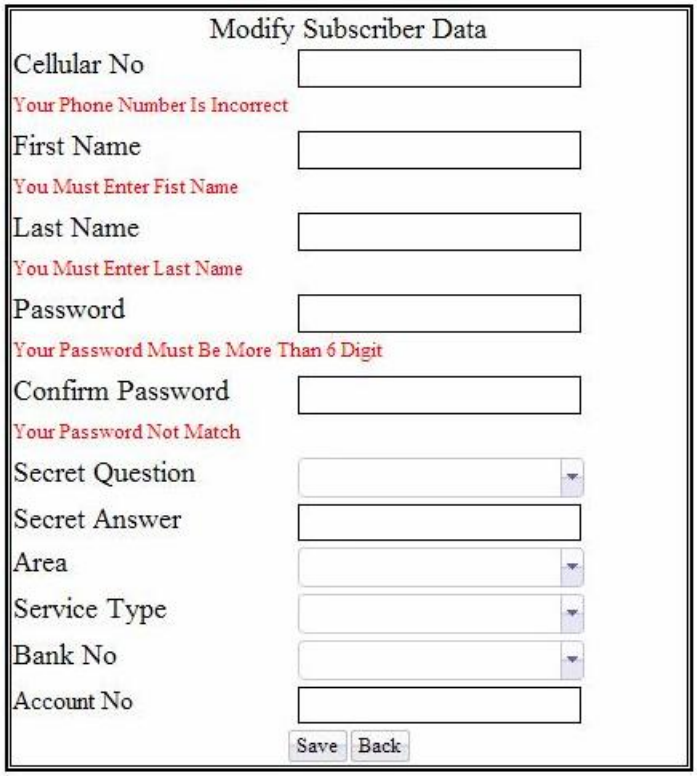


Figure 101 Modify subscriber data

- **Manage bill:**

In this form the administrator can add new bill to the subscriber.

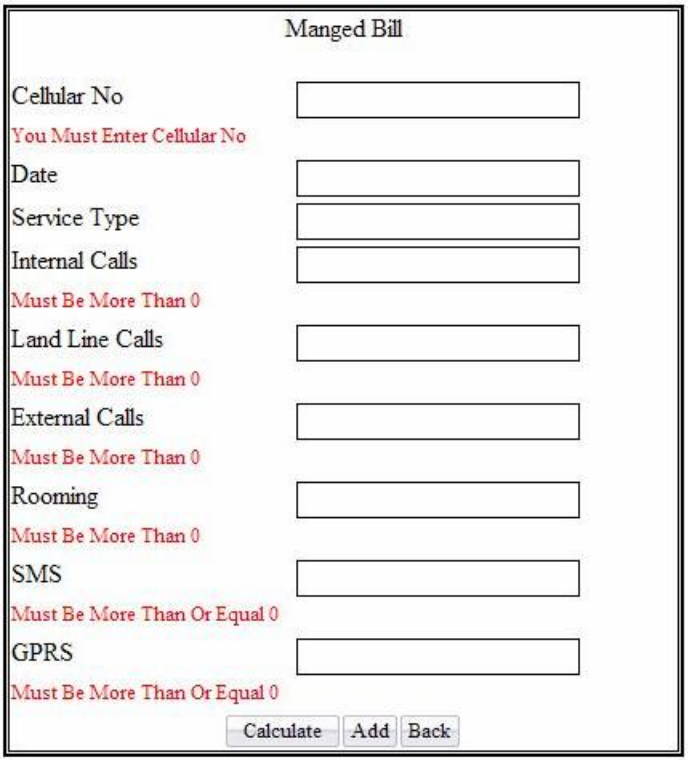


Figure 102 Manage bill

- **Help:**

This form included help to the administrator that tell him how to use the system.

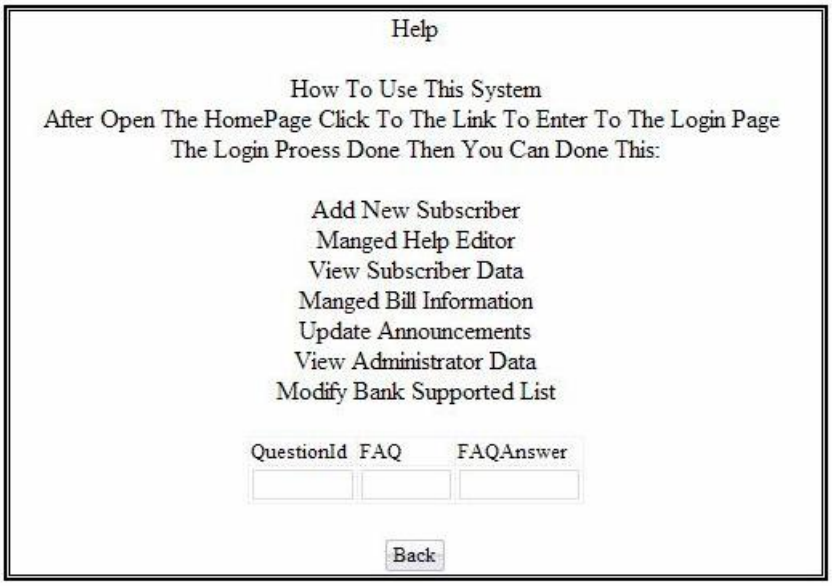


Figure 103 Help form

- **Help editor:**

This form allows the administrator to edit the subscriber help by adding new data and modify it.

Figure 104 Help editor form

- **Add supported bank:**

This form allows the administrator to add new bank to the supported.

Figure 105 Add supotrted bank form

- **Update supported bank:**

This form allows the administrator to modify the bank supported list.

Figure 106 Update suportsd bank form

- **Delete supported bank:**

This form allows the administrator to delete bank from the supported banks.

Figure 107 Delete suported bank form

- **Subscriber announcement:**

This form allows the administrator to add new subscriber announcement for the subscriber.

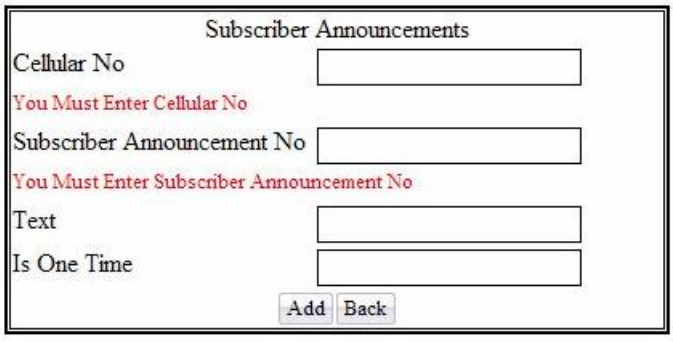


Figure 108 Subscriber announcement form

- **Delete subscriber announcement:**

This form allow administrator to delete subscriber announcement.

Figure 109 Delete subscriber announcement form

- **Add service type announcement:**

This form allows the administrator to add new service type announcement.

Figure 110 Add service type announcement form

- **Delete service type announcement:**

This form allows the administrator to delete the service type announcement.

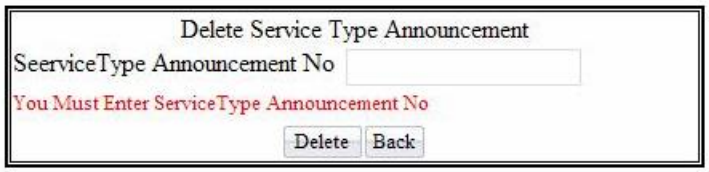


Figure 111 Delete service type announcement form

- **Add advertisements:**

This form allows the administrator to add new advertisement.

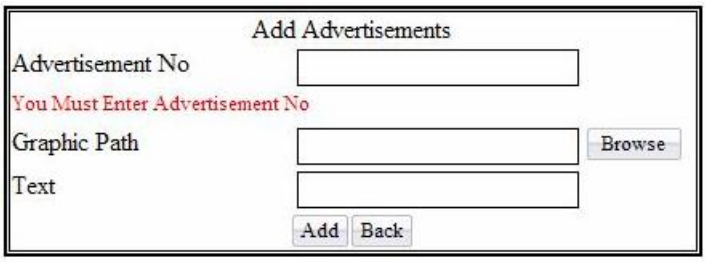


Figure 112 Add advertisment form

- **Delete advertisement:**

This form allows administrator to delete advertisements.

Figure 113 Delete advertisment form

4.4 DB design:

4.4.1 Database model:

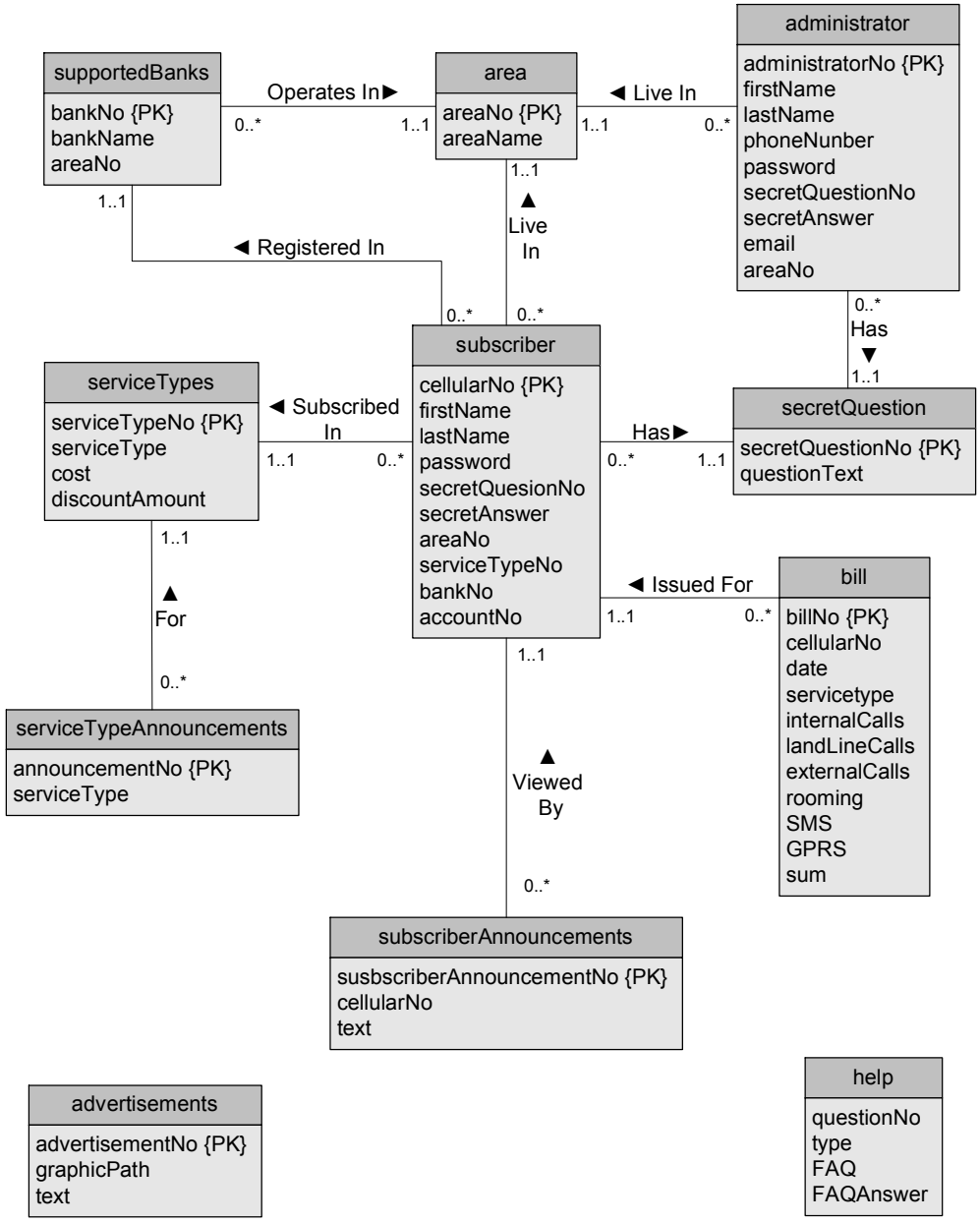


Figure 114 UML database model

The UML Database model shows the data base tables and the relation exists between them.

4.5 Test plan:

In this section we describe the methodologies that used to test the system, the step that used in the system tested are described below:

Testing step:

- **Unit and Module testing:**

Unit testing will be used to test each class we design weather it works correctly or not, and operates as expected.

- **Component testing**

We will use component testing to test the individual component in the system to expose faults in these components.

- **Integration testing**:

We will use integration testing to test how the objects in our system work together and ensure that it is work properly as expected.

- **System testing:**

We will test the whole system to ensure that all objects work together correctly and efficiency, and all errors were detected.

- **WAP display testing:**

We will use WAP display testing to test how the system well appear in all WAP enabled cellular phone, and all critical information is displayed.

- **Acceptance testing:**

We will test the system again to ensure that if the system is accept to the functional requirement and accept to the end user or not.

Chapter 5

UML Design

Chapter Five UML Design

5.1 Introduction

This chapter surrounds the UML design of the system, and the need for this chapter come to support the specification, visualization, architectural design, and communication for the Object Oriented design and implementation of the system.

UML is selected between the Object Oriented methodologies to produce the diagrams of the system, which is a set of graphical notations; these notations can be grouped together to present one of the UML models.

It's important to notice that this system design follows the latest UML notations (UML 2.0), because there are some differences between it and the previous versions.4

The Diagrams in this chapter ordered by there types (Behavioral or Structural) then entire these two categories depend on there dependency.

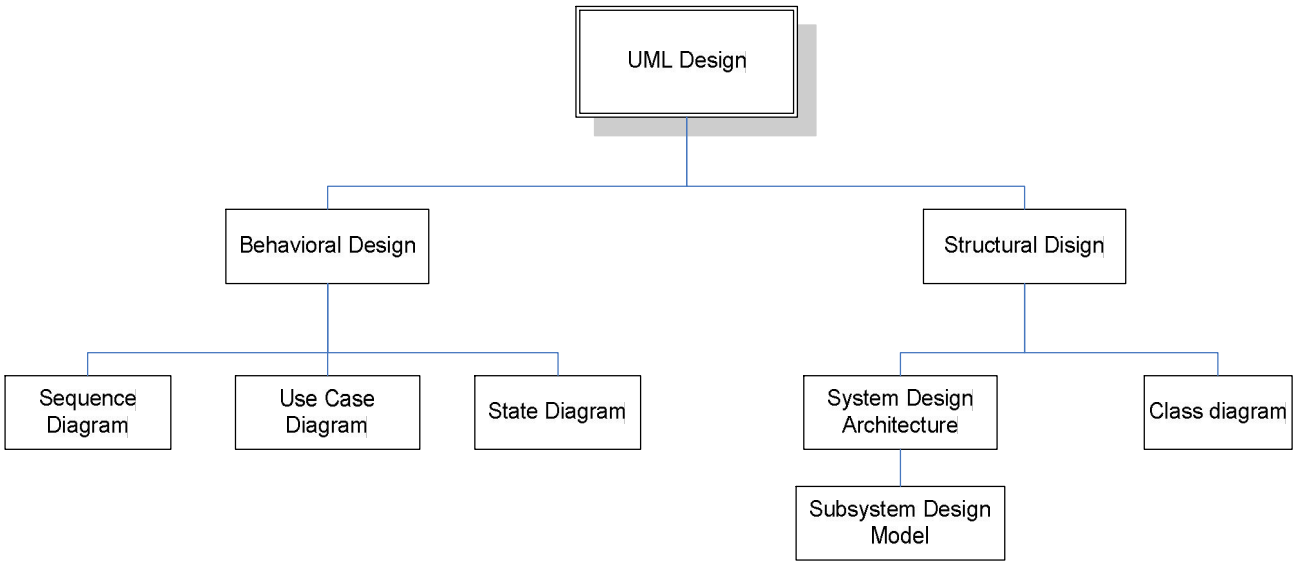


Figure 115 UML Design structure hierarchy

[4] Further information about the UML specifications and versions can be found on its official site, http://www.uml.org.

- **The Structural Diagrams:**
    - Class Diagram.
    - Classes identifications.
    - System design architecture.
    - Subsystem design model.
- **The Behavioral Diagrams:**
    - Use case diagram.
    - Sequence diagram.
    - State chart diagram.

5.2 The Structural Diagrams

This section contains the needed structural diagrams from the UML structural design diagrams, these diagrams used to show the building blocks, structure, and features of the system.

5.2.1 Class Diagram

The Class diagram represents the class that exists in the system in the implementation level and the relation between them, class diagram used in this system as base of all the UML diagrams.

