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A mobile application for claims processing and analysis: a case study of motor insurance

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A MOBILE APPLICATION FOR CLAIMS PROCESSING AND ANALYSIS: A CASE STUDY OF MOTOR INSURANCE

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A dissertation submitted in partial fulfilment of the requirements for the Degree of Master of Science in Mobile Telecommunication and Innovation (MSc. MTI) at Strathmore University

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Declaration

I declare that the content in this work is my original research and has not been submitted before for the award of any degree or for any other academic purpose. Due acknowledgment has been made to any information that has been used within the dissertation from any other source.

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Dedication

I would like to dedicate this research to God, who has walked with me through my life's journey.

Acknowledgement

Firstly, my sincere appreciation goes to my supervisor, Prof. Ismail Ateya. I am grateful for his effort, input and crucial support that went into this research. I am grateful to iLab/Safaricom Academy and the support provided by the academic and non-academic staff.

I would also like to acknowledge my family and friends who have advised, supported and encouraged me as I carried out the research.

Abstract

Insurers experiencing higher than permissible loss ratios are sometimes victims of fraudulent claims filed by their customers. Insurance claim process can also be long and tedious for the insured parties, especially with insufficient evidence provided for investigation to the insurer. These are some of the concerns that the current insurers face since it affects their financial health in case they settle fraudulent claims. Claims management is therefore a major concern in the insurance industry since it is likely to impact on business performance. Insurance companies are therefore embracing new strategies in making processes and procedures more efficient in terms of time and costs. Most insurance company customers are also unaware of the process followed in case of an accident and the information they need to gather at the scene of the accident, to be presented as part of the accident report. This research sought to identify the current solutions employed by insurance companies and customers within the country in case of a motor accident; as well as review mobile architectures, models and systems developed by other researchers for motor insurance claims processing, and to develop a mobile application that resolves recognised issues. The study that took place included 97 respondents comprising of insurance company personnel that handle claims processing and motor insurance subscribers. The survey results indicated clear limitations and inaccuracies in the current claims management process followed by insurers in Kenya. As a result of these limitations, it was clear that there was need for a mobile application to initiate claims processing and have these filed claims easily accessed by the insurance companies. The mobile application that was proposed and developed as a result of this research was found to be a reliable tool that could be used by insurance customers especially for collecting more accurate data at the scene of a motor accident as well as for reporting to the insurance companies the accident details. The speed of reporting accident details to the insurance companies was found to be greatly improved as a result of using the mobile application since details of the accident could be sent even at the scene of the accident.

Keywords: Mobile Technology, Insurance Claims, Motor Insurance, Claims Analysis

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Abbreviations/Acronyms

3G	-	Third Generation
API	-	Application Program Interface
BPMN	-	Business Process Modelling Notation
CA	-	Communication Authority
CSS	-	Cascading Style Sheets
FSD	-	Financial Sector Deepening
GPS	-	Global Positioning System
GUI	-	Graphical User Interface
HTML	-	Hypertext Markup Language
IRA	-	Insurance Regulatory Authority
RBAC	-	Role Based Access Control
SMS	-	Short Message Service
UAP	-	Unified Analytics Platform
WSN	-	Web Services Notification

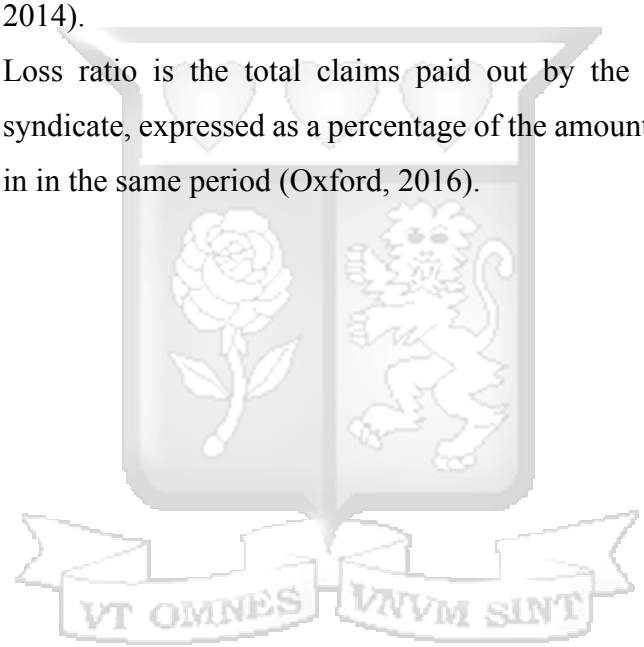
Definition of Terms

Android An embedded operating system for mobile devices that is based on the Linux open source platform and Oracle's Java and can run mobile applications (Jackson, 2012).

IBM Cognos A web-based, integrated business intelligence suite by IBM. It provides a toolset for reporting, analysis, score-carding, and monitoring of events and metrics (Manoria, 2012).

iOS An operating system developed by Apple for the iPhone, iPod Touch and iPad. It is derived from Mac OS X and has UNIX roots (Parsons & Oja, 2014).

Loss Ratio Loss ratio is the total claims paid out by the insurer, underwriting syndicate, expressed as a percentage of the amount of premiums coming in in the same period (Oxford, 2016).



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1 CHAPTER 1: INTRODUCTION

1.1 Background of the Study

According to Business Monitor International, motor insurance in Kenya is particularly well developed aided by its compulsory state, and with the number of vehicles on the road set to increase substantially it is one area where we expect to see particularly healthy growth (Business Monitor International, 2014). With the frequency of road accidents in Kenya, these insurance companies get to handle a lot of motor insurance claims from their policy holders. Many vehicle owners who have been in an accident have become disillusioned due to corruption and inefficiencies that occur in claims management processing (Kiana, 2010). This therefore affects the insurance customers that may or may not be compensated by the insurance company.

As required by IRA, a motor insurance holder is required to obtain specific details at the scene of an accident including: names and addresses of all drivers and passengers involved in the accident, registration numbers make and model of each vehicle involved in the accident, details of the driving license, insurance policy and certificate of the third party driver, and names and addresses of as many witnesses as possible (Insurance Regulation Authority, 2014). This information is therefore necessary across the board by all insurance companies to process motor insurance claims. Apart from this, the policy holder should contact the insurance company to notify them about loss and also contact the police. They are needed to present documents to the insurance company including: police abstract report, driver's license, and driver's statement of the loss to insurer (Insurance Regulation Authority, 2014).

The policy holder is then required to take the vehicle to a garage approved by the insurer for assessment and repairs and is required to present filled in claim forms with supporting documents to the insurer as soon as possible (Insurance Regulation Authority, 2014). This can be a difficult and inconveniencing process for the policy holder especially when they do not have knowledge of the whole process and requirements that would lead to compensation.

1.2 Problem Statement

Filing motor insurance claims involves submission of data by the insured party and this data is then reviewed and investigated by the insurance company, followed by remittance or denial of the claim by the insurer (BusinessDictionary.com, N.D.). The challenges faced during

motor insurance claims processing as reported by Insurance Regulation Authority of Kenya, include fraud which causes insurance companies great losses. Claims management is a major concern in the insurance industry since it is likely to impact on business performance. The strategies employed in insurance claims settlement are applying efficient processes, procedures and promptness (Insurance Regulatory Authority, 2015) .

With the continued increase in mobile penetration in Kenya, now at a level of 88.1 per cent (Communication Authority of Kenya, 2015), financial institutions, including insurance companies, have taken the opportunity to provide some of their services via mobile applications. This gives them a marketing platform and provides their customers with easier access to their services. The use of mobile phones to handle transactions improves the efficiency of service delivery by these institutions and gives them a good reputation in the market (American Telephone & Telegraph, 2009).

The National Transport and Safety Authority in Kenya reported that the economic cost of road crashes is 5.6% of the GDP 300 billion Kenya shillings annually (National Transport and Safety Authority , 2016). Therefore, vehicle owners should have a platform on which they can efficiently collect accurate accident data needed by insurance companies to handle their claims applications. The proposed smart-phone based mobile application will be used to collect this data with the aim of increasing efficiency and reducing fraud in motor insurance claims. The application will be used to improve the ease of the evaluation process to authenticate of the details of the claim.

Therefore, the main challenges faced by the insurance company and its customers while filing and investigating claims were; the insurance customers mostly do not know the data that needs to be captured at the scene of an accident, which would in turn affect the investigations done by the insurance company since some cases are not duly compensated due to lack of sufficient data collected and submitted as part of the accident report.

1.3 Research Objectives

i. To determine the accuracy of data that is collected for claims processing.
ii. To identify the challenges currently faced in motor claims management.
iii. To review existing architecture, models, frameworks, designs and solutions used.
iv. To design and develop a mobile application.
v. To test the mobile application.

1.4 Research Questions

i. What is the accurate data necessary for processing claims?
ii. What are some of the challenges faced in processing motor claims?
iii. What are the existing architecture, models, frameworks, designs and solutions used?
iv. How can the mobile application be designed and developed?
v. How will the mobile application be tested?

1.5 Justification

Motor insurance policy holders have a general distrust of insurance companies and often opt to settle accident costs using their own finances regardless of the fact that they are entitled to claim cover from their insurance companies. This is often caused by the time taken to process filed claims, fraud cases and experiences of those whose claims were denied. In many cases, claims denial is caused by the lack of sufficient or accurate information and evidence presented to the insurance company about the details of the accident. The proposed mobile application seeks to provide vehicle owners a simple, less time consuming and accurate way of collecting this data need and conveying it to the user's insurance company. Therefore, this application is aimed at providing a convenient solution for the policy holder and reducing fraudulent motor claims for insurance companies.

1.6 Scope

This research was carried out specifically in the Nairobi region. The research was also limited to cover vehicle to vehicle accident claims processing. The provided easy access to the insurance company staff and their customers who reside within Nairobi.

At the end of the research duration, the deliverables expected were as follows:

i. A functional motor insurance claims mobile application.
ii. A functional web backend for insurance companies to access filed claims and claims analysis.
iii. A research report.

1.7 Limitations

Kenya has 49 registered insurance companies (Insurance Regulatory Authority of Kenya, 2013). The research will not focus on a particular or single insurance companies, since the solution will be accessible to any insurance company that would like to adopt it.

The mobile application was also built specifically for the Android platform and not iOS, Windows and Blackberry platforms. This meant that the application could only be used by motor insurance policy holders with Android devices.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Insurance claims are initiated by the insured party based on the accident/incidents that occurred. Since the process is similar for the different insurance products with only slight variations, this chapter contains an analysis of the existing claims processing in general and analysis architecture, models and frameworks as well as mention existing literature on the subject.

With 49 licensed insurance companies in Kenya - according to the Insurance Regulatory Authority (Insurance Regulatory Authority of Kenya, 2013), new and innovative avenues are being adapted to attract and retain customers are being adapted by these companies to remain competitive in the growing market. Insurance Regulatory Authority reported a growth in the industry's insurance premiums by 16.4% during the first quarter of 2015 (Insurance Regulatory Authority, 2015). The market growth poses additional challenges such us ensuring insurance claims processing remains efficient as well as profitable to the companies. This calls for additional avenues in processing claims as well as easier, faster reporting of the claims process.

In Kenya, though the volume of policy fraud has not been quantified, it had the highest estimated percentage of fraudulent policies and claims as compared to Tanzania and Uganda reported in 2014 (Klynveld Peat Marwick Goerdeler, 2015). In 2015, Insurance Regulatory Authority Insurance Fraud Investigation Unit (IFIU) reported fraud 26 cases with a total amount of KES 259.71 million, during the period of 1st January to 31st March 2015 only (Insurance Regulatory Authority, 2015). One of the major contributions to fraud is lack of proper data collected and investigations carried out after an accident occurs.

The adoption of mobile apps in the insurance industry has been growing at an encouraging rate. In mature markets such as American and European markets, it has been in existence for a while but they are just making their appearance in emerging markets especially those in Africa. The introduction of mobile apps in the motor insurance industry is meant to help insurance companies save money, protect against fraud and enable clients have a better experience while filing insurance claims.

2.1.1 Insurance in Kenya

For motor vehicles in Kenya, an insurance cover is mandatory and is regulated by the Insurance Act, Laws of Kenya, Chapter 487 (Insurance Act Chapter 487, 2012). As stated in the law, it is a legal offence to be found driving a car without a third party insurance cover. In

this case, third party refers to a person who suffers property damage or loss or death or bodily injury as a result caused by someone else's car. Motor insurance is meant to protect the car owner by covering them against loss or damage due to theft, accidental fires, and accidents and with regards to third party issues like property loss or damage, bodily harm/injury and death. The main players in the Kenyan insurance industry are insurance companies, reinsurance companies, intermediaries such as insurance brokers and insurance agents, risk managers or loss adjusters and other service providers (Insurance Regulatory Authority, 2010).

Table 2.1: Current Use of Financial Products by Year (Financial Sector Deepening, 2013)

	Number of Subscribers in Millions		
Product	2006	2009	2013
Insurance and pensions			
Car insurance	1.9	1.1	2.7
House or building insurance	0.5	0.2	0.5
Private medical insurance	-	0.7	1.5
Life insurance	1.1	1.0	1.4
NHIF	-	4.3	15.6
Education policy	1.0	0.6	1.2
Retirement annuity	1.4	1.2	2.6
NSSF	2.8	2.9	9.6

According to the Insurance Industry Annual report 2015, the penetration of insurance in Kenya is estimated at 2.92%, which is relatively high by regional standards. Internet penetration stood at 38.3% in 2014 (Association of Kenya Insurers, 2015). There are currently 49 registered insurance companies and the most popular insurance bought is the motor vehicle insurance cover. The leading 10 insurers in Kenya handle 70% of the motor business. Almost 41% of the non-life insurance market is for car insurance: 24% is commercial life insurance and 17% is private car insurance (Klynveld Peat Marwick Goerdeler, 2013). This shows that motor insurance is a major business in the country leading insurers to ensure top profits for the company. The table above illustrates the increase in use of car insurance in Kenya from 2006 to 2013 (Table 2.1).

2.2 Insurance and Mobile Internet Penetration in Kenya

There is an increase in use of mobile phones in Kenya as reported in the FinAccess Report where mobile phones in Kenya increased from 4.7 million to 12.9 million between 2006 and 2013. It is also of equal importance to note that there was also an increase in use of mobile

internet. As in the figure below (Figure 2.1), more people use internet on their mobile phones than any other devices (65%).

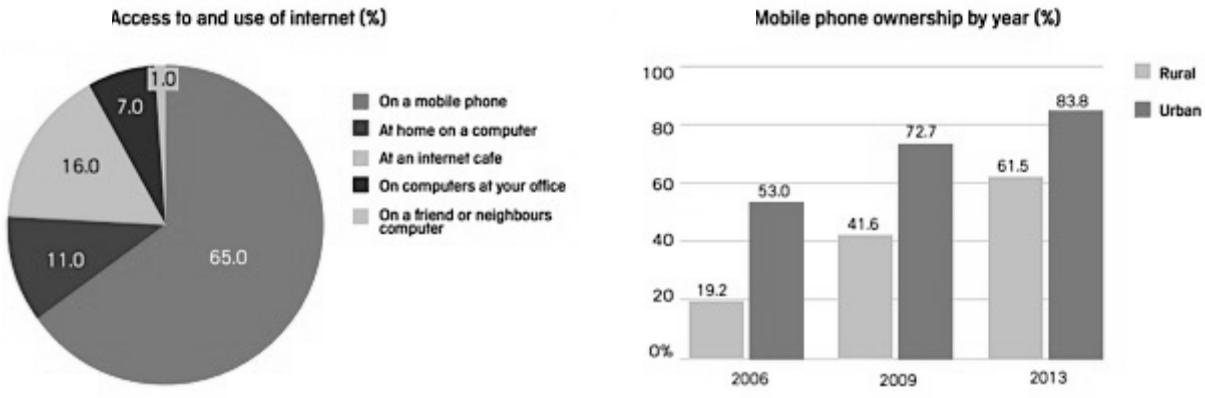


Figure 2.1 Mobile Ownership and Internet Usage Statistics in Kenya (Financial Sector Deepening, 2013)

The current market of insurance services largely consists of the more educated people in Kenya. FinAccess 2013 Report showed the highest levels of use of insurance products are in those with tertiary education over 6 in 10 (Figure 2.2) of them have an insurance product (Financial Sector Deepening, 2013).

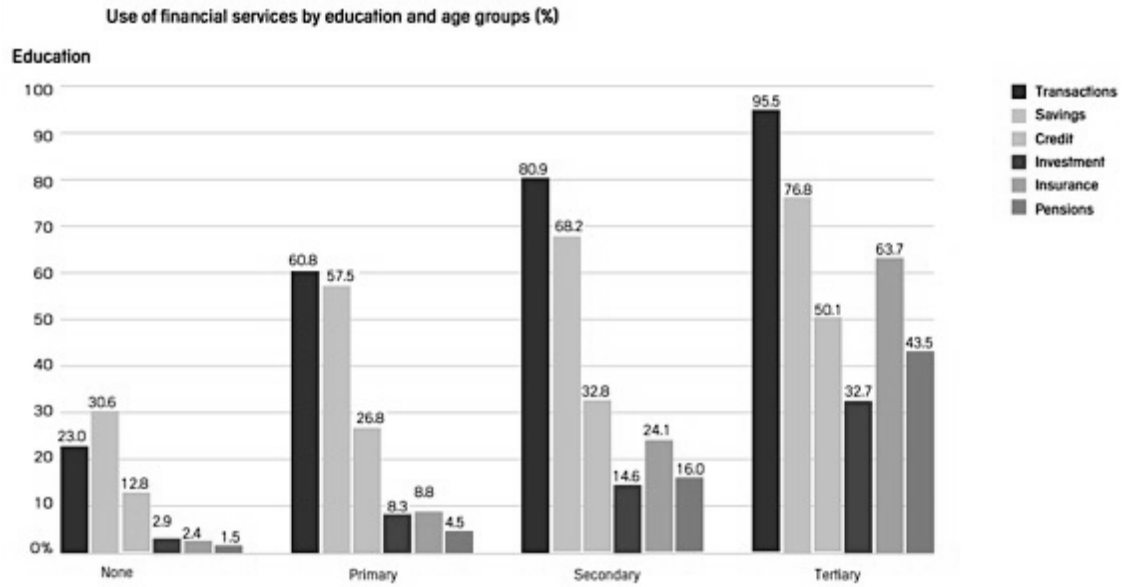


Figure 2.2 Use of financial Services by Education and Age Groups

This information provides useful insight on the target market, which is insurance policy holders. The information provided shows that most insurance policy holders are educated and thus can be able to use a mobile application for filing insurance claims. It also shows that

mobile phone owners use internet on their mobile phone thus giving them the ability to submit claims using their mobile phones.

2.3 Insurance Company Profits

According to a survey carried out by Interim Partners', it was found that "a third (33%) of senior Insurance executives surveyed said that spending more on technology would boost profitability". The same survey reported that the use of technologies increases efficiency and provides a wider range for information analysis in terms of product pricing and strategy (Interim Partners, 2015). The mentioned survey was carried out in the western markets where technology in insurance services has been in use for quite a while, and more specifically the use of mobile and web applications in insurance processes such as underwriting and claims processing. The analysis of the data gathered through the applications has a potential of guiding business decisions made by the insurance companies which would lead to better service delivery and higher profits.

In Kenya, Insurance Regulatory Authority data released data in 2014 showing some some insurance companies, such as CIC and AAR, reported a total underwriting loss of Sh480.2 million in the period. This type of loss means that the insurance companies paid out more in claims and expenses than the premiums collected during the respective period (Herbling, 2014). The loss was attributed to price mismatch and inadequate management of claims to ensure the claims were not fraudulent or exaggerated. With constant improvement in mobile technology and data networks, mobile applications should be adopted by insurance companies to save money, mitigate risk and increase productivity (Frost and Sullivan, 2011). Mobile technology has a high potential of improving Insurance processes such as claims, underwriting and analysis of data gathered from the applications to improve company performance.

2.4 Insurance Claims Analysis

Most insurance companies in Kenya follow the same process when handling filed claims sometimes with slight variations to the process. The process (Figure 2.3) below is an example of the process followed;

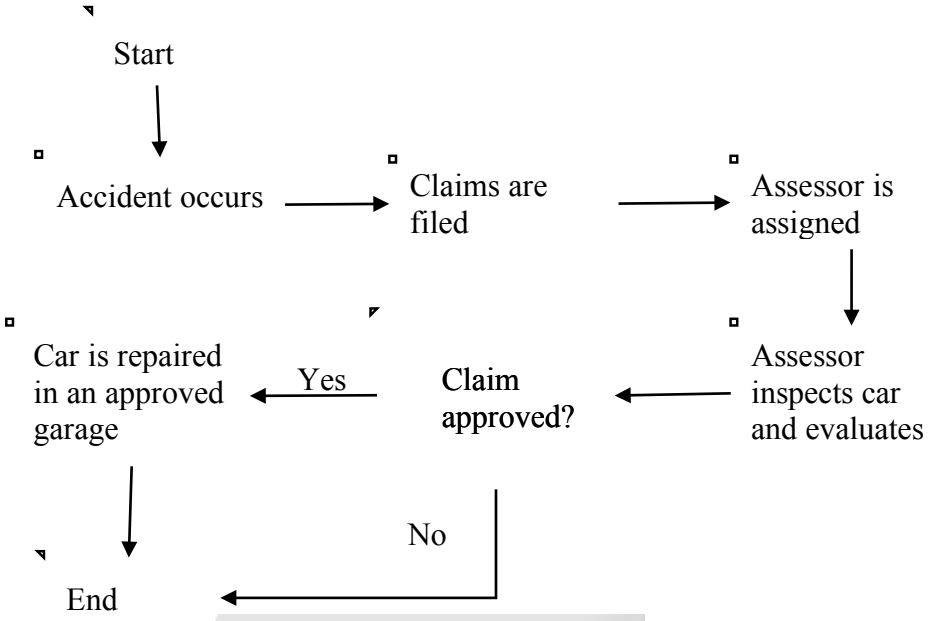
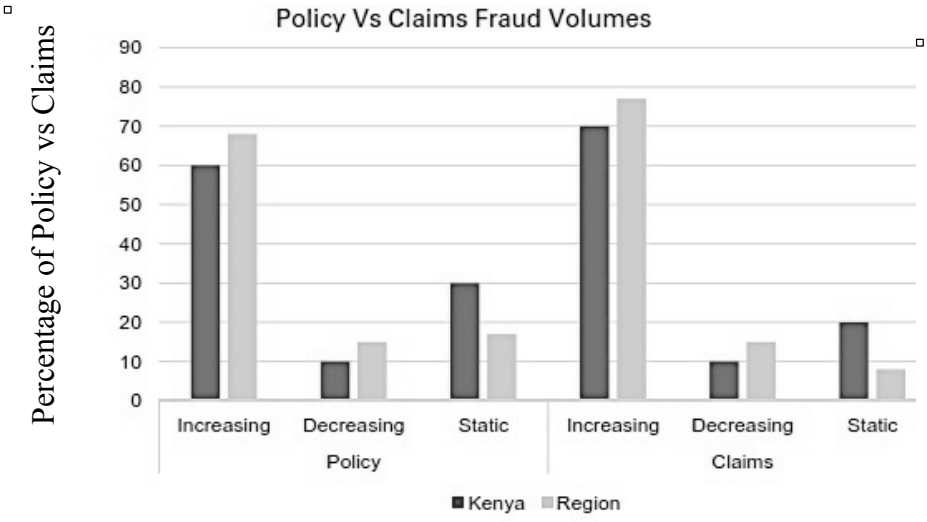


Figure 2.3 Motor Insurance Claims Process

Insurance analytics promises to deliver information which is vital in making well-informed profitable decisions. Although business decisions still need some amount of creativity and intuition, it is equally important to have all the facts at hand to make the best decisions. Analytics provides the facts needed to make key decisions especially on new strategies for products and marketing.

