



**SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**COLLEGE OF COMPUTER SCIENCE AND  
INFORMATION TECHNOLOGY**

**DEPARTMENT OF COMPUTER SYSTEMS AND  
NETWORKS**

# **Android Point of Sale**

## **(Android POS)**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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**Android Point of Sale  
(Android POS)**

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## الحمد لله

الحمد لله رب العالمين ..

أعطى اللسان، وعَلَّمَ البيان، وخلق الإنسان،

فبأي آلاء ربكما تكذبان..

الحمد لله رب العالمين..

خلق اللوح والقلم.. وخلق الخلق من عدم..

ودبر الأرزاق والأجال بالمقادير وحكم..

وجمل الليل بالنجوم في الظلم ..

الحمد لله رب العالمين..

الذي علا فقهر .. ومَلَكَ فقدر .. وعفا فغفر ..

وعَلِمَ وستر .. وهزَمَ ونصر .. وخلق ونشر ..

# آية

قوله تعالى

(وَقُلْ رَبِّ زِدْنِي عِلْمًا) ..

صدق الله العظيم

## الإهداء

### الى والدي :

إلى حكمتي .....وعلمي...  
إلى أدبي .....وحلمي ...  
إلى طريقي ..... المستقيم...  
إلى طريق..... الهداية...  
إلى ينبوع الصبر والتفائل والأمل...

### الى أمي :

إلى كل من في الوجود بعد الله ورسوله ...  
إلى سندي وقوتي وملاذي بعد الله ...  
إلى من آثروني على أنفسهم ...  
إلى من علموني علم الحياة ...

### الى إخواني :

إلى من كانوا ملاذي وملجئي ...  
إلى من تذوقت معهم أجمل اللحظات ...  
إلى من سأفتقدهم ..... وأتمنى أن يفتقدوني ...  
إلى من يجمع بين سعادتي وحزني ...  
إلى من أتمنى أن أذكرهم .....إذا ذكروني  
إلى من أتمنى أن تبقى صورهم .....في عيوني ..

## شكر و عرفان

وأفنيينا بحر النظم والنشر

لو اننا اوتينا كل بلاغة

ومعترفين بالعجز عن واجب الشكر

لما كنا بعد القول الا مقصرين

فإن الحروف تتوارى خجلاً و نحن ننثرها على الأسطر لنتقدم بها بأسمى آيات الشكر و التقدير و العرفان لكل من أشعل شمعة في دروب عملنا ولكل من وقف على المنابر وأعطى من حصيلة فكره لينير دربنا ولو بكلمة لتخطي هذه المرحلة و الخروج بهذا البحث في هذه الصورة .

المشرف القائم على و نخص بخالص الشكر و عطاء الثناء للدكتور أسامة أحمد إبراهيم هذا المشروع على حسن اشرافه و صادق تشجيعه و كريم مساندته لنا

والشكر اجزله موصول للأستاذة داليا محمود السر المشرف المساعد لهذا المشروع على حسن متابعتها و مساندتها و عونها طوال فترة تقدم المشروع.

# ABSTRACT

The development caused by internet banking and electronic transactions has contributed to facilitate various kinds of banking transactions to the customers and reduce the time and effort spent by them.

Electronic banking transactions can be completed through POS, but traditional POS is not available to regular customers but only for merchants, it also contains a set of problems such as: the need for special equipment and very expensive software.

This research aims to solve some of the traditional POS problems and add new services to POS systems by developing a mobile application using Android operating system to work as a dynamic POS system that offers electricity purchasing service, pay fees for SUST students and cars insurance services which it proceed the task without the need for bringing customer car to the company building. Those services are available for both customers and merchants. This application is attach to a system that simulates the functionality of the SNS which is responsible for financial transactions between banks and institutions.

The results that have been obtained from implementing the project is a simulation for SNS and provisioning of new services to POS systems which is electricity purchasing service , pay fees for SUST students , cars insurance services. And a system for insurance company administrator.

## المستخلص

إن التطور الذي أحدثته الخدمات المصرفية عبر الإنترنت والمعاملات الإلكترونية قد ساهم في تسهيل عمليات التعامل مع البنوك بمختلف أنواعها على المستخدم وقللت الزمن والجهد المستهلك من قبل العملاء.

المعاملات الإلكترونية البنكية يمكن ان تتم عن طريق نقاط البيع, لكن نقاط البيع التقليدية متوفرة فقط للبائعين وغير متاحه للعملاء كما يوجد بها عدد من المشاكل منها : الحاجة لاجهزة ومعدات خاصه وبرمجيات خاصه بنقاط البيع.

يهدف هذا البحث إلى حل بعض المشاكل الموجوده في نقاط البيع التقليدية وازضافة خدمات جديده غير متوفره في انظمه نقاط البيع ذلك من خلال عمل تطبيق علي جهاز الموبايل باستخدام نظام التشغيل أندرويد يعمل كنقطة بيع ويقدم خدمات شراء الكهرباء و دفع الرسوم الجامعية للطلاب وتأمين السيارات دون الحاجة لإحضار العميل لسيارته إلى شركة التأمينات.ويصلح ليتم التعامل معه من قبل المستهلكين والبائعين وتم ربط التطبيق بنظام يقوم بمحاكاة عمل المحول القومي لبنك السودان المركزي المسؤول عن التحويلات المالية بين البنوك والمؤسسات .

النتائج التي تم الحصول عليها من تنفيذ المشروع هو محاكاة للمحول القومي وتقديم خدمات جديدة لأنظمة نقاط البيع هي خدمة شراء الكهرباء ودفع الرسوم للطلاب جامعه السودان للعلوم والتكنولوجيا و خدمات التأمين السيارات عن طريق نقاط البيع , كما تم عمل نظام للموظف شركة التأمين.



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# LIST of TERMS

Term	Description
POS	Point Of Sale
ATM	Automated Teller Machine
WCF	Windows Communication Foundation
C#	Programming language
C#.NET	C# Under .NET Framework
Java	Programming language
JSON	JavaScript Object Notation
UML	Unified Modeling Language
SNS	Sudan National Switch
IOS	Innovation Oprating System
PC	Personal Computer
DB	Data Base
MSR	Magnetic stripe readers
PIN	Personal Identification Number
C++	Programming language

IDE	Integrated Development Environment
SQL	Structured Query Language
RDBMS	Relational DataBase Management System
SSMS	SQL Server Management Studio
JDT	Java Development Tools
Perl	Programming language
SUST	Sudan University of Science and Technology

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# **CHAPTER 1**

## **INTRODUCTION**

# **1.1 INTRODUCTION**

The world is changing with an amazing rate and the technology is considered to be the key driver for these changes. Many activities are handled electronically due to the acceptance of information technology at home as well as at workplace. Slowly but steadily customers around the world are moving towards the internet banking and electronic transactions are become popular.

Financial institutions can expose banking services via electronic channels including ATM, POS, and Internet. As they want to offer their customers a secured and around-the-clock access to electronic financial services anywhere and at any time.

Merchants accept payments via various types of cards using traditional POS terminals, where the card is swiped to trigger a payment transaction with the acquiring bank. Though; such POS terminals are complex to use. Nowadays merchant are looking for new ways to manage transactions in a modernize way, and keep them secure [1].

# **1.2 PROBLEM**

One of the main problems that POS device is composed of a set of internal components connected with one another, when any of them is disrupted then the entire device will not working correctly.

POS software needs special equipment to work. And outfitting every POS solution with peripheral devices is too expensive.

The POS device is available only for the merchant, and Because of the complexity of POS systems, users must receive extensive training on how to perform transactions and operate the system, If a user enters incorrect information or launches the wrong application, POS systems may become unpredictable or fail to process transactions correctly.

# **1.3 OBJECTIVES**

This Research aim to achieve set of goals and they are:

- Create a dynamic POS application to provide new services not available in traditional POS.
- The POS Software can work in any device that uses Android operating system.
- Provide a more user friendly interface, and therefore easier to use.
- No more bulky terminals and costly software.
- Make POS available to customers and merchants.

## **1.4 SCOPE:**

This research present simulation of SNS web service and application to work as a POS system using android operating system as platform. It provides set of services which is electricity purchasing, Pay university fees for SUST students and car insurance. Also an application for insurance company administrator.

Car insurance does not cover the internal components.

## **1.5 METHODOLOGY**

The followed methodology at this project is firstly, installing Eclips and visual studio ultimate 2012.

Eclipse is used to create an android application that works as a POS system and connected to through public network to a simulation of SNS web service functionality. The simulation is done by using WCF service technique and SQL server databases to handle payments and to be responsible for financial transactions between banks and institutions.

In order to complete the insurance for the car an application for the insurance administrator has been developed using Android.

## **1.6 OBSTACLES:**

The obstacles faced the progress of this research is:

- Sudanese Company for Electricity Distribution, general traffic administration and insurance company databases were not available to connect with, Which led to use virtual databases for each of them.
- Not able to connect with SNS, which let simulating the web service functionality.
- Android magnetic reader device was not available, This led to the user enters the card number manually.

## **1.7 THESIS STRUCTURE**

In addition to this chapter the research is structured as follow:

Chapter 2, discusses some previous studies that related to the project.

Chapter 3, discusses general introduction to the cash register, traditional POS and web service POS.

Chapter 4, discusses the tools and technologies used in this research.

Chapter 5, discusses proposed system and how the system will work using UML diagrams.

Chapter 6, discusses the followed steps to create the project and the results we get after complete the project.

Chapter 7, conclusion, recommendations and reference's.

## **CHAPTER 2**

### **RELATED STUDIES**

## 2.1 INTRODUCTION

POS systems are historically an important part of running any business and mobility solutions such as Android POS systems are proving to be a powerful evolution to the traditional sales system.

This Chapter discusses some of these systems as previous studies that related to the project.

## 2.2 SHOPIFY POS

It is an IOS application that lets you sell your Shopify store's products in a physical, retail setting. And it can be used to sale anywhere using Shopify hardware and card reader to accept VISA, MasterCard and AMEX cards [2].

Shopify POS hardware is shown in Figure 2.1.



Figure 2.1: Shopify POS

### 2.2.1 Advantage Of Shopify POS:

- Analytics and reporting: Merchants can track information on sales, customers, visitors and more from both sides of their business using their Shopify dashboard.
- The e-commerce platform Shopify released a POS system designed to simplify the transition between selling in-store and online.
- Simple and easy checkout process.
- Email receipts: Shopify POS lets store owners choose between printing an order receipt and instantly sending a customized version to customers through email.
- Include all telephone services [2].

## 2.2.2 Disadvantage Of Shopify POS:

- Complete hardware kit: The Shopify Hardware Kit includes a receipt printer, cash drawer and credit card reader.
- Very expensive.
- Include retail transaction only [2].

There no similarities between Shopify POS and thesis.

The differences between Shopify POS and this thesis that Shopify POS using IOS OS but this project is using Android OS, and Shopify POS needs special equipment to provide its services but this project just need Smartphone, and each of them provide different services.

## 2.3 PAYMENTMAX POS

It is an Android application, leading provider of payment processing solutions. It can be used for all types of businesses including: retail, restaurant, services, wireless, telephone and mail order, Internet, and many more. Thousands of small to mid-sized businesses rely on PaymentMax to simply, securely, and efficiently get money into their accounts [3].

PaymentMax POS is shown in Figure 2.2.



Figure 2.2: PaymentMax POS

### 2.3.1 Advantage of PaymentMax POS:

- Turns on at any android Smartphone.
- No Special hardware required. All you need is your Smartphone and a PaymentMax Merchant Account



- Email receipts: With every successful transaction, an email of the transaction can be automatically sent to the customer [3].

## 2.3.2 Disadvantage of PaymentMax POS:

- This application is very expensive.

The similarities between PaymentMax POS and this thesis that each of them using Android OS and just needs Smartphone to offer their services.

The differences between PaymentMax POS and this thesis that each of them provides different services.

## 2.4 GOPAGO

It is the best POS system to help you run your business. It is the only solution that includes everything you need, including the cloud-based POS software and point of sales hardware (android tablet/ smartphones, stand, cash box, printer, credit card reader).