In this section an abstract class diagram is presented to facilitate understanding of the diagram itself and show the relations between classes, all the features of the classes are suspended5, in the next section (class identification) the classes is presented in details.

The Class diagram shows the following classes and the relation between them:

- announcements.
- advertisements.

[5] Class features: properties, methods, and fields of the class.

- serviceTypeAnnouncemetns.
- user.
- subscriber.
- administrator.
- forgetPassword.
- login.
- subscriberLogin.
- administratorLogin.
- administratorForgetPassword.
- subscriberForgetPassword.
- help.
- payment.
- bank.
- bill.

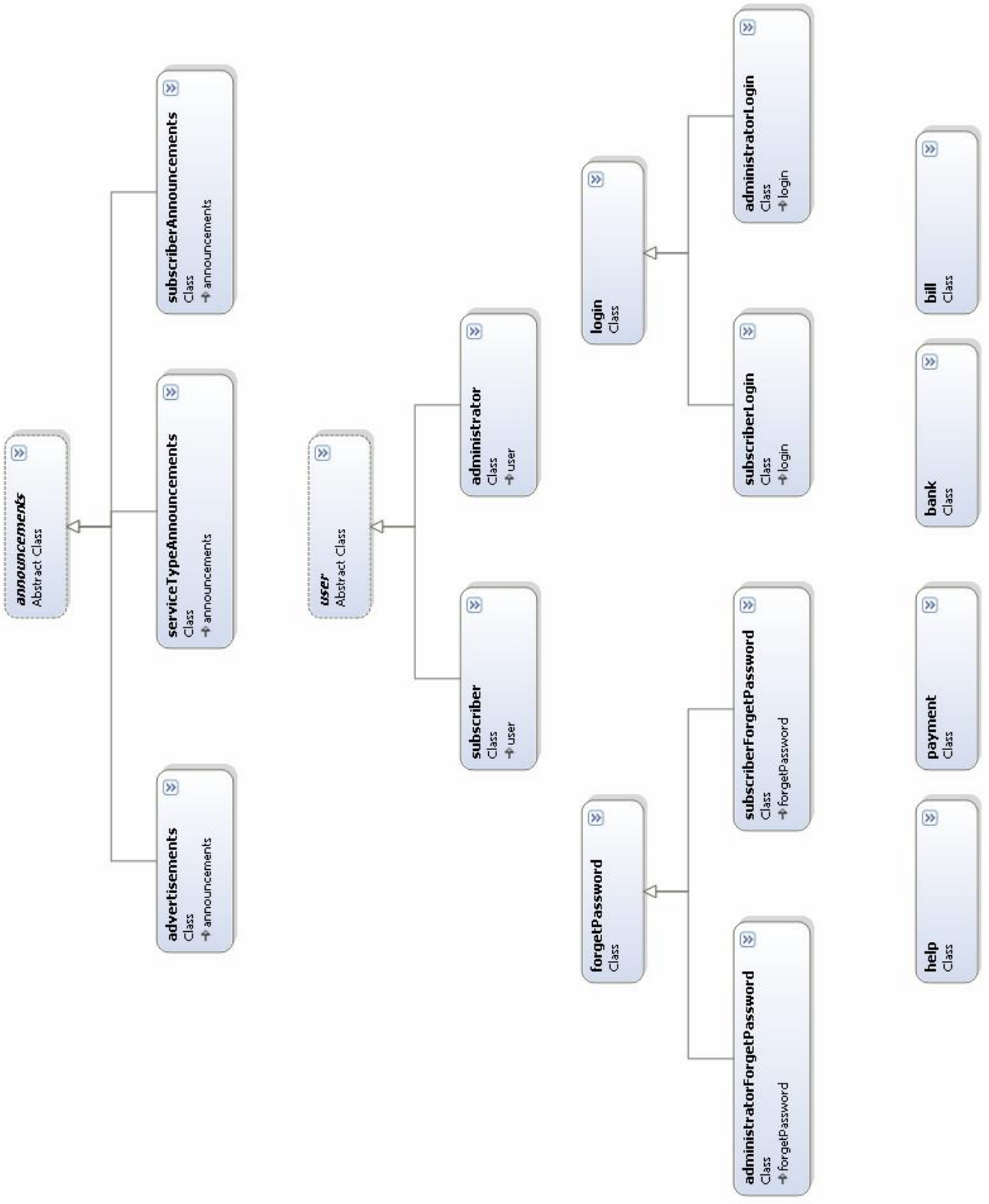


Figure 116 The Class Diagram

5.2.1.1 Class Identifications

Here we set each class with it fields and methods that include in it. There are deferent relations between the classes such as inheritance relation between the user class, which is an abstract class, and the subscriber and administrator classes.

5.2.1.1.1 user class

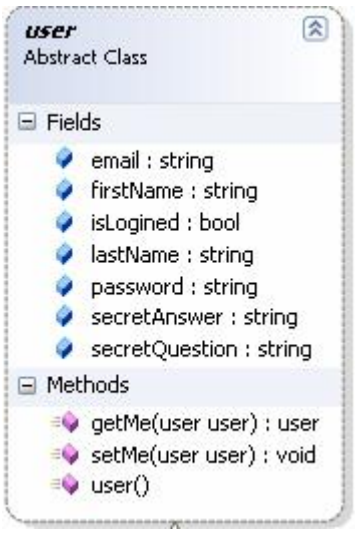


Figure 117 user class

5.2.1.1.2 subscriber class

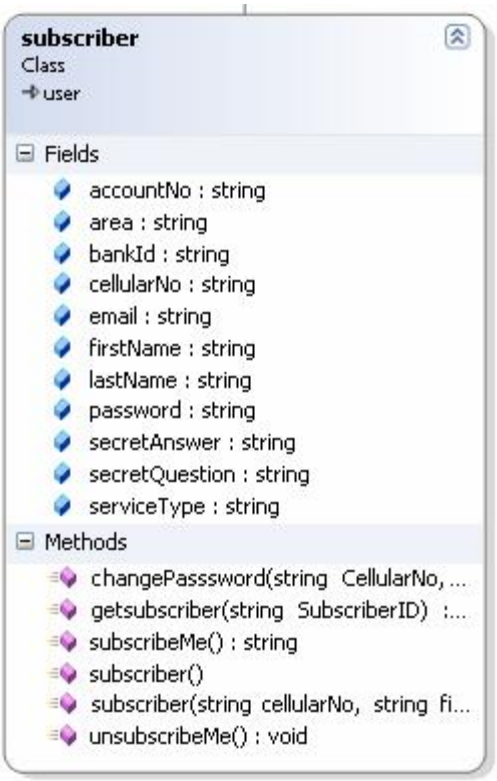


Figure 118 subscriber class

5.2.1.1.3 administrator class

Figure 119 administrator class

5.2.1.1.4 login class

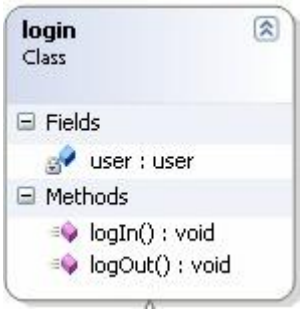


Figure 120 login class

5.2.1.1.5 subscriberlogin class

Figure 121 subscriber login

5.2.1.1.6 administratorlogin class

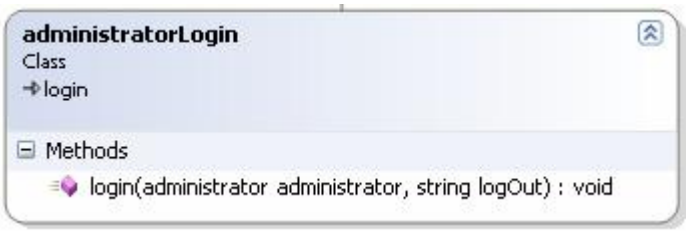


Figure 122 administrator login

5.2.1.1.7 forgetPassword class

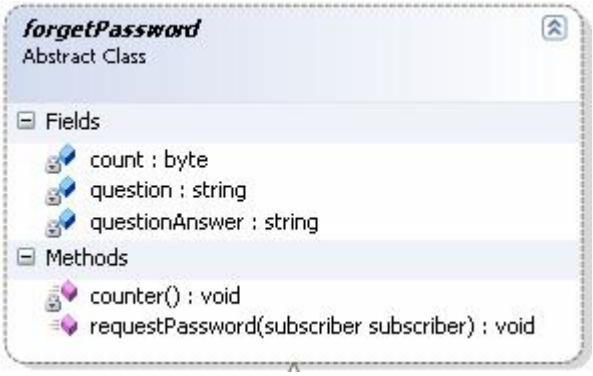


Figure 123 forgetPassword class

5.2.1.1.8 subscriber forget password class

Figure 124 subscriberForgetPassword class

5.2.1.1.9 administratorForgetPassword class

Figure 125 administratorForgetPassword class

5.2.1.1.10 help class

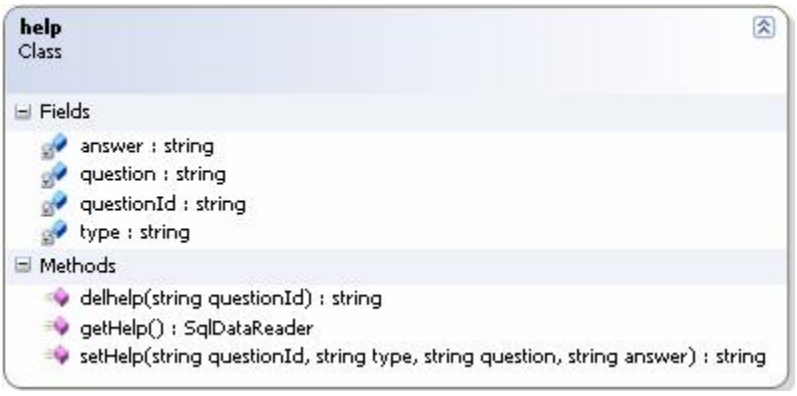


Figure 126 help class

5.2.1.1.11 bill class

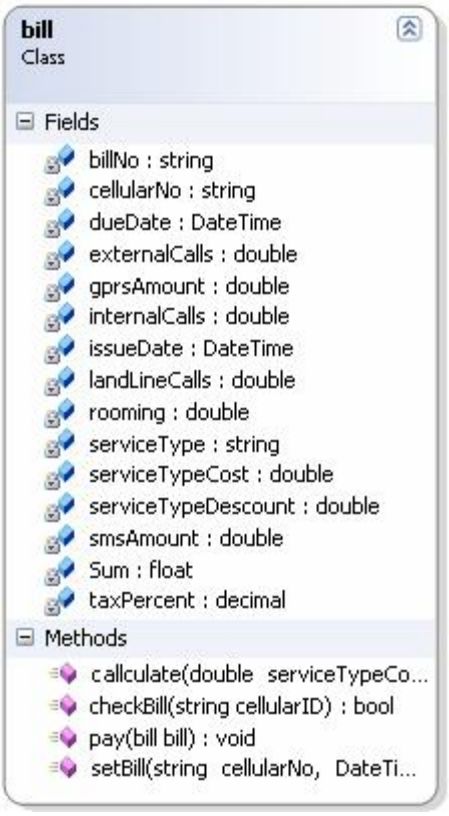


Figure 127 bill class

5.2.1.1.12 bank class

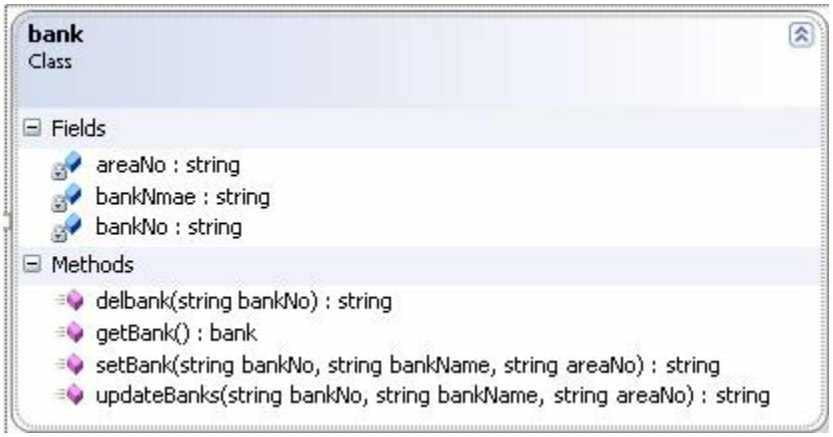


Figure 128 bank class

5.2.1.1.13 payment class

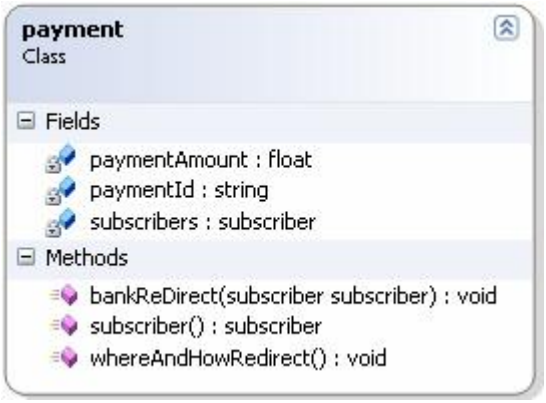


Figure 129 payment class

5.2.1.1.14 announcements class

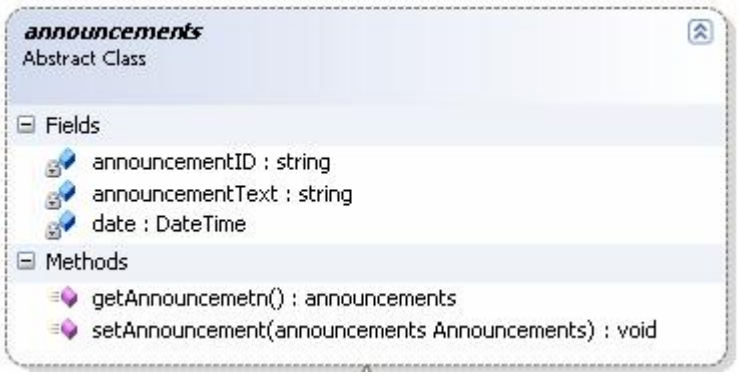


Figure 130 announcements class

5.2.1.1.15 advertisements class

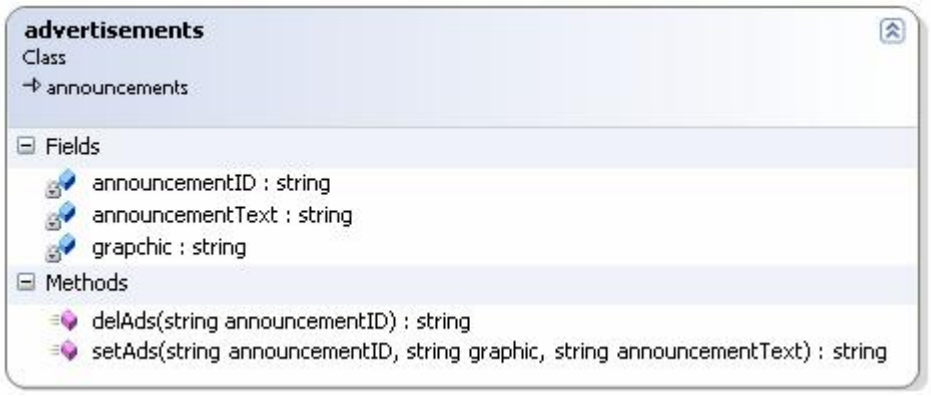


Figure 131 advertisements class

5.2.1.1.16 service type announcement class:

Figure 132 serviceTypeAnnouncements class

5.2.1.1.17 subscriber announcement class:

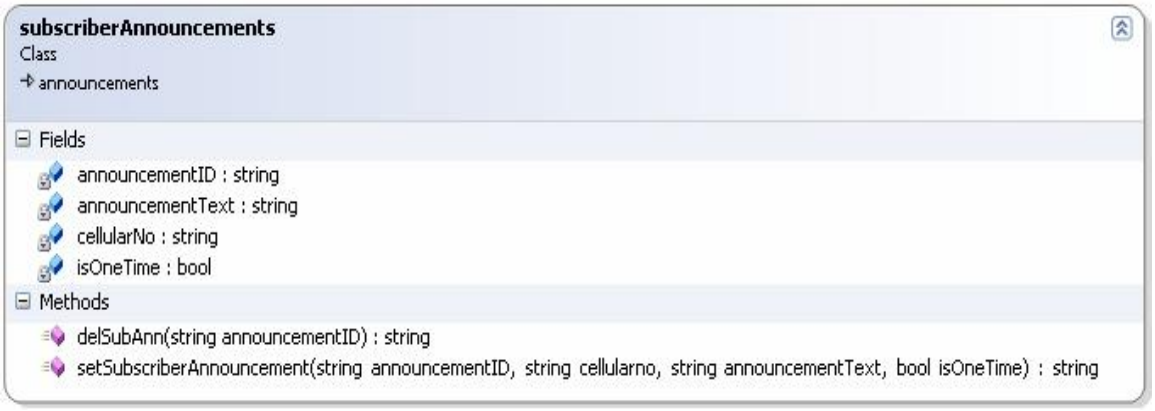


Figure 133 subscriberAnnouncements class

5.2.2 System Design Architecture

The Design Architecture, which divides the system into subsystems depending on their functionality, also its represents the system as a whole and its subsystems with notes representing the main functionality of each subsystem.