2.5 Insurance Claims Fraud



Rate in percentage of policy and claims volumes in Kenya compared to the East African Regions

Figure 2.4 Policy vs. Claims Fraud in East Africa (Klynveld Peat Marwick Goerdeler, 2015)

Kenya was reported to have the lowest scores for increased policy fraud but was well positioned on increased claims fraud (Figure 2.4 and Table 2.2) with the highest percentage (9%) of fraudulent claims regionally (Klynveld Peat Marwick Goerdeler, 2015). The same report by Klynveld Peat Marwick Goerdeler (KPMG), reported that "claims incurred rates increase as Gross Written Premium (GWP) increases and the largest class of business by both GWP and claims losses in all countries is motor. Due to inadequate risk management and governance, organisations are suffering from price undercutting; fraud; training gaps; a shortage of skill in actuarial science and risk; a need for more professionalism; and limited collaboration" (Klynveld Peat Marwick Goerdeler, 2015, p. 3).

Table 2.2: East Africa Insurance Fraud Survey (Klynveld Peat Marwick Goerdeler, 2015)

Country	Volume of Fraudulent Policies Sold	Volume of Fraudulent Claims Detected	% of policies Believed to be Fraudulent	% of claims Believed to be Fraudulent
Kenya	Unknown	18	3.8%	9%
Uganda	1	8	1.3%	4.61%
Tanzania	20	108	2.5%	6.67%
Rwanda	Unknown	Unknown	0.7%	5.91%

The impact of this increase in fraudulent claims, has been felt by the policy holders since they have been subjected to increasing insurance premiums by the insurer. With the growing economic and social middle class, insurers will be expected to reduce fraud and introduce innovative products with improved customer service and optimised technology (Klynveld Peat Marwick Goerdeler, 2015). This data is vital when considering the design of the motor insurance claim mobile application, since it offers insight into the challenges faces by insurers and policy holders. The mobile application design will therefore be geared towards reducing motor claims fraud.

2.6 N-tier Architecture Model

The use of N-tier architectural system has greatly improved fault tolerance, scalability and reliability of applications and this has architecture has become the most widely used. The most commonly used architecture in mobile and web applications in the 3 tier architecture

which consists of storage, business logic and presentation of data to the client (B'Far, 2005). These tiers are represented in the provided diagram (Figure 2.5) and are represented by the hardware used in such a hierarchy, especially in the case of mobile applications. These make up the 3 tiers: Presentation Tier, the Application Tier and the Data Tier. This layering is accomplished at the server and the client basically has no change. The Presentation Tier occupies the top level and displays information related to services available on a client device, such as a mobile phone and a desktop. This tier communicates with other tiers via a network. The application Tier can also be referred to as the middle tier, logic tier, business logic or logic tier - this is because the logic and handled in this tier. Its role is to control application functionality by performing detailed processing. The last tier is the Data Tier which houses database servers where information is stored and retrieved. The data in this tier is kept independent of application servers or business logic.

The researcher intended to use the 3 tier architecture to implement the claims filing and analysis mobile application. This is because the architecture is well suited building scalable and reliable systems. With improvement of internet infrastructure and mobile data 3G services, thus improving the transmission of data wirelessly, the three tier architecture will give the best experience for system users.

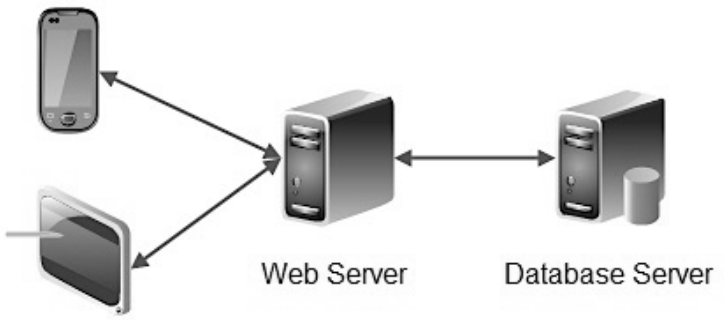


Figure 2.5 Three tier Architecture (Jenkov, 2014)

2.7 Model-View-Control Architecture

The Model-View-Control (MVC) pattern is mainly used in interactive applications with the purpose of enabling easy change of the user interface. The diagram (Figure 2.6) demonstrates standard MVC architecture interactions. This architecture is commonly used in development of mobile and web applications, though it is more common for some platforms/frameworks compared to others such as, iOS, Yii and many more. It has also been adapted by developers in some platforms that do not traditionally use the architecture.

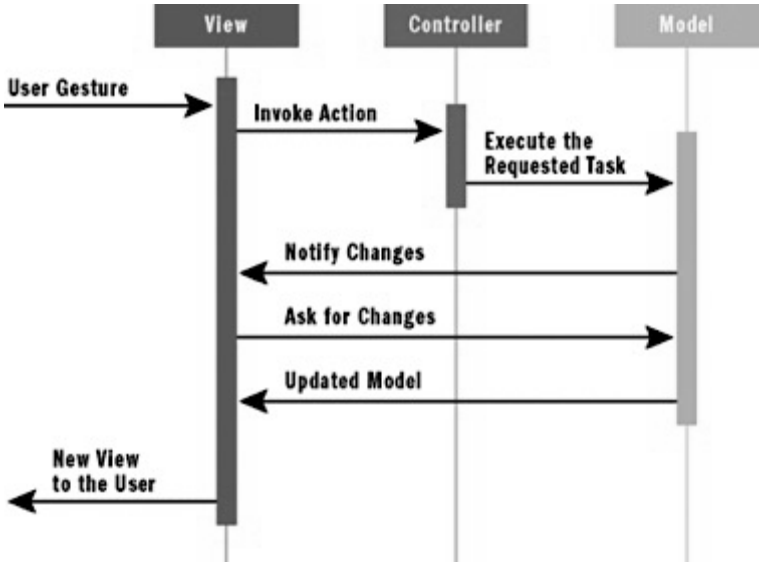


Figure 2.6 Standard MVC Interaction (Tamada, 2009)

The model is a class or a set of classes to contain data as well as functions that operate on the data. The view is the user interface and is the part of the application that the user interacts with. Therefore, the graphics, text boxes and so on – found on the view, present the data from the model. The controller contains all the logic that determines what the view displays and is contains functions that instruct to model to change based on input from the user (Alessi, 2013).

The researcher used the MVC model in development of the claims processing mobile app, specifically on the web backend. MVC model simplifies the use of classes in development to handle specific functions within the application.

2.8 Claims Management Business Process

The claims management business process is mostly similar for across the various insurance companies. Baecker & Bereuter (2010) documented an overview the "as-is" claims management process implemented by most insurers today. They made use of Business Process Modelling Notation (BPMN) as a graphical representation (Figure 2.7) of the claims management process and to simplify the diagram, it only shows the customer process and the process of the insurer. The customer process starts with the occurrence of a car accident, then after some time, the insurer learns gets the accident details through various channels such as a manually filled form, phone call, or submission of details on a web back end. The accident details and policy details are then submitted as part of the loss report and after evaluation, the insurer gathers further information, such as the assessor's report and police abstract and further

details to clarify the question of guilt. Finally, the claim is settled and, if applicable, a payment is issued (Baecker & Bereuter, Technology-Based Industrialization of Claims Management in Motor Insurance, 2010).

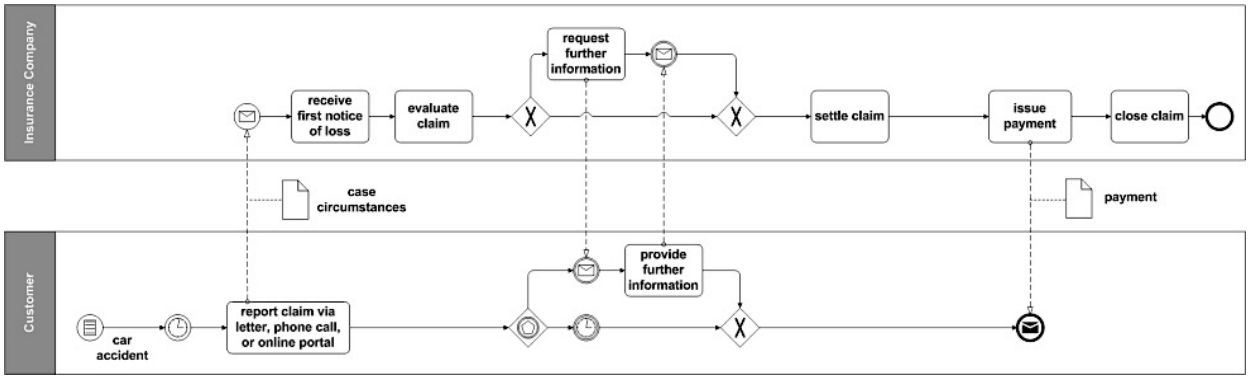


Figure 2.7 Claims Management Business Process (Baecker & Bereuter, Technology-Based Industrialization of Claims Management in Motor Insurance, 2010)

In Kenya, the customer submits the accident details by filling in a form that is manually delivered to the insurance company along with any relevant information. The researcher is seeking to leverage the smart phone features, making using of device capabilities such as the device camera, GPS location and mobile data (2.5G, 3G or 4G) to simplify the process of filing claims.

2.9 Unified Analytics Platform Architecture

Unified Analytics Platform (UAP) architecture, mostly focuses on simplifying the process of combining data from various source to provide "unified" real-time reports. This architecture takes into account the following;

i. Data is gathered in various formats such as text, audio, video and so on.
ii. Data is also collected from heterogeneous sources, such as social media, mobile, cloud and so on.
iii. This data can be structured, semi-structured or unstructured.
iv. And the data is collected in real-time or near real-time.

This causes a gap since various stakeholders are unable to access this important data from a single platform the information since there is a challenge integrating the various data sources. Unified Analytics Platform (UAP), is an architecture that combines this data and presents descriptive, predictive and prescriptive analytics (Serendio, 2015).

The diagram below (Figure 2.8) illustrates the Unified Analytics Platform architecture applied to an insurance claims analytics system. This is an important concept since it offers full fidelity analytics and provides access to stakeholders and management within the companies to relevant information to help improve their service.

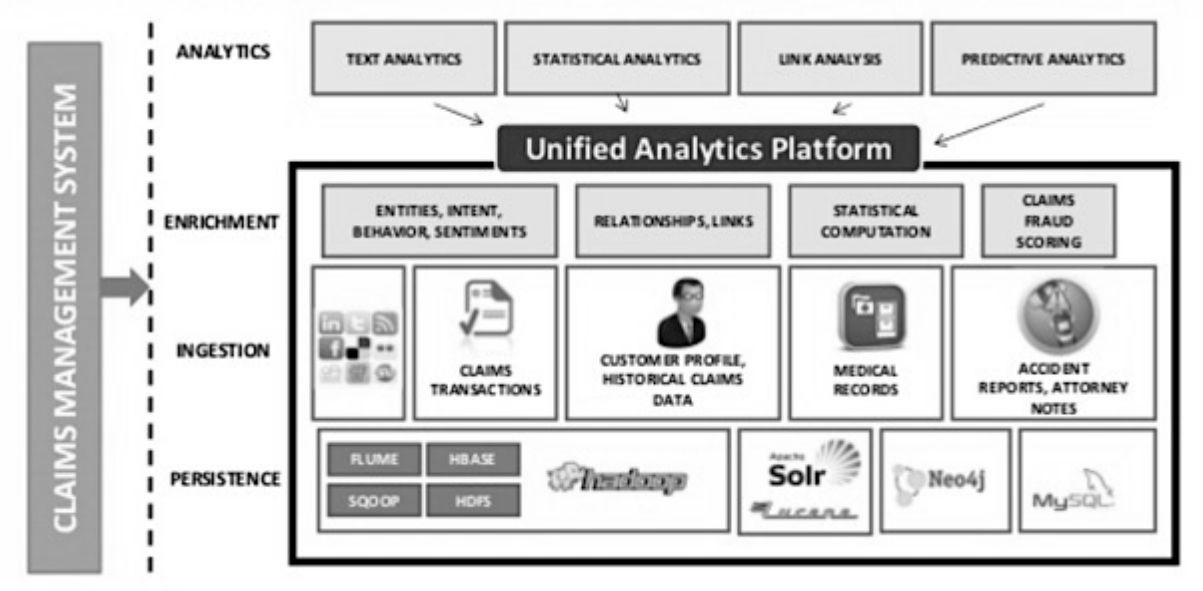


Figure 2.8 Insurance Claims Analytics (Serendio, 2015)

2.10 Claim Clarity Architecture

ClaimClarity is a system that was developed by Acrometis to provide end-to-end claims processing for insurers, and is used once the claim has been filed. The filed claims are processed on a single repository and at every step of the process, the relevant process details are captured and time stamped. This system is delivered as a Software as a Service (SaaS) solution which combines the critical elements of a claims operation into one solution. The system's core is referred to as CLAIMExpert and it is described as a comprehensive claim processing and claims management system. It is a "rule-driven engine that automatically routes electronic claim files and related notes, schedules and executes tasks, flags priorities and anomalies, communicates with vendors, and pays medical bills" (Acrometis, 2014). This system was built with the intention of improving the business process to increase speed and accuracy.

The claims data is input into the system when a claim has been filed, and the system provides updates to both the administration and external partners. The claimant's documents are processed and the system is maintained by Acrometis. The adjusters also have access to CLAIMExpert from any web interface, thus allowing them to access the system remotely. CLAIMExpert also provides data analytics to provide insight to improve efficiency, reduce costs and time taken to process claims. Acrometis' solution is also customizable according to client requirements and they provide updates to their system (Acrometis, 2014). The diagram below (Figure 2.9) illustrates the architecture of the Claim Clarity system.

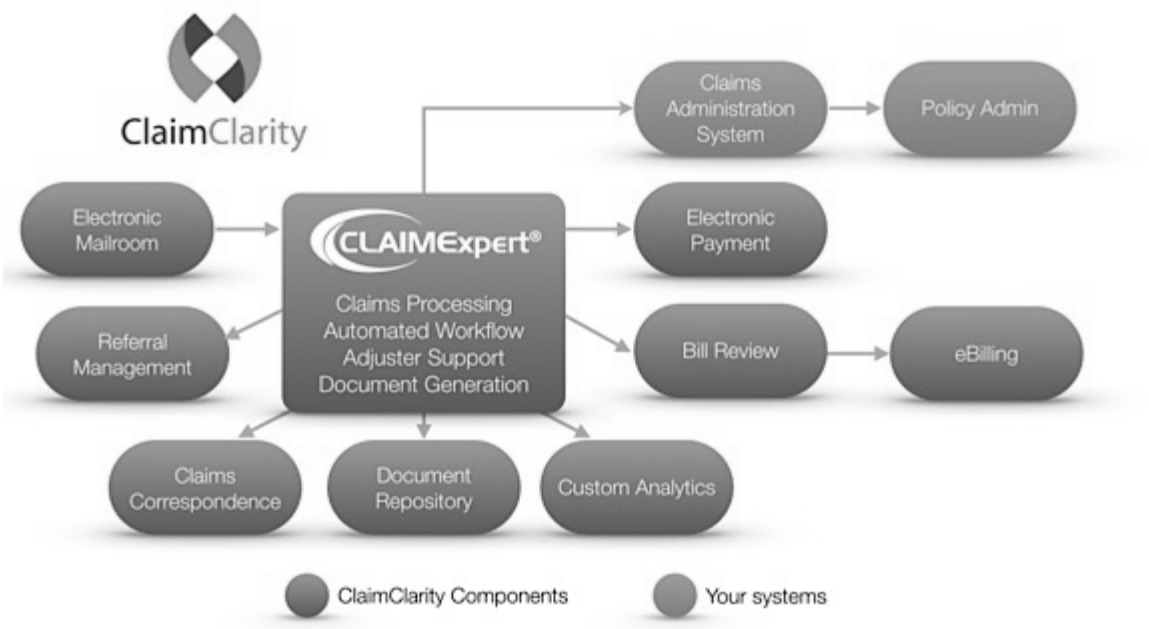


Figure 2.9 Claim Clarity Architecture (Yu, Mylopoulos, & Lesperance, 1996)

2.11 SAS Insurance Analytics Architecture

SAS Insurance Analytics Architecture is a solution that was developed by Statistical Analysis System (SAS) company. This architecture offers an insurance data model, a data management module which has a GUI and a web-based reporting and business intelligence tool. The architecture was built to provide insurance businesses with a complete data analysis tool with multiple operational systems including policy, claims, and billing. This is meant to guide businesses to make well-informed decisions based on consistent, complete and accurate data. Since reporting is web-based, the reports easy to access to managers and business analysts. This type of system prevents use of redundant systems by a single company and reduces risks and cost incurred when integrating different systems. The diagrams below (Figure

2.10) illustrate part of the implementation of the SAS insurance data model (Statistical Analysis System Institute, 2011).

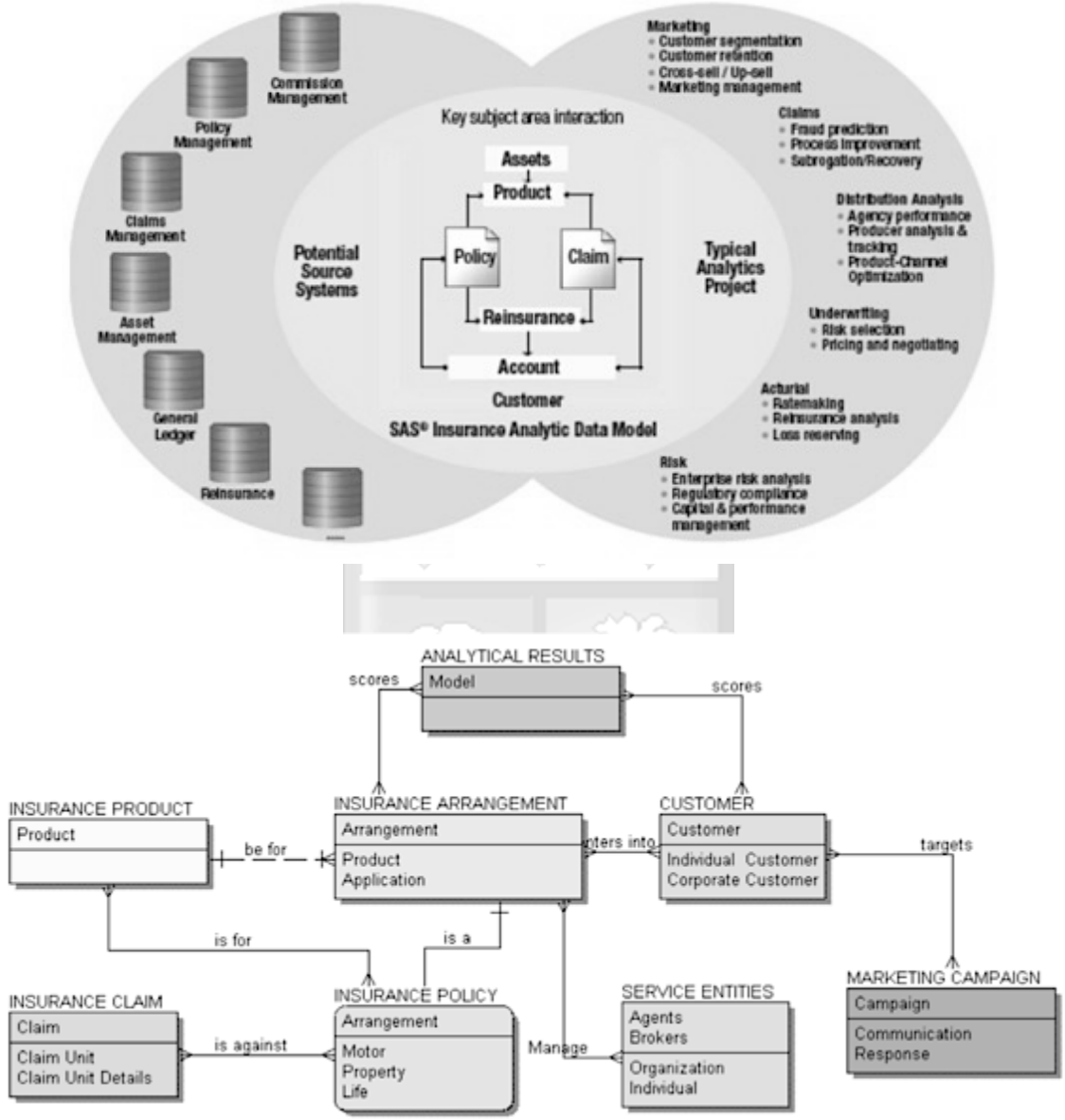


Figure 2.10 Part of the SAS Insurance Data Model (Statistical Analysis System Institute, 2011)

A sample of the reports that this architecture gives is provided in the figure below (Figure 2.11). These reports contain graphical data reports with configurable queries as well as filters to provide specific reports.