GoPago's tablet POS software run on the Android operating system, not IOS, which differentiates GoPago POS from virtually every other tablet-based POS in the market for merchants.

GoPago's mobile consumer application is integrated into every POS system. This free-to-consumer app enables merchants to broadcast their business to both IOS and Android smartphones. Consumers can browse the menu, order and pay before they visit a merchants' business. The customer can message the POS from their phone (like a text) asking for things. And it supports multiple devices to one printer configuration [4].

GoPago POS is shown in Figure 2.3.



Figure 2.3: GoPago POS

## 2.4.1 Advantage of GoPago POS:

- GoPago updates its POS software every 2-3 weeks, and every GoPago tablet unit receives those updates automatically. But the iPad POS doesn't allow automatic updates and requires merchants to check for updates.
- Trun on android OS and IOS OS [4].

## 2.4.2 Disadvantage of GoPago POS:

- Very expensive.
- It is include retail transaction only.

The similarities between GoPago POS and this thesis that each of them using Android OS and needs Smartphone to offer their services.

The differences between GoPago POS and this thesis that GoPago is using IOS OS also, can provide its services by Tablet POS, and that each of them provide different services.

## 2.5 COMPARISON BETWEEN PREVIOUS STUDIES AND THIS THESIS

	Shopify POS	GoPago POS	PaymentMax POS	WCF-POS
<b>Oprating System(OS)</b>	IOS	IOS or Android	Android	Android
<b>equiment</b>	Shopify hardware	Tablet POS or Smartphone	Smartphone	Smartphone
<b>Services</b>	Retail services	Retail services	Retail , restaurant services	Car Insurance , Pay university fees and Electricity services

Table 2.1: comparison between Previous Studies and this thesis

## **2.6 CONCLUSION**

This chapter has discussed the related studies that provided services by using similar techniques to achieve the goals or solve the problems of the research topic.

# **CHAPTER 3**

## **BACKGROUND**

## 3.1 INTRODUCTION

Most of today's retail stores had been migrated from cash register to POS system in order to handle the payments and take care of many things related to the business. POS systems consist of hardware and software or a web-based program.

This Chapter discusses general information about the point of sale systems, its component.

## 3.2 POINT OF SALE SYSTEM

"It is the physical location of a transaction. It's also refers to any device or system that is used to record the transaction for the retailer" [1].

Point of sale systems made huge advancements from the mechanical cash registers of the first half of the 20th century, whereas these registers are mechanical device for calculating and recording sales transactions on paper tapes or journal tapes and attached drawer for storing cash. It's usually prints a receipt for the customer.

The mechanical cash register is shown in Figure 3.1.



Figure 3.1: Mechanical Cash Registers

The next step in evolution of the POS was to convert the mechanical cash registers into high-end electronic cash registers as shown in Figure 3.2 . These units may have a barcode scanner attached to them and a touch screen. They likely have the ability to track sales at an item level.



Figure 3.2: High-End Electronic Cash Registers

Since 1986, the Point of Sale Systems became based on PC as shown in Figure 3.3 , which offers advanced capabilities beyond the ability to collect payments. It provides automated ways to track sales, control inventory, manage customers and streamline the accounting process [1].



Figure 3.3: Point of Sale Systems based on PC

Currently, there exist methods for handling POS payment over the Internet through Web services or WCF services using computerized POS terminal or even through smart phones so that POS are provided as a services that can be accessed by remote POS applications, including mobile POS solutions.

POS systems include all the basic hardware and software that a business needs to manage it sales, inventory and customers. There are several types of POS systems each of which caters to a different type of business.

There are varieties of terms being used when referring to a POS system. Those terms can include: multi-location management system, retail management software, business management software and POS software [1].

### 3.2.1 Mobile POS:

As shown in Figure 3.4, mobile POS are solutions consist of a handheld mobile computer or device with a payment card reader and compact, portable printer. Once the store associate swipes the card, the data is encrypted and sent over a wireless network. After the charge is authorized, the shopper sings the screen on the device and the associate prints a receipt on the spot [6].



Figure 3.4: Mobile POS

## 3.2.2 POS Systems Features:

The key requirements that must be met by modern POS systems include:

- High and consistent operating speed.
- Reliability.
- Ease of use.
- Remote supportability.
- Rich functionality.

In fact, most POS Systems do much more than just POS tasks.

There are POS Solutions available that include:

- Fully integrated accounting.
- Inventory tracking and management.
- Open-to-buy forecasting.
- Customer relation management.
- Service management.
- Rental services.
- Operation reporting payroll modules [1].

Currently, retail POS Systems were among the most sophisticated, powerful and user friendly computer networks in commercial usage. Which make that all of these features and functions are available.

## 3.2.3 Pos Standards:

### 3.2.3.1 JavaPOS:

JavaPOS stand for (Java for Point of Sale Devices). It used to integrate specialized hardware peripherals typically used to create a point-of-sale system into POS software written in Java . It reduced POS terminal costs because its platform independent.

A few of the hardware types that can be controlled using JavaPOS are:

- POS printers (for receipts, check printing, and document franking).
- Magnetic stripe readers .
- Magnetic ink character recognition readers .
- Barcode scanners/readers.

- Cash drawers.
- Coin dispensers.
- Pole displays.
- PIN pads.
- Electronic scales [1].

### **3.2.3.2 OPOS:**

OPOS stand for OLE for Retail POS, it's a platform specific POS device standard used to integrate POS hardware into applications for Windows operating systems.

The standard uses the object model component and therefore it's a language independent. This provides a way for the application development to write to an abstract hardware interface while allowing the application to work with a variety of different hardware [1].

OPOS can be deployed on the following operating systems:

Microsoft Windows 95, 98, ME, NT, 2000, XP, Vista, CE.

### **3.2.3.3 UnifiedPOS:**

UnifiedPOS stand for Unified Point of Service. It is a specification for application interfaces to point-of-service and point-of-sale devices (printers, scanners, cash drawers etc) that are used in the retail environment.

The UnifiedPOS committee also oversees the JavaPOS specification, which is a UnifiedPOS implementation based on the Java language (there by making it operating system independent) [5].

## **3.2.4 Advantages of web-based POS system:-**

- Provider will back-up all of POS important information on their server so users will not lose anything due to a computer, mobile crash or theft.
- Users can access information from any device that have the POS Application installed in with an internet connection.
- There is no need to purchase expensive POS software.



- Most services provide free updates so the POS application will never become outdated.
- Web-based POS programs are easy to upgrade and to add features or work stations to fit the business as business grows or during busy seasons.
- The provider can address technical problems instantly over the web by accessing user account and fixing problems remotely [7].

### **3.2.5 Disadvantages of web-based POS system:-**

- Potential security risks should be considered when using POS systems utilizing web based, as opposed to software based operating systems.
- Web-based POS providers may charge a monthly fee.
- Users must have an internet connection at their mobile or workstation.
- Some POS require users to use their hardware, which can be expensive [7].

### **3.2.6 POS components:**

#### **3.2.6.1 Monitor:**

The monitor is the screen where sales staff views sales information as a transaction is in progress. And they can view the list of accumulated items, price, tax, savings and any other applicable information pertaining to the type of business being conducted[8].

Monitor is shown in Figure 3.5.



Figure 3.5: Monitor

#### **3.2.6.2 Bar-code scanner:**

Bar code scanners retrieve coded pricing information using a laser beam for various items. These components are often flat glass at the base of the counter near the cash register, with a laser beam beneath the glass to capture the bar code [8].

Bar-code scanner is shown in Figure 3.6.



Figure 3.6: Bar-code scanner

### 3.2.6.3 Cash drawer:

POS systems at retail stores will most often have an electronic cash drawer. It is used to hold money collected for goods or services [8].

Cash drawer is shown in Figure 3.7.



Figure 3.7: Cash drawer

### 3.2.6.4 Keyboards:

Keyboards are an essential component to be used with the back office server. The keyboard is used to enter items, services, pricing information, updates and all other information essential to running the business. Point of sale systems that function without touch screens or bar-code scanners may require a keyboard as well [8].

Keyboards is shown in Figure 3.8.



Figure 3.8: Keyboards

### 3.2.6.5 Printer:

At least one small printer is usually added to the POS system. This component can be programmed from the back office server to produce customized receipts or invoices for customer use. The printer may also be used for printing sales reports or employee time cards [8].

Printer is shown in Figure 3.9.



Figure 3.9: Printer

### **3.2.6.6 MSRs and PIN Pads:**

MSR are used to capture credit or debit card information to process sales. An MSR component can be attached to the work station terminal to enable a customer to swipe a credit card at the time of payment.

PIN Pads (PIN entry device) is an electronic device used in a debit, credit or smart card-based transaction to accept and encrypt the cardholder's PIN. PIN pads are normally used with automated teller machines and integrated point of sale devices in which an electronic cash register is responsible for taking the sale amount and initiating/handling the transaction [8].

MSRs and PIN Pads is shown in Figure 3.10.



Figure 3.10: MSRs and PIN Pads

### **3.2.6.7 Handheld data collection devices:**

Handheld PDTs (Portable Data Terminals) are portable barcode scanners used to gather item information which can be imported into your retail software.

- Increase speed and efficiency during physical count
- Quickly count merchandise during receiving and store-to-store transfers [8].

The handheld data collection devices is shown in Figure 3.11.



Figure 3.11: Handheld data collection devices

### 3.2.6.8 Pole displays:

Pole displays allow customers to view information while checking out.

- Pole displays commonly display change due, sale amounts, item descriptions, and prices.
- Increase ticket accuracy and maximize customer satisfaction [8].

Pole displays is shown in Figure 3.12.



Figure 3.12: Pole displays

## 3.3 CONCLUSION

This chapter has discussed the theoretical background for the research and some of the concepts related to POS systems and its components.

# **CHAPTER 4**

## **TOOLS AND TECHNOLOGEIS**

## 4.1 INTRODUCTION

This chapter discusses Android , WCF service which is used to simulate SNS and differences between WCF and web service , UML , the tools used in this research which is visual studio, SQL server, enterprise architect and eclipse.

## 4.2 TECHNOLOGIES

The technologies that have been used in this project is :

### 4.2.1 Android:

Android is an operating system based on the Linux kernel and designed primarily for touch screen mobile devices such as smart phones and tablet computers. Initially developed by Android, Inc., which Google backed financially and later bought in 2005, Android was unveiled in 2007 along with the founding of the Open Handset Alliance—a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices.

The user interface of Android is based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects. Internal hardware such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented. Android allows users to customize their home screens with shortcuts to applications and widgets, which allow users to display live content, such as emails and weather information, directly on the home screen. Applications can further send notifications to the user to inform them of relevant information, such as new emails and text messages.

#### 4.2.1.1 Advantages of android OS over other mobile operating systems:

- Open source framework:-Since Android OS is open source.
- Uses of tools are very simple.

- Availability of Apps:-majority of the apps in Google Play are free as compared to the paid apps on iPhone.
- Updated user interface design.android OS differs from iOS operating system in performance:
- Android OS is capable of displaying flash content on a webpage or an application. iOS does not support flash content due to the restriction laid on it by Apple.
- Many widgets are available in Android OS which can be customized by adding widgets like clock; weather etc. iOS do not have any widget.

#### **4.2.1.2 Disadvantages of android:**

iOS is quicker and smoother than Android in terms of interaction like scrolling zooming .

iOS supports multi-touch gestures . Maximum 10 touches can be detected at a time .It makes closing or opening an application faster. Android OS lacks this feature [9].

#### **4.2.2 WCF Service:**

Windows Communication Foundation (WCF) is a framework for building service-oriented applications. Using WCF, you can send data as asynchronous messages from one service endpoint to another. The messages can be as simple as a single character or word sent as XML, or as complex as a stream of binary data. A few sample scenarios include:

- A secure service to process business transactions.
- A service that supplies current data to others, such as a traffic report or other monitoring service.
- A chat service that allows two people to communicate or exchange data in real time.
- Exposing a workflow implemented using Windows Workflow Foundation as a WCF service.