In this system, this diagram is used to understand each subsystem functionality and to divide the work between system developers.

All these subsystems interact with each others from the login in until logout for both Subscriber and Administrator.

The subsystems represented in this diagram:

- **Administration subsystem :** this subsystem contains all the functionalities for the system Administrator , i.e. contains managing bills information , viewing and/or modifying subscriber information, viewing administrator data , manage announcements, managing and/or viewing help.

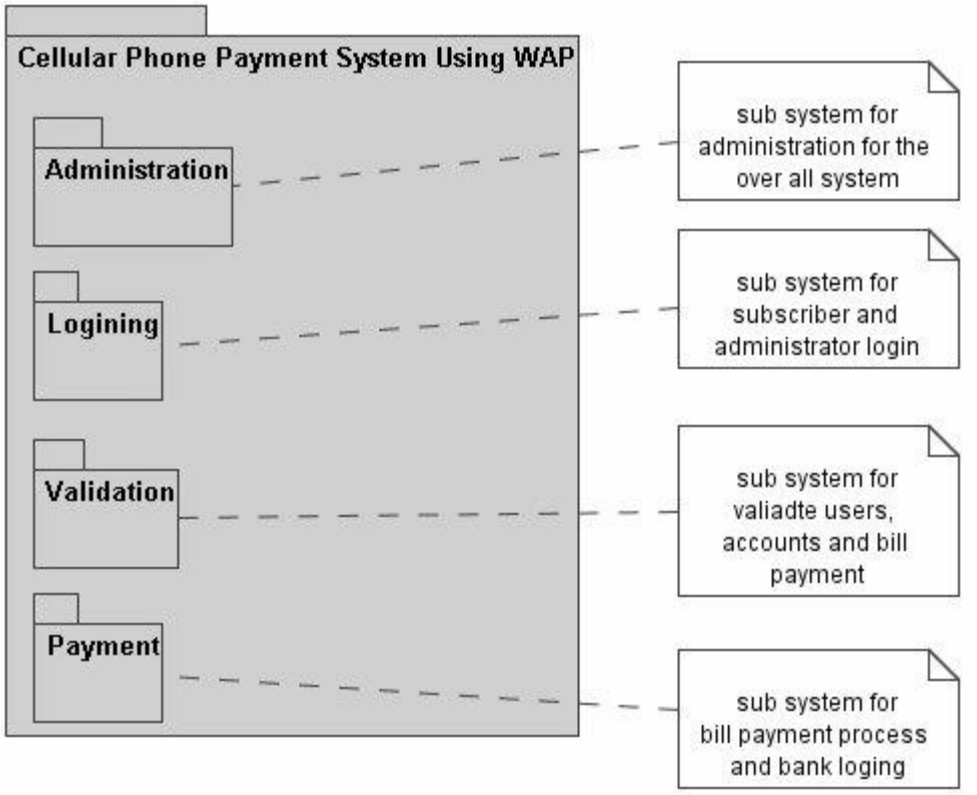


Figure 134 System Design Architecture Diagram

- **Login in subsystem**: this subsystem contains all the functionalities associated by authorizing both Subscribers and Administrators, this subsystem performs its functionality with the validation subsystem (in the authentication), and i.e. this subsystem interacts in the login in for both Subscriber and Administrators.
- **Validation subsystem**: this subsystem contains all the functionality for authentication and verifies the identity of the Subscribers and Administrator. I.e. this subsystem interact in the login in for both Subscriber and Administrators, bill payment and password recovery

- **Payment**: this subsystem contains all the functionalities for the bill and its payment process until reaching the bank login page.

5.2.2.1 Subsystem design model

This model come up to give more details for the subsystems presented in the System design architecture diagram, i.e. this model shows the details of each subsystem and how its components6 perform there functionality.

The "Do:" describes how this component performs in this subsystem to accomplish his reason of existence within the system.

5.2.2.1.1 Administration

Figure 21 shows the components of the Administration subsystem, and each functionality of them to perform the subsystem tasks.

[6] In this System, components mean classes.

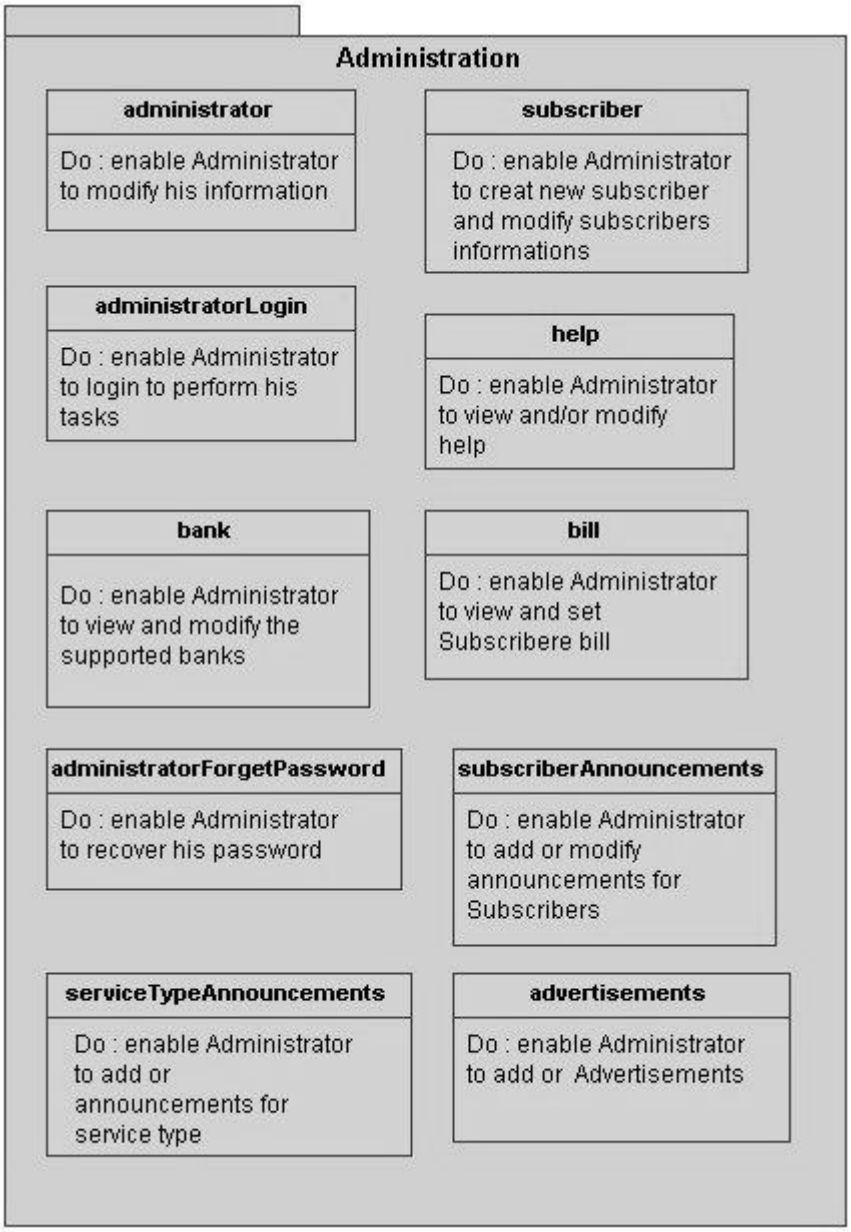


Figure 135 Administration Subsystem design model

5.2.2.1.2 Loggining

Figure 23 shows the components of the Logging subsystem, and each functionality of them to perform the subsystem tasks.

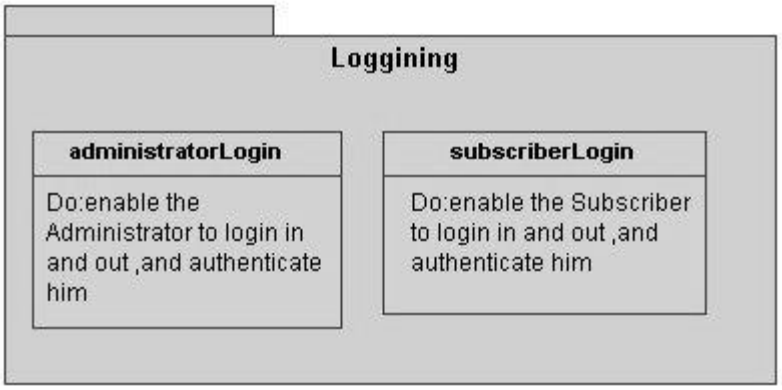


Figure 136 Login Subsystem design model

5.2.2.1.3 Validation

Figure 25 shows the components of the Validation subsystem and each functionality of them to perform the subsystem tasks.

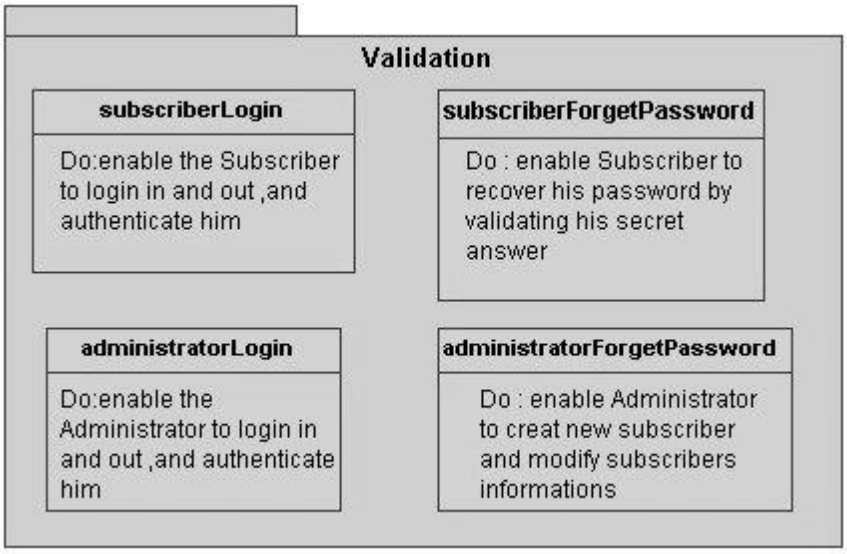


Figure 137 Validation Subsystem design model

5.2.2.1.4 Payments

Figure 27 shows the components of the Validation subsystem and each functionality of them to perform the subsystem tasks.

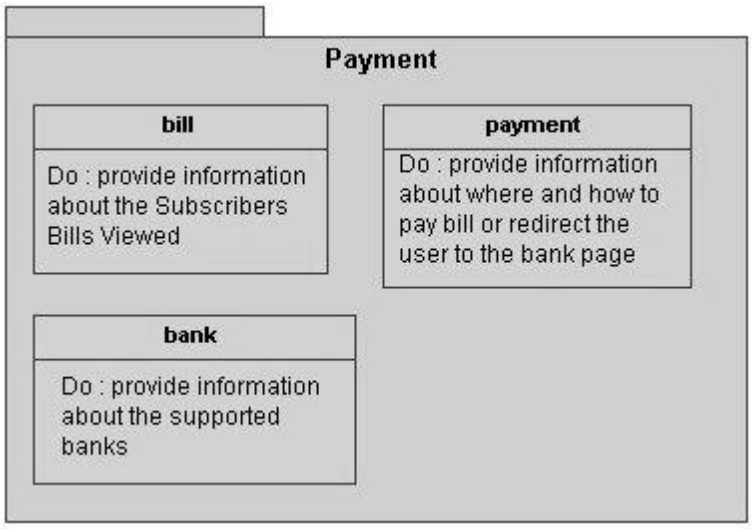


Figure 138 Payment Subsystem Design Model

5.3 Behavioral Diagrams

This Section contains the needed behavioral diagrams, which contains the Interaction diagrams, these diagrams used to show how the system response to requests or otherwise changes over time.

5.3.1 Use case diagrams

To represent the user[7] interaction and use of the system in a static manner[8] , each figure below represents a potential "use case" may exists between the system and its users.

Use case employed in this chapter to understand the system's requirements from the users perspective.

Use case diagram work by describing the typical interactions between the users of the system and the system itself, providing a description of how a system is used and its some how a translation of the requirements presented in previous chapters.

[7] Users mean other system, Subscriber and Administrator.
[8] The sequence diagram shows the interaction between users, objects and the objects with each others.

5.3.1.1 System use case:

Figure 25 represents the interaction between the user and the system as a top level.

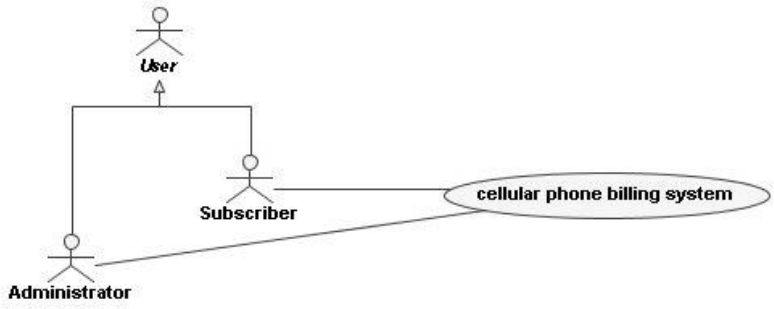


Figure 139 User-System Use case diagram

5.3.1.2 Subscriber use case

Figure 26 represents the potential use case between the subscriber and the system, each use case is presented in details in the next diagrams.

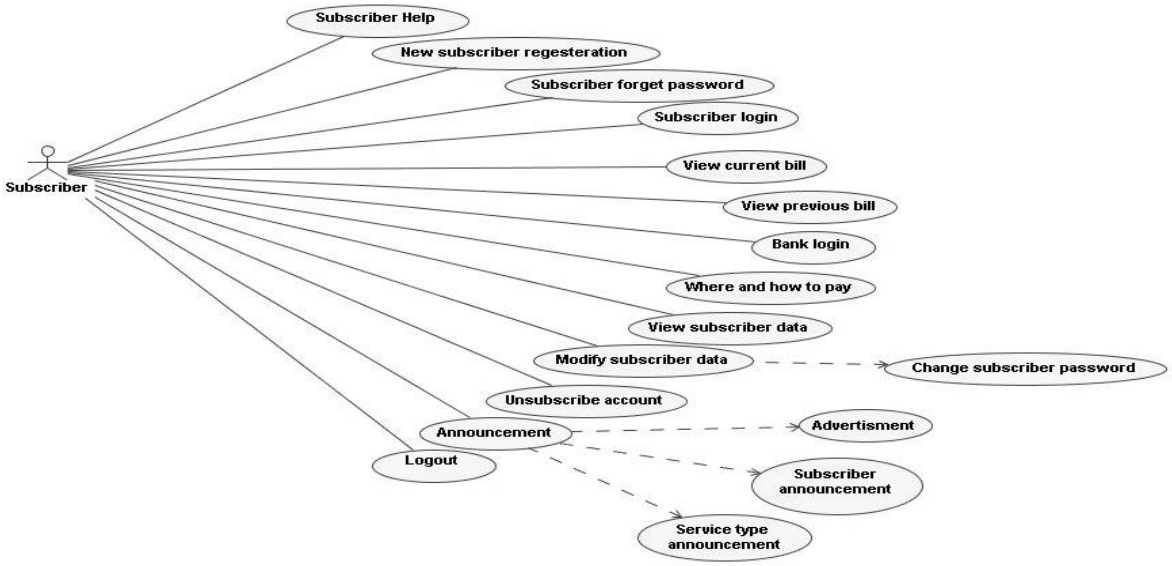


Figure 140 Subscriber - System Use case diagram

5.3.1.3 Administrator use case

Figure 27 represents the potential use case between the System Administrator and the system, each use case is presented in details in the next diagrams.