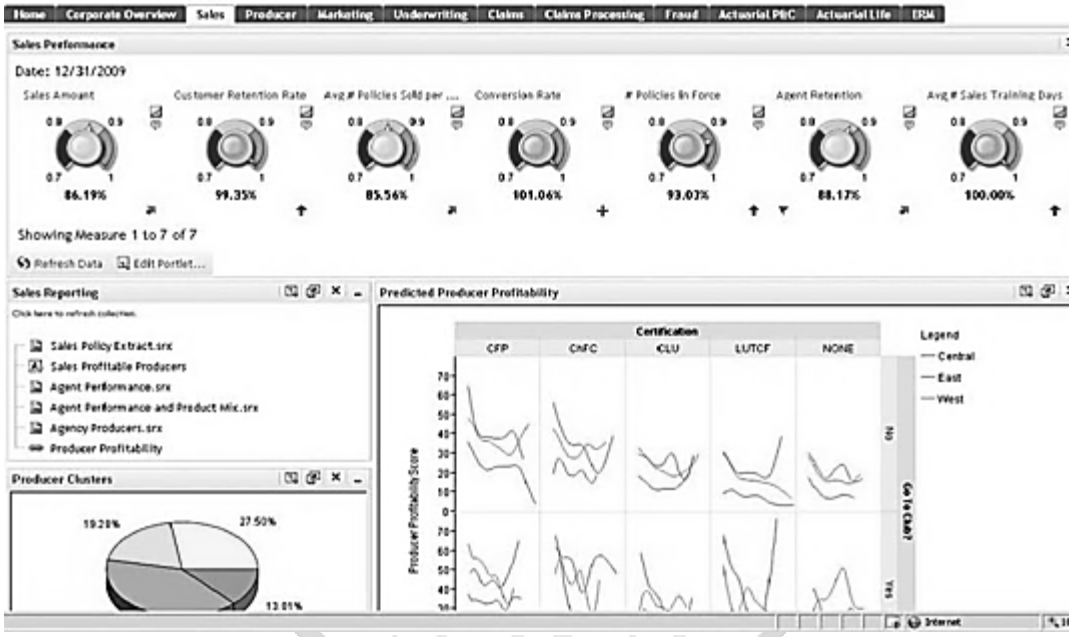


Figure 2.11 SAS Insurance Data Model Analysis Reports (Statistical Analysis System Institute, 2011)

2.12 NTT Data's Insurance Reporting Tool

The NTT (Nippon Telegraph and Telephone) Data's Insurance Reporting Tool is similar to the SAS Insurance Analytics Architecture and it was developed to give key company decision–makers the ability to analyse processed information. This product was integrated with IBM Cognos Analytics software. The Insurance Reporting Tool gives insurers a GUI on which they can view performance across Gross Written Premium (GWP), Budgeted GWP, Renewed GWP, Expiring GWP, Expiring Count, Losses Paid, Large Claims Count and so on. These performance reports are available across geographies, business units, policy types and for selected periods of time. These reports are presented in tabular and graphical formats which can be exported as portable formats such as PDF, Excel and HTML (Nippon Telegraph and Telephone Data, N.D.). The diagram below (Figure 2.12) illustrates the architecture of the NTT Data's Insurance Reporting tool and it consists of several components as seen in the diagram including the user interface that displays the report analysis results, data sources such as claims, policy and more, the reporting tool which consists of the IMB Cognos tool and external systems.

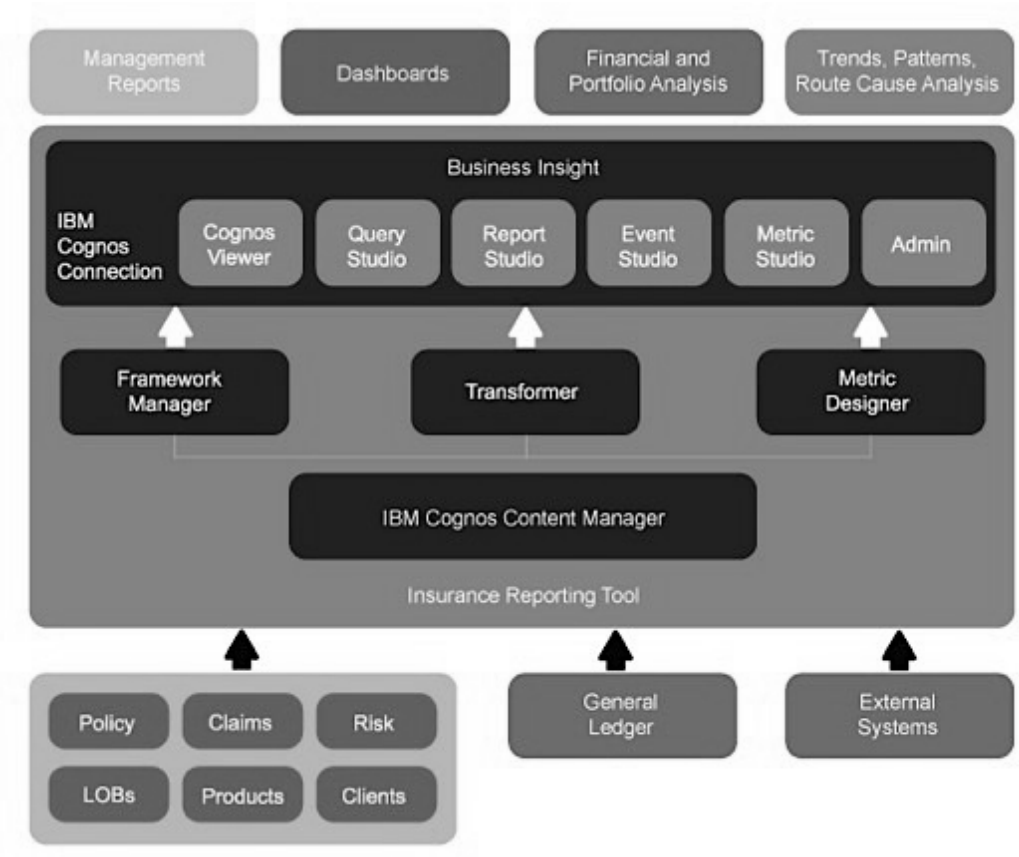


Figure 2.12 NTT Insurance Reporting Tool Architecture (Nippon Telegraph and Telephone Data, N.D.)

2.13 Mobile Claims Assistant: A Technical Integration between Smartphones and Claims Management Enterprise Systems

Based on a quantitative customer survey carried out in Zurich, the results indicated that customers' high intention to use smartphones in the aftermath of a car accident, while results from a qualitative user study showed a statistically significant increase of customers' trust in the insurer after using an insurance claim processing application developed by a researcher named 'Mobile Claims Assistant' (Baecker & Ackermann, Mobile Claims Management: Practical Implications and Recommendations, 2011). From the research, it was found that the insurance claims mobile applications in the currently available on the market had not been technically integrated with the existing claims management enterprise systems. The lack of integration forms a disconnect between the mobile apps and the insurers' claims system thus preventing the insurers from leveraging the full potential of insurance claims mobile

applications. This affects the process efficiency, data accuracy, and business partner integration (Baecker & Bereuter, Technology-Based Industrialization of Claims Management in Motor Insurance, 2010). The product of the research by Baecker & Ackermann (2011) was a dedicated integration architecture that connects smartphones with claims management enterprise systems. As illustrated in the diagram (Figure 2.13), the smartphone is used to submit a loss report to the claims management enterprise system via an integration architecture.

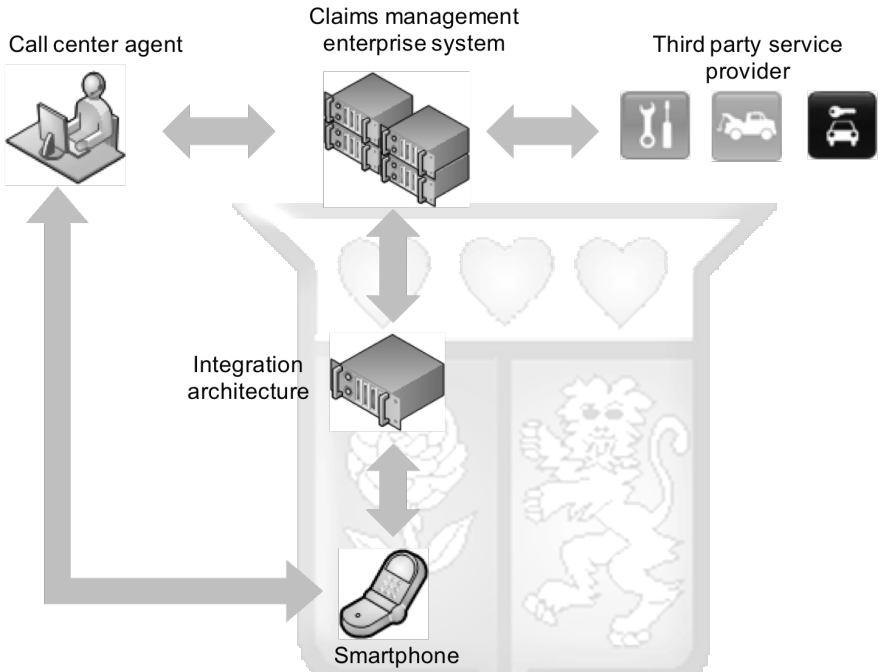


Figure 2.13 Application Scenario (Baecker & Ackermann, Mobile Claims Management: Practical Implications and Recommendations, 2011)

Baecker & Ackermann (2011) made provision for urgent cases where the customers could make an emergency call and submit their location details and their personal data. Apart from the accident details that would be captured, the loss report could be enriched with additional information such as pictures of the accident scene. Their solution also offered location based services such as requesting for a tower and getting directions to the nearest authorised garage. The customers could also access helpful information such as, the customer's eligibility to a get a rental car and arrival time of a requested tow truck. The insurer, is able to access and review the transmitted information from the customer such as accident details, pictures and also crash sensor data in the claims management enterprise system. This solution was developed for multiple smartphone platforms; Android, Blackberry and iOS. To connect

the various mobile application platforms with the commercial SAP system, a service-oriented integration architecture was developed as is on (Figure 2.14). Baecker & Ackermann (2011) reportedly made the architecture using "a set of Enterprise Java Beans components, which are deployed on an SAP NetWeaver web application server and offer their functionality as Web Services Architecture (Baecker & Ackermann, Mobile Claims Management: Practical Implications and Recommendations, 2011).

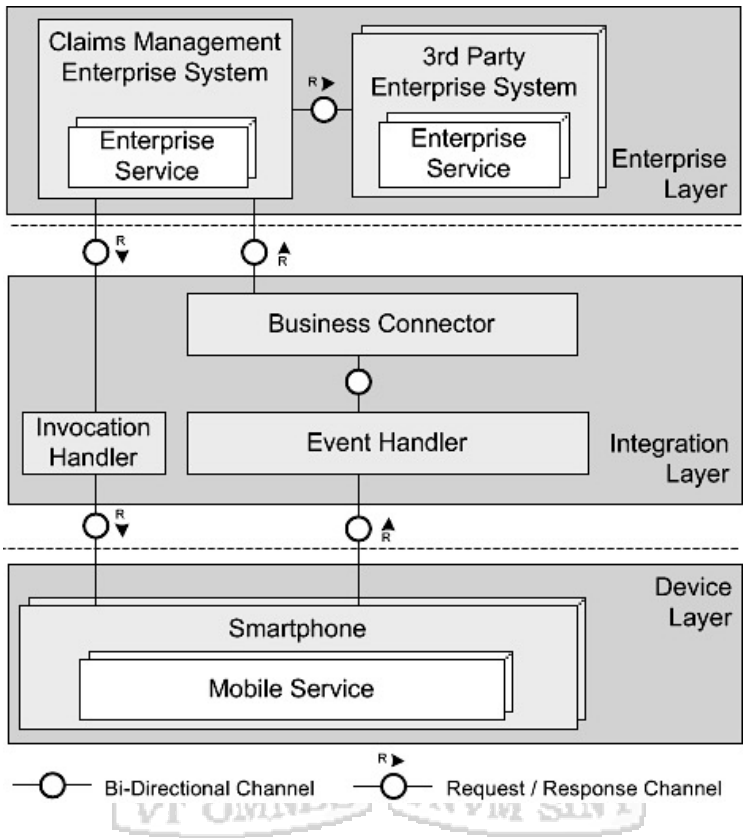


Figure 2.14 Service-Oriented Integration Architecture (Baecker & Ackermann, Mobile Claims Management: Practical Implications and Recommendations, 2011)

The three components in the integration layer connect the device layer with the enterprise layer. The Event Handler component implements the OASIS Web Services Notification (WSN) standard which was used to broadcast device-level events (Graham, Hull, & Murray, 2006). The Business Connector enables uniform and the Invocation Handler allows claims management enterprise systems to invoke mobile services offered by smartphones (Baecker & Ackermann, Mobile Claims Management: Practical Implications and Recommendations, 2011).

2.14 Existing Motor Insurance Claims Mobile Applications

i. Report AXA CS Motor Claim

The Report AXA CS Motor Claim mobile application was developed by AXA UK for its customers. The application allows the user to enter the accidents details in text form and pictures and is purely built for submitting claims. This application was specifically built for multiple platforms; Android and iOS. The insurer's main aim was to reduce the time taken to submit the file the claim from the time of the accident since it is crucial in gathering accurate information and make it easier to investigate the accident circumstances. The customer types in crucial claims related data which is sent to the insurer in real time. This data is sent in the form of an email to the insurer. Other features include, access to location-based information that would be useful to the user such as facilities such as public transportation options, locations of approved garages and car parks. The below screen shots show how the Report AXA CS Motor Claim application design looks like (Figure 2.15).

Figure 2.15 Report AXA CS Motor Claim (Google, N.D.)

ii. Liberty Mutual Mobile App

The Liberty Mutual mobile application was developed specifically for Liberty Mutual customers to provide a better experience to its vehicle policy customers in the case of an accident. This application was specifically built for multiple platforms; Android and iOS. It gives the user the ability to create a profile with their policy details, to pay their premiums, file claims contact insurance agents and to get updates or track the progress of their filed claims (sent via SMS). The application also allows the user to record voice noted with the accident details, that making it easier to use at the scene of the accident. These recordings will be used by the insurer as part of the information to process the claim. The below screen shots show how the Report AXA CS Motor Claim application design looks like (Figure 2.16).

Figure 2.16 Liberty Mutual Mobile Application (Apple, 2015)

2.15 Weaknesses and Limitations

These mobile applications; Liberty Mutual mobile application and Report AXA Motor Claim application were also dependent on good internet connectivity for the device in use which is not always the case, especially in a third world country like Kenya. These applications also lacked They were also found to be unfit for the Kenyan market since they were tied to their countries' insurance policies. Mobile applications that have claims analysis are not easy to find and this is where the researcher decided to focus. There are other applications in use in the global market for insurance claims processing though not many offer analysis on the data collected from the applications. In Kenya, there is yet to be a mobile application and web backend that provides these features to insurers.

The researcher's goal is to design a mobile application that is suited for the needs of the local insurance claims market with a focus on motor insurance claims. The design will be made scalable to allow multiple insurers to use the platform for their claims process and analysis. Insurance companies in Kenya will be granted access to the backend to view reports based on the claims filed through the mobile platform. The aim of this is to improve business decisions based on generated reports and to improve the user experience for the policy holders filing claims with the use of the mobile application.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The aim of this research was to design a mobile application and web backend to improve claims processing and analysis. This research seeks to determine vehicle to vehicle accident data collected from claimants by the insurance company to process motor vehicle claims. It also sought to identify challenges faced in motor insurance claim processes in place and to determine how to improve the current motor claim processes. It also sought to determine the best design requirements for a motor insurance claims mobile application.

The findings of this research led to the design, implementation and testing of a motor insurance claims mobile application. The resulting architecture was meant to be suited for the needs of motor insurance policy holders as well as the insurers.

3.2 Software Methodology

The software methodology used was System Development Life Cycle (SDLC) which is also referred to as systems development cycle. The SDLC is a structured methodology that is comprised of a sequence of phases, and each phase in considered incomplete until expected deliverables are produced (Elgendy, 2014). These phases are; requirement analysis, system design, development and testing; it then goes through the deployment and maintenance stage of the system.

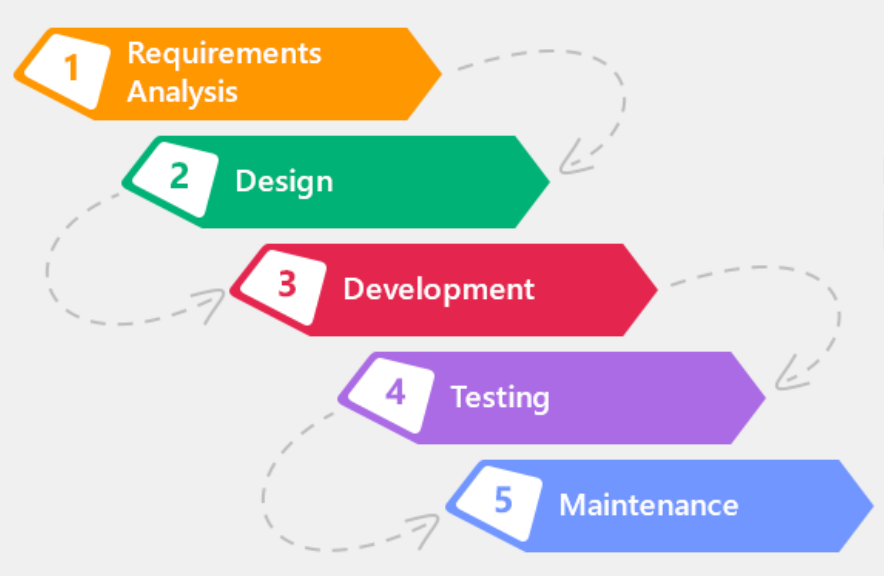


Figure 3.1 SDLC (Gordiyenko, 2014)

System Development Life Cycle

This framework is made up of five main phases which are discussed below.

i. Requirement Analysis

This was the phase where the location of the study was selected as well as the the sample size. The user's requirements were also collected and documented, in terms of how the system was expected to behave. A feasibility study was also made for the project through the document review.

ii. System Design

The system design was created as a result of the user requirements gathered during analysis stage. This is the phase where the system architecture, system design as well as system prototyping to determine how the system would look and function.

iii. System Implementation

In this phase, the system was developed and was ready to be deployed to the production environment at the end of this phase. The system design and architecture are at this point used to develop a system that would meet the requirements of the users. Depending on the complexity of the system, this phase sometimes takes a long time.

iv. System Testing

Testing was carried out by both system users and a team of specialized personnel. The tests are mainly systematic and sometimes automated to ensure that the actual outcomes are compared and equal to the predicted and desired outcomes.

v. System Implementation

In this phase, the system was deployed to the production environment and the users were trained on how to use the system. This phase also included evaluation of the whole system and this evaluation sought to answer some of the questions that needed to be answered, including: does the newly implemented system meet the user requirements? Is the system reliable and fault-tolerant? Is the system valid?

3.3 System Analysis

This is a phase where user requirements are identified and analyzed. The analysis results will be used in answering the research questions and also be used while designing and developing the proposed system.

3.3.1 Feasibility Study

The feasibility study will be done through reviews of literature on methods used to manage health records and challenges facing health records management systems in Kenya as stated on the research objectives. This study will be performed to analyze and evaluate the impending solution of the proposed system.

3.3.2 Research Design

The aim of this research was to study the current motor vehicle claim submission process and design a solution for the challenges currently faced in the industry, both by the insured parties and the insurers. The research approach used for this study was exploratory research since it led to the realisation of the research goals. Exploratory research design was chosen since the researcher sought to get more depth into the issues faced by motor insurance customers during motor insurance claims processing in order to build a mobile solution based on the findings that would seek to improve the customer experience as well as improve the insurance company efficiency.

3.3.3 Location of Study

The study was carried out in Nairobi. This location was chosen mainly due to cost constraints, since carrying out research in other parts of the country would have been expensive. Another reason for selecting Nairobi was that many insurance companies have offices located within Nairobi, which facilitated easier set up of interviews with the insurance company employees and their customers within the Nairobi region.

3.3.4 Population

Nairobi County has a population of 3.138 million (Kenya National Bureau of Statistics, 2010) and within this population, 66.7% of the adult population use different form of formal financial services (Financial Sector Deepening, 2013). Of the 66.7%, 34.9% of these have

subscribed to insurance packages (Financial Sector Deepening, 2013). This research targeted three groups of people; one of these groups was the insured parties within Nairobi, whose motor insurance covers fall under the Third Party and Comprehensive cover and more so, those who have been indemnified before. They were the target since they have knowledge on how the current claim process works and their past experience was a good reason for identifying them as a target population. Respondents that participated in this category were from 14 different insurance companies. These companies were: First Assurance, Britam, CIC Insurance, ICEA, AON, Kenya Alliance, Kenya Orient, Saham, Phoenix, Heritage, Invesco, General Accident, UAP Insurance and APA.

The second group of people consisted of insurance employees considered as key decision makers within their organisation, who deal with motor insurance claim processing. The respondents in this category were selected from Heritage and Jubilee Insurance companies. The third group of people consisted of police officers since they also play a vital role in accident investigations. The respondent from this category was from the Central Police Station in Nairobi. These three categories were chosen since they have knowledge on the current vehicle insurance claims process and can identify the challenges faced. They also have in-depth knowledge on what causes delays or even denial of compensation for filed insurance claims.

3.3.5 Sampling

Since it was crucial to carry out a sample targeting the two groups that are of interest in this research, a sample selected to ensure the data collected was representative of the collective group of interest. Nairobi county was selected purposively due to the presence of insurance company headquarters within the region. Nairobi county being an urban region is also ideal since the percentage of insurance policy holders is significantly higher.