#### 4.2.2.1 Features of WCF:

- Service Orientation.
- Interoperability.
- Multiple Message Patterns.
- Service Metadata.
- Data Contracts.
- Security.
- Multiple Transports and Encodings.
- Reliable and Queued Messages.
- Durable Messages.
- Transactions.
- AJAX and REST Support.
- Extensibility [10].

#### 4.2.2.2 Different between WCF and web service:

- **By Definition:**

- **WCF:**

Windows Communication Foundation is a Program development platform and runtime system for building, configuring and deploying network-distributed services. Such like Secured Transactions between an ATM and a central server of a bank. It is the latest service oriented technology developed by Microsoft.

It is unified programming model provided in .Net Framework 3.0. WCF is a combined feature of old Microsoft Framework Service Technologies like Web Service, Remoting, MSMQ and COM+. WCF provides a common platform for all .NET communication [11].

- **web service (WS):**

Web Services are platform-independent and language-independent, that they use XML languages. A client program can be programmed in C++ and running under Windows, while the Web Service is programmed in Java and running under any Linux Operating System. The main benefit of Web service is that it uses HTTP for transmitting messages, because most of the Internet's proxies and firewalls will not block HTTP traffic [11].



- **By performance:**

To test the performance of the proposed architecture, tests have been developed by comparing WS of our WCF service. The web service executes the same actions as our WCF service does. A comparison has been made based on both technologies consuming time when providing variable values to the client application. That is to say, we have recorded the time that elapses between when the client asks the service for variable values and when the service provide the client with these values.

There are two technologies that influences the amount of time consumption those are the service technology(WS or WCF) and MSMQ which were earlier proposed by Microsoft. Despite the time that MSMQ consumes in both the architectures, which is marked, there is a big time that MSMQ consumes in both architectures, which is marked, there is big time difference when using WS and WCF. Figure 1 shows comparison between two architectures. The difference in velocity is significant. When the client requests the value of 10 variables, the values are received in 15 ms with WCF whereas it is 156 ms with WS [11].

The conclusion from these result that WCF is more reliable and fast than WS.

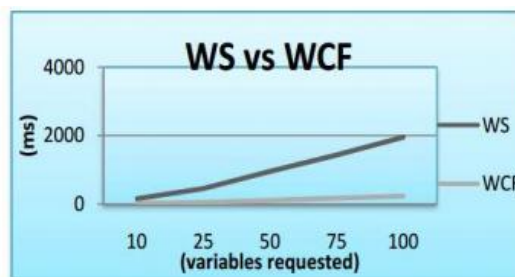


Figure 4.1: Performance of WCF vs Web Services

### 4.2.3 UML:

UML is an international industry standard graphical notation for describing software analysis and designs. When a standardized notation is used, there is little room for misinterpretation and ambiguity. Therefore, standardization provides for efficient communication and leads to fewer errors caused by misunderstanding [12].

## 4.3 TOOLS

The tools that have been used in this project is:

### 4.3.1 Visual Studio:

Visual Studio is a complete set of development tools for building ASP.NET Web applications, XML Web Services, desktop applications, and mobile applications. Visual Basic, Visual C#, and Visual C++ all use the same IDE , which enables tool sharing and eases the creation of mixed-language solutions. In addition, these languages use the functionality of the .NET Framework, which provides access to key technologies that simplify the development of ASP Web applications and XML Web Services.

Visual Studio has been used in this thesis to build WCF service [13].

### 4.3.2 SQL Server:

SQL Server is Microsoft's RDBMS. It is a full-featured database primarily designed to compete against competitors Oracle DB and My SQL.

Like all major RBDMS, SQL Server supports ANSI SQL, the standard SQL language. However, SQL Server also contains T-SQL, its own SQL implementation. SSMS (previously known as Enterprise Manager) is SQL Server's main interface tool, and it supports 32-bit and 64-bit environments [14].

### 4.3.3 Enterprise Architect:

Enterprise Architect is a visual platform for designing and constructing Software systems, for business process modeling, and for more generalized modeling purposes.

Enterprise Architect is based on the latest UML 2.4 specification. UML defines a visual language that is used to model a particular domain or system (either proposed or existing).

Enterprise Architect is a progressive tool that covers all aspects of the development cycle, providing full traceability from the initial design phase through to deployment, maintenance, testing and change control.

### 4.3.3.1 Differentiates enterprise architect from other UML tools:

- Comprehensive UML 2.4-based modeling.
- Built-in Requirements Management.
- Extensive Project Management support, including resources, tasks, project calendar and metrics.
- Flexible documentation options: HTML, PDF and DOCX report writers.
- An integrated Visual Execution Analyzer to profile , debug and document executing.
- Applications; instantiate run-time model objects; and record sequence diagrams from a stack trace .
- Extensible modeling environment that can host user-defined profiles and technologies.
- Usability: Enterprise Architect makes it easy to get up and running quickly with UML.
- Speed: Enterprise Architect is a spectacularly fast performer.
- Scalability: Enterprise Architect can handle extremely large models and many concurrent users with ease.
- Price: Enterprise Architect is priced to outfit the entire team, making collaboration and team development cost effective. [14]

### 4.3.4 Eclipse:

Eclipse is an integrated development environment (IDE). It contains a base workspace and an extensible plug-in system for customizing the environment. Written mostly in Java, Eclipse can be used to develop applications.

By means of various plug-ins, Eclipse may also be used to develop applications in other programming languages : Ada, ABAP, C, C++, COBOL, Fortran, Haskell, JavaScript, Lasso, Natural, Perl, PHP, Prolog, Python, R, Ruby (including Ruby on Rails framework) , Scala, Clojure, Groovy, Scheme, and Erlang. It can also be used to develop packages for the software Mathematical Development environments include the Eclipse JDT for Java and Scala, Eclipse CDT for C/C++ and Eclipse PDT for PHP, among others. [15]

## **4.4 CONCLUSION**

This chapter has discussed the most important tools and techniques that will be used to achieve the goals of this research.

## **CHAPTER 5**

# **PROPOSED SYSTEM AND SYSTEM ANALYSIS**

## 5.1 INTRODUCTION

This chapter discusses the proposed system and the project theoretical analysis .this done using UML diagrams.

## 5.2 PROPOSED SYSTEM

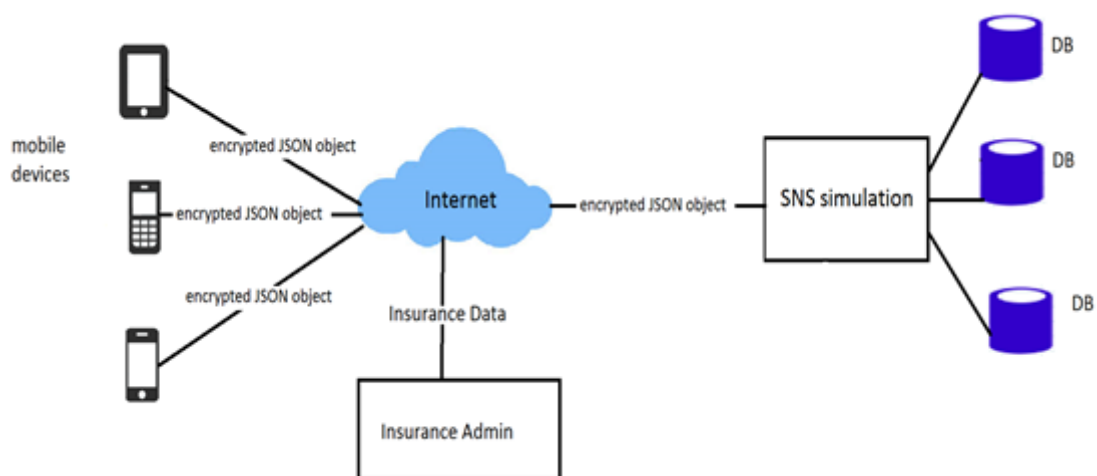
Figuer 5.1 show The Simulation of the national switch web service functionality by a WCF service which is connected to three banks databases , Sudanese Company for Electricity Distribution database , general traffic administration database and insurance company database.

The mobile devices can be any smart phone that have android operating system installed into it .

The mobile consume the services from public networks through HTTP protocol to consume cars Insurance service , Electricity purchasing service and handles SUST student payments.

The insurance system administrators makes the appropriate adjustments in the insurance percentages which determined by the Insurance Company, that percentages is calculated to decide the fees imposed on customers and also to monitor the insurance process without the need for bringing the car to the Insurance Company by the customer.

All transferred data between the service and both android application in JSON object encrypted by RSA encryption algorithm.



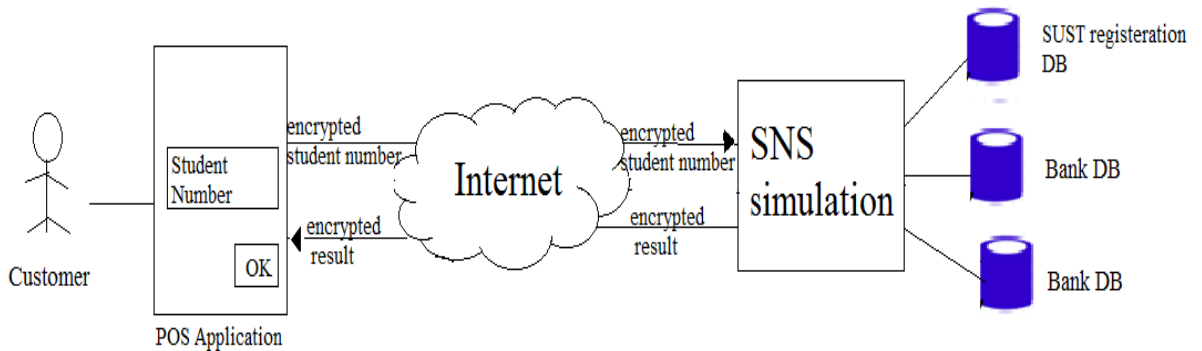
Figuer 5.1: proposed system

## 5.2.1 System Functions:

### 5.2.1.1 SUST student's fees bay:

This function allow SUST students to pay there university fees by entering the student number , this number will be verified from SUST registration database if its correct the amount and any arrears will be withdrawn automaticlly from his bank account that he used to login to the system.

This process is shown in Figuer 5.2.

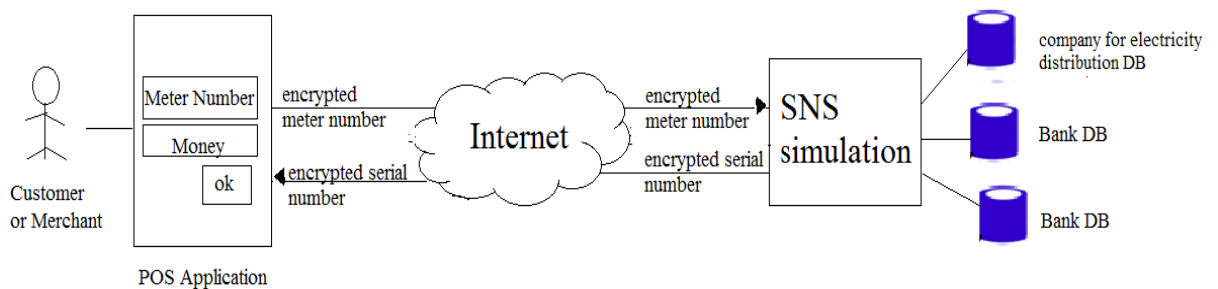


Figuer 5.2: SUST student's fees bay

### 5.2.1.2 Electricity purchasing:

This function allow any customer or merchant to buy electricity by entering the meter number , this number will be verified sudanese company for electricity distribution database if its correct the amount will be withdrawn automaticlly from his bank account that he used to login to the system . Also if the customer have not pay water fee and/or meter rent fees for the month or have any arrears this amount will be also withdrawn automaticlly from his bank account.

This process is shown in Figuer 5.3.



Figuer 5.3: Electricity purchasing

### 5.2.1.3 Car insurance:

This function allows any user to insure his car from this application without the need for going to the insurance company.