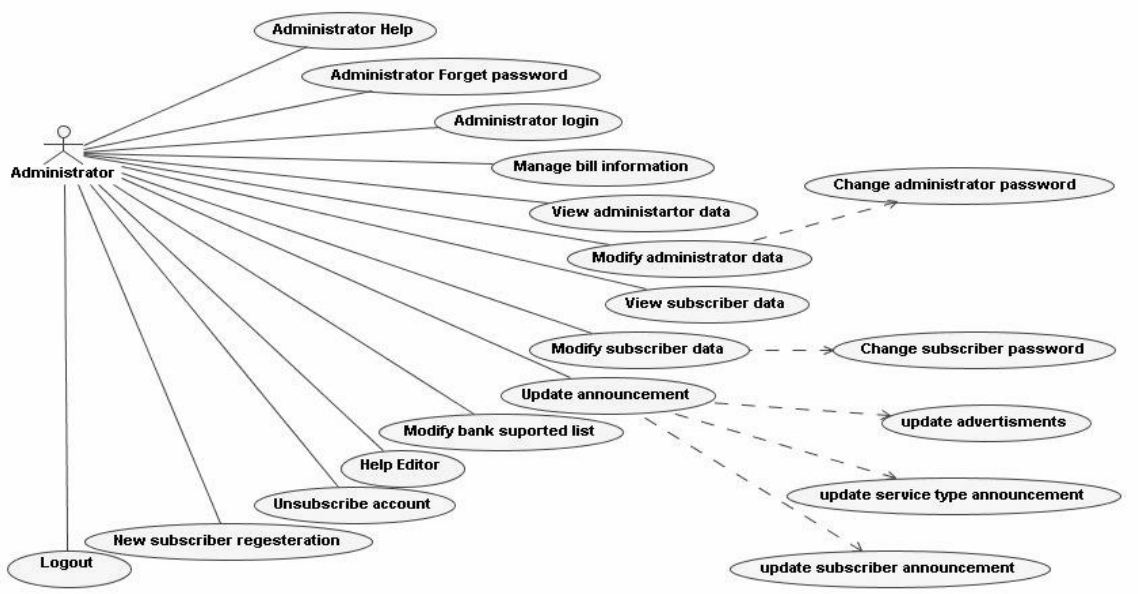


Figure 141 Administrator - System Use case diagram

5.3.1.4 Login use case

Figure 28 represents the potential use case between the Subscriber and Administrator (inherited from the User), and the Subscriber login and the Administrator login (inherited from Login).

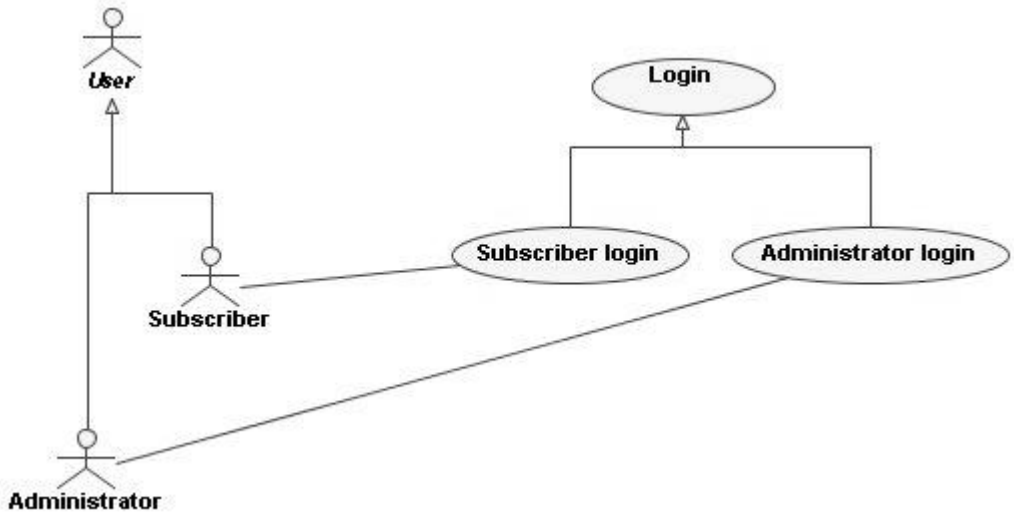


Figure 142 User - Login use case

5.3.1.5 Forget password use case

Figure 29 represents the potential use case between the subscriber and administrator (inherited from the User) and the Subscriber forget password and the Administrator forget password (inherited from forget password).

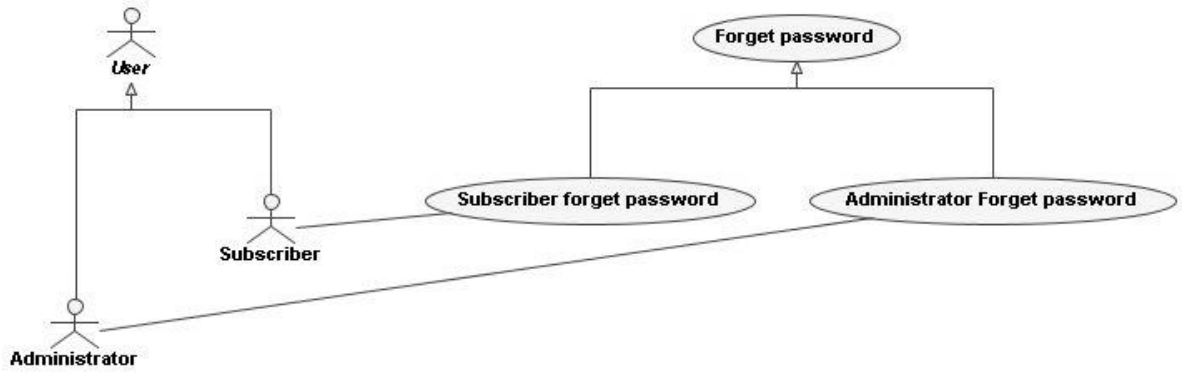


Figure 143 User-Forget password Use case diagram

5.3.1.6 Help use case

Figure 30 represents the potential use case between the subscriber and administrator (inherited from the User) and the Help for the Subscriber and the Administrator with the Administrator Help, and Editing the Help.

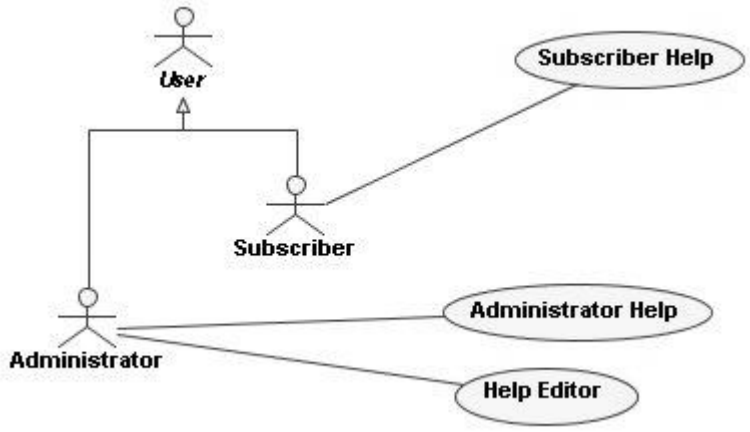


Figure 144 User-Help Use case diagram

5.3.1.7 New subscriber account use case

Figure 31 represents the potential use cases between the Subscriber and Administrator (inherited from User) and the New subscriber registration, the use case happened between the Subscriber when he subscribe, and the Administrator when he add new Subscriber to the System.

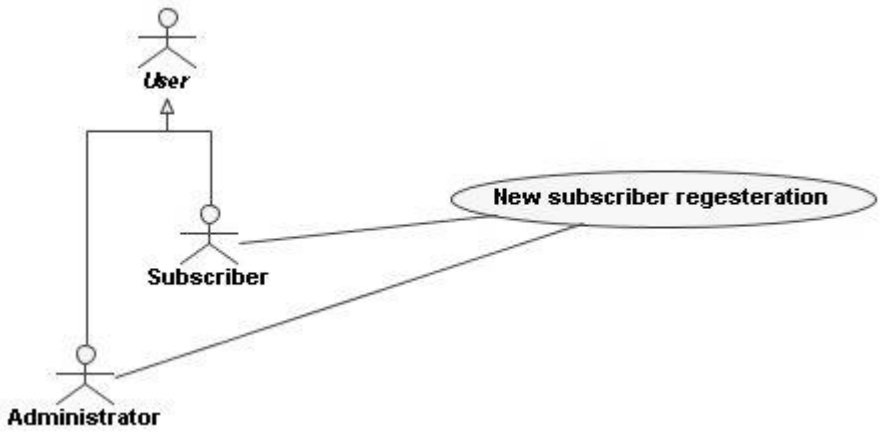


Figure 145 User-New Subscriber Registration

5.3.1.8 Subscriber View or/and Modify data use case

Figure 32 represents the potential use cases between the Subscriber and Administrator (inherited from User) and viewing and/or modifying subscriber data, the use case happened between the Subscriber viewing and/or modifying his data, and the Administrator when he view and/or modify Subscriber data .

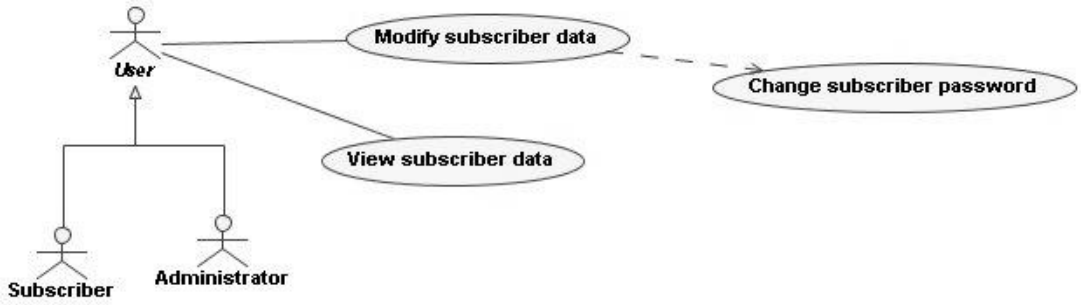


Figure 146 Subscriber-View or/and Modify data use case diagram

5.3.1.9 Change subscriber password use case

Figure 33 represents the potential use cases between the Subscriber and Administrator (inherited from User) and changing Subscriber password, the use case happened between the Subscriber by changing his password, and the Administrator when he change the Subscriber password.

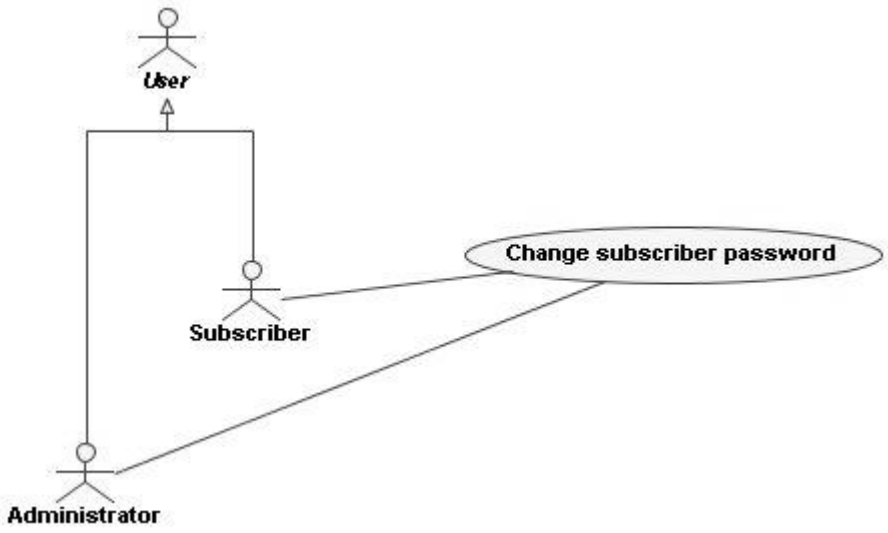


Figure 147 User - Change password Use case

5.3.1.10 Unsubscribe account use case

Figure 34 represents the potential use cases between the Subscriber and Administrator (inherited from User) and unsubscribing Subscriber, the use case happened between the Subscriber when he want to cancel his account, and the Administrator when he cancel a Subscriber account .

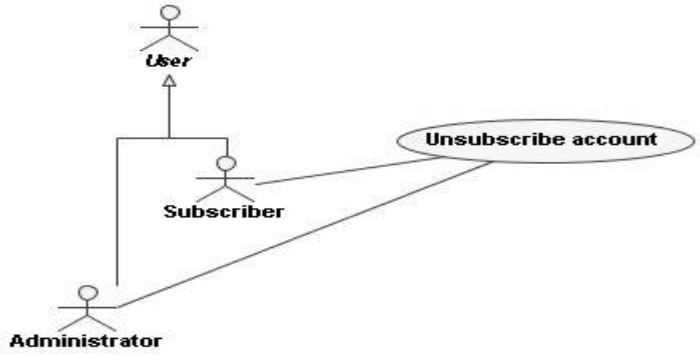


Figure 148 User - Unsubscribe Use case

5.3.1.11 Administrator modify data use case

Figure 35 represents the potential use cases between the Administrator and modifying his data, the modify Administrator data include changing his password.

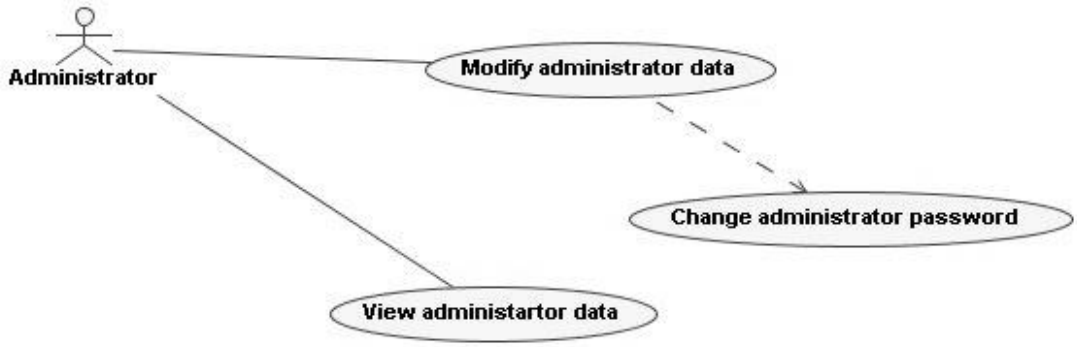


Figure 149 Administrator-modify data Use case

5.3.1.12 Change administrator password use case

Figure 36 represents the potential use cases between the Administrator and changing his password.

Figure 150 Administrator - change Administrator Use case Diagram

5.3.1.13 User – bill data use case

Figure 37 represents the potential use cases between the Subscriber and Administrator (inherited from User) and the bill, the use case happened between the Subscriber viewing previous and current bill, where and how to pay and bank login. The Administrator potential use case with managing the bills and the supported banks.

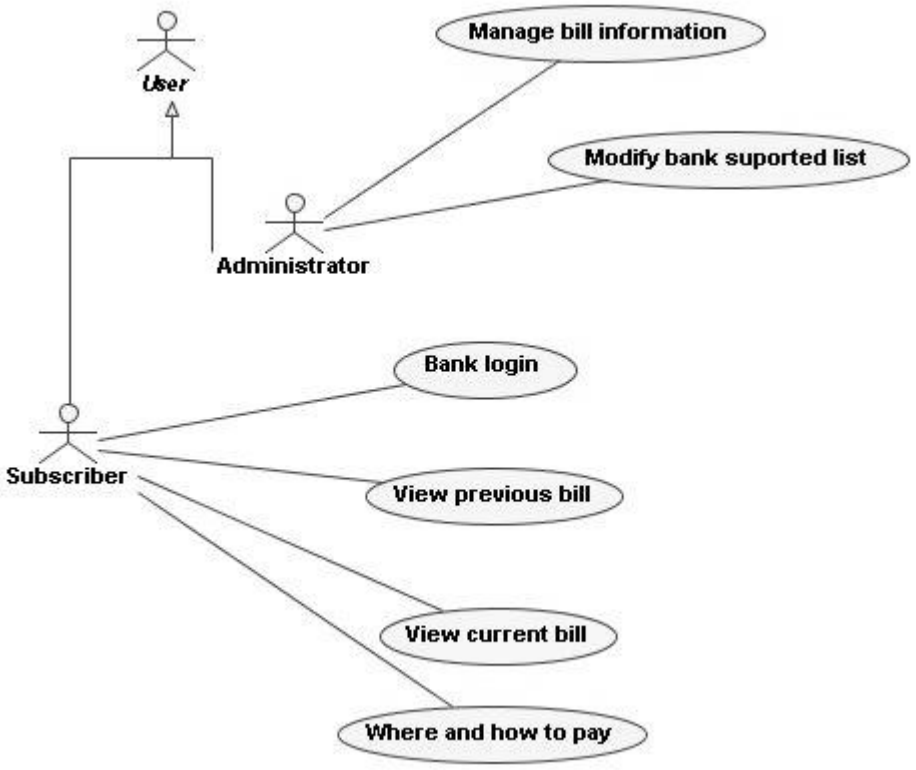


Figure 151 User – bill data use case Diagram

5.3.1.14 Administrator bill operation use case

Figure 38 represents the potential use cases between and Administrator by managing bills information and modifying the supported banks list.