The level of precision is the amount of error that can be tolerated. For this research, the precision level selected was 10 meaning that the researcher can be sure that if the same questions were asked to the entire population ± 10 percent will choose that answer. On the other hand, the confidence level is the amount of uncertainty that can be tolerated. For this research the confidence level used was 95%.

As this research is working with a large population of motor insurance policy holders, the sample formula used was developed by Cochran (1977) to yield a representative sample for proportions.

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails (1 - α equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. e value for Z is found in statistical tables which contain the area under the normal curve (Cochran, 1977).

The sample size chosen to test the mobile application was 97 people. The above data has been calculated using an online sample size calculator that based its formula as shown using the above formula (Cochran, 1977).

To identify the individuals to be interviewed the researcher chose a purposive sampling method called a respondent-driven sampling method was chosen. This means that the respondents were obtained through referrals made by other respondents, which was a network-based method. This technique was used because it was a low cost method of finding respondents who fit the criteria used in selecting the individuals to question (respondents had to be motor insurance policy holders who have been in a vehicle accident and had attempted to file for insurance claims). The same purposive respondent driven method was used to identify the insurance company employees to interview as well as the police officer. To ensure that the data collected was not from insurance customers of the same company, the questionnaire was sent to several respondents based on their insurance companies and some of the respondents were found in public places to ensure there was a variety of companies covered.

3.3.6 Data Collection Methods

The data collection methods selected were interviews, mail questionnaires and document reviews. Personal interviews were conducted while speaking to the insurance agents/brokers, staff and the police officer, while mail questionnaires were sent to insurance policy holders along with the mobile application by email. Document reviews were also carried out to investigate the motor insurance claim requirements by various insurance companies.

The data collected through the above methods was vital for the design and implementation for the motor insurance claims mobile application since it provides a better picture of the solution needed for the research problem.

i. Interviews

Interviews were conducted to collect data from insurance agents, brokers and staff who deal with motor insurance claims. This method was used since it was the best way to capture the respondents' views, attitudes, and their values as well as give insight to the successes and short comings of the current vehicle insurance claims submission process.

The interviews were carried out based on the questions in the Appendices (Appendix A Part B).

A separate interview that was also conducted was with a police officer. The interview questions were open ended questions as seen below:

i. What is the process before, during and after writing an abstract form for a vehicle to vehicle accident and what details do you capture?
ii. What do you like about the entire process?
iii. What challenges do you face?
iv. How would you like the process to be improved?
v. Would you be willing to give work and contact details (Name, work ID, Contact Phone Number, Police Station) to an insured party?

ii. Questionnaires

Questionnaires were the primary data collection tools which were distributed to the sampling target to get a list of challenges faced in motor insurance claims submission and processing. The questionnaire contained both multiple choice questions and open ended questions. A list of questions was also prepared to determine whether the mobile application developed tackled the challenges faced effectively. From the findings and results, a conclusion was deduced and determined what could be added to the mobile application design, for it to serve its users more efficiently. To accomplish that design different scales were used on the questionnaire:

i. Dichotomous scale: The questionnaire had questions that had two possible responses; such as agree or disagree
ii. Likert scale: This scale enabled the users to give different point of views that can be ordered.

iii. Document Review

Data about motor insurance claims within Nairobi, was collected by reviewing various existing information, documents and publications. This was essential in determining the needs of the insurance companies when it comes to processing insurance claims. The information,

documents and publications were attained from insurance company websites and the governing body, Insurance Regulatory Authority's website.

3.4 System Analysis and Design

The System Analysis and Design (SAD), is a crucial occurrence in the software development cycle. The motor insurance claims mobile application design used an Object-Oriented approach to the System Analysis and Design (OOAD).

The task of system analysis was carried out by studying the current processes with the aim of specifying system requirements and eventually building a working model of the system. The model was the utilised to implement the system by building a real-world version of the model. In this phase, the software development process, the software's overall structure and its nuances were defined. Several tools, techniques and models were employed to record and analyse the current processes and new user requirements, which would be used to define a format for the new system (Bhushan & Parikshit, 2010).

System design was carried out to determine how the system will operate, in terms of the hardware, software, and network infrastructure; the user interface, forms, and reports that will be used; and the specific programs, databases, and files that were needed for the entire system. This provided crucial information needed to determine how the system will operate by the requirement specification worked out during the system analysis phase (Bhushan & Parikshit, 2010).

The major system analysis and design tools used include;

i. Use Case diagram.
ii. Context Diagram.
iii. Data Flow Diagram (DFD).
iv. Entity relationship diagram (ERD).
v. System Sequence Diagram (SSD).
vi. Design Class Diagram (DCD).

Unified Modelling Language (UML) notation, was used for all the diagrams.

3.4.1 Use Case Design

Use case diagrams were used to model the interaction of the software application system and the end user and also any external system that interacts with the application. This use case diagram was used to document and understand the requirements of the evolving software

application system. These use case diagrams are some of the most important tools used in Object-Oriented Systems Analysis and Design (Dennis, Wixom, & Tegarden, 2005).

3.4.2 Design Class Diagram

Design class diagrams were also used to create a vocabulary to be used by both the researcher and users. These design class diagrams normally represent the things, ideas or concepts that are contained in the mobile application (Dennis, Wixom, & Tegarden, 2005). In this case for example, the design class diagram contained classes that represent things such as policy holders, claims, witnesses, vehicles and so on. The class diagram also described the relationships among the classes.

3.4.3 Entity Relationship Diagram

Entity Relationship Diagrams were used to provide a pictorial representation of the database design. Entities and attributes that were needed to initiate motor insurance claims using the mobile application database were established to produce the entity relationship diagram. The diagram also demonstrated the maximum and minimum times that an entity occurrence can exist in a relationship, for example, a policy holder can submit zero or more claims (Ward & Dafoulas, 2006).

3.5 System Architecture

The system architecture enabled the researcher to breakdown the system into the various system components and defined their interactions. The different systems in the whole architecture are represented by the motor insurance policy holders who access the system using mobile devices mainly, the back end of the system is represented by how the insurance companies access the same system using different devices and having completely different access rights to the same system.

4 CHAPTER 4: DATA ANALYSIS

4.1 Introduction

Analysis of the interviews responses was done using Google analysis tools and charts and graphs were generated from the data collected for visualization of the responses and easy understanding of results. The results were used to answer research questions evident in section 1.4 of this dissertation. The overall results contributed to the system design of the application through integration of various functionalities.

The total sample size was 97 respondents of both gender, which consisted of insurance company customers. The respondents were requested to fill in the interview questionnaire attached in Appendix A. The response rate was 100% of the respondents since all the respondents participated in the survey.

4.2 System Analysis

4.2.1 Gender Distribution

The gender of the respondents had much higher number of males (89%) versus females (11%). This is because, in Nairobi, most vehicle owners are male as compare to female. Hence the survey and testing was carried out by mostly men.

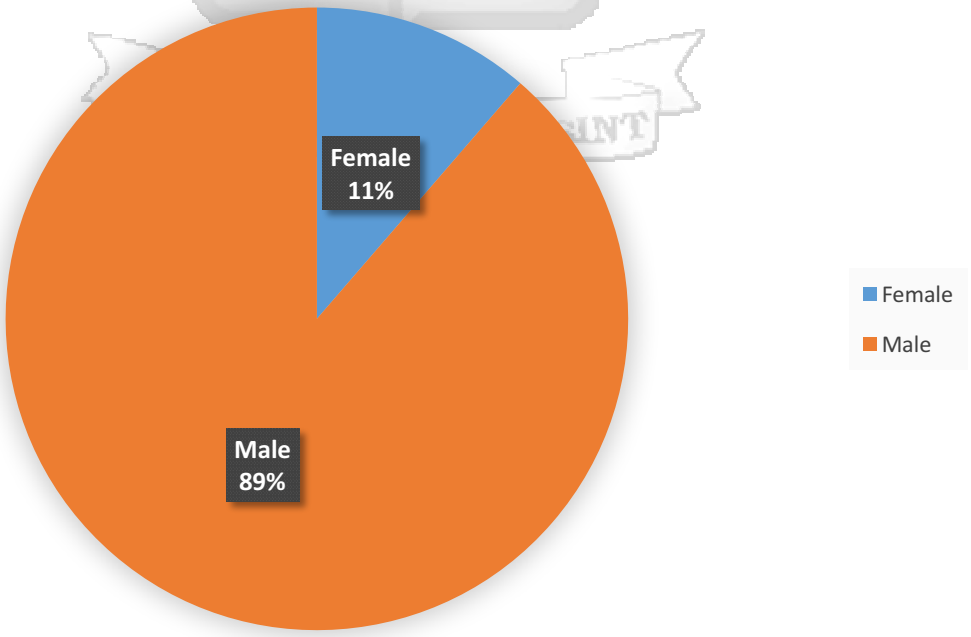


Figure 4.1 Respondents' Gender

4.2.2 Age Distribution

Figure 4.1 and 4.2 shows the diversity in ages and occupations of the respondents. Once the testing was done, 62% of the total sample represented people between the age of 35 and 45. While 35% represented 25 to 35. Only a mere 1% represented respondents that were above 45 and 1 % below 25. Majority of respondents were aged between 25 and 45 who are well established in their careers and have purchased one or more vehicles. This research was targeted at this particular age group since they have experience in car policies and claims processing. Not many respondents below 25 were able to answer the survey questions, since many of them are yet to purchase a vehicle and do not have an idea of how the claims process works. Not many respondents above 46 participated in the survey/ mobile app testing either, however their challenge was that they had limited experience with mobile applications and were sceptical about using a mobile application to carry out the process.

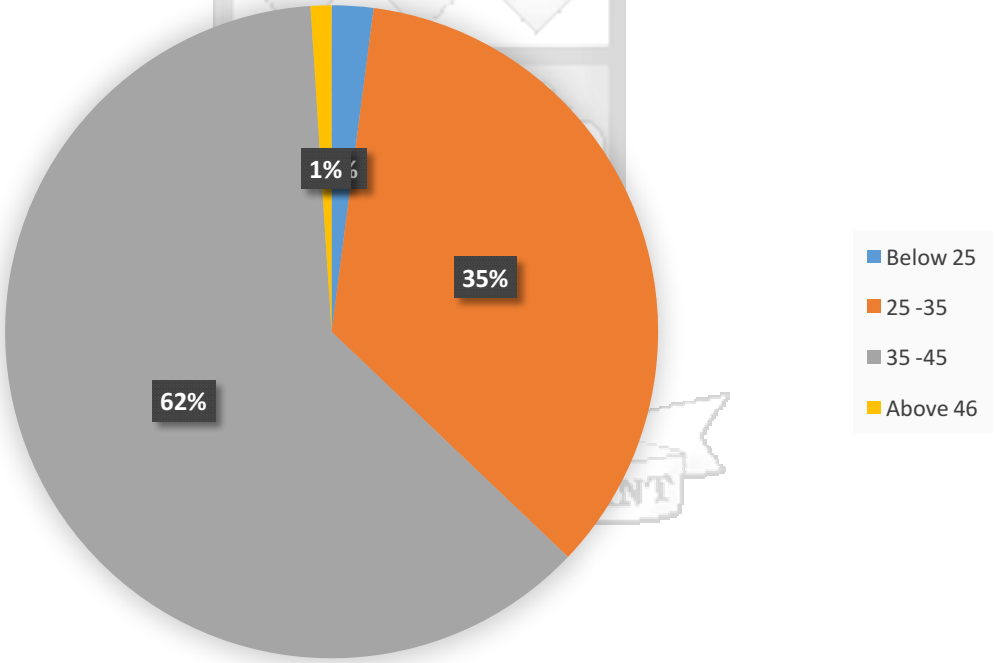


Figure 4.2 Age of Respondents

4.2.3 Occupation Distribution

Most of the respondents constituted employees in the public and private sector as well as business owners.

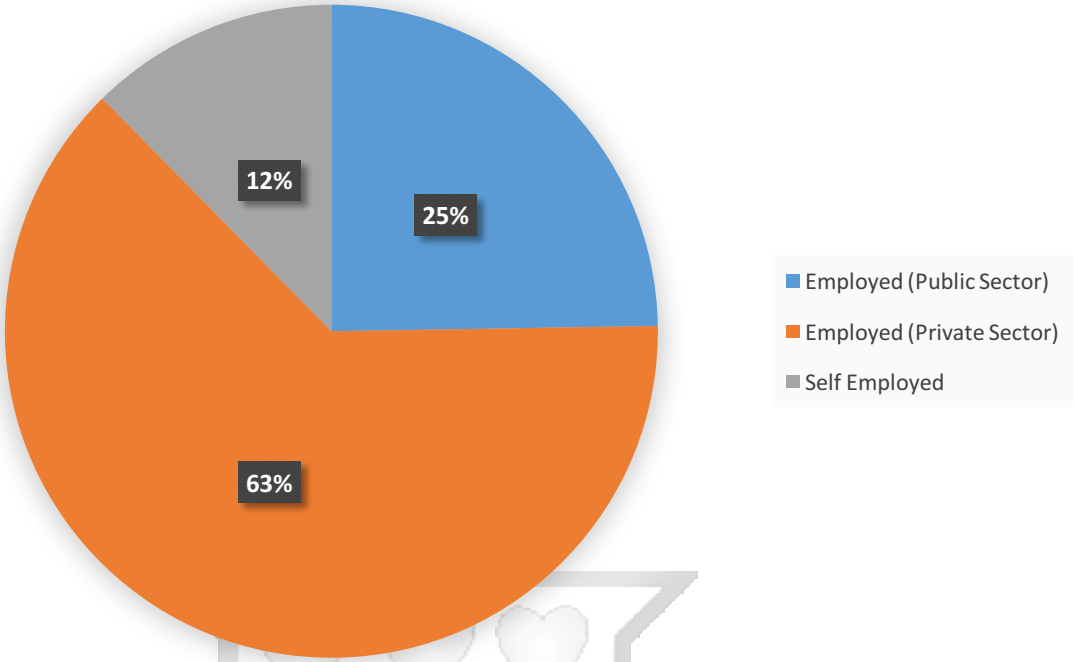


Figure 4.3 Occupation of Respondents

4.2.4 Mobile Device Distribution

It is also important to note that all the respondents owned smart phones therefore, they could install applications on their phone and could access internet on the mobile devices. This proves that the market is ready for mobile applications.

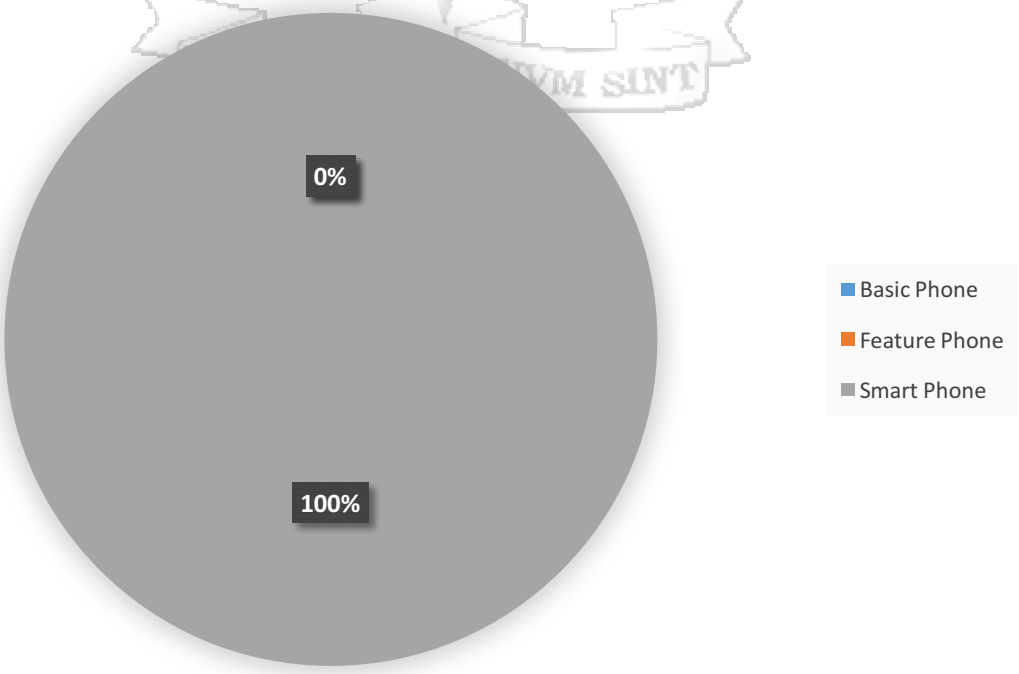


Figure 4.4 Respondents' Type of Phone

4.2.5 Summary of the Pre-test Questionnaire

The researcher carried out testing of the system with a sample size of 97 respondents who evaluated the overall performance, ease of learning, navigation, responsiveness and effectiveness of the application. Table 4.1 contains the demographic information of the respondents who were selected using respondent-driven sampling. The sample size was 97 as earlier calculated from the sampling formula. This number was equally divided among 4 data collection centres around the city, with each centre getting about 24 respondents. These centres ranged from offices, public malls and social gatherings as well as sharing on email.

Table 4.1: Pre-test Questionnaire Data

Demographic information	**Response**	**Total Number**
Gender	Female	11
	Male	86
Age	Below 25	2
	25 -35	34
	35 -45	60
	Above 46	1
Occupation	Employed (Public Sector)	24
	Employed (Private Sector)	61
	Self Employed	12
Mobile Phone	Basic Phone	0
	Feature Phone	0
	Smart Phone	97

4.2.6 Source of Claims Process

The respondents were requested to state the source they would use to get information about the claims process in case of an accident and 55% (Figure 4.5) said they would get the information from an insurance agent or broker. The others would ask the Insurance company (15%) or their friends (15%) or search the company website (10%) for that information.

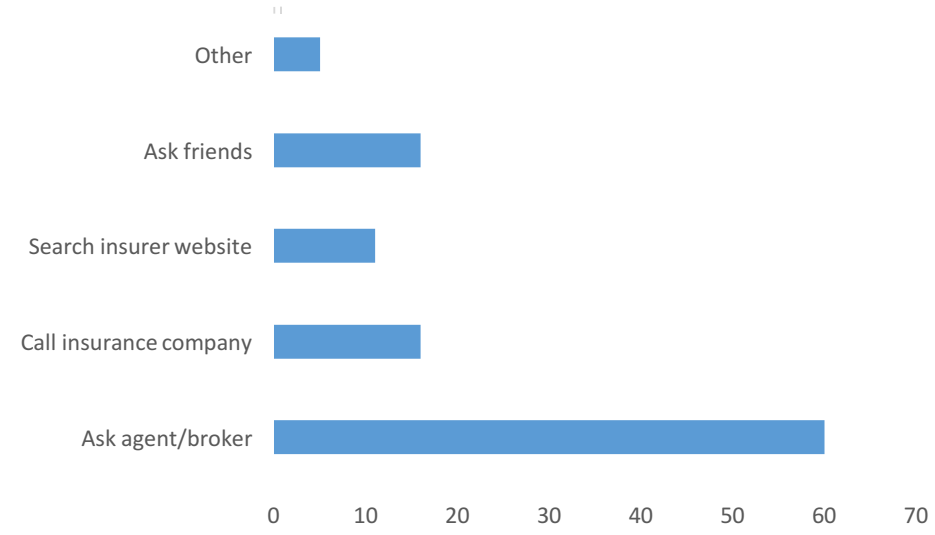


Figure 4.5 Source of Claims Information

4.2.7 Claims Processing Efficiency

The respondents were unhappy with the turn-around time from the insurance companies after their claims had been filed. 56% of the respondents have waited between 2 weeks and a month to get a response from the insurance company with information on whether they would be indemnified or not. 28% have experienced delays in receiving that information with some waiting up to 3 months or even longer (Figure 4.6). The inconsistency could be caused by the different insurance companies, however, since the process is the same across the different companies, the speed should be more or less the same across.

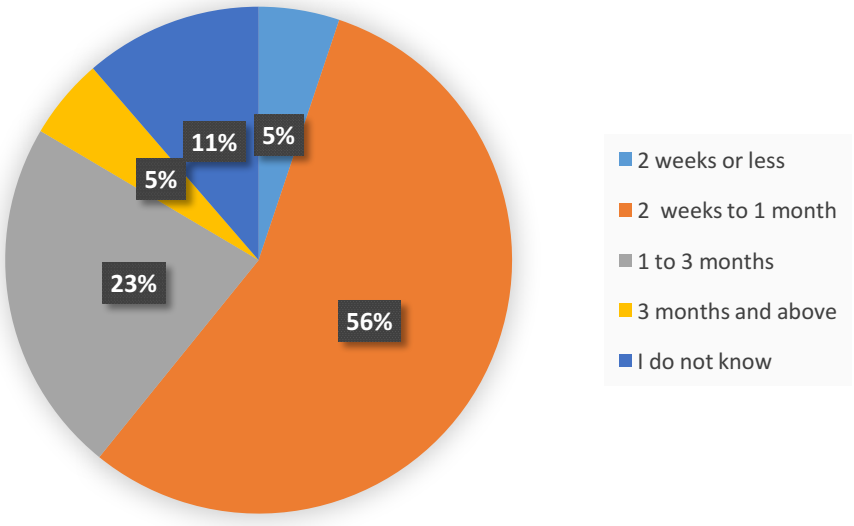


Figure 4.6 Turn-around Time

4.2.8 Challenges in Claims Filing

The challenges faced during claims processing were categorized into; time taken to get response, no progress updates, tedious process, corruption, unavailable assessors, unreliable garages and others. From the answers received from the respondents, the three biggest challenges are: the process takes too long, no communication on progress are sent to the policy holder and the whole process is too tedious.