The user fill a form with his car information and take four photos for his car from four different directions (front,back,right and left sides) , the traffic license information will be verified from general traffic administration database and the images will be send to the insurance administrator in the insurance company that will track this process . He will accept or reject the car if the car accepted the premium will be calculated for the user by using specials equations.

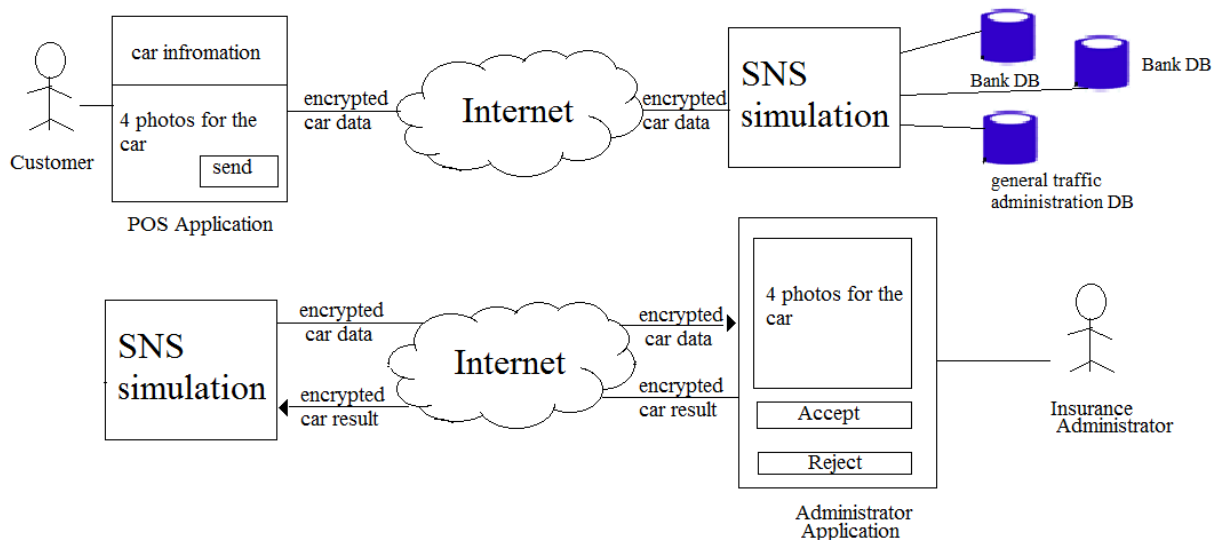
The amount varies according to the car informations that was entered by the user such as the type of car and the purchase price and the type of insurance.

The premiums will be divided for the user depending on the insurance duration if it's a month the premiums will be paid weekly, if its 6 months or year the premiums will be paid monthly then the premium will be sent to the user.

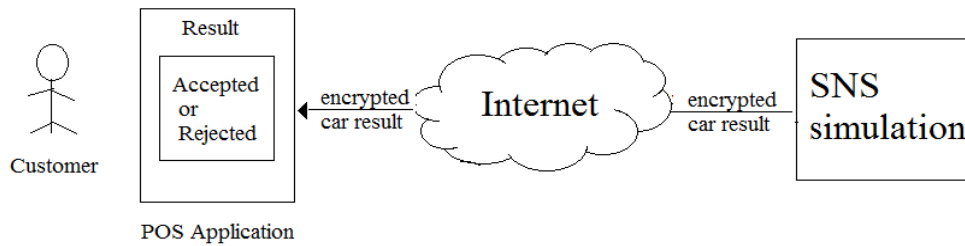
The user can also can pay the car insurance premium by entering the chassis number.This number will be verified from his car registration informations if it's correct the premium and any arrears will be automatically withdrawn from his bank account.

The insurance do not include insurance for car internal component except the car radio and if the user wants to insure these components as additional features he will need to go to the insurance company.

This process is shown in Figuer 5.4.







Figuer 5.4: car insurance

### 5.2.1.4 Update user registration information:

This function allow users to edit their registration information such as account number , bank , card number , user name , password , address and phone number.

### 5.2.1.5 Delete user account:

This function allows the users to delete their accounts.

## 5.2.2 System Users:

### 5.2.2.1 Customer:

Is a person (merchant or regular customer) who wants to take advantage of the services provided by the system to buy electricity or pay university fees for SUST students or for car insurance and pay the car insurance premium.

### 5.2.2.2 Insurance administrator:

Is a person who tracks the insurance process from the Insurance Company where car images are sent.

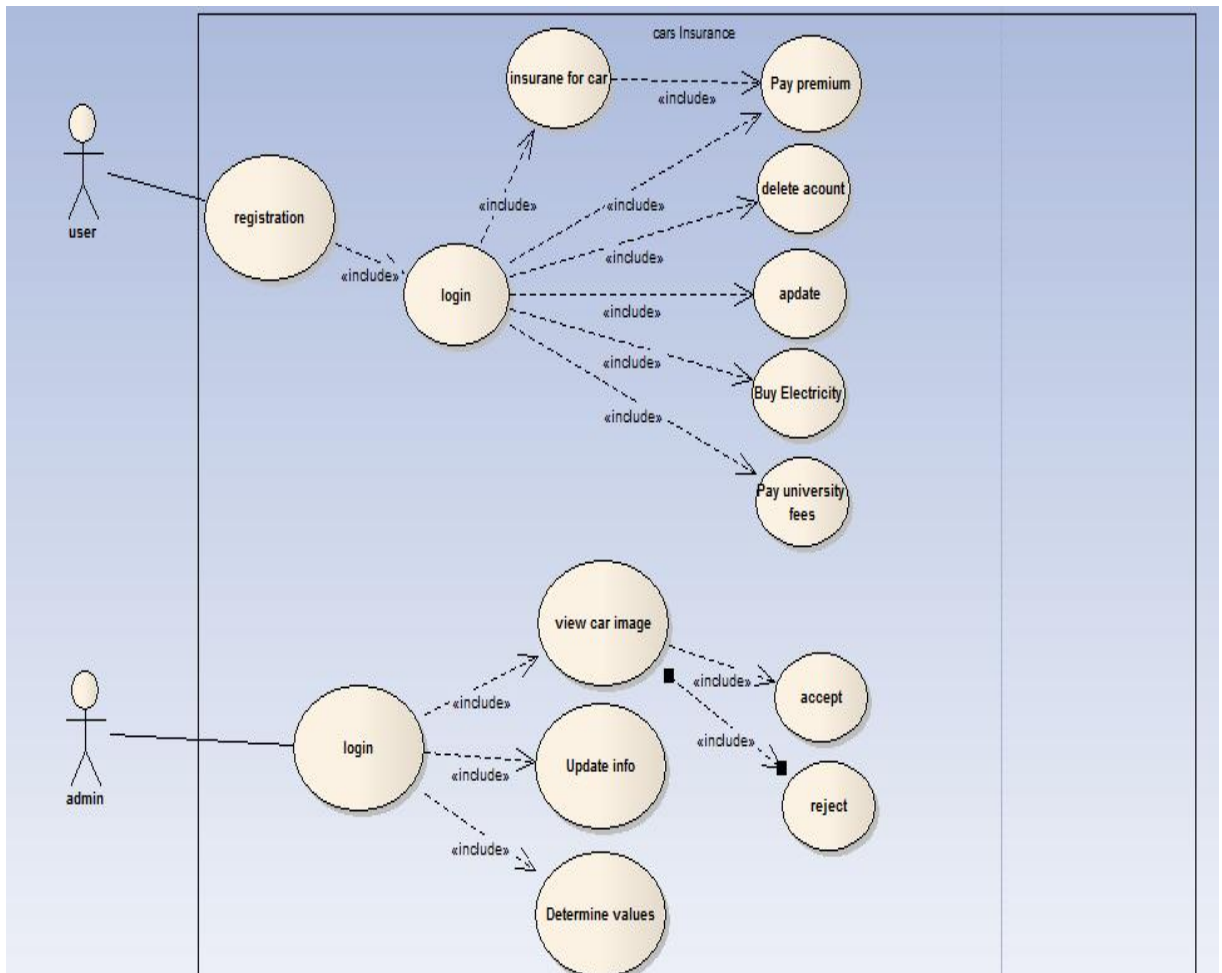
This person can also upadte the insurance percentages, value of diorder and value of passengers which determined by the Insurance Company.

## 5.3 SYSTEM ANALYSIS

The diagrams used to analyze this project are use case daiagram, activity diagram and class diagram.

### 5.3.1 The Use Case Diagram:

Figuer 5-2 shows the use case diagram for the system user and the administrator in insurance company.



Figuer 5-2: Use case diagram

The process that user is able to make is :

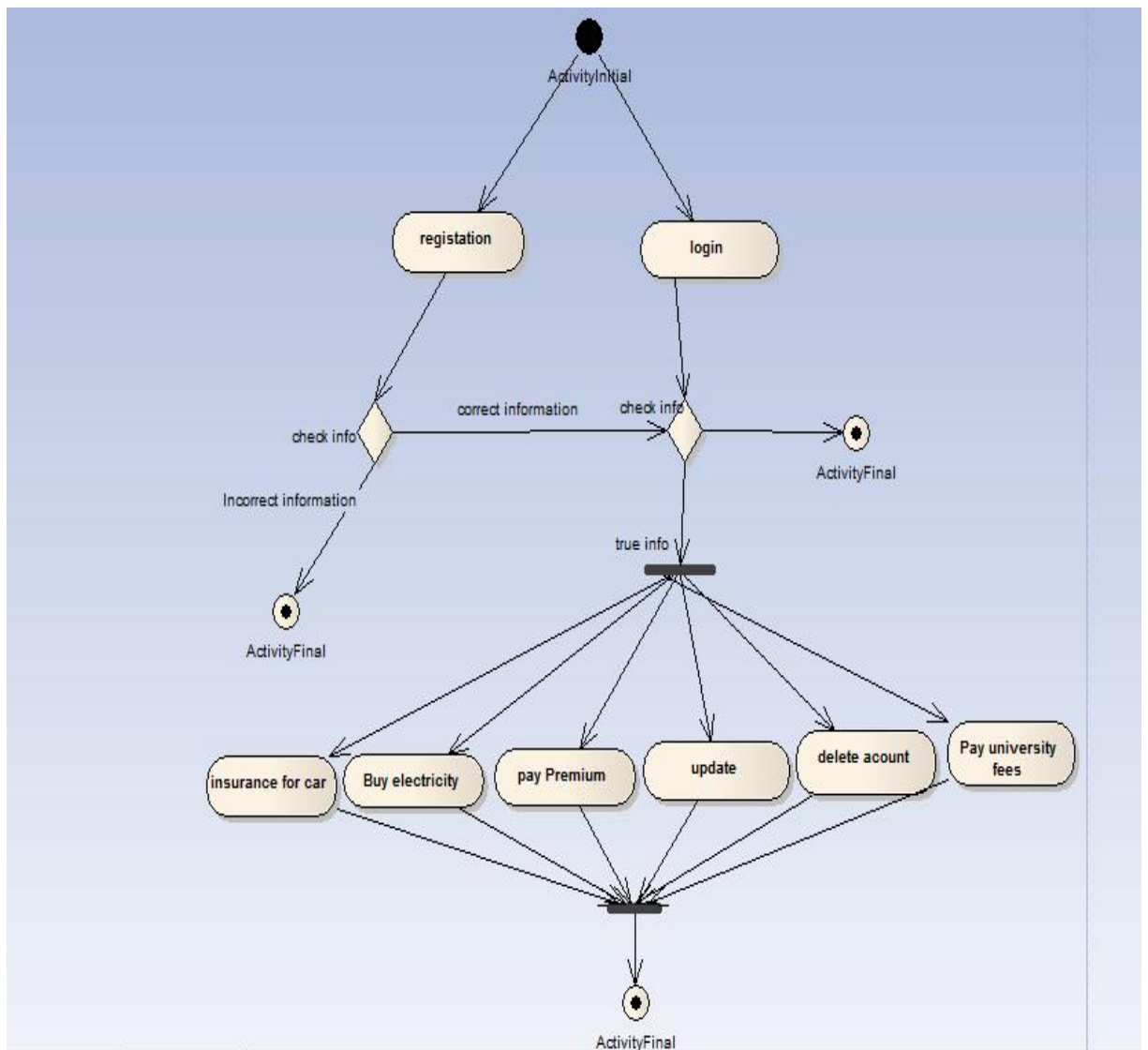
- Register in the system.
- Login to the system, and make the user able to :
  - 1-Insurance for car.
  - 2-Pay the premium .
  - 3-Electricity purchasing.
  - 4-Pay university fees.
  - 5-Delete his account.
  - 6-Update his registration information.