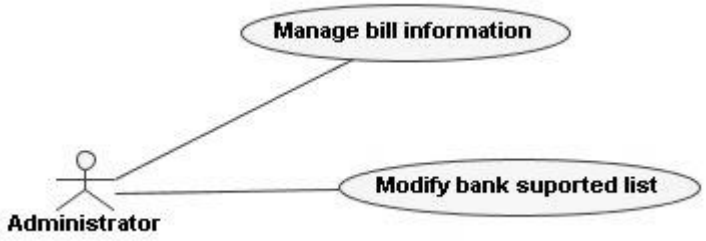


Figure 152 Administrator bill operation use case Diagram

5.3.1.15 Subscriber bill operations use case

Figure 39 represents the potential use cases between the Subscriber and viewing his previous and current bill, where and how to pay and bank login..

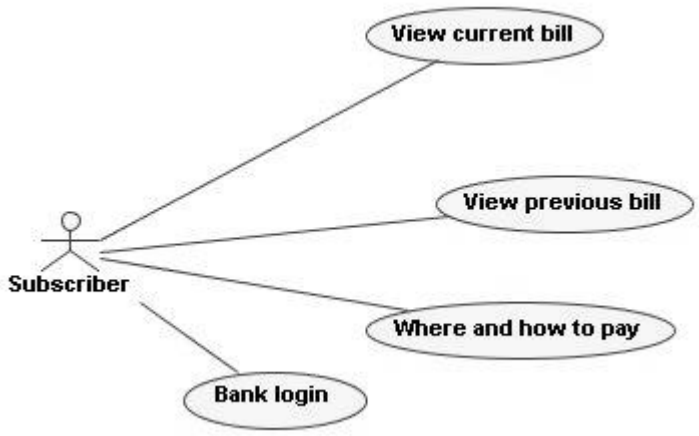


Figure 153 Subscriber -bill operations use case Diagram

5.3.1.16 Announcement use case

Figure 31 represents the potential use cases between the Subscriber and Administrator (inherited from User) and Service type announcements ,Subscriber announcements and Advertisements (inherited from Announcements) for the subscriber , also update Service Type Announcements ,update Subscriber Announcements, and update Advertisements (inherited from update announcement) for the Administrator.

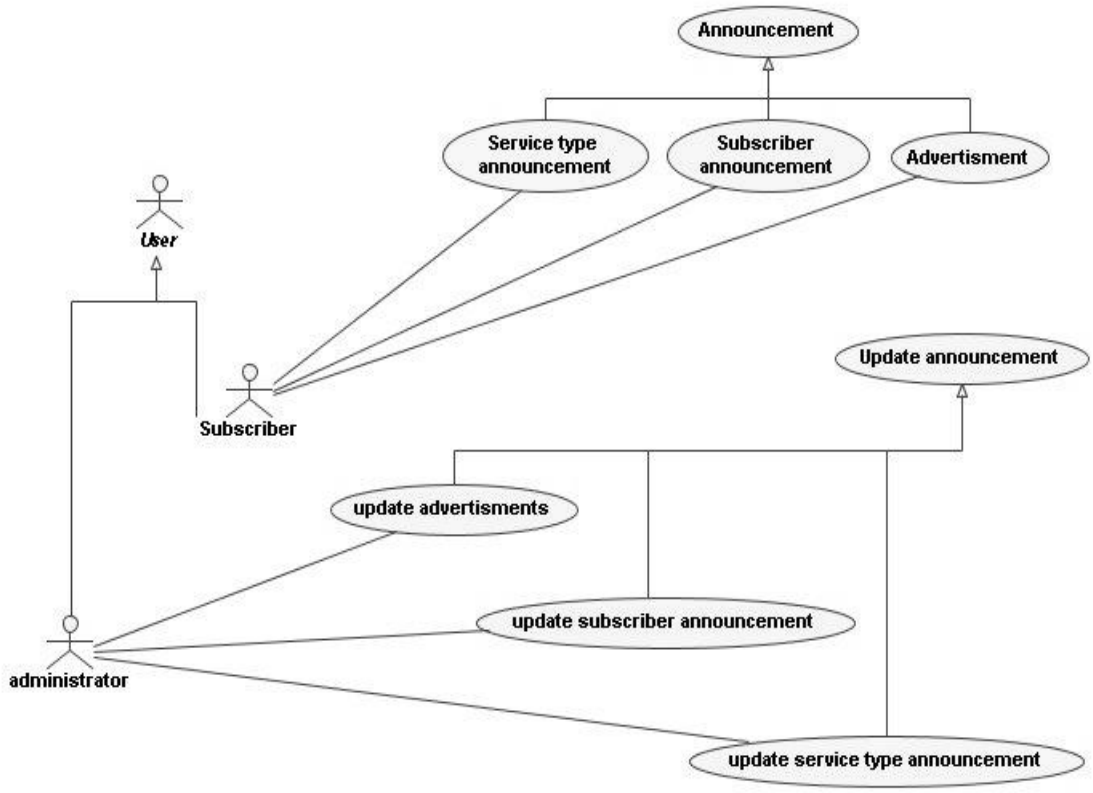


Figure 154 User - Announcement use case Diagram

5.3.2 Sequence diagram

To show the interaction between the objects in the system we need on of the interaction diagrams, the best one for this system is the sequence diagram9, also here a detailed sequence diagram used which shows the real objects as in the implementation and there interaction.10

Sequence diagram used to show the interaction between objects related to the system. This diagram shows a small group of objects and the events (important moments in time) being passed between the objects.

[9] Communication diagram also show interactions between objects, but in a way that emphasizes links rather than sequence.

[10] An abstract sequence diagram can be used in the system analysis level.

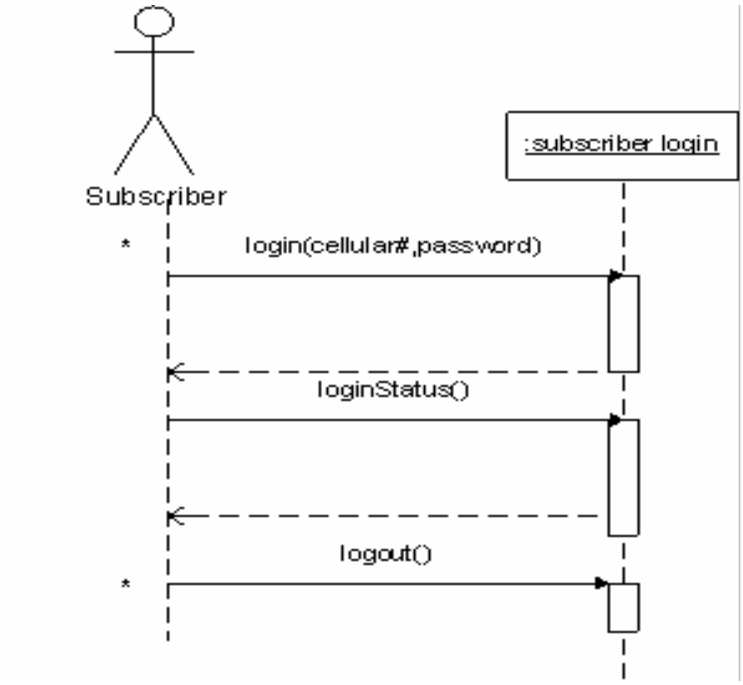


Figure 155 Subscriber loggining Sequence diagram

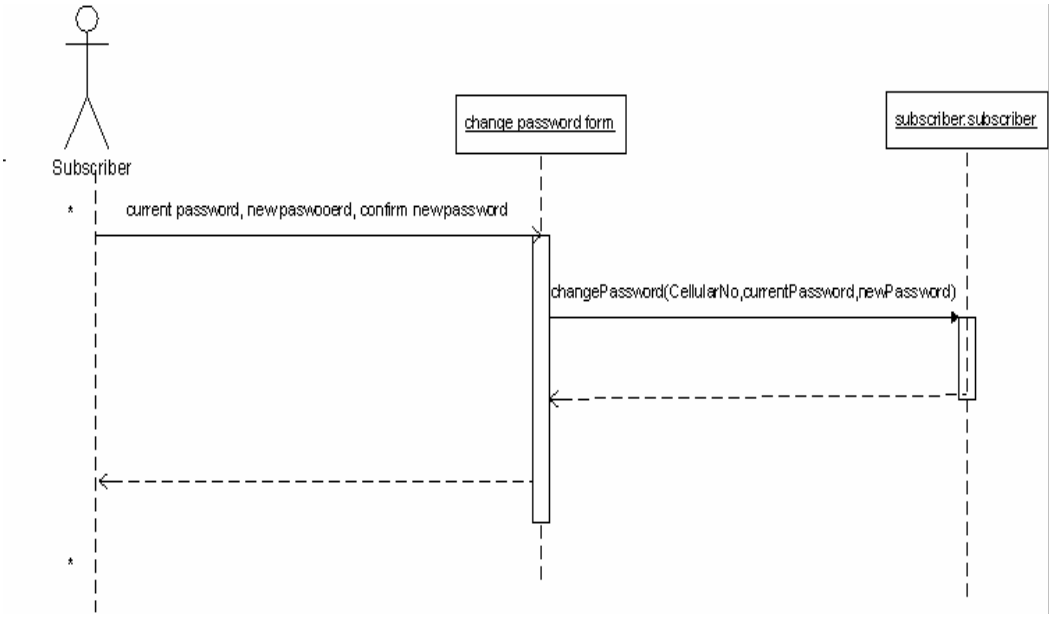


Figure 156 Change Subscriber Password Sequence Diagram

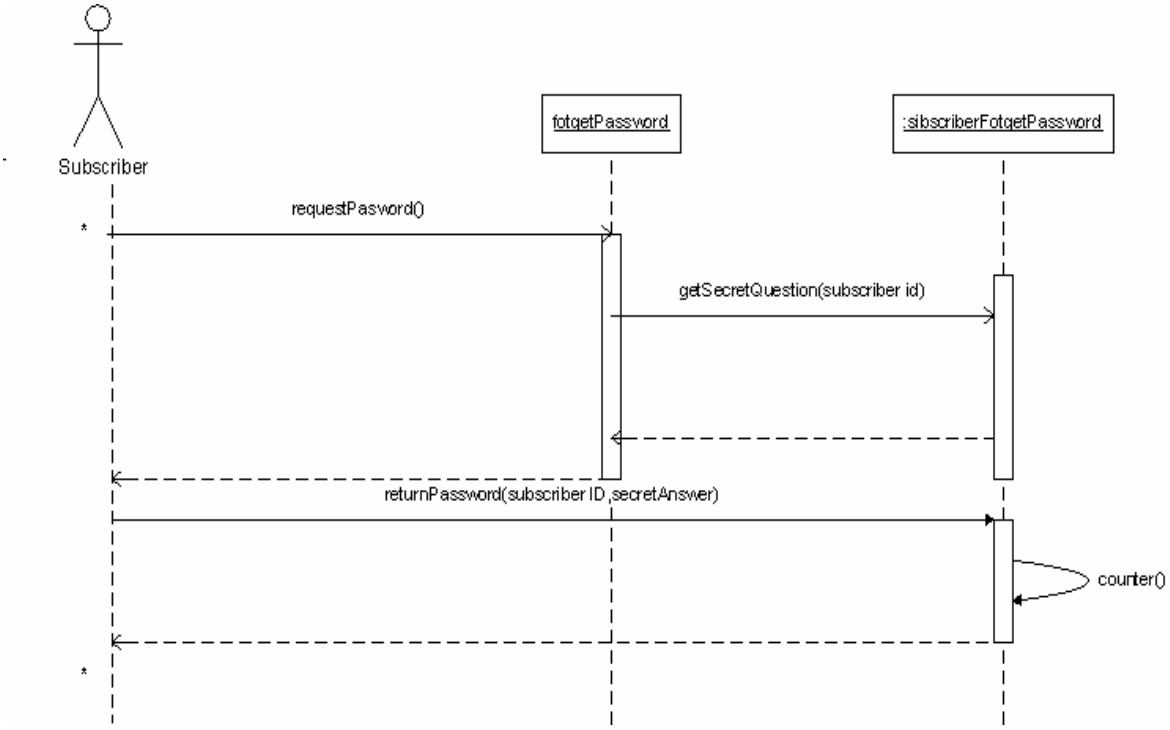


Figure 157 subscriber forgot pasword sequence diagram

5.3.3 State Diagram

In this system all objects change their state over time or in response to some events by calling there methods, this events change there properties , to represent this we use State diagram , this diagram show the internal workings and life cycles of the objects from its initialization until its collected by the garbage collector

State diagram represents these important moments in time, including the event transitions. The state themselves represents what the objects are supposed to do after an important event.

All objects in this system change there state over time, in this system using the state diagram is useful and comprehensible for representing the state of subscriberLogin and administrator Login because they change there state over time in response to calling there methods , in addition its important for the system developer to understand there state as illustrated bellow .

5.3.3.1 SubscriberLogin State Diagram

subscriberLogin State Diagram represents the life cycle starts by the waiting state, then the object transits to validating state by requesting the account validating, if this account is valid the object transits to the login in state and stay here until calling the logout method which transits the object into the logout state and after that the final state were the object collected by the garbage collector.

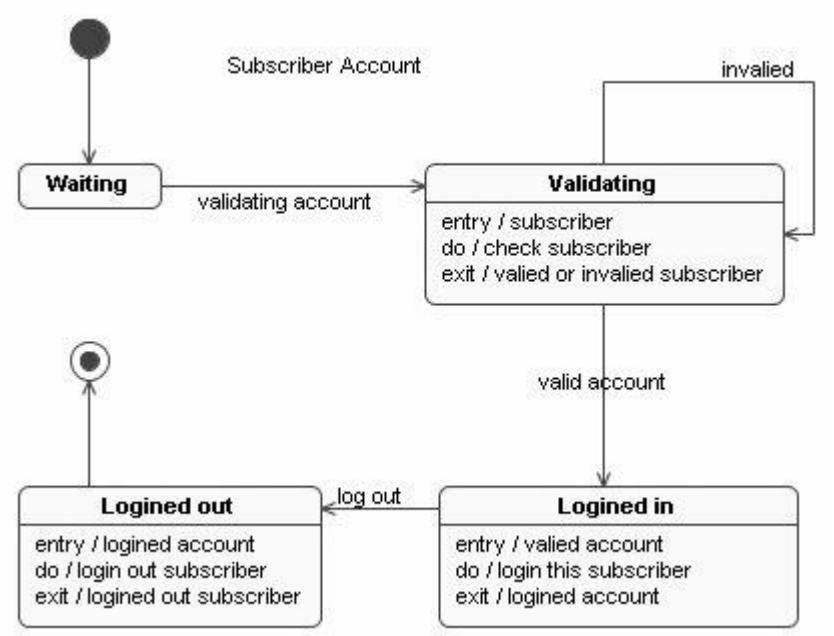


Figure 158 subscriberLogin State Diagram

5.3.3.2 AdministratorLogin State Diagram

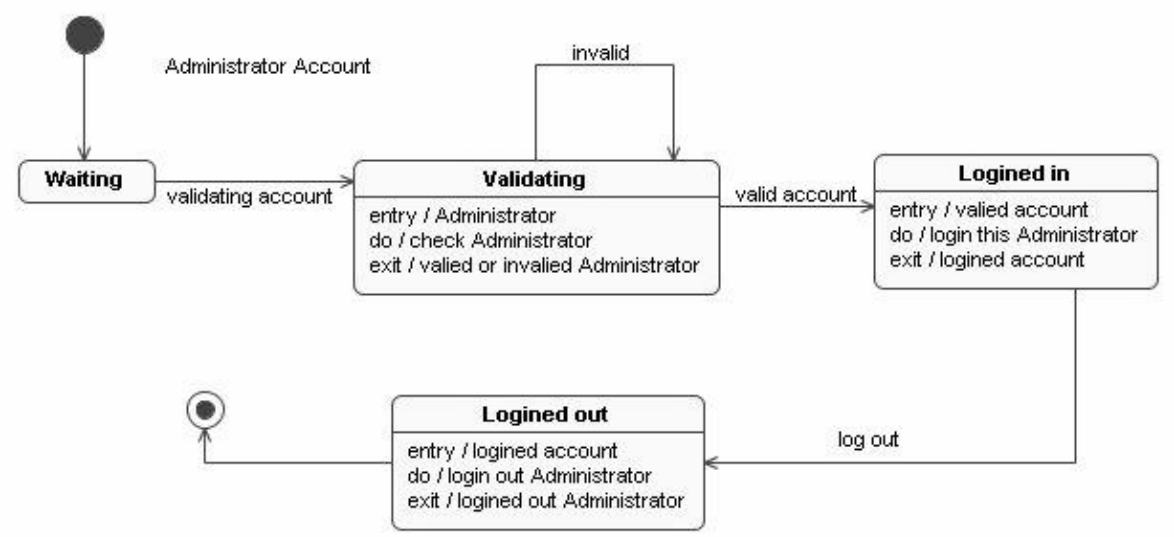


Figure 159 administratorLogin State Diagram

The administratorLogin State Diagram represents the life cycle of the adminisrtartorLogin object starts by the waiting state, then the object transits to validating state by requesting the account validating (triggered by the login method), if this account is valid the object transits to the login in state and stay in this state until calling the logout method which transits the object into the logout state and after that the final state were the object collected by the garbage collector.