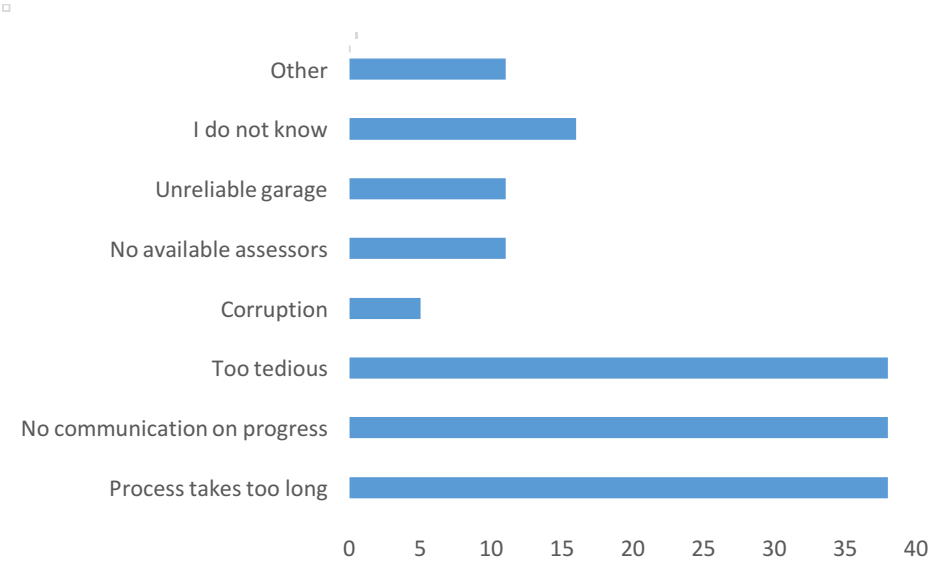


Figure 4.7 Challenges in Claims Processing

4.2.9 Mobile App

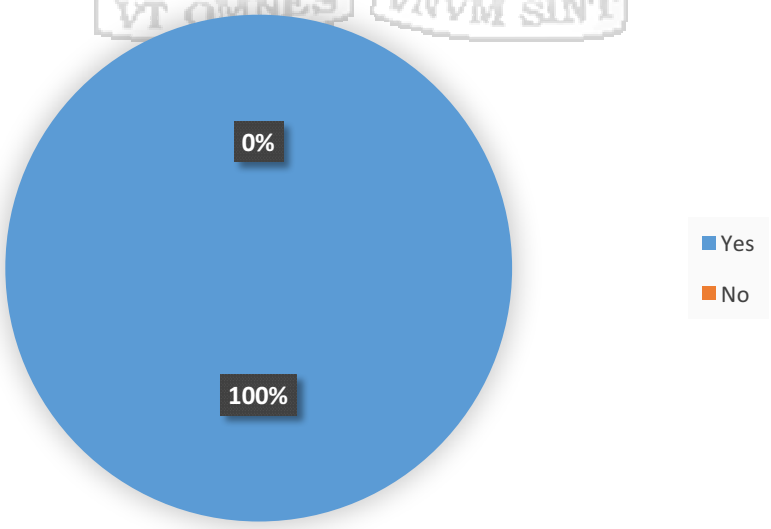


Figure 4.8 Use of Mobile App for Claims Processing

100% of the respondents (Figure 4.8) felt that a mobile application for insurance claims processing would be a better way of carrying out the whole process. When asked why, the respondents stated that an application would make the process more efficient, more convenient, less tedious and time-saving. Some also stated that the use of a mobile application would improve the accuracy of the information provided regarding the accident.

4.3 Feedback from Insurance Companies

The researcher was able to get feedback from two insurance company personnel and agents. The feedback collected was based on the questionnaire provided in the appendices – Appendix B, part B. Theses respondents felt that a mobile application would be of importance to the company since it would improve the speed and efficiency of the process. They both also stated that in addition to the data that they collect from their customers during claims, they would like to collect additional evidence such as witness accounts and their contacts. They stated that the biggest challenge in while processing claims that mainly cause claims to be rejected is the lack of sufficient information provided by the customer who submitted the claim. Therefore, they both felt that the MotorClaim mobile application would be a great tool to use which would ensure the customer has submitted all the necessary information for the claim to be processed. They also felt that the application would provide them an easy channel to reach the customer regarding the claims process.

The only reservation they had about the mobile application was that it needed to allow agents and brokers to access the system so that they could also better serve their customers. They also suggested that the application should give the customer the option to renew their policy within the application and pay for it within the app, to improve convenience.

4.4 Feedback from Police Officer

The researcher was able to get feedback from two police officers that commonly dealt with vehicle to vehicle accident reporting. The feedback collected was based on the questionnaire provided in the appendices – Appendix A, part C. These respondents felt that the current process of collecting accident details and presenting abstracts could be improved. In order to get an abstract that can be used by insurance companies, the vehicle owners involved in the accident are both required to give a statement on the details of the accident. These details, as well as observation of the accident scene, the police officer is able to give a report of the accident. The respondents reported that the challenges commonly faced involve vehicle to

vehicle accidents where the cars have been moved from the scene of the accident, which leads to uncertainty when reporting the accident events and thus affecting the insurance investigation.

5 CHAPTER 5: SYSTEM DESIGN AND ARCHITECTURE

5.1 Introduction

In the event of a vehicle accident, the vehicle owner is in most cases unsure about the best way to start the insurance claim process and what data is necessary for this process and thus causes a major inconvenience on the owner's part. In case the claim filed by the policy holder has insufficient information, then the insurance companies cannot indemnify the claimant. Currently, information on what is needed for the claims process is recorded by the vehicle owner on paper and some of the forms to be filled are found in the insurance company website.

This process can be long and tedious for a policy holder, and may take a long time to complete. Some insurers also fail to indemnify the insured party due to some missing information that is vital for processing the claim. The MotorClaim application will be used by the insured party to contact emergency numbers, contact the insurance company and to file their claims. This simplifies the claims application process for the insured party and ensures correctly filled in claim forms as well as evidence is directly communicated to the claims department at the insurance company. The proposed system has two interfaces;

i. The MotorClaim mobile application
ii. A web interface to be accessed and managed by several Insurance companies

5.2 System Design

As per the system requirements gathered by the researcher, system analysis and design was carried out to determine system specification. The system design was made with main actors; the insurance customer, the claims personnel and the system administrator. The sections that follow contain UML standard design diagrams that were used as a basis in development and implementation of the application.

5.2.1 Use Case Diagram

A use case diagram identifies the activities that the system must address as well as describing the relationship between the system actors and the system (Grady, 2006). Only registered motor insurance customers can access file motor claims using the mobile application. Figure 5.1 illustrates the use case diagram for the motor claim system.

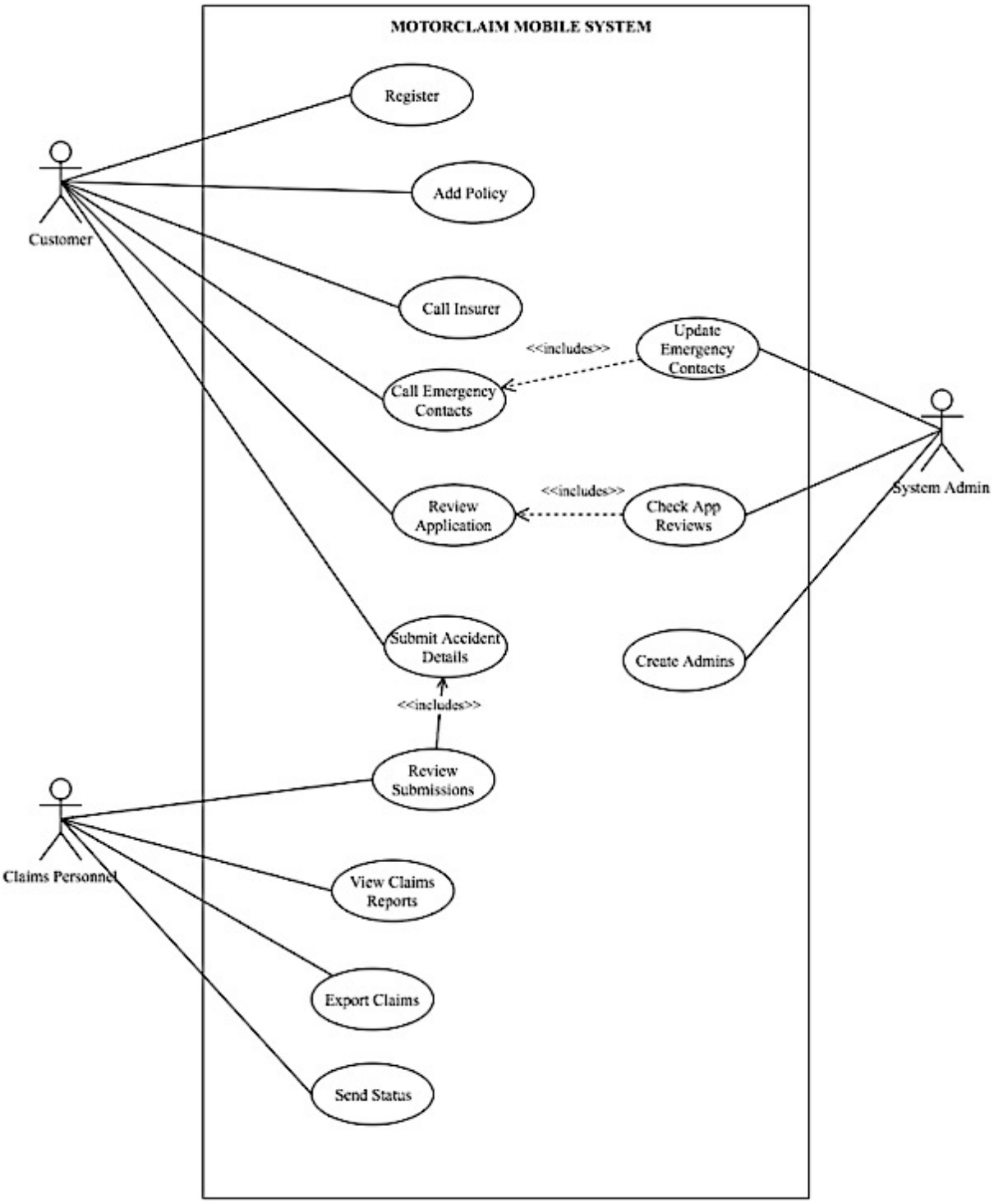


Figure 5.1 MotorClaim Use Case Diagram

5.2.2 Context Diagram

The context diagram plays a fundamental role in this system's design and it is advisable to start with a context diagram when developing a system. The context diagram clearly defines the functionality of the application thus it dictates what the user can get from the application. Figure 5.2 represents the context diagram for MotorClaim System.

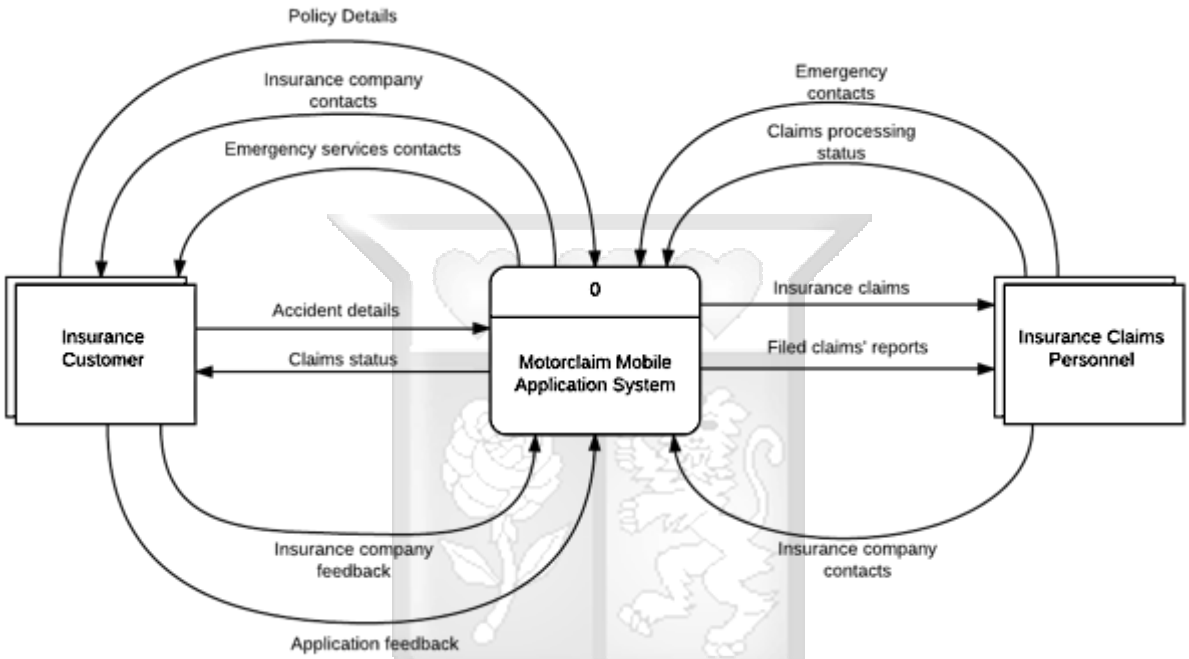


Figure 5.2 MotorClaim Context Diagram

5.2.3 Data Flow Diagram

The Data flow diagrams (DFDs) are usually used to illustrate the data flow between external entities, processes and data stores in the system (Hay, 2003). DFDs are often decomposed to form a hierarchy of DFD diagrams. Figure 5.3 is the representation of the applications Data flow diagram.

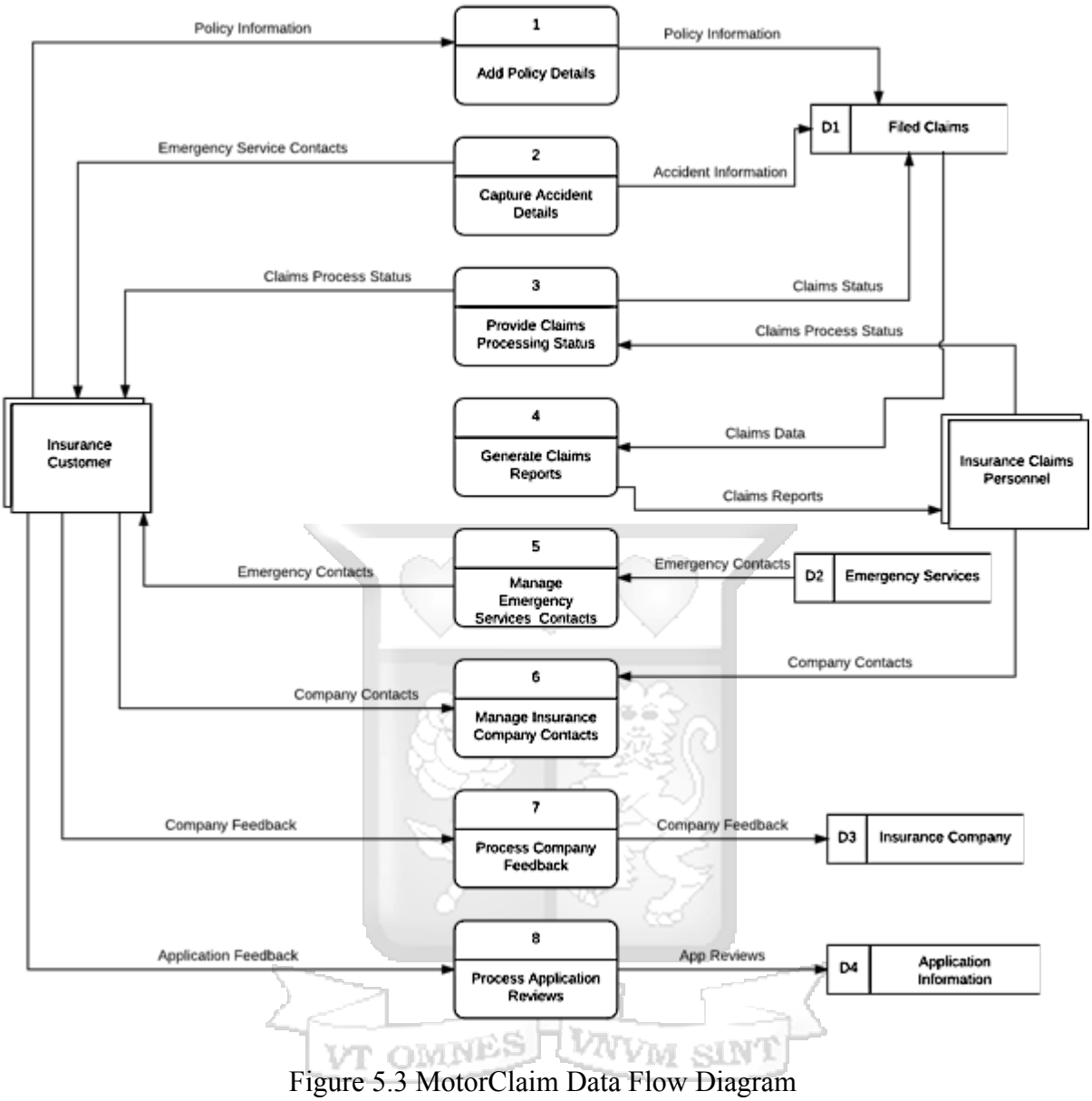


Figure 5.3 MotorClaim Data Flow Diagram

5.2.4 Entity Relationship Diagram

The Entity Relationship Diagram (ERD) is used to demonstrate the structure of the system's database. This database stores data from the mobile application and the web back end and is accessed by both interfaces to display data. The ERD was used by the researcher to normalize the database. Figure 5.4 represents the MotorClaim Mobile application entity relationship diagram

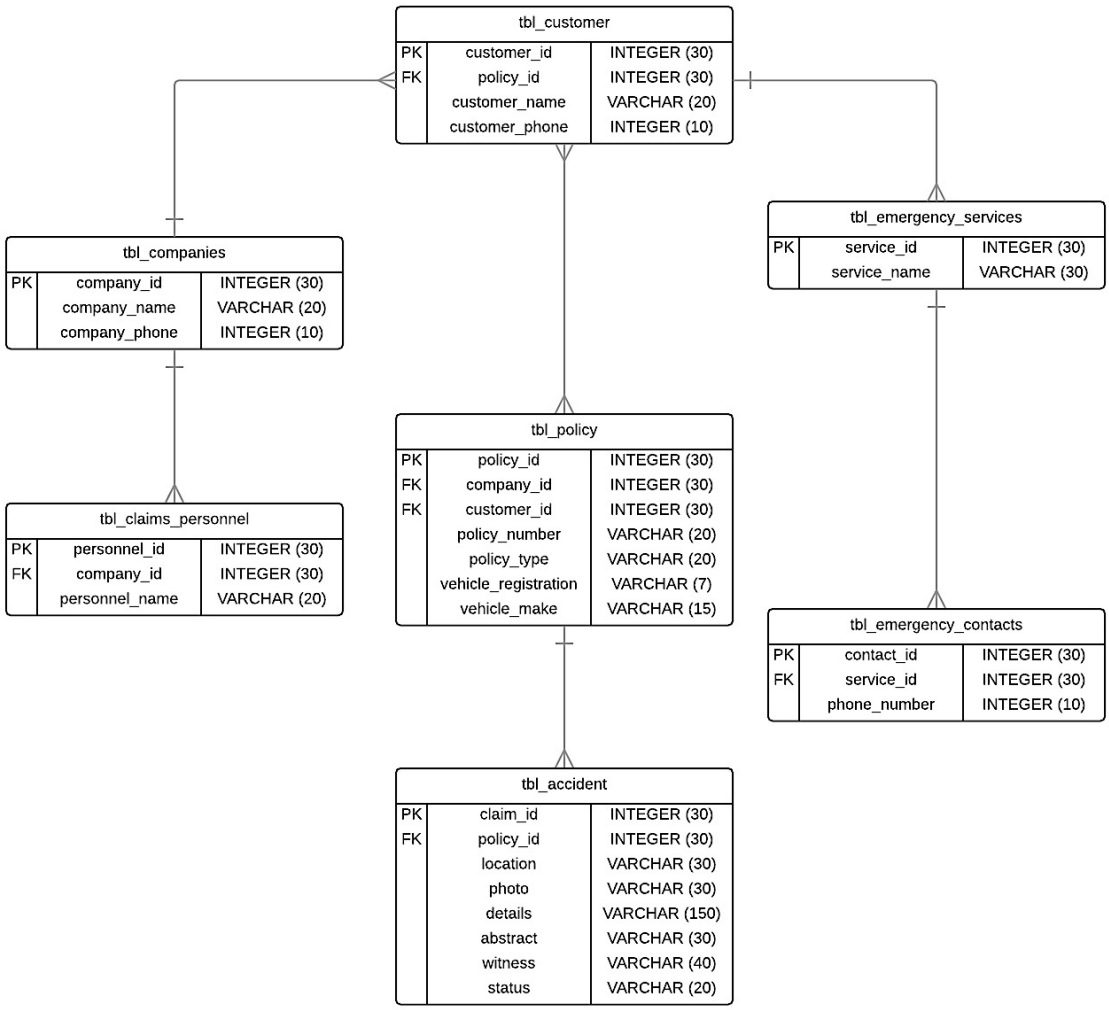


Figure 5.4 MotorClaim Entity Relationship Diagram

5.3 System Model

In order to illustrate the system's objects and interactions, the researcher prepared a sequence diagram and a design class diagram using UML notation.

5.3.1 Sequence Diagram

Sequence diagrams in UML are used to show how objects interact with each other and the order the interactions occur. It is therefore important to use a sequence for the MotorClaim mobile application. Figure 5.5 represents a sequence diagram for MotorClaim application in UML notation.