The process that administrator is able to make is :

- Login to the system, and make the user able to :
  1. Determine insurance percentages.
  2. View car images to accept insurance for the car or reject it.
- Update login information.

## 5.3.2 The Activity Diagram:

Figuer 5-3 shows the activity diagram for the system.



Figuer 5-3: Activity diagram

The administrator enters the user name and the password to the interface then the application checks this information if they are valid or not. If they are valid then another activity appears.

The user enters the account number and the password to the interface, then the POS system checks this information if they are valid or not. If they are valid then another activity appears.

In the new activity the user can consume the WCF services which is electricity purchasing, car insurance, pay insurance premium, pay student fees, update registration information and delete his account.

### 5.3.3 The Class Diagram:

Figuer 5-4 shows the class in the system.

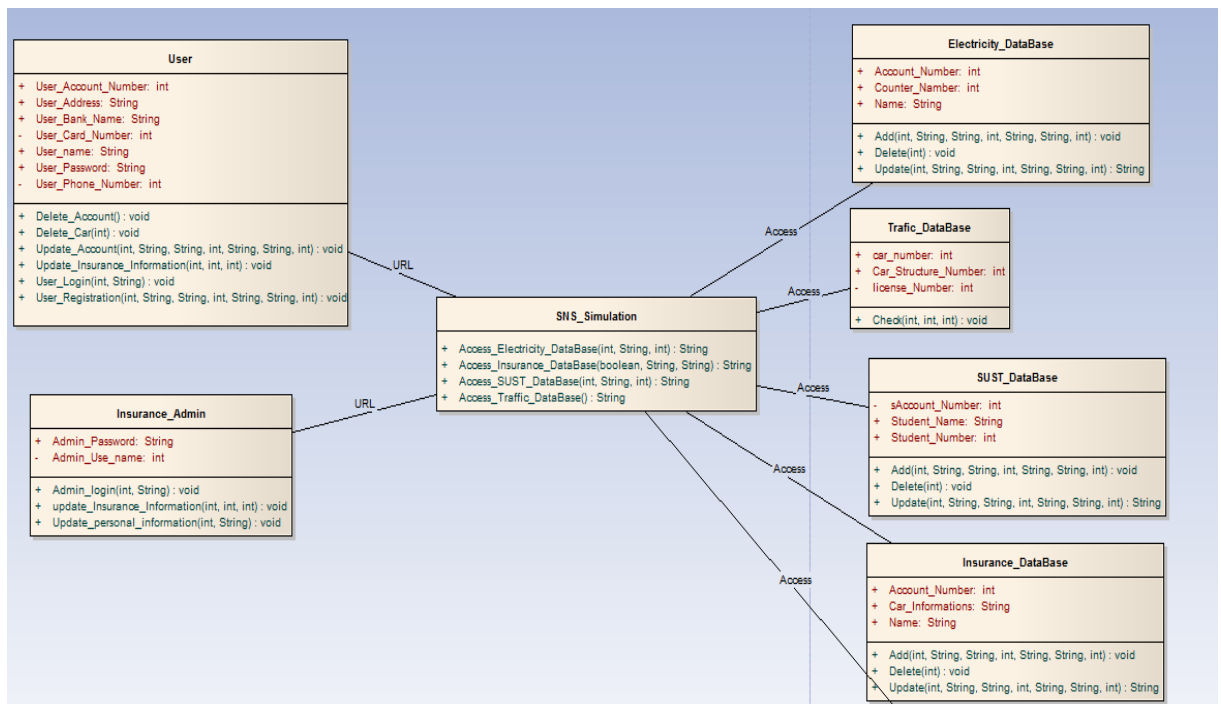


Figure 5-4: Class diagram

### 5.3.4 The Deployment Diagram:

Figure 5-5 shows the component of the system.

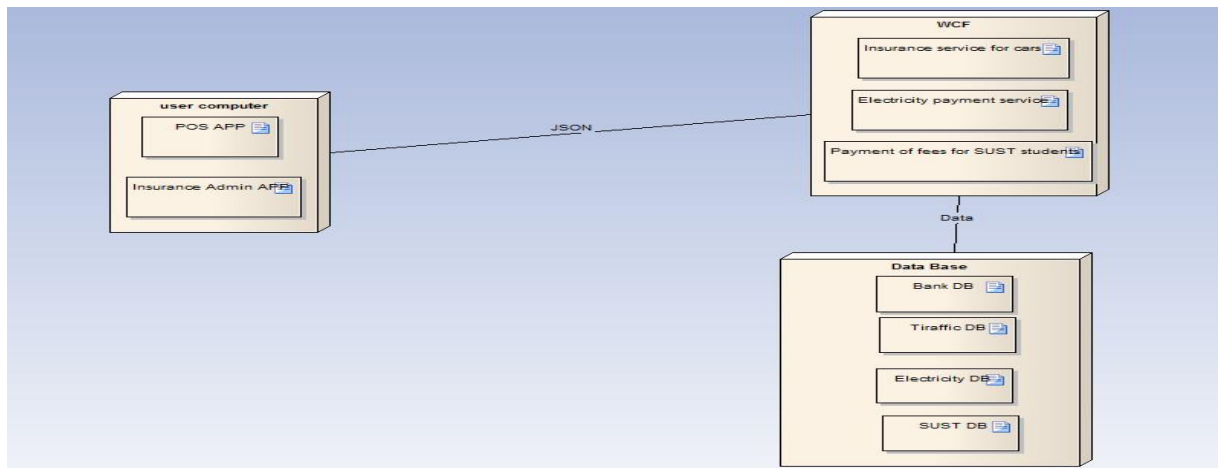


Figure 5-5: deployment diagram

## 5.4 CONCLUSION

This chapter has discussed a general description of the proposed system and its functions and the analysis of the system operations using UML diagrams.

# **CHAPTER 6**

## **IMPLEMENTATION & RESULTS**

## 6.1 INTRODUCTION

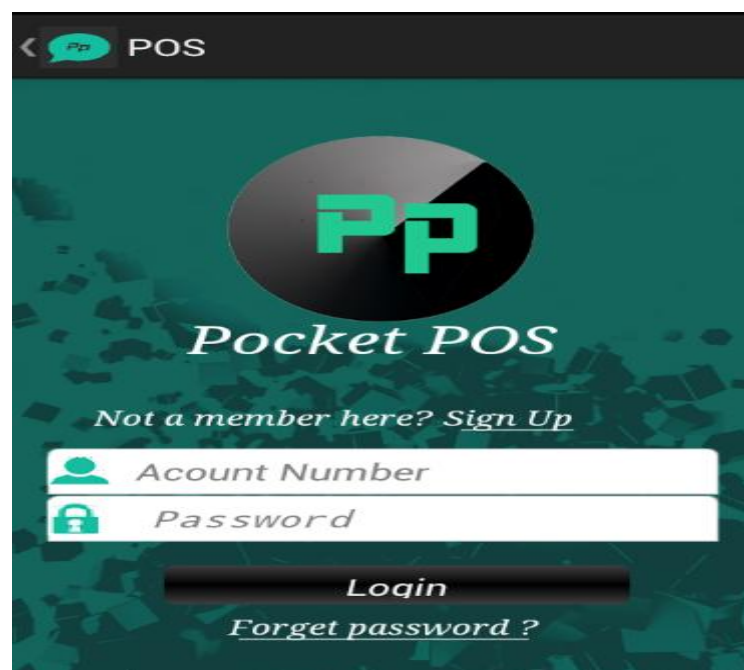
This chapter discusses the implementation steps and the results.

## 6.2 IMPLEMENTATION

### 6.2.1 Customer Login Interface:

Figuer 6.1 shows the main screen in the system, which allows the user access the POS application by entering user account number and password correctly.

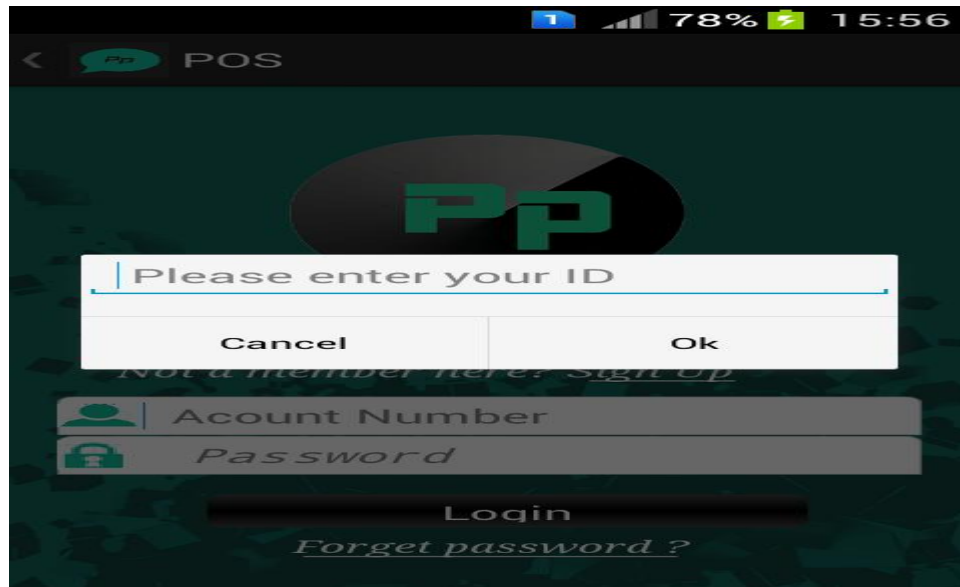
From this screen the user can also retrieve password by pressing forget password or press sign up to move to customer registration screen.



Figuer 6.1: Customer Login Interface

### 6.2.2 Forget Password:

If the user forget his account password he will press at forget password then the following screen will show up asking the user to inter his ID as shown in Figuer 6.2.



Figuer 6.2: Forget Password

### 6.2.3 Wrong Login Information:

If the user enter invalid account number or password this statement will show up as shown in Figuer 6.3.



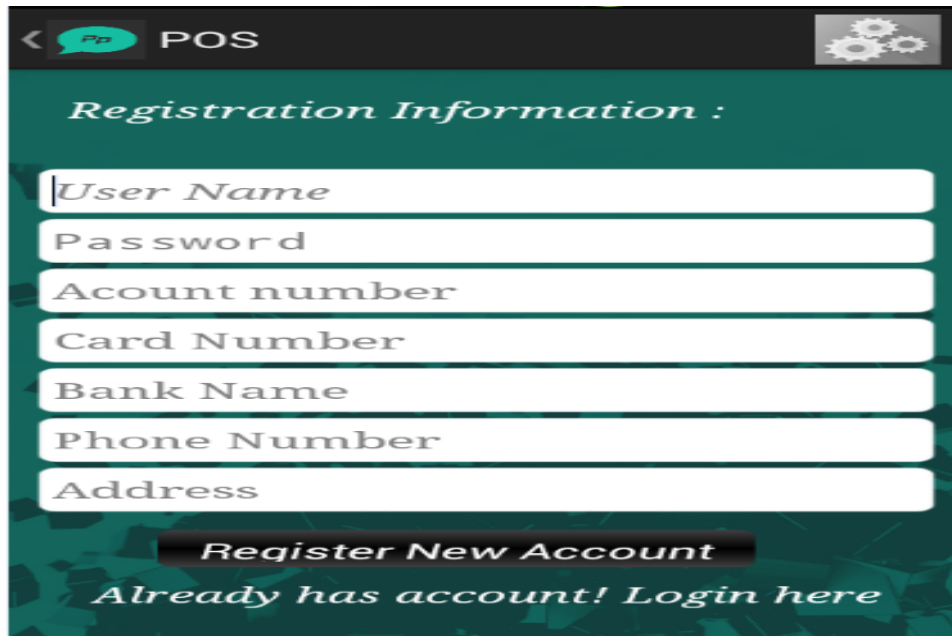
Figuer 6.3: Wrong Login Information's

### 6.2.4 Customer Registration Interface:

If a new user wants to create an account in the application he will Fill the form shown in Figuer 6.4 and press Register New Account. This information will be

verified if its correct automaticly services screen will show up and if it is not an error message will show up.