5.4 Database Design

5.4.1 Entity-Relationship Model (ER Model)

This section introduce the Entity-Relationship for the Systems database, the purpose of structuring this model is to provide a precise understanding of the nature of the data and how its used by the system .This model introduces the entities that exist in the system and how it will be in the database; also, it shows the relationships between these entities.

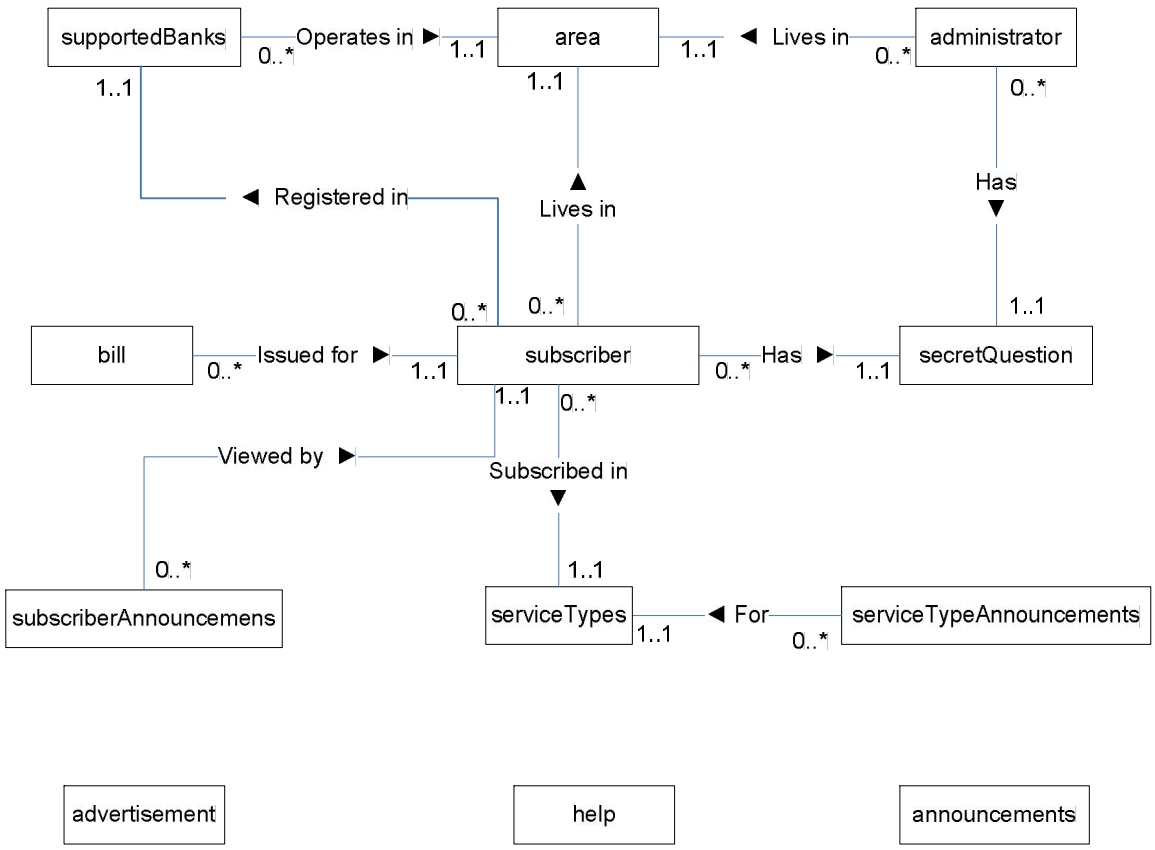


Figure 160 Top Level Entity-Relationship Model

Chapter 6

Coding and Implementation

Chapter six Coding and implementation

6.1 Introduction:

This chapter introduces the coding an implementation of the system, starting from building the infrastructure and the installation of the required software, in addition this chapter describes the configuration of some of the software used and their features.

Coding refers to the process of writing the necessary program, which implements the main objects classes of the project. The code of the project written from the scratch using C# language in the .NET framework.

This chapter includes:

- Development the environment.
- Establishment of the environment:
- Openwave Emulator.

6.2 Development Environment:

6.2.1 .NET framework

The Microsoft .NET Framework is an integral Microsoft Windows component; it provides a large body of pre-coded solutions to common program requirements, and manages the execution of programs written specifically for the framework. The .NET Framework is a key Microsoft offering, and is intended to be used by most new applications created for the Windows platform.

The class library and the Common Language Runtime (CLR) are the basic two parts of the .NET framework, there were work together to compress it. The framework intended to make easier to develop computer application and reduce computer security threats.

6.2.2 ASP.NET 2.0:

ASP.NET is a set of web development technology used to build dynamic web sites, web application and XML web services. It is a part of Microsoft .NET platform and is the success to ASP technology.

ASP.NET 2.0 is the last version developed from Microsoft, this version includes number of new features such as web parts, master pages, new data control (GridView, FormView, DetailsView) and others features.

The ASP.NET includes many languages that the programmer want to choice which is depends on object oriented languages such as C#, J#.

6.2.3 Visual C# Programming Language:

Visual C# is an object oriented programming language design for building a wide range of enterprise application that run on .NET Framework. The evaluation of the visual C# is simple, modern, type safe and object oriented.

Visual C # has a number of new features that give it more secure, strength, and more simple to use for building projects. One of these features is that partial classes allow class implementation across more than one type.

6.2.4 Microsoft Visual Studio 2005:

Microsoft Visual Studio is an advanced integrated development environment from Microsoft. It is the most productive development environment to build visual C# solution for Microsoft Windows, PocketPC, Smartphones, the Web and WAP applications.

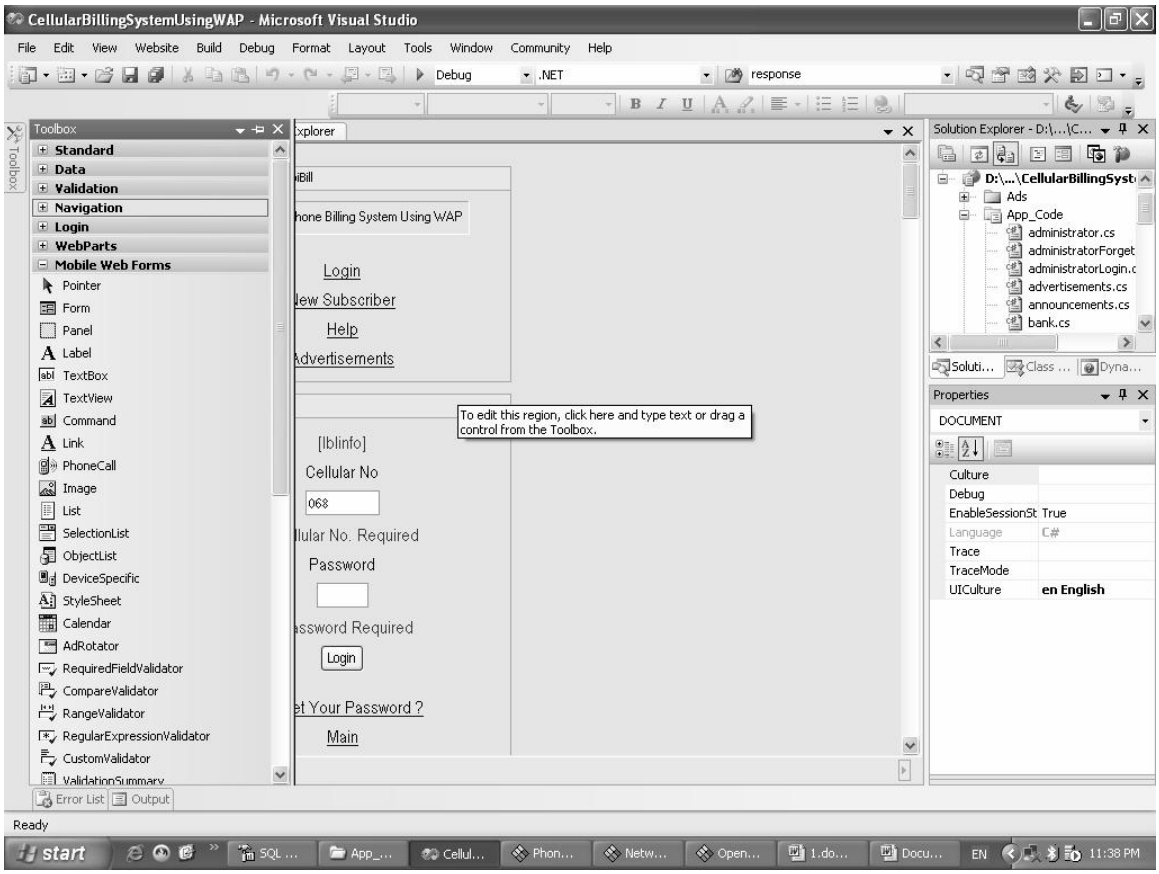


Figure 161 Microsoft Visual Studio 2005

6.2.5 Class Designer:

Class designer is a tool that integrated with Visual Studio.Net 2005 to implement the classes and the relationships between classes, and visualize its. The class designer contains Class, Interface, Abstract Class, Struct, and Delegate.

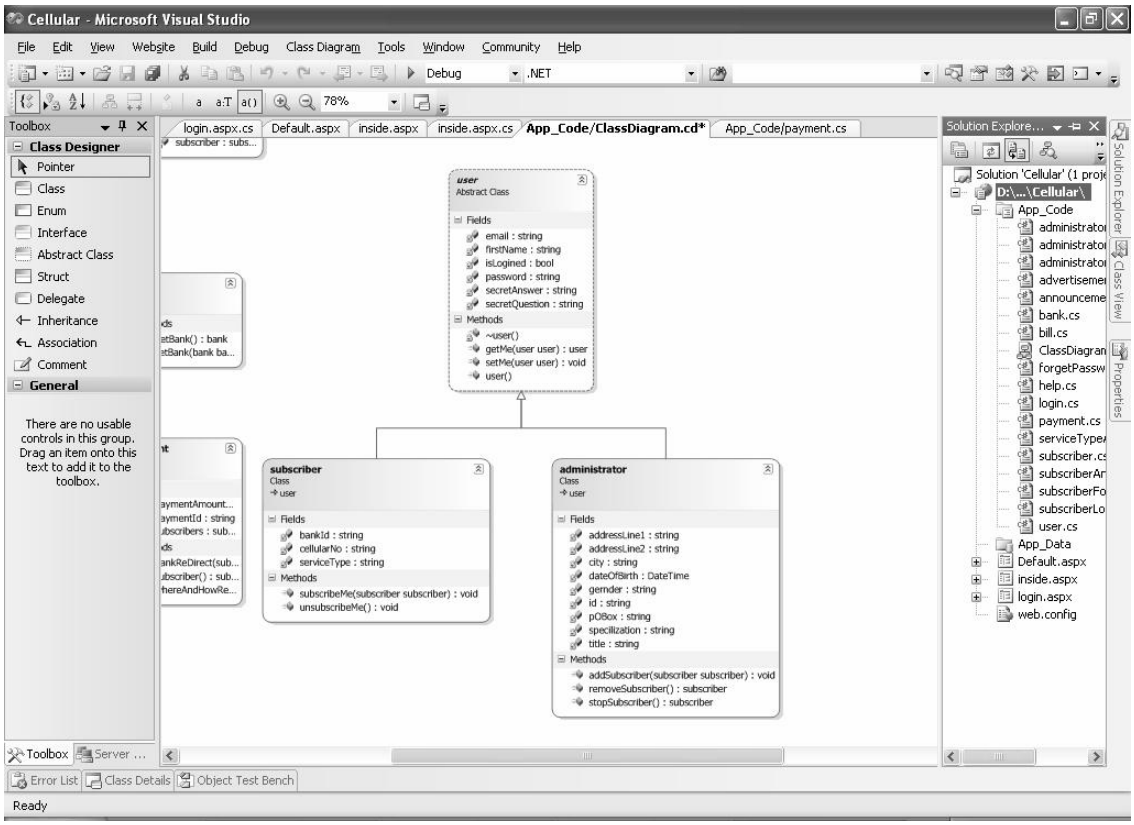


Figure 162 class designer

6.2.6 Microsoft SQL Server 2000

SQL Server 2000 is a powerful tool for turning information into opportunity enhances tools for system management. It is a high availability features; a maximize availability of your business application, and it have a backup online.

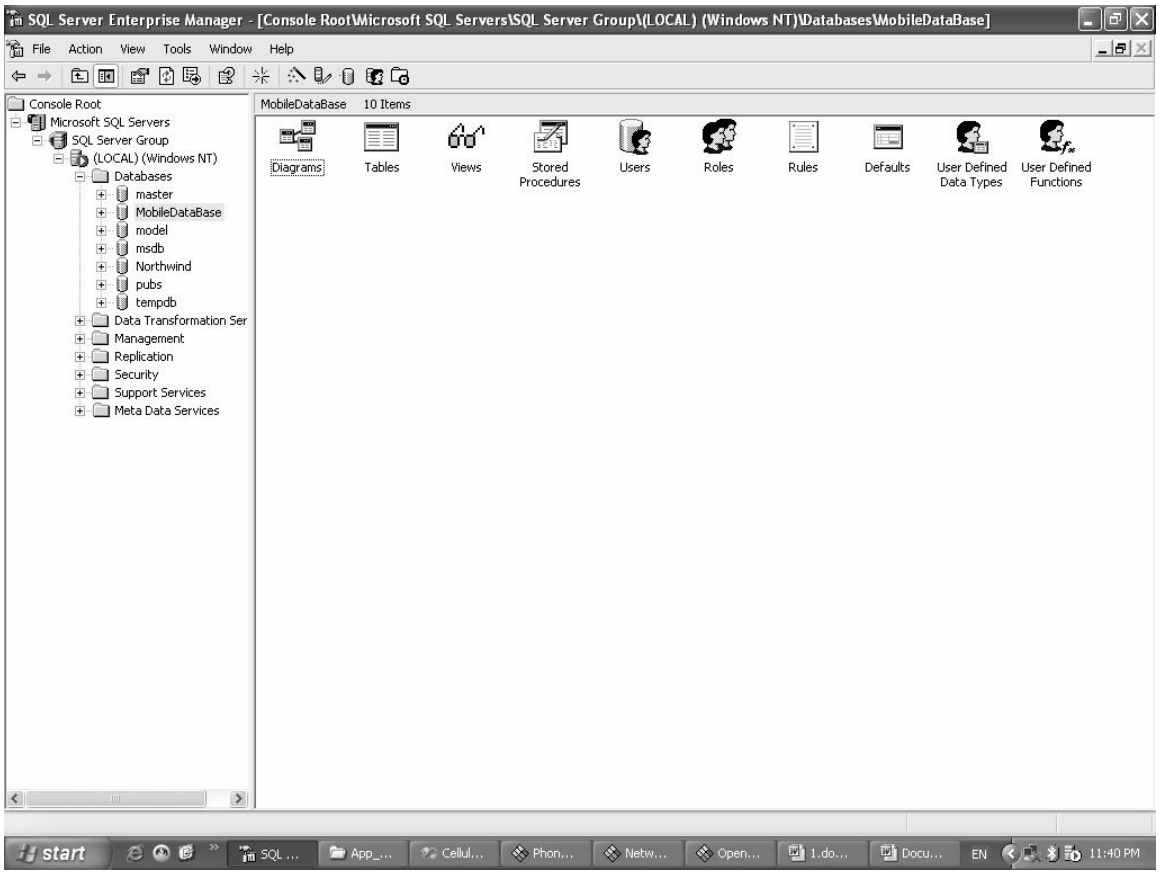


Figure 163 Microsoft SQL Server 2000

6.3 Establishment of the Environment

This section describes the process of installing and configuring the required software and its configuration.