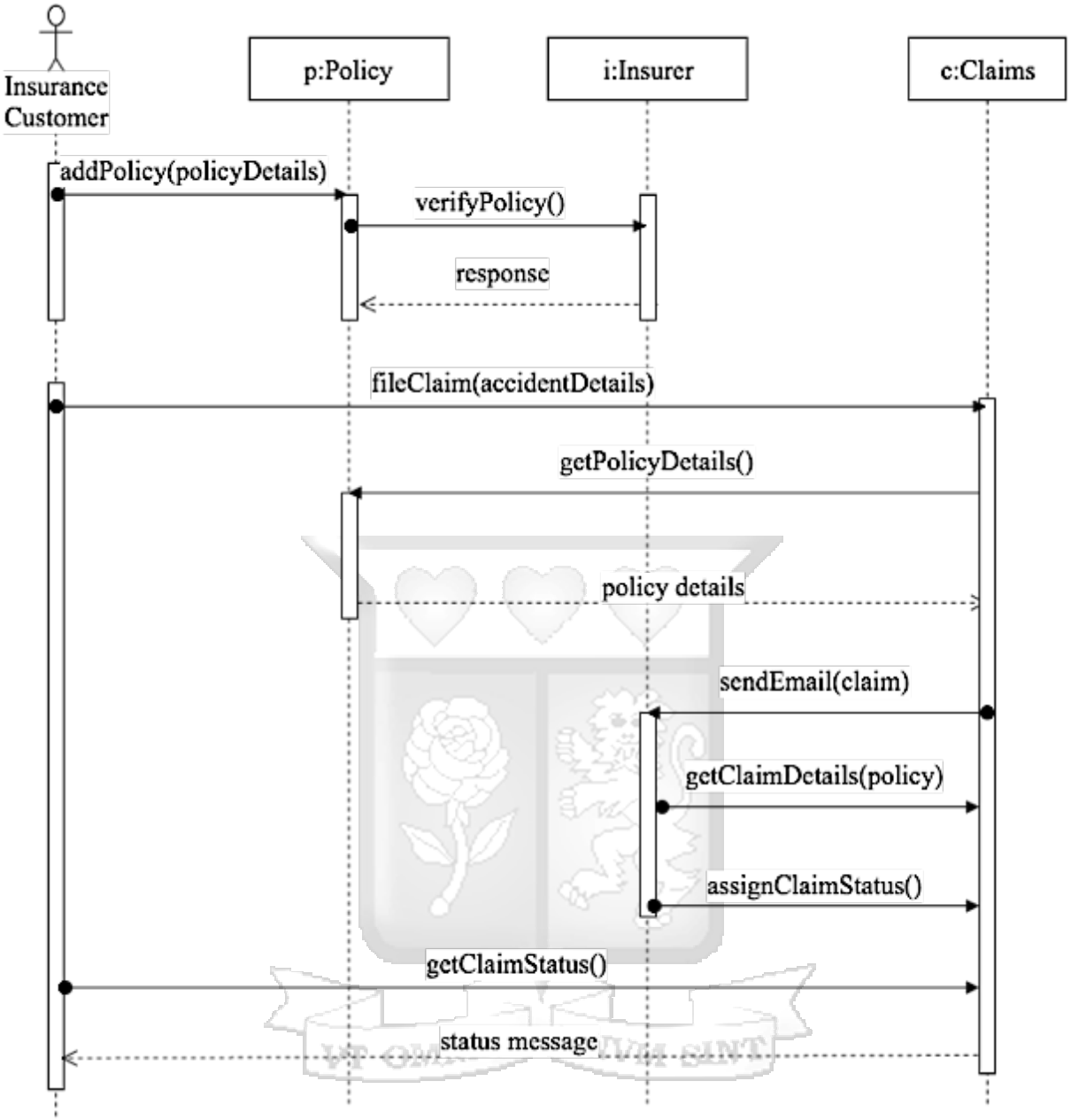


Figure 5.5 MotorClaim Sequence Diagram

5.3.2 Design Class Diagram

A design class diagrams focuses on the way the solution is given and can be obtained through analysis of interaction and collaboration between objects (Favre, 2003). Figure 5.6 represents the MotorClaim Mobile application design class diagram.

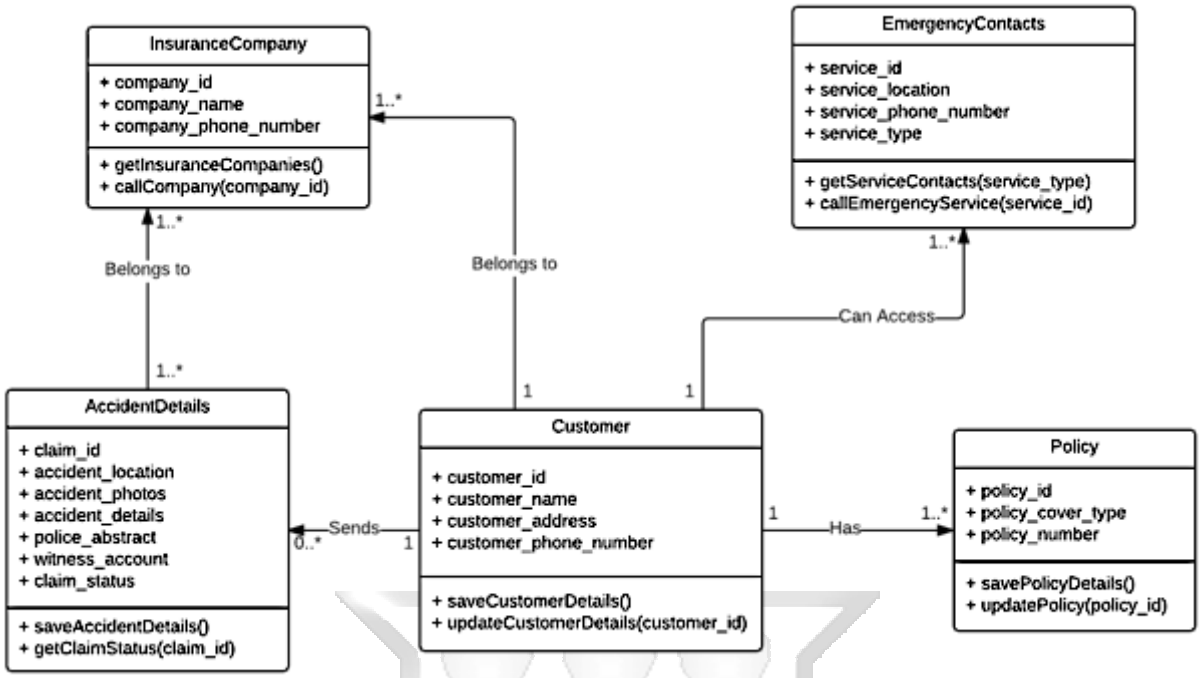


Figure 5.6 MotorClaim Design Class Diagram

5.4 System Architecture

The claim personnel from the insurance companies can review the transmitted data from the MotorClaim mobile application on a web backend. This web back end can be accessed from any device browser that is compatible with HTML5 and can only be accessed if the device has access to the internet since it is a web system hosted on a remote cloud server. This remote cloud server consists of the web server, application server and database server which are independent pieces of software that are be installed on the same physical server but on different virtual machines to give the systems administrator a lot of flexibility when managing these systems. To make the user experience better, the application will later be integrated with the existing enterprise applications in the Insurance companies. This would allow the system to collect insurance details about the customer directly from the existing enterprise applications and prevent collection of invalid data. Figure 5.7 represents the current MotorClaim Application architecture.

Firewall

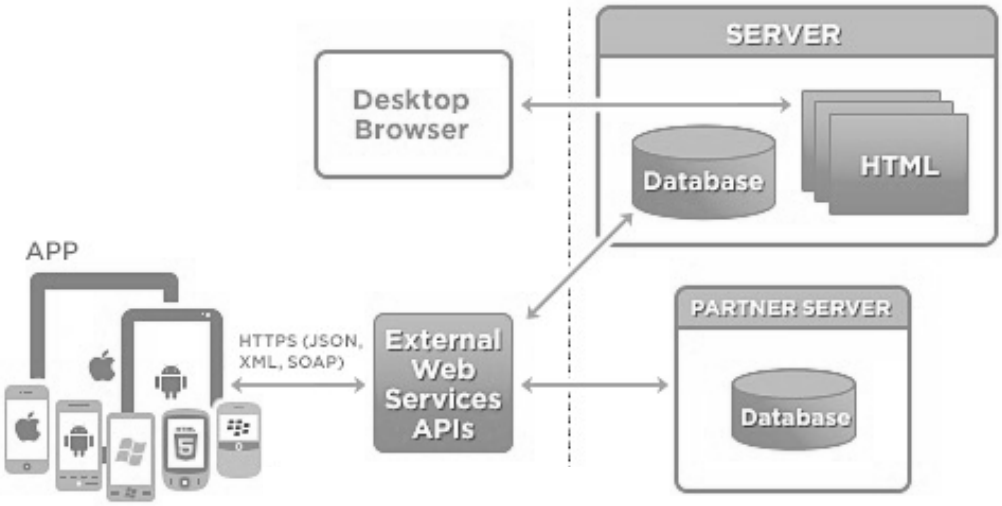


Figure 5.7 System Architecture (Mubaloo, N.D.)

5.5 Database Schema

The database was created using MySQL and was made using the Entity Relationship Diagram (Figure 5.4) as a guide. The schema was as per the diagram below:

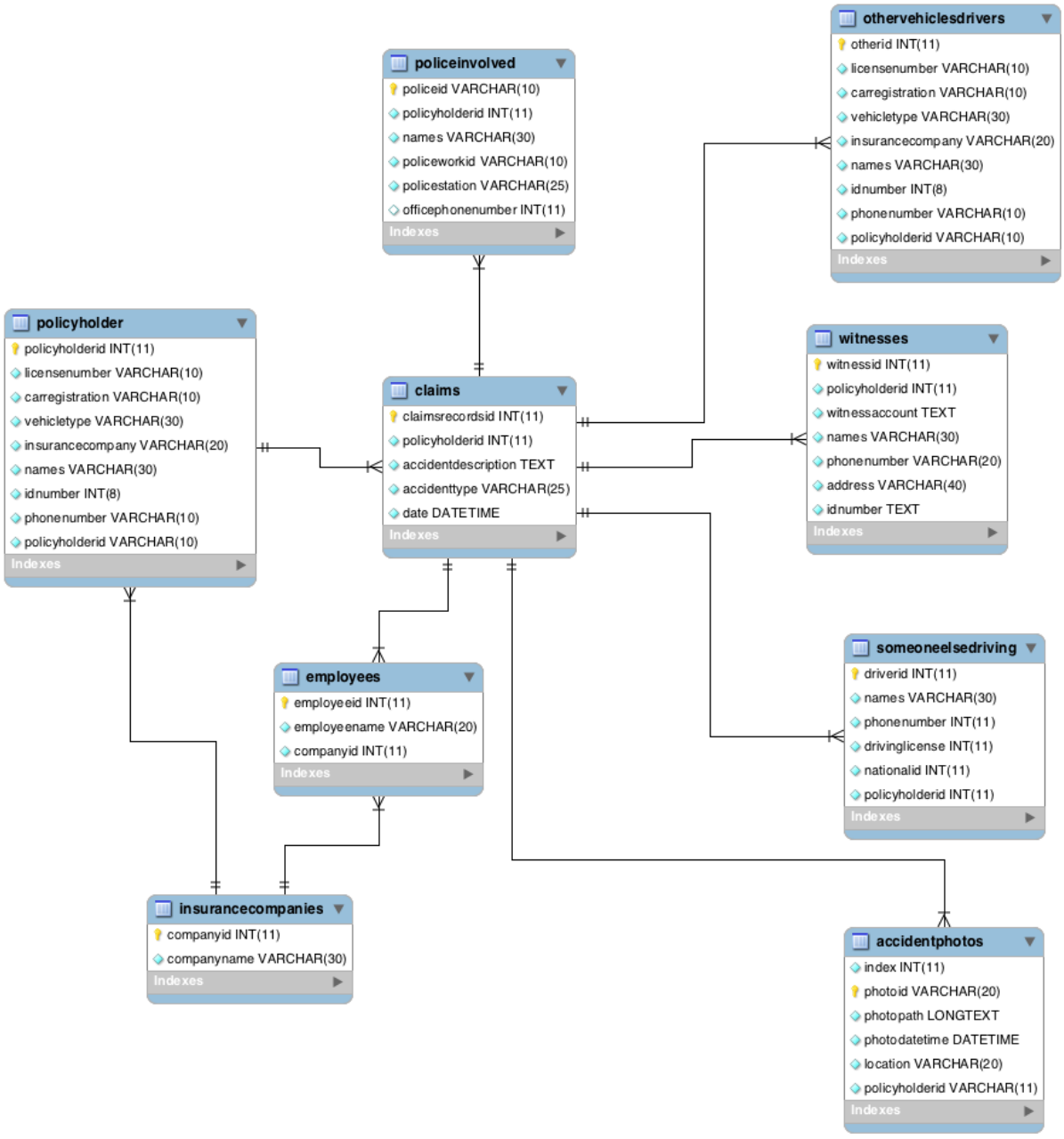


Figure 5.8 Application Database Schema

5.6 User Interface Design

The user interface was designed after gathering system requirements as per the research and analysis that was done. The system consisted of the mobile part of the application, which was meant for the insurance customers and the web part consisted of the web interface which would be accessed by the system administrator and the insurance companies.

The UI was initially created using a prototyping tool as shown in Figure 5.8. The prototype outlines the main features on the mobile application.

Figure 5.9 MotorClaim App Wireframes

5.7 Security Design

The system consisted of the mobile application and the web portal. A two legged OAUTH 2.0 with Resource Owner Password Flow was the authentication method used to authenticate system users. The authentication required users to enter their username and

password which would generate a token from the authentication server. The generated token was then used to by the client application to send and request data to and from the application server. This was used to reduce the risk of unauthorised users from accessing data saved in the application server.

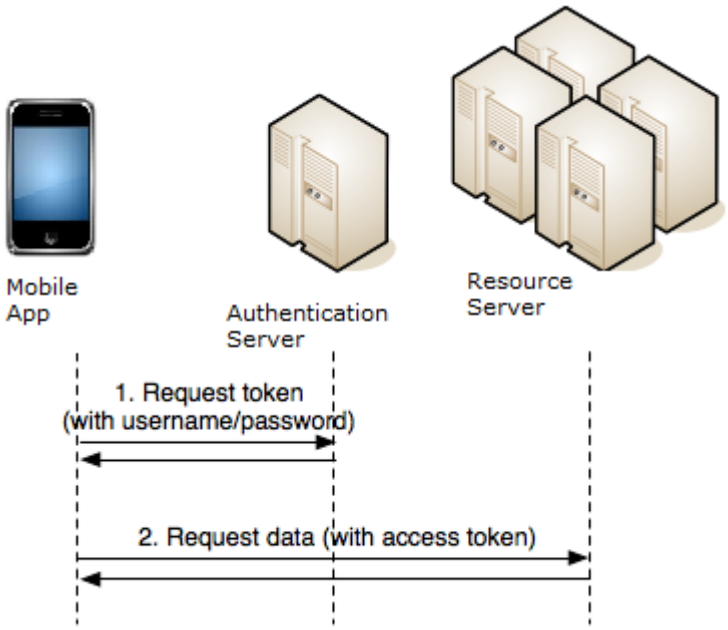


Figure 5.10 OAuth 2.0 with Resource Owner Password Flow (Salesforce, 2015)

Other security measures used include input validation to restrict the type of data sent to the server as well as the use of password rules. Password were required to have a minimum length of 6 characters and have at least one number, one capitalised letter and a special character. This would reduce the risk of successful brute force attacks on the system. Input validation would also reduce the risk of successful SQL injection attack.

6 CHAPTER 6: SYSTEM IMPLEMENTATION AND TESTING

6.1 Introduction

The aim for MotorClaim application system is to improve business decisions based on generated reports and to improve the user experience for the policy holders filing claims with the use of the mobile application. Insurance company customers are currently not well informed on the process of submitting claims and are in most cases confused about what to do in case of an accident and how to involve the insurer. This application will bridge the gap between the insurer and its customers to make the process more efficient and reduce inaccuracy in accident data collection. A mobile application for submitting claims was developed for the customer and a web back end for the insurers to login and access data and reports based on the data collected from the application. The mobile application was tested with 97 respondents who gave feedback about the application. The mobile application will be developed at first for the Android platform, while

6.2 Mobile Application

MotorClaim mobile application was developed to provide motor insurance customers are able to use their smart phones to collect accident details and send the information directly to their insurance company without. Additionally, to the customers will also access useful information such as the ability to call emergency services directly from the application as well as view approved garages. Currently, the application is only compatible with Android devices.

6.2.1 Main Menu

Once registration is complete, the user will be able to access the main menu which has all the main application functions listed such as, Emergency Services, the Policy Details, the File Claims option and Approved Garages. Emergency Services provides the user with emergency numbers they can call at the scene of the accident. The Policy Details contains the user's policy details and contact details; this information is editable. The File Claim page contains the forms that require filling in when an accident has occurred. Approved Garages provides the user with a list of garages approved by the insurance company. Figure 6.1 shows the application main menu.

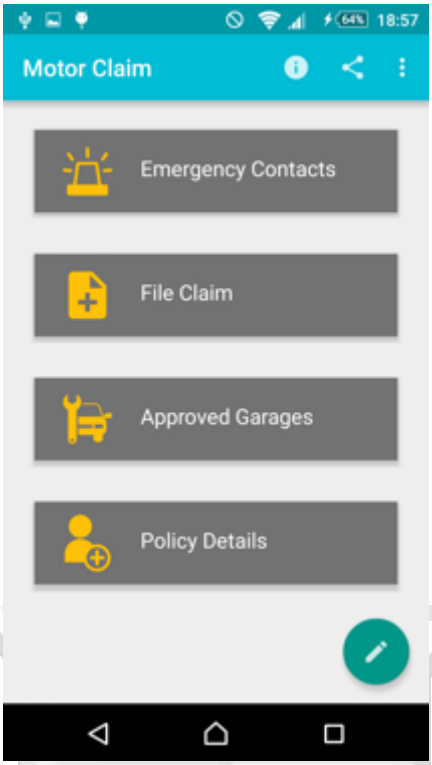


Figure 6.1 MotorClaim Main Menu

6.2.2 Emergency Services

The users can access a list of emergency services with their contacts. Figure 6.2 shows the Emergency Services details. The Services listed and the contacts provided will be updated from the backend database by the system administrator. The available categories of emergency contacts will include police stations, ambulance services phone numbers, towing services contacts and car rescue services such as Automobile Association Kenya (AA Kenya). When the user selects a specific contact, such as Kenya Red Cross Ambulance, the application will automatically begin dialling the ambulance call centre, therefore the user will not have to exit the app to call the ambulance after viewing the contact number.

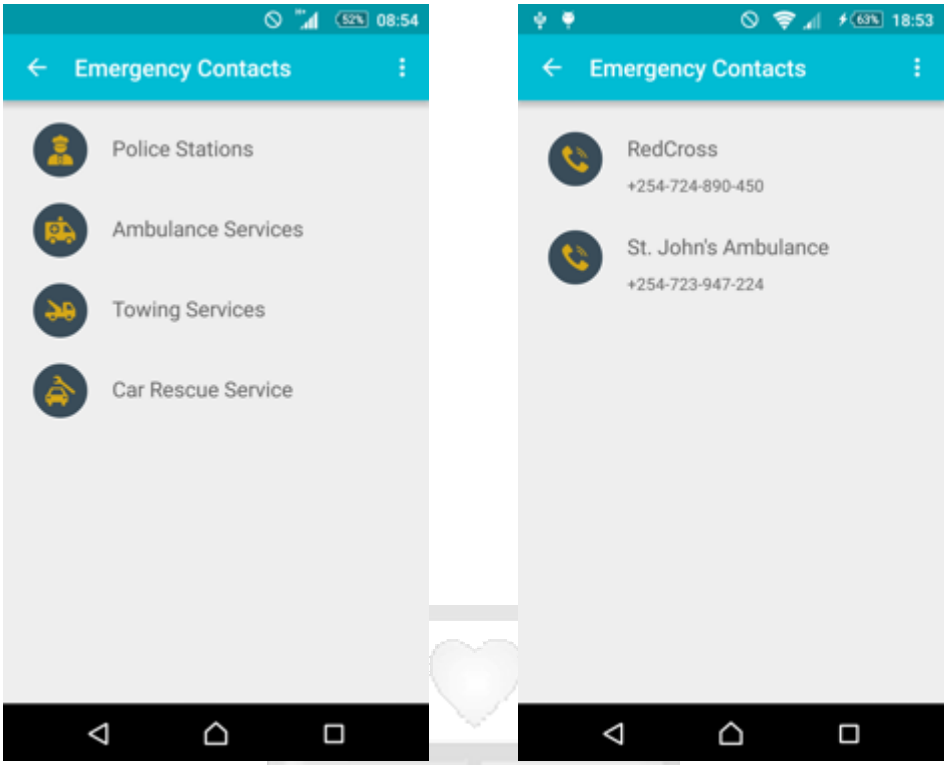


Figure 6.2 MotorClaim Emergency Services

6.2.3 File Claim

Figure 6.3 shows the File claim page which contains a list of steps the user needs to go through in terms of filling in the claims forms. This includes taking photos of the accident scene, entering the details of other driver(s) involved, getting details of how the accident happened, location and time. The user will also be able to upload the police abstract and contact details. The user will be allowed to upload a maximum of 6 photos of the accident. Since the application should be working even when internet is not available, the user can type in all these accident details and the details will be save on an offline database using SQLite libraries. Once the user is able to access internet, they can submit the accident details. To ensure the data submitted is from a genuine customer, the application will require the user to enter their password before submitting the accident details. The Figure 6.3 shows the forms that are expected to be filled by the customer in the event of an accident and is vital for claims processing.