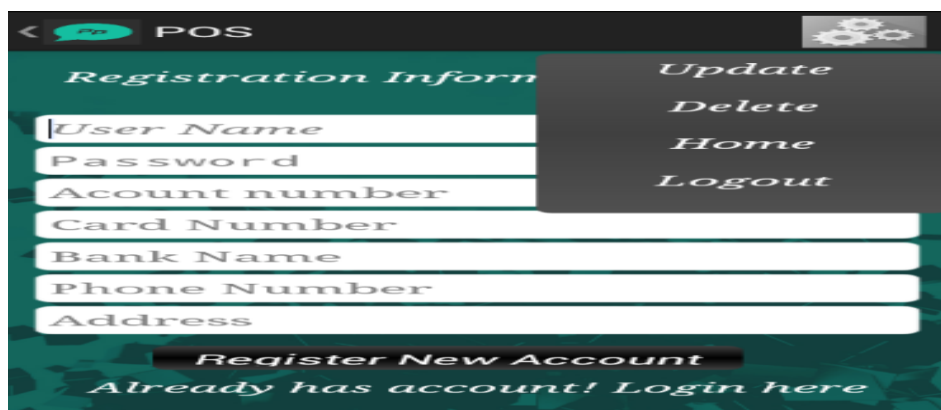
The user can also go back to the login screen by pressing Login here or can move to additional options screen by pressing the setting button that shows in the upper right corner.



Figuer 6.4: Customer Registration information's

## 6.2.5 Additional Options:

This screen shows the additional options in the POS application like updating user information , deleting his account , return to the main screen or logout of the application as shown in Figuer 6.5.



Figuer 6.5: Additional Options



## 6.2.6 Update Registration Information:

If the user wants to update his information the form shown in Figuer 6.6 will show up with his old information then he can change any of this information and press update information button.

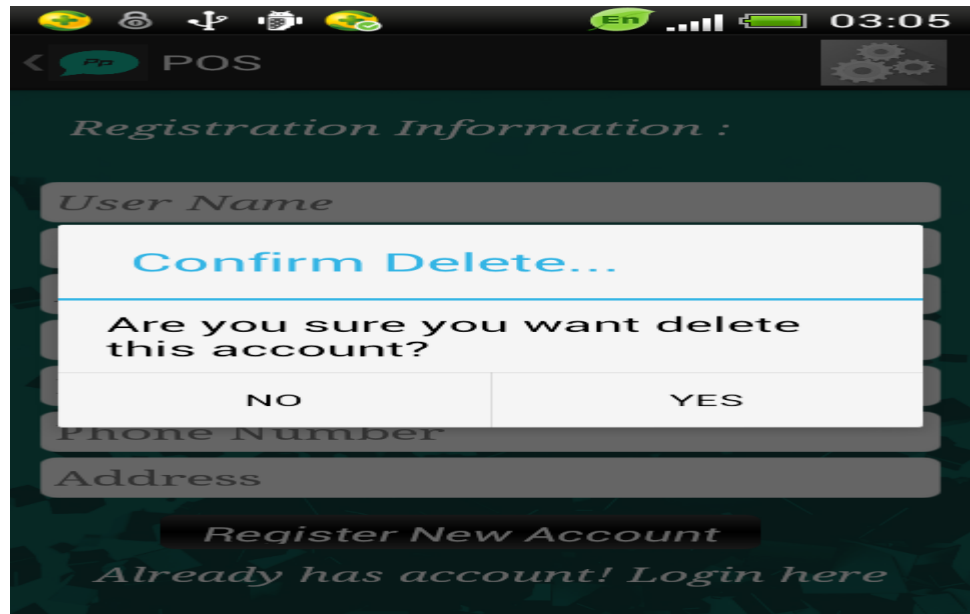


The screenshot shows a mobile application interface for updating registration information. The title bar at the top displays 'PP POS' and the time '02:46'. The main heading is 'Registration Information :'. Below this, there are seven input fields containing the following text: 'yosra', a masked field with seven dots, '02568', '1578425890517894', 'Faisal', '0928018645', and 'omdorman'. At the bottom, there are two buttons: 'Update information' and 'Cancle'.

Figuer 6.6: Update Registration Information

## 6.2.7 Delete User Account:

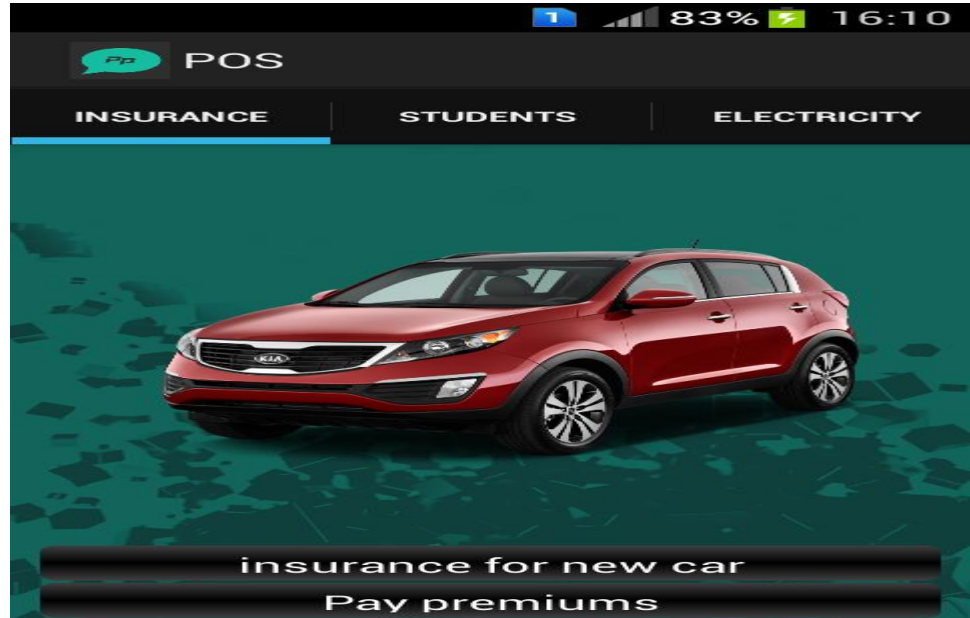
As shown in Figuer 6.7 by pressing delete button from additional operation the user can delete his account.



Figuer 6.7: Delete User Account

## 6.2.8 Insurance Tab:

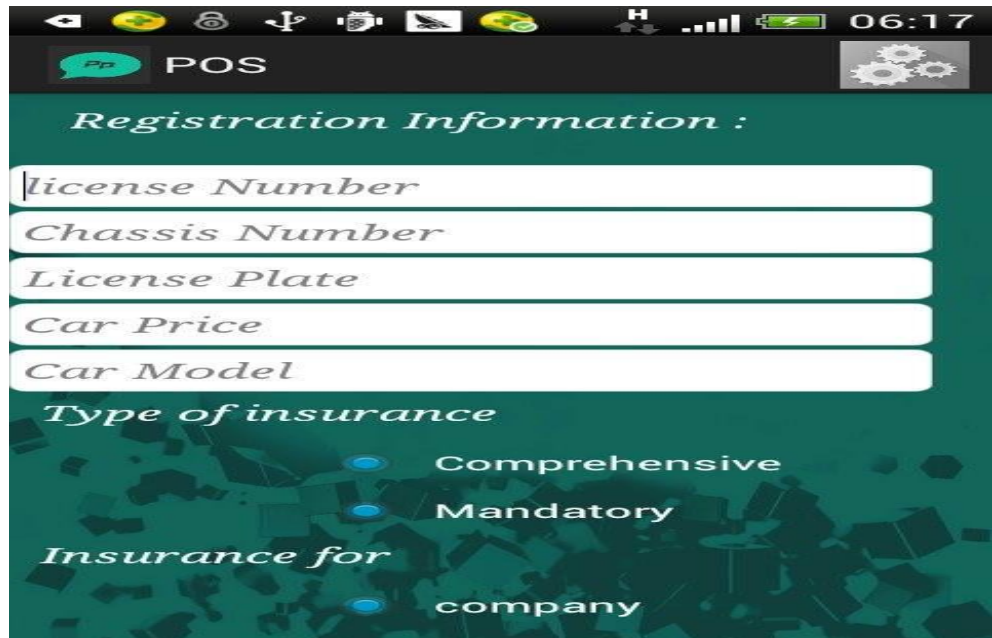
If the user successfully login into the application a screen with tabs will show up as shown in Figuer 6.8 and if he Chose the insurance tab he can pay premium or chose to insure new car.



Figuer 6.8: Insurance Tab

## 6.2.9 Insurance for New Car:

if the user wants to insure a new car hi will fill the form shown in Figuer 6.9 and Figuer 6.10 and takes four images for his car then his premium will show up .



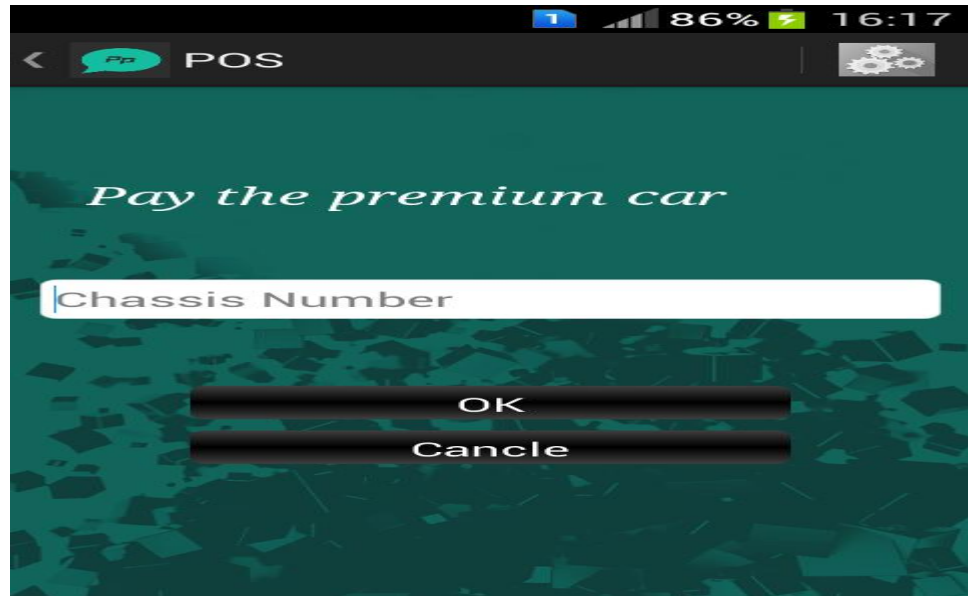
Figuer 6.9: Insurance For New Car



Figuer 6.10: Insurance for New Car

### 6.2.10 Pay Premium:

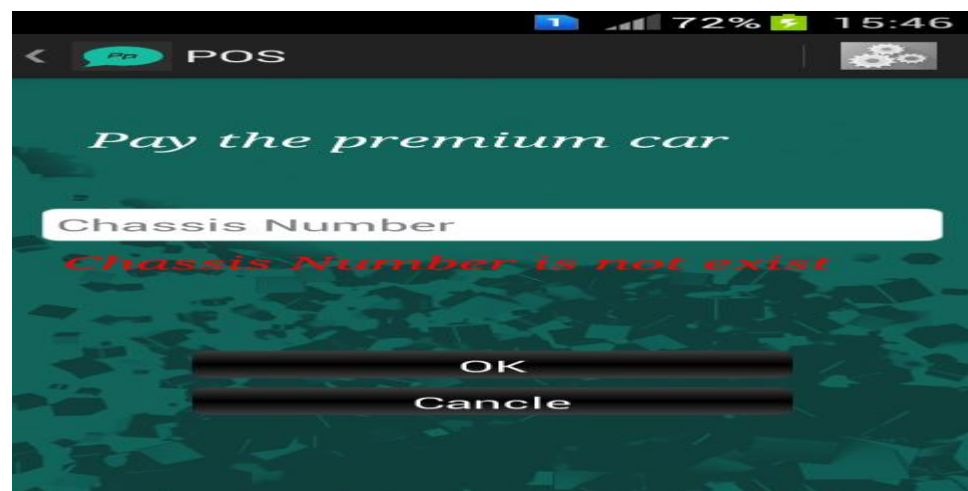
Through the screen shown in Figuer 6.11 the user can pay the insurance premium just by entering car's chassis number or cancle the operation by pressing cancle button.