6.3.1 Install IIS 6.0

IIS (Internet Informational Services) is a required to install the Microsoft Visual Studio 2005. Its install from the control panel, choose and remove programs, then choose windows component then add the IIS component by chick box and finally click next .

6.3.2 Installing Microsoft SQL Server 2000

An Enterprise edition of the Microsoft SQL server 2000 meets our system requirement in creating, accessing, and managing the system database.

Configuration of SQL Server 2000:

When using .NET technology ADO.NET used for database connections, ADO.net which is a new technology that based on the usefulness of Microsoft ActiveX Data Object (ADO).

ADO.NET is specifically designed for data connections located in a disconnected environment, so it the best choice when developing and implementing internet based applications.

When configuring the SQL server 2000 to be mixed mode authentication, which is the preferred method due to its higher security, configuration need user name and password to be transferred back and forth between servers. The next figure shows the configuration of SQL server 2000 authentication mode to be "SQL server and windows authentication".

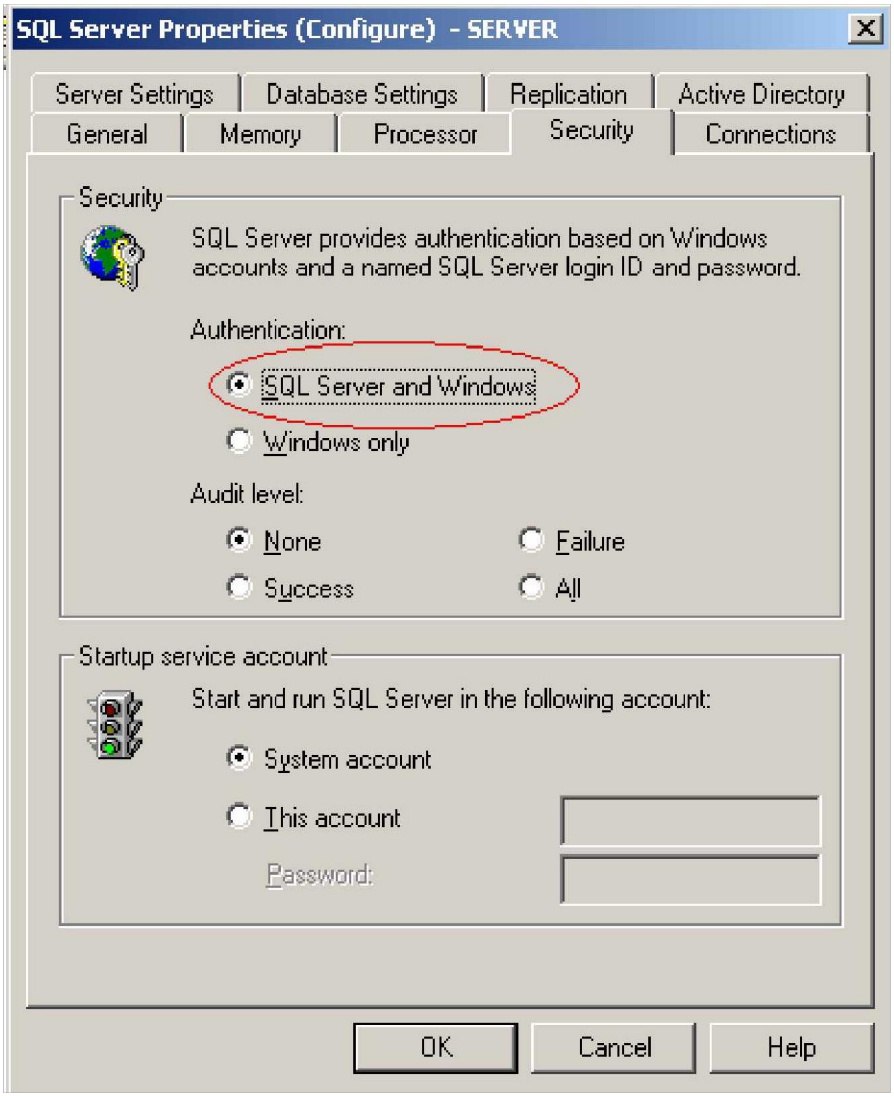


Figure 164 Mixed Mode Authentication

6.4 Openwave Emulator:

Openwave Phone Emulators is tools used for run the mobile web application by generate it in XHTML, WAP Push, and WML.

Openwave Phone Emulators Contains the same built in Mobile Browser, which can be the actual measurement of all kind of Mobiles platforms available.

Openwave Emulator is the Standard Emulator for all models of phone, because it's provided from the open mobile alliance which is a global organization that puts the WAP standards

Figure 165 Openwave Emulator

Chapter 7

Testing

Chapter Seven System Testing

7.1 Introduction:

In this phase system is tested; which is a very important process to ensure that the system is meeting its specifications or not.

We tested all part in the system using different types of testing; in this chapter we describe these types of testing as follows:

- Module and Unit Testing.
- Component Testing.
- Integration Testing.
- System Testing.
- WAP Display Testing.
- Acceptance Testing.

Testing will include place in a time space that was assigned for the testing process; the next figure shows the test schedule:

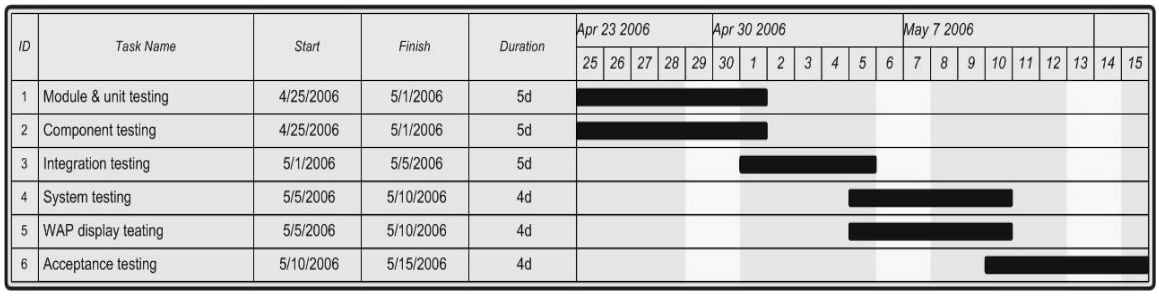


Figure 166 Testing Scheduling

7.2 Module and unit testing:

All system units and modules have been tested using the white box testing method against its specification by using the path testing on each module in the system.

In this section, we describe some of these modules testing and its associated result using path testing:

7.2.1 Subscriber login:

- *Testing Method*: path testing.
- *Conformance to specifications*: testing result show that the module perform the expectation.

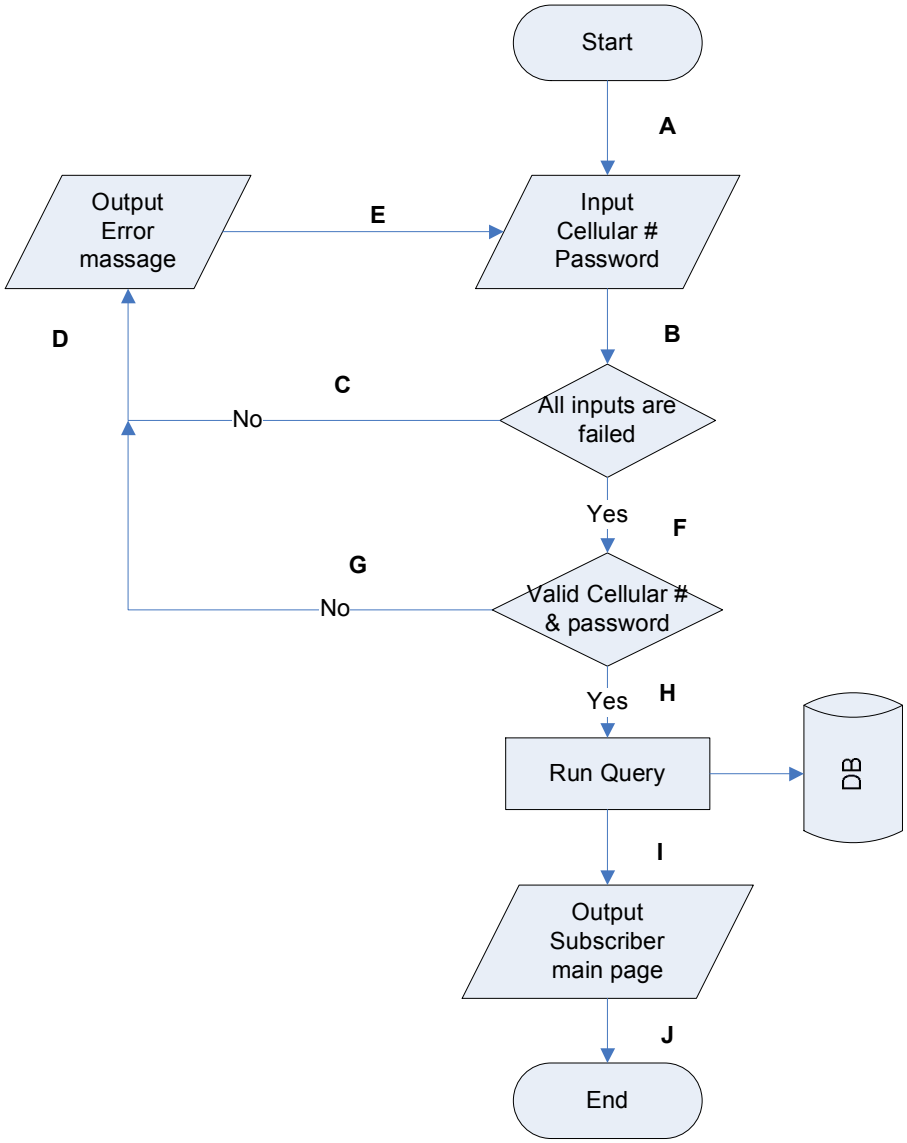


Figure 167 Subscriber login testing flowchart

Table 48 subscriber login test cases

Test cases path	Test data		Expected output	Actual output
	Cellular #	Password		
A-B-F-H-I-J	068767640	1234567	Valid Cellular # & password	Valid Cellular # & password
A-B-C-D-E	068767640	----------	Cellular # is not failed in	Cellular # is not failed in
A-B-C-D-E	----------	1234567	Password is not failed in	Password is not failed in
A-B-F-G-D-E	0689767640	1345	Invalid Cellular # or password	Invalid Cellular # or password
A-B-F-G-D-E	068767640	1234567	Invalid Cellular # or password	Invalid cellular # or password

7.2.2 Change administrator password:

- *Testing methods:* path testing.
- *Conformance specification*: testing result show that the module perform the expectations.

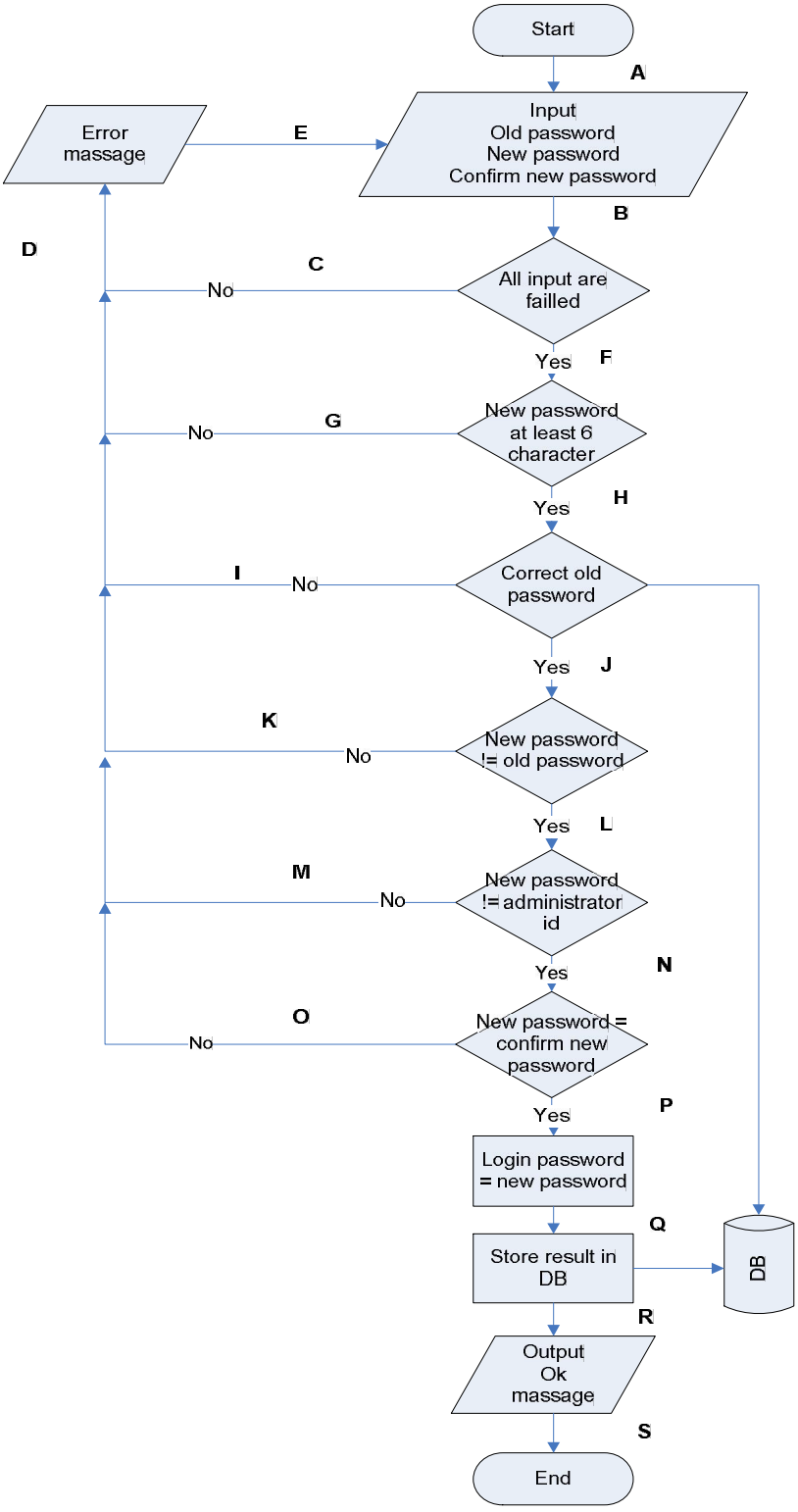


Figure 168 Change administrator password testing flowchart

Table 49 Administrator change password test case

Test cases path	Test data			Expected output	Actual output
	Old password	**New Password**	**Confirm new password**		
A-B-F-H-J-L-N-P-Q-R-S	Yosri23	Shadid23	Shadid23	Accepted new password	Accepted new password
A-B-C-D-E	----------	Shadid23	Shadid23	Old password is not fail	Old password is not fail
A-B-C-D-E	Yosri23	----------	Shadid23	New password is not fail	New password is not fail
A-B-C-D-E	Yosri23	Shadid23	----------	Confirm new password is not fail	Confirm new password is not fail
A-B-F-G-D-E	Yosri23	Sh23	Sh23	New password is less than sex	New password is less than sex

A-B-F-H-I-D-E	Yosri2	Shadid23	Shadid23	Incorrect old password	Incorrect old password
A-B-F-H-J-K-D-E	Yosri23	Yosri23	Yosri23	New password = old password	New password = new password
A-B-F-H-J-L-M-D-E	Yosri23	Administrator	Administrator	New password = administrator ID	New password = administrator ID
A-B-F-H-J-L-N-O-D-E	Yosri23	Shadid23	Shadid3	Confirm new password not equal new password	Confirm new password not equal new password

7.3 Component testing:

In this type of testing individual methods within a class is taken to be tested by a set of calls for these methods with different parameters and arrangements and tested if it exposes faults in these methods.

In this section, we took some of methods within a class and tested it:

7.3.1 Subscriber login class testing:

Figure 169 subscriber login class testing

Here we took the three methods in deferent sequence for testing:

- Login() → loginStatus() → logout()

Table 50 subscriber login class testing

Login		**LoginStatus**	**Logout**
SubscriberID	**Password**		
0689767640	1234567	True	No
002353453	2223322	False	Yes

In the previous table the first case the subscriber logs in the system by correct Subscriber ID and password by login() method, the loginStatus() method takes a Boolean value which is true so the third method takes void value which is not logout.