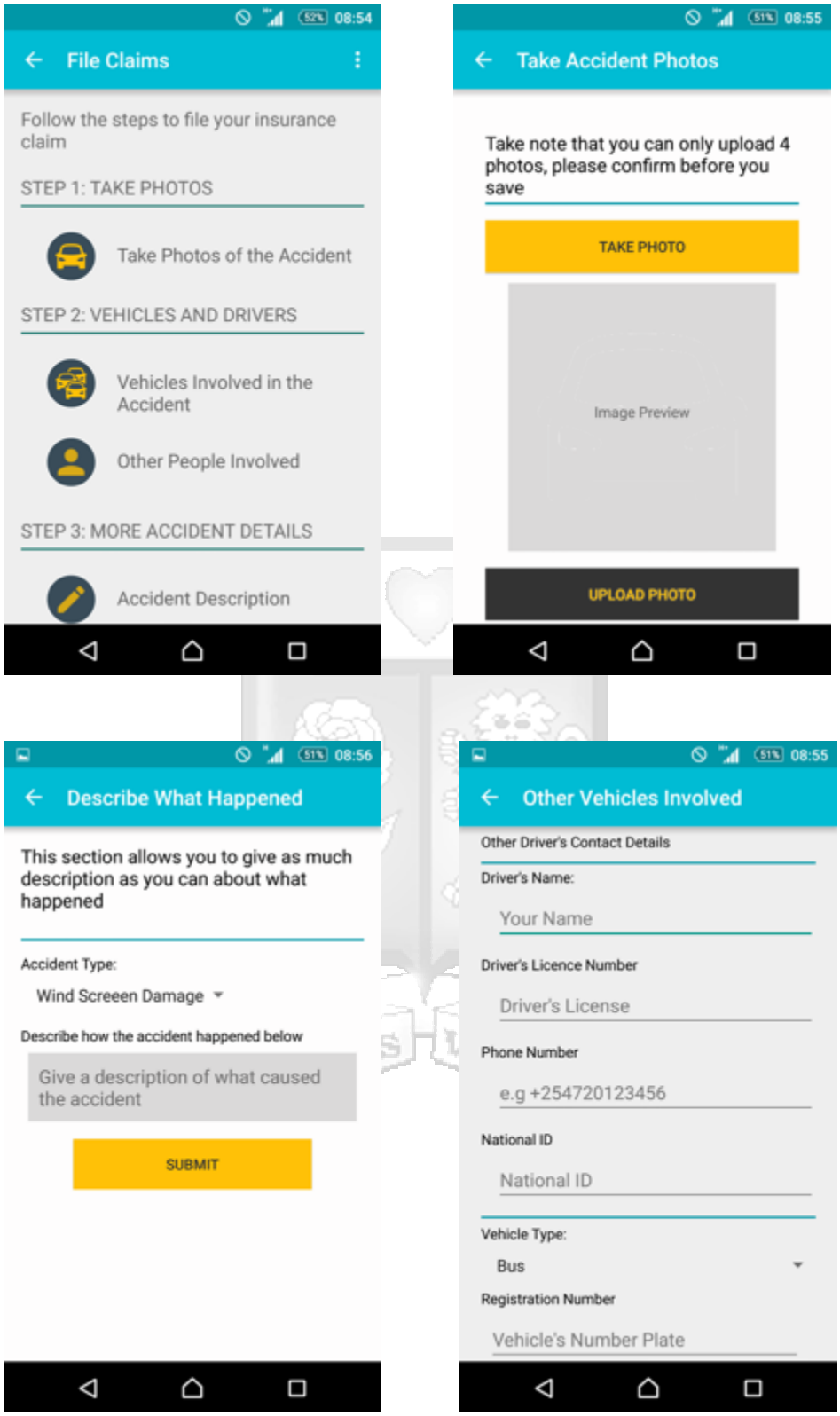


Figure 6.3 Filing Claims

6.2.4 Approved Garages

The insurance customers will also be able to view a list of garages that their insurance company has approved. Not many customers have this information beforehand and it also tends to slow down the process as well as cause them some inconvenience by having to call the insurance company or their agent for this information at the scene of the accident. The list of garages will be listed in order of the distance, so the nearest will be at the top and the farthest at the bottom. The application makes use of Google Location APIs and the device GPS to accomplish this feature. The user can also view the same list of approved garages on a map as seen on Figure 6.4 using the Google map APIs. The Approved garages will be editable from the backend to allow the insurance company claims personnel is able to update the list with accurate data. Therefore, this list will be pulled from the online database to be displayed on the mobile application.

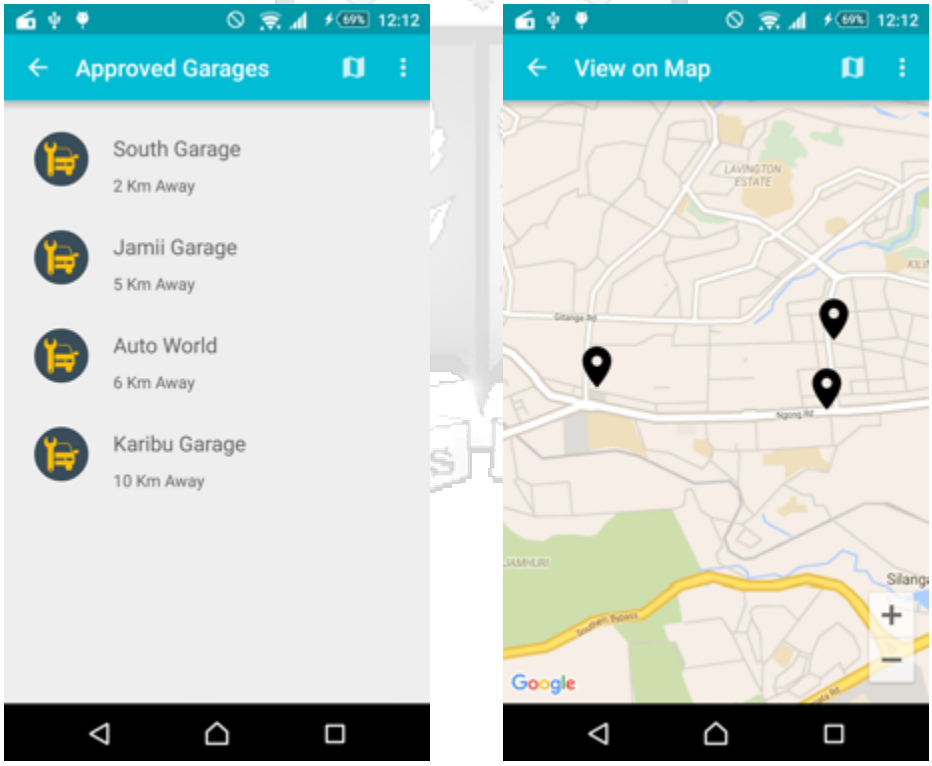


Figure 6.4 Approved Garages

6.2.5 Submitted Claims

The mobile application also has a that displays the list of submitted claims and its status. The user cannot edit the data that was submitted to the insurance company, but can only view

the status or feedback provided by the insurance company regarding the submitted claims. The list of submitted claims and the status will be pulled from the online database. Figure 6.5 illustrates this feature.

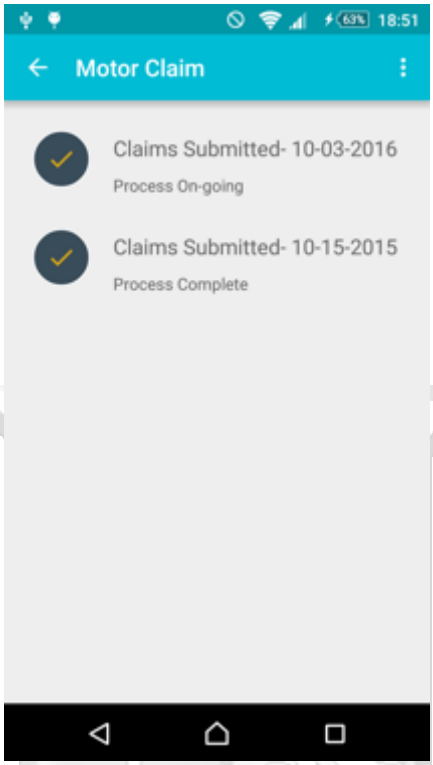


Figure 6.5 Filed Claims Status

6.2.6 Feedback

The application users will also be able to submit feedback using the platform. This feedback form allows them to rate the application and to enter their comments about the mobile application as well as about the insurance company. Only users with a policy from a specific company can give feedback about the company. This will help reduce inaccurate feedback being reviewed by the insurance company's claims personnel. Figure 6.6 illustrates the feedback page.

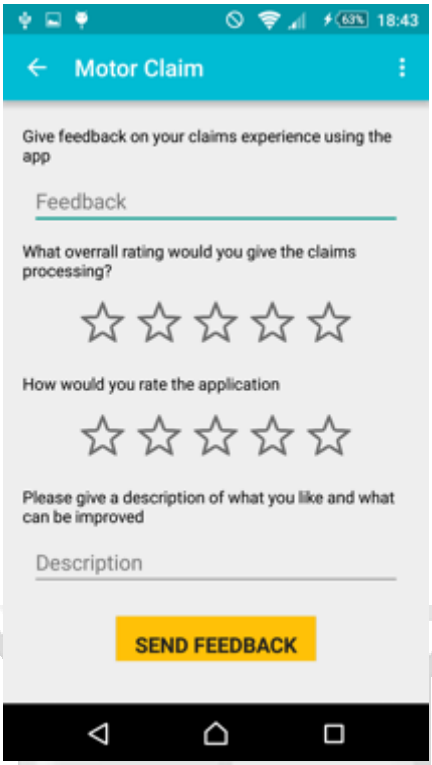


Figure 6.6 MotorClaim Feedback Page

6.3 MotorClaim Back End

The web interface for the various Insurance companies was developed using the Yii framework with the use of web technologies including HTML5, CSS and JavaScript. Yii is an open source PHP framework, which uses a modified version on the Model-View-Controller model. The web backend allows insurance companies to view and action any data that is submitted by their customers via MotorClaim mobile application. This data is dynamically updated from the mobile application and insurers are able to get real time claims filed. The web back end can also be used by the developer and insurer to check for reviews about the application that are submitted by the users and to view feedback about the insurers. The system will employ Role Based Access Control (RBAC) to provide security when users are accessing the web back end. This implementation of role based access will enable different insurance companies to access information that is only relevant to them, thus protecting the user's information from being accessed by unauthorised parties.

The web back end will be accessed by both the insurance companies' claims personnel to manage filed claims and updated all company related information information. For the companies that we to use this platform, the system administrator created users as company

administrators, and they had the ability to add more users to cater for the number of users within the company that might need to use the platform. The system administrator also has access to the backend and can update the emergency services information.

The back end has the following functionality:

i. Filed Claims Management

The claims personnel from the insurance company are able to view claim requests submitted by their customers. The data accessed will consist of the accident description with photos, the police abstract and police contact details, details of others involved in the accident, witness contact details and in case the accident happened while another person was driving, their contact details. This information is important for the insurance company to initiate claims processing for the customer. The claims personnel will be able export this data in portable formats such as excel and pdf and will be able to edit the status of a submitted claim form. That way, the mobile application user can get updates on the status of their submitted claims.

ii. Claims Reports

Processed claims will also be used to generate reports that can be used by the insurance company claims management to provide them with data they can use to review past performance and identify areas of improvement in the process. These reports are updated directly from the database and will therefore give up to date and real-time reports. The reports are only accessible to management and they were created in the system by the system administrator.

iii. Manage Company Information

The claims personnel from the insurance company are also able to edit company information such as company specific approved garages, and their contact information.

iv. Manage Emergency Contacts

The system administrator will also be able to update emergency services contacts that are saved in the database. The updated emergency contacts will therefore be displayed on the mobile application when.

v. Feedback

Both the system administrator and the claims personnel have access to feedback from mobile application users. The system administrator will only have access to feedback about the mobile application, while the claims processing and management in insurance company have access to feedback provided about the company itself. The feedback page lists the ratings and reviews submitted by the application users. This is vital in improving the user experience both on the application and with company in question.

vi. User Manager

The user manager enables the system administrators within the insurance companies to add new users who can access the web back end. The user creation form requires the user group i.e. whether the user is a Claims Manager, Claims Personnel or another Administrator, needs to be specified.

6.3.1 Home Page

Figure 6.7 shows the home page of the back-end system which is accessible to anyone and is meant to be a tool for marketing the application to especially to Kenyan insurance companies. The home page highlights the advantages of using MotorClaim for both the end customer and the insurance company.

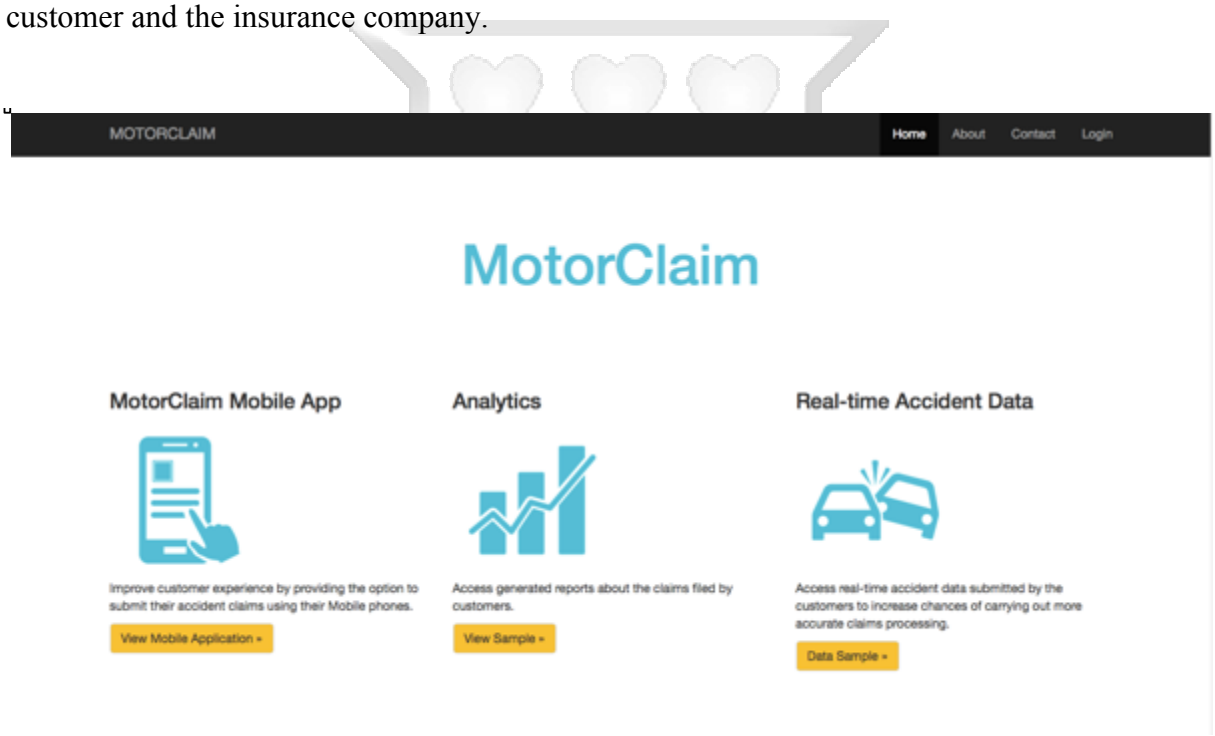


Figure 6.7 MotorClaim Web Backend: Home Page

6.3.2 Submitted Claims

Figure 6.8 shows the submitted claim forms that can be viewed by claim personnel; the status field is editable to allow the claims personnel to update the status as it is processed. All submitted claims will be assigned a status being processed, when saved in the database through MotorClaim mobile app.

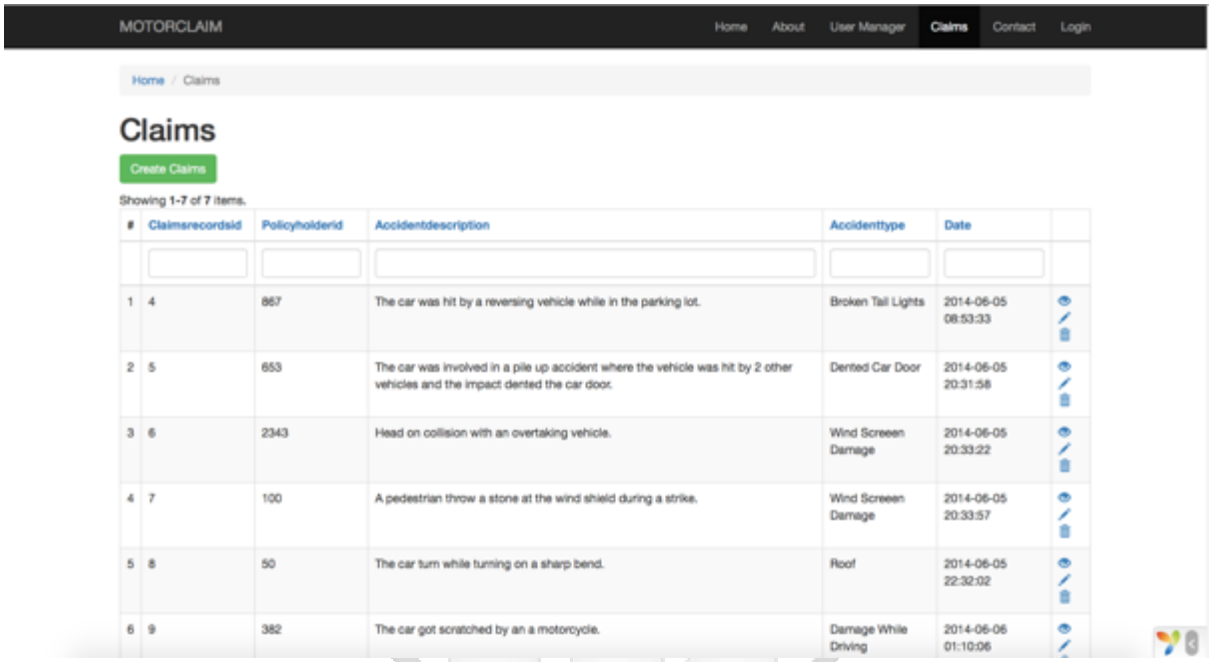


Figure 6.8 Claims Submitted

6.3.3 Claims Report Analysis

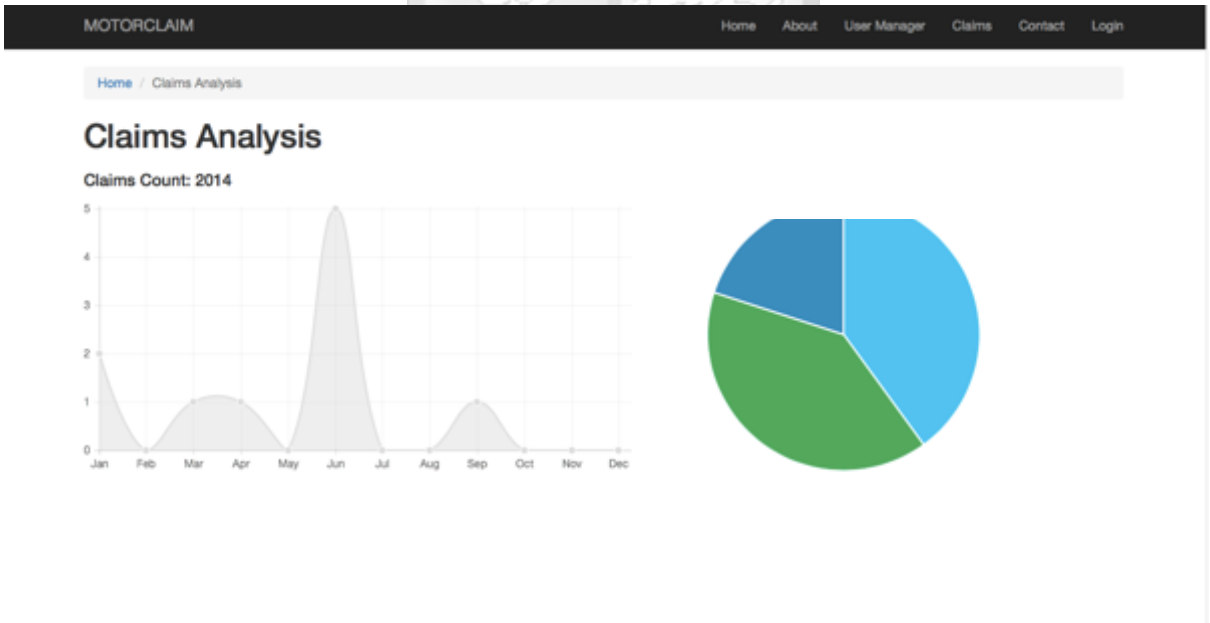


Figure 6.9 Claims Analysis

Figure 6.9 demonstrates the analysis of the claims reports are generated from the claims data available in the database. These reports are generated to provide a summary the status of the claims filed over the last year and summary of claims submitted over the last year. This information is important to the Claims management and the insurance company as a whole,

since these are some of the factors that may increase the risk posed by an individual and thus can be used to determine better premiums to make the business have better profits.

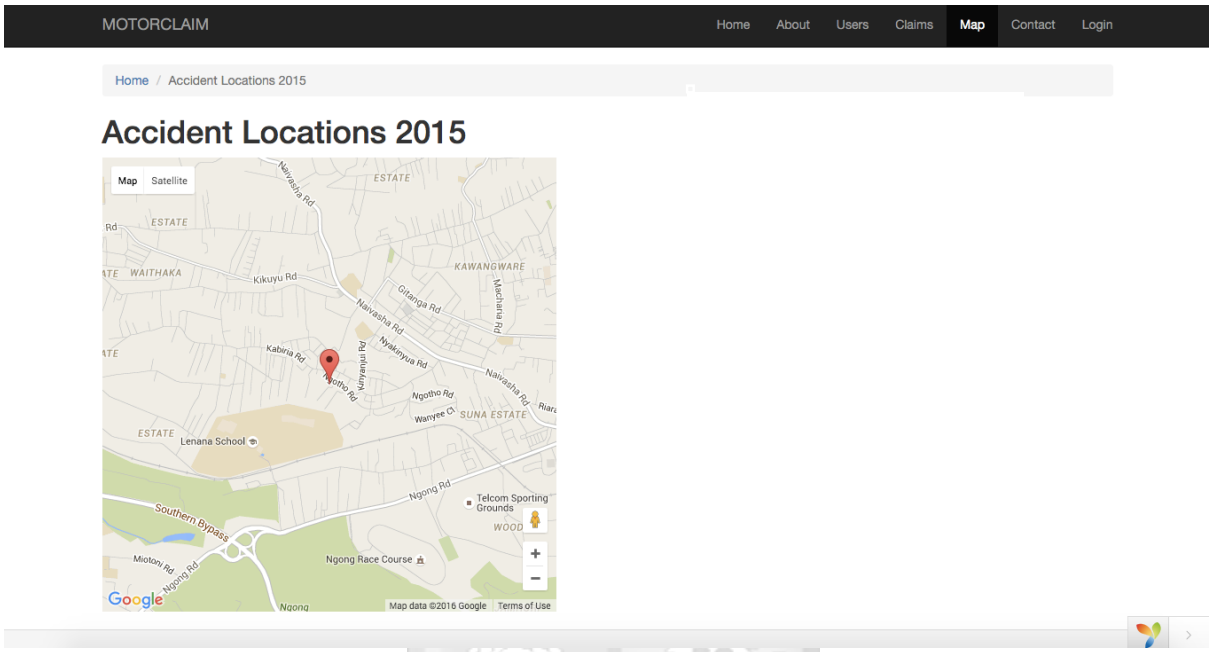


Figure 6.10 Claims Analysis: Accident Locations

Figure 6.10 demonstrates the analysis of the claims reports by location and displays the points at which accidents have occurred on a map. This provides useful information as to which areas are more prone to accidents.