Figuer 6.11: pay premium

### 6.2.11 Wrong Chassis Number:

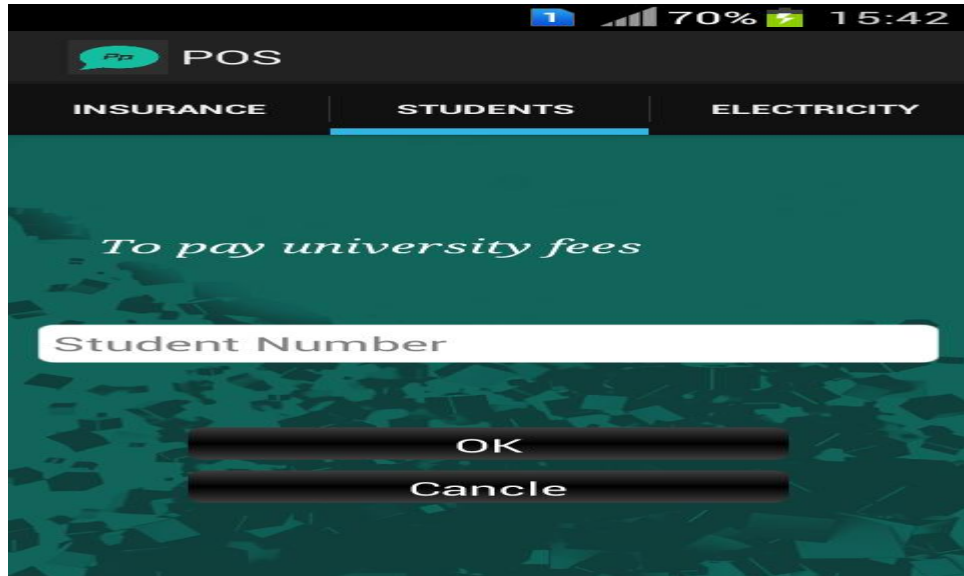
If the user enters wrong chassis number this statement will show up as shown in Figuer 6.12 .



Figuer 6.12: Wrong Chassis Number

### 6.2.12 Pay University Fees:

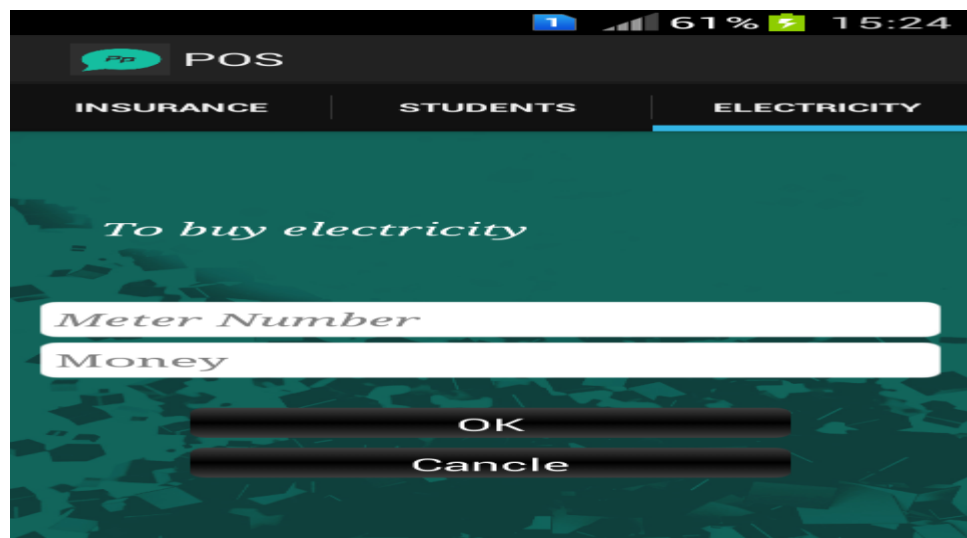
The tab shown in Figuer 6.13 allow SUST student to pay there fees by entering the student serial number.This number will be verified if its correct the fee will be withdrawn from his bank account.



Figuer 6.13: Pay University Fees

### 6.2.13 Electricity Purchasing:

As shown in Figuer 6.14 if the user wants to purchase electricity he will choose electricity purchasing tab and will enter the meter number and the amount of mony. The meter number will be verified if its correct the fee will be withdrawn from his bank account and then the serial number will show up.



[Figuer 6-14] Electricity Purchasing

### 6.2.15 Electricity Serial Number:

After the user enters the meter number correctly and the amount the he will receive the serial number as shown in Figuer 6.15.

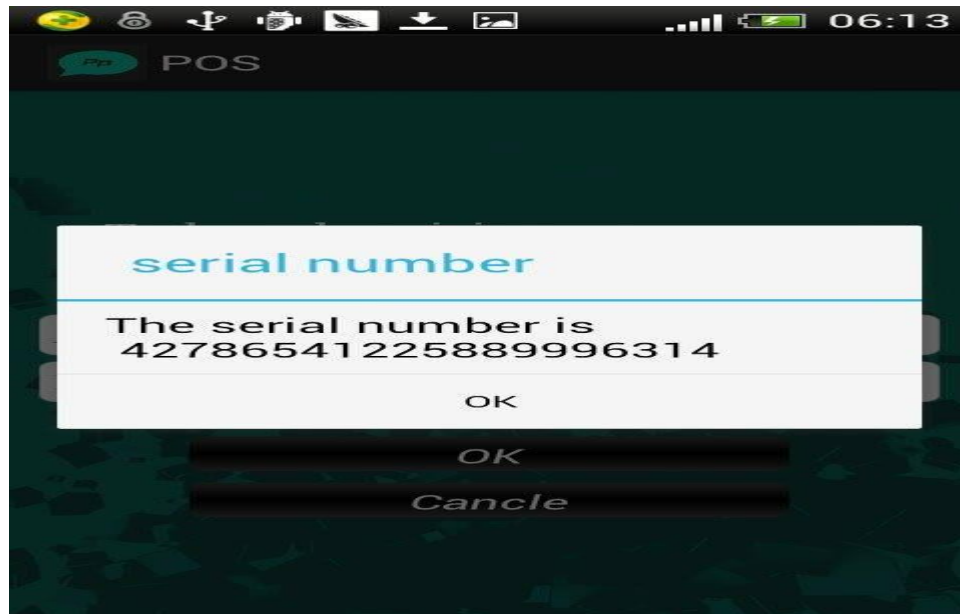


Figure 6.15: Electricity Serial Number

## 6.2.16 Insurance Administrator Login Screen:

Figure 6.16 shows the main screen in the administrator application, which allows the admin to access the application by entering user name and password correctly

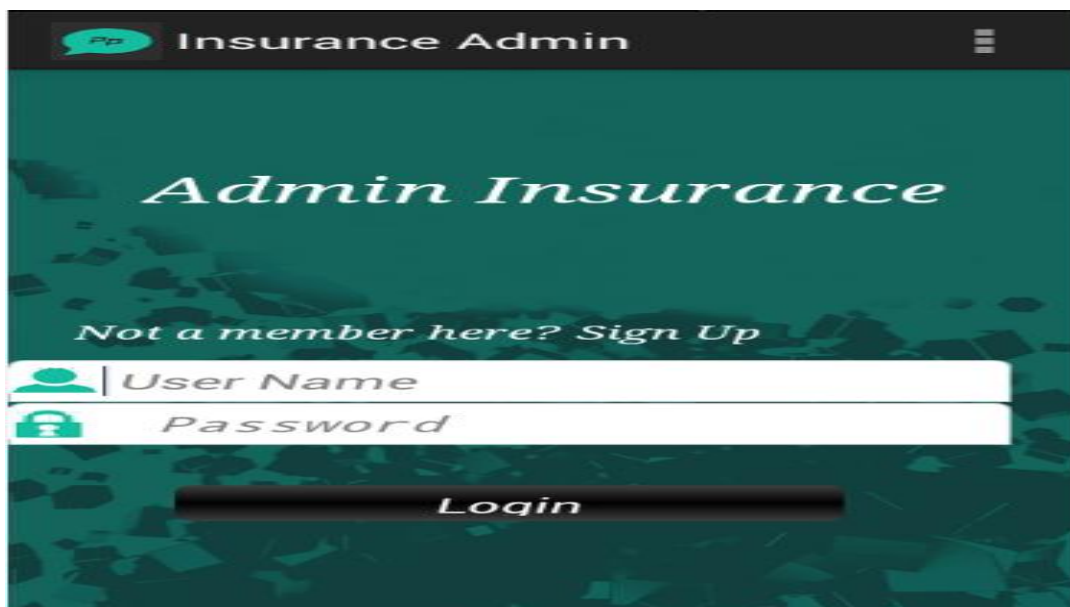


Figure 6.16: Insurance Administrator Login Screen

## 6.2.17 Insurance Administrator Operations:

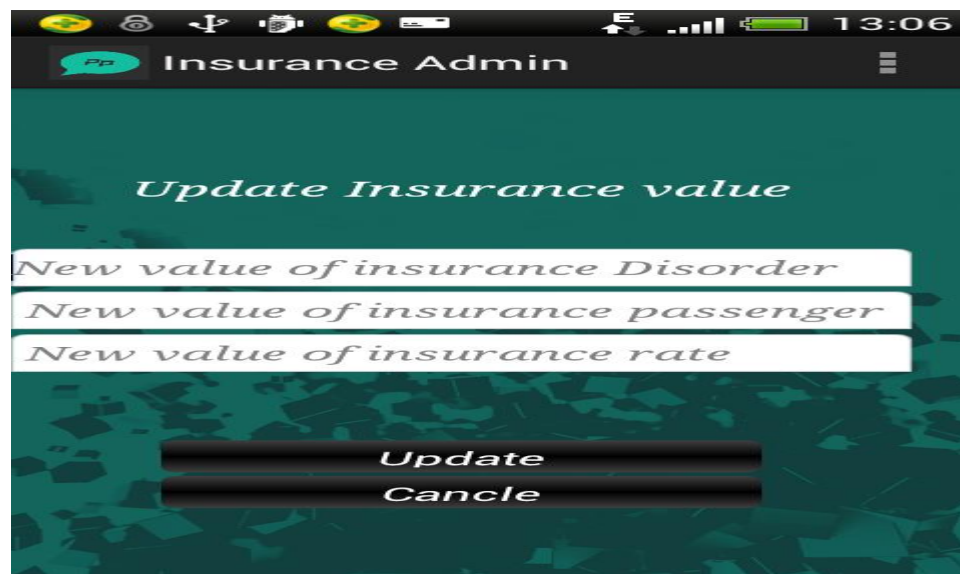
Figure 6.17 shows a screen that displays the operations that can be done by the administrator, which are update information, update insurance, and view cars picture.