In the second case the Subscriber ID and password are incorrect so the loginStatus() take a false value and the logout() method take logout value.

Here the system is running by the correct sequence of using methods without faults.

- Logout () → login() → loginStatus()

This sequence is incorrect because we cannot logout the system without calling the login method first and take a true value for the loginStatus method.

As described above, the system cannot run with this sequence.

- LoginStatus() → logout() → login()

This sequence of the methods is incorrect because we cannot know the value of the loginStatus method without calling the login method.

As described above, the system cannot run with this sequence.

- ***Testing result***: the system confirm to its specification.

7.4 Integration testing:

The integration of all objects and classes was tested to ensure that all work together correctly and the whole system perform as expected. Top-down integration testing was used; so the overall skeleton of the integration was improved by adding the first components (objects).

Testing results: the testing of the integration between the classes and object indicated that the system works properly and perform as expected.

7.5 System testing:

In this section we tested the system by adding records to ensure that the system runs as specified.

Here we took a new subscriber registration process with it snapshots:

7.5.1 New subscriber registration:

- Welcome page:

Subscriber select new subscriber link to register in the system.

Figure 170 Welcome Page Snapshot

- Step one in registration process:

In this form the subscriber enter his cellular number and then select next to go to the second step.

Figure 171 Step one in registration process

- Step two in registration process:

In this form the subscriber inputs his first and last name then clicks next to continue.

Figure 172 Step tow in registration process

- Step three in registration process:

In this form the user must input his password and confirm it then select next to continue.

Figure 173 Step three in registration process

- Step four in registration process:

In this form the subscriber selects the secret question from the list and inputs the answer in the text box and clicks next to continue.

Figure 174 Step four in registration process-1

Figure 175 Step four in registration process-2

Figure 176 Step four in registration process-3

- Step five in registration process:

In this form subscriber selects the area where he lives and selects the type of his cellular service.

Figure 177 Step five in registration process -1

Figure 178 Step five in registration procees-2

Figure 179 Step five in registration process-3

- Step six in registration process:

In this form the subscriber selects his prefered bank and inputs his account number then click next to continue:

Figure 180 Step six in registration process-1

Figure 181 Step six in registration process-2

Figure 182 Step six in registration process-3

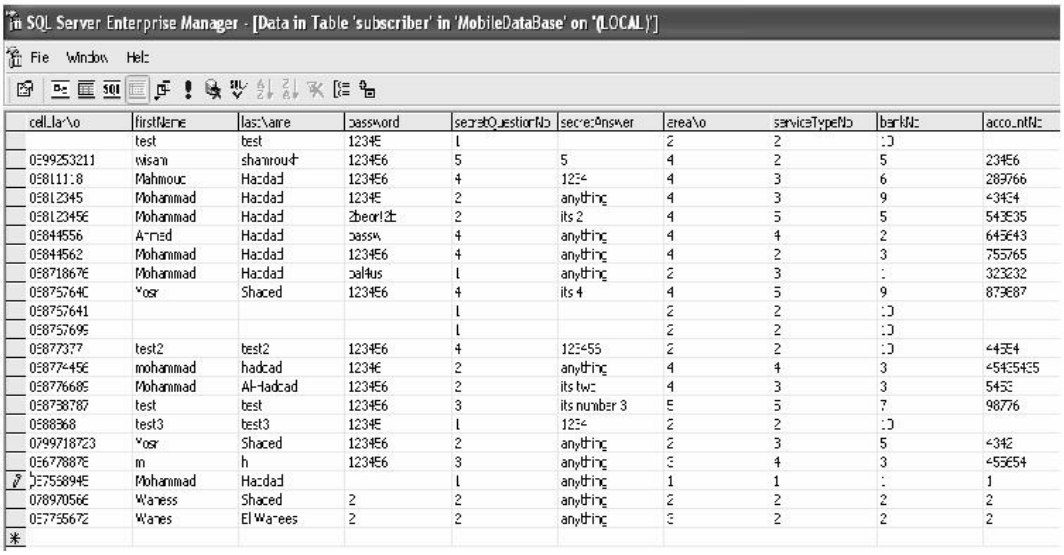
- Step seven (final step) in registration process:

In this form the subscriber clicks on button submit and then the user data is entered in the database, the system output the confirmation massage after that.

Figure 183 Step seven (final step) in registration process-1

Figure 184 Step seven (final step) in registration process-2

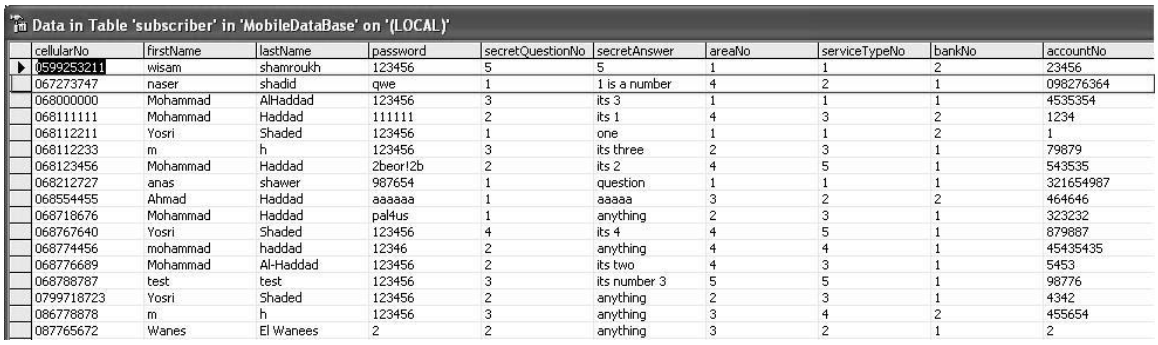
Subscriber table before add new subscriber:



cellular\o	firstName	last\ame	password	secretQuestionNo	secret\nswer	area\o	serviceTypeNo	bankN:	acco_ntN:
	test	test	1234E	l		2	2	:D	
0599253211	wisam	shamrouk	1234E6	5	5	4	2	5	23456
058111:8	Mahmouc	Hacdad	1234E6	4	123<	4	3	6	289766
05812345	Mohammad	Hacdad	1234E	2	anything	4	3	9	<3434
058123456	Mohammad	Hacdad	2beor!2b	2	its 2	4	5	5	543E35
05844556	A-med	Hacdad	2assw	4	anything	4	4	2	645E43
05844562	Mohammad	Hacdad	1234E6	4	anything	4	2	3	755765
058718676	Mohammad	Hacdad	2al4us	l	anything	2	3	:	323232
058757640	Yosr	Shaced	1234E6	4	its 4	4	5	9	879E87
058757641				l		2	2	:D	
058757695				l		2	2	:D	
05877377	test2	test2	1234E6	4	123<55	2	2	:D	<45E4
058774456	mohammad	hadcad	1234€	2	anything	4	4	3	<5435435
058776689	Mohammad	Al-Hadcad	1234E6	2	its twc	4	3	3	5453
058788787	test	test	1234E6	3	its number 3	5	5	7	98776
0588868	test3	test3	1234E	l	123<	2	2	:D	
0799718723	Yosr	Shaced	1234E6	2	anything	2	3	5	<342
05677887E	m	h	1234E6	3	anything	3	4	3	<55E54
)E755894E	Mohammad	Hacdad		l	anything	1	1	:	1
07897056E	Waness	Shaced	2	2	anything	2	2	2	2
0E7755672	Wanes	El Wanees	2	2	anything	3	2	2	2

Figure 185 subscriber table before add new subscriber

Subscriber table after add new subscriber:



cellularNo	firstName	lastName	password	secretQuestionNo	secretAnswer	areaNo	serviceTypeNo	bankNo	accountNo
0599253211	wisam	shamroukh	123456	5	5	1	1	2	23456
067273747	naser	shadid	qwe	1	1 is a number	4	2	1	098276364
068000000	Mohammad	AlHaddad	123456	3	its 3	1	1	1	4535354
068111111	Mohammad	Haddad	111111	2	its 1	4	3	2	1234
068112211	Yosri	Shaded	123456	1	one	1	1	2	1
068112233	m	h	123456	3	its three	2	3	1	79879
068123456	Mohammad	Haddad	2beor!2b	2	its 2	4	5	1	543535
068212727	anas	shawer	987654	1	question	1	1	1	321654987
068554455	Ahmad	Haddad	aaaaaa	1	aaaaa	3	2	2	464646
068718676	Mohammad	Haddad	pal4us	1	anything	2	3	1	323232
068767640	Yosri	Shaded	123456	4	its 4	4	5	1	879887
068774456	mohammad	haddad	12346	2	anything	4	4	1	45435435
068776689	Mohammad	Al-Haddad	123456	2	its two	4	3	1	5453
068788787	test	test	123456	3	its number 3	5	5	1	98776
0799718723	Yosri	Shaded	123456	2	anything	2	3	1	4342
086778878	m	h	123456	3	anything	3	4	2	455654
087765672	Wanes	El Wanees	2	2	anything	3	2	1	2

Figure 186 Subscriber Table after add new subscriber

7.6 WAP Display Testing:

This type of testing is done to make sure that the WAP pages are displayed in all WAP enabled cellular phones, and all critical information is displayed.

The main Testing tool is the Openwave emulator 6.2.2 from the open mobile alliance; this emulator maintains the WAP standards for second generation cellular phones.

But using this emulator we can make sure that the WAP pages is displayed in each cellular phone, but we don't know about the appearance of the pages.

To solve this problem we use the WAP Display testing to test the WAP pages in Varity of mobile phones, from different generations.

7.6.1 Openwave 6.2.2

This cellular phone emulator is used to test that the systems WAP pages are displayed across the cellular phones brands, and mobile generations.

All the system pages tested using this emulator, but in this section we will show one page that's contains all the controls.

This is emulator is used because its follows the WAP standards and come from open mobile alliance which is the a global organization that buts the WAP standards

Figure 187 Openwave cellular phone Emulator

7.6.2 Display across mobile generations

In this section a WAP page from the system, is tested on three will known cellular phones brand, also this test take three cellular phone from each brand each cellular phone belong to a mobile generation 2, 2.5 and 3 generation.

And we should notice that nothing can exactly differentiate between the generations, for example 2.5 (2.5G) and third generation (3G) capabilities are almost the same.

7.6.2.1 Second Generation (2G) Display Testing

Here are three mobile phones from the second generation (2G) displays the first page of the system.

In Ericsson R320 Cellular Phone not all images parts are displayed, other controls are displayed.

Figure 188 Ericsson R320 Cellular Phone

Motorola Timeport can't display the images, all other controls displayed.

Figure 189 Motorola Timeport Cellular phone

Nokia P3330 displays the images but in black and white, all other controls are displayed.

Figure 190 Nokia P3330 Cellular Phone

7.6.2.2 2.5 Generation (2.5G) Display Testing

Here are three mobile phones from the 2.5 generation (2.5G) emulates the first page of the system.

Ericsson T65 displays the images but in grayscale colors, all other controls are displayed.

Figure 191 Ericsson T65 Cellular Phone

Motorola V60 displays the images but in grayscale colors, all other controls are displayed, the subscriber needs to use the scroll keys too much.

Figure 192 Motorola V60 Cellular Phone

Nokia 7520 displays all the images and controls, in this cellular phone the subscriber need to use the scroll keys

Figure 193 Nokia 7520 Cellular Phone

7.6.2.3 Third Generation Display Testing

Here are two mobile phones from the third generation emulates the first page of the system.

In Motorola V980 all controls displayed, no need from too much scroll from to see all the page contents.

Figure 194 Motorola V980 Cellular Phone

The best results achieved in Nokia 6660 cellular phone, all contents displayed with out the need for the scroll in the most cases.

Figure 195 Nokia 6660 Cellular Phone

7.6.3 Display Testing Results

The system success to be displayed on all the mobile phones and here are the testing results:

- The test shows different appearance for the same page across cellular phones brands and generations, the systems pages should be formatted as simpler as it could to maintain constant appearance, or at least near to.
- The second generation (2G) cellular phones can't display the images in some phones (for example Motorola Phones), so all information in the system should be introduced as a text and images can't be used to produce critical information.
- The System faces no problems in the 2.5 generation (2.5G) cellular phones, but all cellular phones suffer from the limited display area, so that the subscriber need to use the scroll buttons two much.

- The best results achieved using the third generation (3G) cellular phones; all the page contents displayed clearly and no need for too much scroll from the subscriber.

7.7 Acceptance testing:

The system was testing its requirement specification:

7.7.1 Subscriber requirements:

Table 51 subscriber requirements testing

Requirements	Achieve
New subscriber registration	√
Subscriber help	√
Subscriber login	√
Subscriber forgot password	√
View current bill	√
View previous bill	√
View advertisements	√
View service type announcement	√
View subscriber announcement	√
View subscriber data	√
Modify subscriber data	√
Change subscriber password	√
Unsubscribe account	√
Subscriber logout	√

- Testing result: testing subscriber requirements indicated that the subscriber part of the system accepts the end user need and perform as expected.

7.7.2 Administrator requirements:

Table 52 administrator requirements testing

Requirement	Achieve
Administrator help	√
Administrator login	√
New subscriber registration	√
Administrator forgot password	√
Manage bill information	√
View administrator data	√
Modify administrator data	√
Change administrator password	√
Modify bank supported list	√
View subscriber data	√
Modify subscriber data	√
Change subscriber password	√
Help editor	√
Update advertisements	√
Update service type announcement	√
Update subscriber announcement	√

Unsubscribe account	√
Administrator logout	√

- Testing result: testing administrator requirements indicated that the administrator part of the system accepts the end user need and perform as expected.

Final testing result: this includes that the system accepted by the end user and perform as expected.

Chapter 8

Maintenance

Chapter Eight System Maintenance

8.1 Introduction:

In this section we discuss how to start working with the system, establish the environment that the system working in it, how to deploy the new system in the company, and finally we describe the maintenance plain for the system.

8.2 Migration:

To deploy the system it must be built by its certain steps to work properly within its environment, the production environment has to be established, configured, and a decided to work within the new system must be taken allowing for all constraints and risks of the process of migration to the new system.

We describe here the steps that must be done to deployment and migration the new system.

8.2.1 Creating the production environment:

The minimum requirements that were needed to deploy the system are described in chapter two [system specifications], and the needed prerequisites to running the system are described in chapter six [coding and implementation].

For example, we say that our software system will not operate on a machine that does not have the Internet Information Service (IIS), so that the company that decides to use our system must have all of the production environment elements.

8.2.2 Deploying the new system:

Throw the plan of the deployment and migration a decision must be taken to deploy the new system, these are managerial issues and mangers are responsible for doing so with their company capability. Does the system cover our requirements? Do we have the minimum requirement that it needed to deploy it? How we deploy it?

We tested our system and the system works well and perform our expected , the system can operate immediately whenever a suitable production environment is created, but we say that our software are integrated system so it must run with all parts integrated, with this the system may not work properly.

Now, the way of migration to it depends on the professionals and mangers recommendations in the company that wishes to deploy this new system.

8.2.3 Running the system:

The goal of having a new system is to work on it, after the system was design and tested throw the development process, and whenever the company buy it, decides to migrate on it, and deploy it the system well operate and run.

8.3 Maintaining the system:

There is always a possibility for failure, errors, and other type of errors that may appear when running the system. We discus here the maintenance plain that cover some of the actions that is taken when certain situations occurs.

- **Backup:**

Where the adaptation of the backup methodology [type and time interval] is determined and implemented by the company working on the system itself. The backup on the system database could be configured by means that are provided by the producer company of the DBMS that we have used in our software system which is Microsoft© on its DBMS product [SQL Server 2000].

- **Error reporting and handling:**

When errors occur, a number of actions take as the contract agreement, which describe how the maintenance should be with its condition and situations and the responsibility allocation on the contract side.

The system provides a simple way for reporting certain errors immediately when they occur, a simple massage should be appears on the cellular screen for the WAP

system, and on the computer screen for the web system to describe the error which occur. Then the company should contact to the vendor and tell him about the error.

The vendor should correct the error, and after he complete correcting it he must make unite, integrated, and system testing to ensure that the system run in the correct way, and ensure that the last correction does not affect to other functions in the system.

The customer can call the programmer using a special form called Software Change Request (SCR), which contains the error information and description.

Note: see Appendix to view SCR.

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Appendices

Appendices A

Software Change Request (SCR)

Requirement #_____ date_____.

Type:

( ) New Requirement.

( ) Change Requirement.

( ) Design Change.

( ) System Problem.

( ) User Interface Problem.

( ) Documentation Correction.

( ) Suggestion for Improvement.

( )Other: _____.

Description:

Please attach supporting documentation for the requested change

(Screen/report printouts, document pages affected, etc.)