Figuer 6.17: Insurance Administrator Operrations

### 6.2.18 Update Insurance Values:

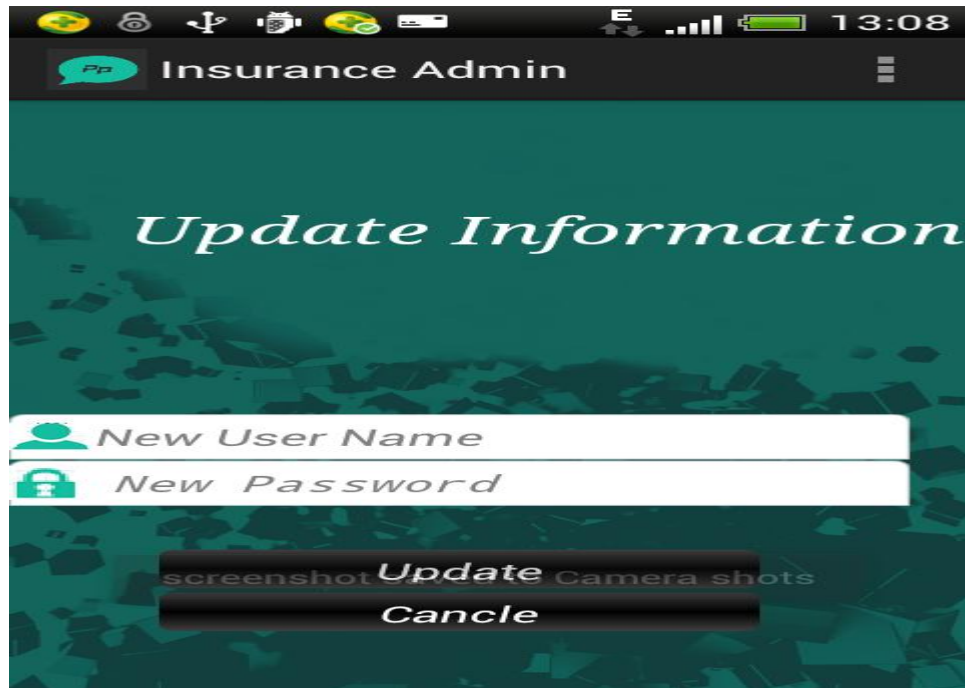
Through the screen shown in Figuer 6.18 insurance administrator can update the values used to calculate the premium by entering new values to the form and pressing update button or cacle this operation by pressing cacle button.



Figuer 6.18: Update Insurance Values

### 6.2.19 Update Administrator Information:

Through the screen shown in Figuer 6.19 the administrator can edit login information by entering new informations to the form and pressing update buttong or cacle this operation by pressing cacle button.

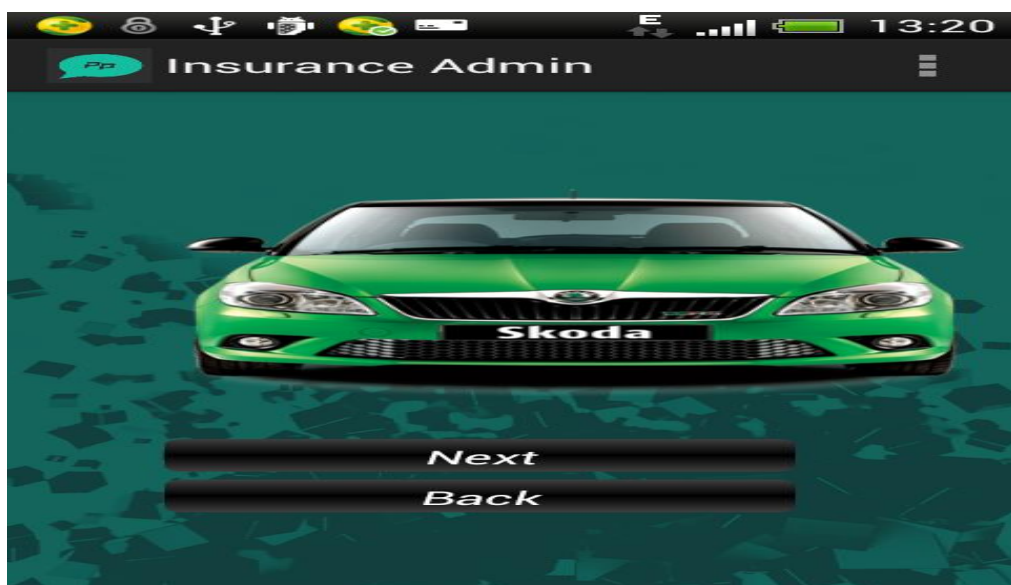


Figuer 6.19: Update Administrator Information

### 6.2.20 View Cars Images:

To complete insurance process car images From four directions will be displayed to The administrator to accept it or reject it. By pressing next button the next direction will be displayed and by pressing back button the previous direction will be displayed as show in Figuer 6.20.

When the last direction is shown, accept and reject buttons will appear. By pressing accept button the car is accepted to be insured and by pressing reject button the car is rejected as show in Figuer 6.21.



Figuer 6.20: View Car Images



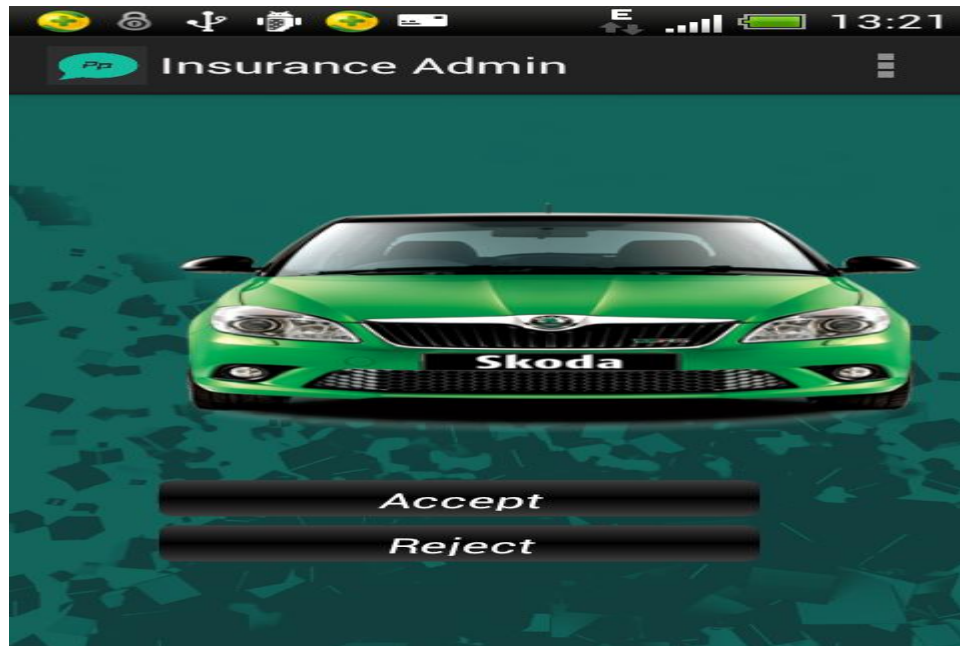


Figure 6.21: Accept or reject car

## 6.3 RESULTS

- SNS have been simulated using WCF technology.
- An android application has been developed using android OS to work as a POS system .The application provide a set of services which are:
  - Electricity purchasing.
  - Pay SUST student's fees.
  - Car insurance.
- An android application has been developed for Insurance administrator in insurance company to track the insurance process and to determine the insurance percentages.
- The implantation of security on the system decreased the system performance.
- System performance is affected by the Internet connection.

## 6.4 CONCLUSION

This chapter has discussed implementation steps and the results.

# **CHAPTER 7**

## **CONCLUSION AND RECOMMENDATIONS**

## **7.1 CONCLUSION**

At the end the project have been completed successfully to provide a dynamic POS application adding new services was not available in traditional POS systems with more user friendly interface to add a new dimension to the concept of POS systems in a very major way to open the door for spreading the concept to be used in developing more services to POS systems.

## **7.2 RECOMMENDATION**

To improve and develop this thesis therefore we recommend:

- Distribute the service among multiple servers to optimize the performance
- Add insurance for the internal components of the car.
- Add new services to the application.

## 7.3 REFERENCES

1. General Information About POS and cash register :

The small business depot , Point-Of-Sale A Beginners Guid to Computerized POS software 2005.

Erik-Jan Monshouwer / Raul Valverde , Architecture For Integration Of Point Of Sale Terminals With Financial Insttutions Through web Services 2011

[http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Cash\\_register.html](http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Cash_register.html)

<http://www.posmatic.com/point-of-sale/what-is-point-of-sale.php>

<http://www.consumer.ftc.gov/articles/0218-electronic-banking>

**Date: 1/3/2014**

**Time: 9:00 AM**

2. Information About Shopify POS:

<http://wemakewebsites.com/blog/using-shopify-point-of-sale-pos-in-the-uk>

<http://www.posoptions.com/pos-reviews/shopify-pos/>

<http://www.shopify.com/pos>

<http://www.merchantmaverick.com/reviews/shopify-pos-review/>

**Date: 5/4/2014**

**Time: 11:00 AM**

3. Information about paymentMax POS:

<http://www.merchantmaverick.com/reviews/paymentmax-processing-review/>

**Date: 5/4/2014**

**Time: 5:00 PM**

4. Information about GoPago POS:

<https://www.gopago.com/software/>

<https://gigaom.com/2012/04/03/gopagos-line-skipping-mobile-payment-system-launches-in-san-francisco/>

<http://www.7x7.com/tech-gadgets/qa-leo-rocco-creator-new-mobile-payments-app-gopago>

**Date: 7/4/2014**

**Time: 12:00 PM**

5. Information about unifidePOS:

<http://www.monroecs.com/posstandards.htm>

**Date: 16/4/2014**

**Time: 1:00 PM**

**6. Information about mobile POS:**

A Zebra Technologies White Paper , using mobile point of sale solutions to enhance the customer experience 2012.

**Date: 1/5/2014**

**Time: 3:00 PM**

**7. Advantages and disadvantages of web-based POS:**

<http://www.thebarrychamishwebsite.com/technology/pros-and-cons-of-web-based-point-of-sale-software/>

<http://www.pos.info/pros-cons-web-based-pos-systems/>

[www.lightspeedretail.com/cloud/retaileasy/2009/01/security-advantages-of-a-web-based-pos/](http://www.lightspeedretail.com/cloud/retaileasy/2009/01/security-advantages-of-a-web-based-pos/)

**Date: 10/5/2014**

**Time: 8:00 AM**

**8. information about POS component :**

<http://www.allbusiness.com/retail/10206845-1.html>

[http://www.ehow.com/list\\_6464069\\_list-components-pos-system.html](http://www.ehow.com/list_6464069_list-components-pos-system.html)

<http://www.retailsystems.com/retail-pos-hardware-basics.cfm>

**Date: 20/4/2014**

**Time: 10:00 AM**

**9. Information about Android Operating System:**

<http://androidqueries.com/what-advantages-android-operating-system-over-other-mobile-operating-systems-242.html>

**Date: 29/5/2014**

**Time: 12:00 PM**

**10. WCF service:**

<http://www.ijcsmc.com/docs/papers/April2013/V2I4201380.pdf>

[http://msdn.microsoft.com/en-us/library/ms731082\(v=vs.110\).aspx](http://msdn.microsoft.com/en-us/library/ms731082(v=vs.110).aspx)

<http://msdn.microsoft.com/en-us/library/ms731082.aspx>

**Date: 5/3/2014**

**Time: 10:00 AM**

**11. WCF and web service:**

<http://msdn.microsoft.com/en-us/library/bb310550.aspx>

<http://www.codeproject.com/Articles/139787/What-s-the-Difference-between-WCF-and-Web-Services>

**Date: 15/6/2014**

**Time: 2:00 PM**

12. UML and Enterprise Architect :

[http://sparxsystems.com/products/ea\\_editions.html](http://sparxsystems.com/products/ea_editions.html)

**Date: 8/6/2014**

**Time: 1:00 PM**

13. Information about Visual Studio:

<http://www.visualstudio.com/>

**Date: 1/4/2014**

**Time: 4:00 PM**

14. Information about SQL server:

<http://www.techopedia.com/definition/1243/sql-server>

**Date: 3/6/2014**

**Time: 3:00 PM**

15. Information about Eclipse :

<http://www.eclipse.org/>

**Date: 3/3/2014**

**Time: 12:00 PM**