6.4 System Testing

The system underwent testing by the group of 97 testers with the test cases in Appendix B. Their feedback was collected and analysed using Microsoft Excel and the results from the survey are documented in Appendix C.

6.4.1 Testing Results

The mobile application testing was done in two stages; testing of the overall app performance and testing each application module of the application on its own in terms of ease of use, navigation, responsiveness and effectiveness. Figure 6.11 shows the overall performance provided by the respondents about the MotorClaim mobile as per the results collected from the questionnaire. The Figure shows that the respondents found the application good in terms of responsiveness, the effectiveness, the user interface and user experience (ease of use). However, 53 users as seen on (Appendix C, Table C.1), found the navigation of the

mobile application fair since the steps outlined on the filing claims did not have a good flow and could have been implemented better. had the time to use it on a scenario base and also due to the fact that the information had not covered the entire country and was only concentrated on selected cities in the country.

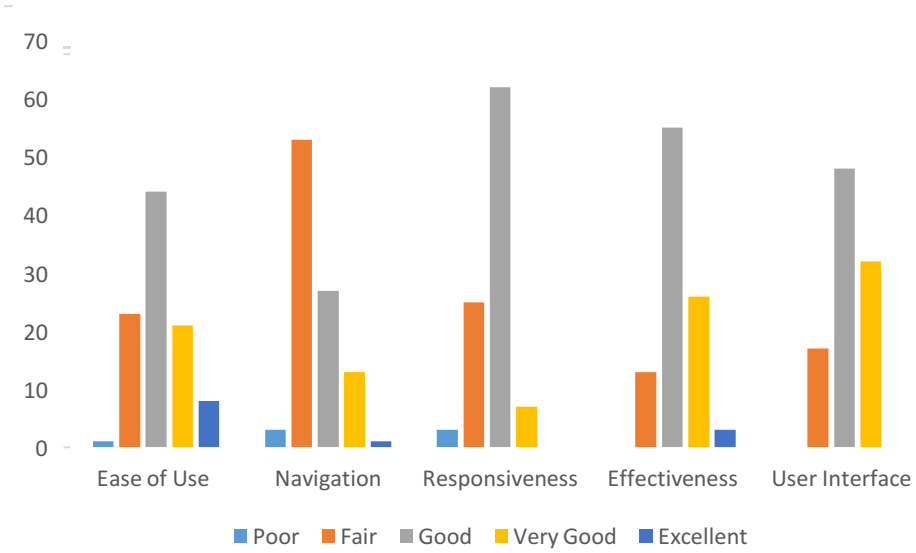


Figure 6.11 Overall Performance

The individual modules of the mobile application were also assessed. Figure 6.12 shows feedback based on the responsiveness of the application. The file claim functionality of the application was found to be responsive by 55 of the respondents as shown in the post testing questionnaire (Appendix C, Table C.2). This was contributed by the fact that data is first saved offline then sent to the database to ensure the users can fill in the forms even while offline. The other modules were also found to be responsive to use as indicated in the visual on Figure 6.12.

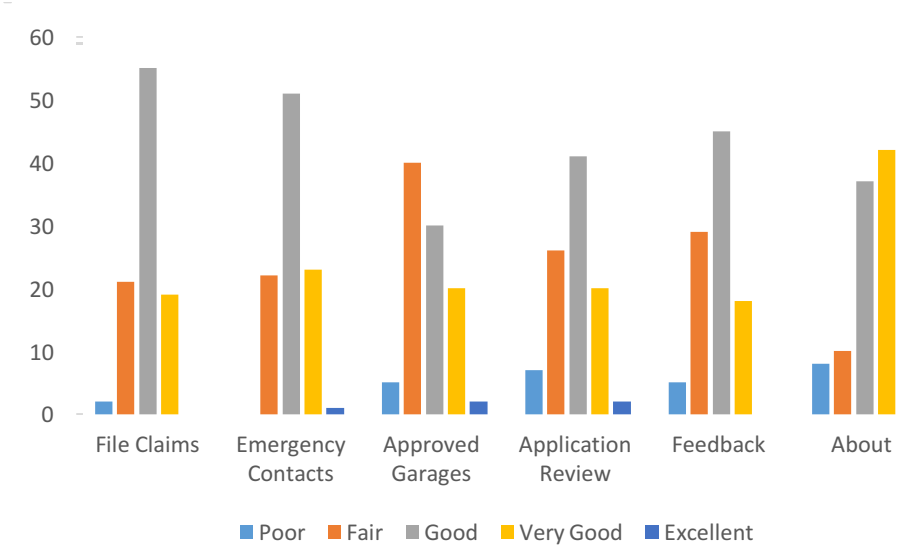


Figure 6.12 Responsiveness of Application

The review and feedback functionality of the application however were rated mostly fair by the respondents this could have been caused by poor internet connection since that data is collected. The garage was described as poor by 40 respondents and this was caused by the map the took time to load on the devices since the map needs fast internet for the user to get first response.

Figure 6.13 shows the feedback based on ease of navigation within the application and all the modules were viewed as good by the respondents. The respondents mainly gave feedback that indicated easy navigation on the main menu and poor navigation for the items on the overflow menu (feedback, app review and about modules). File claims also had relatively more respondents stating that the it was poor and some of them explained that they were unable to know when they have finished navigating through the claim forms. The garages module was stated to be poor by 27 (Appendix C, Table C.3). respondents and that was caused by not clearly finding the map button on the approved garages action bar. The respondents suggested to place the map button in a position that is easier to navigate to.

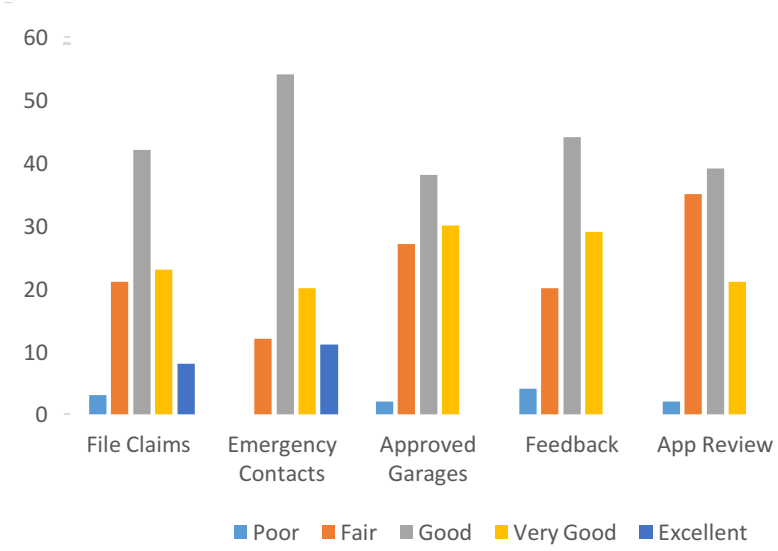


Figure 6.13 Navigation

Figure 6.14 shows the respondent's feedback based on effectiveness of the mobile app. In general, most of the modules had a high number of respondents stating that the effectiveness was good. 63 respondents thought the feedback module was good in terms of effectiveness. The about page was said to be poor by 34 respondents (Appendix C, Table C.4). due the lack of sufficient information about the application in terms of usage and functionality.

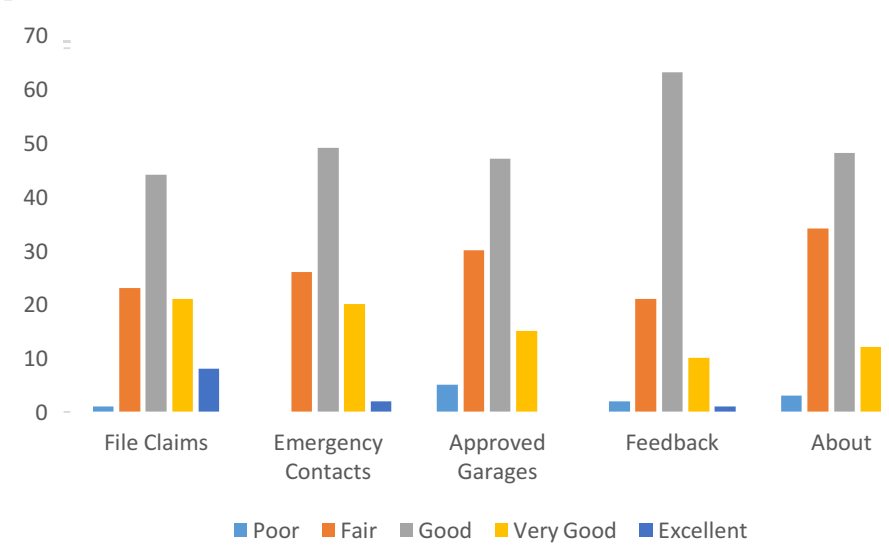


Figure 6.14 Effectiveness of Application

6.5 Summary of Findings

Overall, the application feedback was satisfying as it met the objectives of the research. A good number of the respondents felt that the solution proposed by the researcher was relevant and would be effective if used in claims processing. Most of them felt the process would be more efficient, more convenient and more interactive. These respondents felt the current system is tedious, and inefficient in terms of time and money. The respondents felt user interface was good and easy to follow.

On the other hand, the respondents had some issues with the navigation and responsiveness of the application. The responsiveness of the application was somewhat affected by the lack of sufficient network coverage for some of the respondents especially for the modules that did not work while the device is has limited connectivity. Navigation was also a challenge for some of the respondents since some items were placed in an overflow menu and most are used to accessing menus from a navigation drawer.

Due to the bad experiences some of them had when trying to apply for accident claims, they were excited about the concept of being able to conveniently file a claim from their mobile phones and to be able to track its progress on the same platform. The mobile application could be improved using all the feedback given by the respondents like improving navigation and improving offline capabilities as well. The research objectives were met by using all reviewed systems and trying to fit them to the local context and also be flexible to be used worldwide.

7 CHAPTER 7: DISCUSSIONS AND RESEARCH FINDINGS

7.1 Introduction

The literature review described the concept behind Insurance claims and analysis and also described the claims process used in Kenya by most insurance companies, and described the process in more advanced countries as well. The use of technology in insurance, and more specifically – claims processing was found to be of great importance and that it could even play a role in increasing company profits and affecting the loss ratio. The loss ratio can be described as the the total claims paid out by the insurer, underwriting group, expressed as a percentage of the amount of premiums coming in during the specific period (Oxford, 2016). The insurance market in Kenya was also described as growing, with motor insurance uptake leading among the other insurance products. The challenges that local insurance companies face when processing claims were highlighted and reasons such as fraud, inefficiency and inaccuracies in accident data collected were found to be challenges.

In more advanced markets such as western countries and South Africa, processes such as filing claims have been simplified by providing insurance customers with mobile apps for initiating the claims process. Some of these insurance companies have even gone the extra mile to implement claims analysis tools to gain valuable insights into their customers' claims data. NTT (Nippon Telegraph and Telephone) Data Insurance Reporting Tool is one such system that was discussed which made use of IBM Cognos tool to analyse insurance data collected from various insurance processes including claims, underwriting HTML (Nippon Telegraph and Telephone Data, N.D.). A Unified Analytics platform was also discussed which took into account the fact that data in now collected from heterogeneous sources (mail, social media and so on) and and in multiple formats (voice, images, text and so on). These analysis systems are mostly web-based and do not offer a mobile application solution as a data source, instead the data is mostly collected from web GUIs.

In Kenya, these advancements are still far from being adapted by the local insurers and their customers. However, they have started to see the need to increase the use of technology in claims processing to reduce claims fraud. The high number of reported fraud in Kenya has affected innocent insurance customers because the premiums had to be increased to reduce the risk for the companies (Klynveld Peat Marwick Goerdeler, 2015). It was therefore clear that new and innovative tools were needed to improve and reduce the flaws of the current system. Therefore, the aim of this research was to develop a mobile application solution that would provide data collection and analysis of insurance accident claims. The developer came up with

an Android application to be used by the insurance company customers in the event of an accident. This was to allow the customers to use their mobile phones to submit accident and policy details to the insurance company for claims processing to begin. The developed system also comprised of a we back-end which displayed records and analysis of the accident and claims data. This analysis was meant to be beneficial to the insurance company in making decisions that would affect their profits and loos ratio by minimising risk.

7.2 Discussion of the Mobile Application

The MotorClaim mobile application received positive feedback from the respondents who test the application. A hundred percent of the respondents thought that using a mobile application to submit accident details for claims would be beneficial in improving the efficiency and offering convenience in the event of a motor accident. They also indicated that in order for the system to better serve to the requirements of the local market, more needed to be added to the application, such as including brokers and assessor in the process. Feedback from insurers was also positive and were excited by the notion of accessing analysis of the accident and claims data. Although the application would not solve all the issues faced in claims management, it would offer a great value and would improve customer experience.

The main modules that users seemed to appreciate were;

i. The claims form functionality; the users felt this feature offered them convenience when filing accident claims since many did not know the data to be collected at the scene of the accident or the process followed and they would be saved the inconvenience of queueing after at the insurance company.

ii. The emergency contacts functionality; the users found this feature to be very helpful since most do not know how to access emergency services and since after an accident most people would be disoriented, this feature would provide the information they require.

iii. The approved garage functionality; since most users are not aware of the approved garages, they found this helpful sing they could select the nearest garage that is approved by their insurance company. They also found it helpful that they could view the garages on a map so to help them navigate to the garage after the accident.

7.2.1 Overall Application Feedback

The mobile application was assessed by the respondents and they felt the overall application was good. 100% of the respondents agreed that a mobile application was necessary to be used for claims processing and more specifically, to collect accident data. They specifically assessed the overall application based on ease of use, navigation, responsiveness and effectiveness of the application, as seen in table B.1 in the appendix. These results indicated that in the 63% found the application to be well responsive and 56% found it to be effective.

However, 57% (table B1) of the respondents found the navigation of application in need of improvement and suggested that the claim forms needed to be displayed in a better way and follow in a more orderly way to allow users to easily navigate between forms and review their responses.

7.2.2 Assessment of the Individual Modules

The respondents were also requested to give feedback on the individual modules of the application; these included filing claims, emergency services, approved garages and feedback. The respondents gave positive feedback especially for the file claim module, which 56% felt was responsive (Appendix C, Table C.2). However, 41% of the respondents felt the responsiveness of the approved garages map could be better, since for some it took a long time to load. They were also impressed by the effectiveness of the feedback module since 64% gave feedback to this effect as seen in Table B.4 found in the appendices. The functionality that was rated poorly by the respondents included navigation – especially for feedback, claims status, and the map with approved garages since these features were not easy to navigate to or find.

8 CHAPTER 8: CONCLUSIONS AND RECOMMENDATIONS

The objective of this research was to analyse the existing claims management processes in the local insurance industry and to develop an application that leverages the mobile phone features to simplify the submission of motor insurance claims for the customer and to provide insight to improve current processes. Many local insurance companies provide forms in portable formats on their websites such as pdf for their customers to download and fill. This proved to be challenging for their customers since at the time of an accident, this method is inconvenient and most of the information required to fill the form have to be filled in later. In some cases, the insurance customers were assisted by their agents/brokers to submit their claims, but for many, even this solution was long and inefficient, without feedback on the status of the claims from the insurance company and the agent on the progress.

The literature review investigated the existing models and frameworks in claims processing and analysis and system architectures. With this information, the researcher developed a mobile based application to act as a solution to the challenges faced in claims processing. The research also revealed that no such solution for accident claims submission and analysis was proposed and implemented in Kenya so far and was found backed by the feedback. The respondents' feedback about the application indicated that the market is ready for such a solution and that insurers are also looking to implement such solutions for their customers and internal processes.

8.1 Recommendations

From the findings that were discovered during the research, the following crucial points were recommended;

i. The mobile application should have additional modules to incorporate the brokers and assessors in the process of submitting claims. This can be accomplished by giving brokers access to the web backend to view their customers' submitted claims and also allowing assessors to submit their reports on the application.

ii. The application should also be developed for other mobile phone operating systems such as iOS, Windows and Blackberry since quite a number of the local insurance market use such devices.

iii. The application should be extended to incorporate more insurance processes such as renewal of the policy and subscription of new policies as well as partnering with the insurance companies to market their other products to the customers.

8.2 Suggestions for Future Research

This research provided a solution that could work for the current insurance industry, however, there are some more factors in the industry that need to be analysed and improved using modern technology. Some of these research areas and one such example is the improvement of the underwriting process for the various insurance products. This would help future solutions to have a more holistic approach to providing technology solutions to insurance companies and their customers.

Another area of concern is the integration of innovative systems such as MotorClaim mobile application to the existing enterprise systems. Since some insurance companies in Kenya already have existing internal systems in place as organisations, there is a need to integrate new applications to plug in to their systems since this will provide them with a better experience when accessing data since they will only need a single interface to interact with for a more robust system.

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10 APPENDICES

10.1 APPENDIX A: Questionnaire

A mobile Application for Submitting Motor Claims has been developed and as a result, the researcher is conducting a research on effectiveness of a mobile application in submission of claims to insurance companies.

PART A: CUSTOMER GENERAL DEMOGRAPHIC DATA

(Please tick appropriately)

1. Gender
   - ◤ Female
   - ◤ Male

2. With which insurance company have you insured your vehicle?

   _____

3. What is your occupation?

   - ◤ Employed (Public sector)
   - ◣ Employed (Private sector)
   - ◤ Own business/Self-employed
   - ◤ Farming
   - ◣ Housewife
   - ◣ Student
   - ◤ Retired
   - ◤ Other (Specify)

   Other: _____

4. What is your age?
   - ◣ 18 – 25 years
   - ◤ 26 – 35 years
   - ◣ 36 – 45 years
   - ◤ 46 – 55 years

- 56 – Above years

5. What kind of phone do you use?

Tick as appropriate	Definition of phone	Has any of the following features
	Basic phone	- Send/receive SMS - Make/receive calls
	Feature phone	- All of the above plus, - Access the internet - Send/receive emails - Can take high quality videos
	Smart phone	- All of the above plus, - Touchscreen - Internet access via WIFI - Runs on Android, IOS, Windows or Blackberry - Can download apps from app store

6. If you use a smart phone, what is your favourite application?

_____

7. How do/did you get information about how to submit claims after an accident?

- Asking your broker/agent
- Asking the insurance company
- Visiting the insurance company website
- Asking friends
- Other (Specify)

Other: _____

8. How effective have these methods been for you?
   - Very effective
   - Somewhat effective
   - Slightly effective

- Ineffective
- Not effective at all

9. In your experience/knowledge how long does the process take?
   - 0 to 2 Weeks
   - 2 Weeks to 1 Month
   - 1 to 3 Months
   - 3 Months and Above
   - I do not know

10. What challenges did you experience?
    - Processes take a long time
    - Lack of communication from insurance company on progress
    - Too much of a hustle in case the accident is minor
    - Corruption by police officers
    - Lack of availability of an assessor when called
    - Unreliable garages
    - Other (Specify)

    Other: _____

11. Would you like to use a mobile application to submit your claim forms and accident details?
    - Yes
    - No

    Why/why not? _____

PART B: INSURER/BROKER QUESTIONNAIRE

1. What are the details required for a motor insurance claim to be processed?
   - Car Policy details
   - Police Abstract

- Driver details
- Vehicle damage information
- Contacts of third parties involved and their policy details
- Photos of the accident damage
- Assessor's report
- Other (Specify)

Other: _____

2. How long does the company take to process a motor insurance claim?
   - 0 to 2 Weeks
   - 2 Weeks to 1 Month
   - 1 to 3 Months
   - 3 Months and Above
   - No specific time frame

3. What other means would you like to obtain evidence in this process?
   - Witness accounts and contacts
   - Audio recording describing the accident
   - Video recording describing the accident
   - Contact with the involved police officer
   - Other (Specify)

Other: _____

4. How is the customer notified once the claim processing is complete?
   - Through agents/brokers
   - Phone call
   - Email
   - SMS
   - Other (Specify)

Other: _____

5. What factors affect claims processing?

- Incomplete submission of documents/ information from clients
- Inadequate systems to streamline process
- Lack of enough staff members
- Unreliable services from garages
- Corruption cases in the processes
- Other (Specify)

Other: _____

6. Would you like your customers to use a mobile application to report accident and submit accident details?

- Yes
- No

Why? _____

7. What more functionality can be incorporated in such a mobile application?

_____

PART C: POLICE QUESTIONNAIRE

i. What is the process before, during and after writing an abstract form for a vehicle to vehicle accident and what details do you capture?
ii. What do you like about the entire process?
iii. What challenges do you face?
iv. How would you like the process to be improved?
v. Would you be willing to give work and contact details (Name, work ID, Contact Phone Number, Police Station) to an insured party?

10.2 APPENDIX B: Mobile Application Testing

In application testing: Ask the user to do the following test.

1. Use the file claim feature
2. Use the emergency services feature
3. Use the approved garage feature
4. Submit feedback
5. View about MotorClaim.
6. Use application review

Filing Claims Module:

Task 1: This will enable the user to type in the accident details on the application and submit the claims.

Test Metric 1: The process is easy to understand and follow.

Test Metric 2: Ease of submitting the accident details

Test Metric 3: Appropriate response message after the details are sent.

Emergency Services Module:

Task 1: This task provides a list of available emergency services and the means to contact these service providers. The information is in form of a dynamic list

Test Metric 1: Ease of loading the dynamic list

Test Metric 2: Correct information is displayed

Test Metric 3: Ease of contacting the service providers

Approved Garage Module:

Task 1: This task provides a list of approved garages, which is a dynamic list. and also displays the garage locations on a map.

Test Metric 1: The map loads fast

Test Metric 2: Correct information is displayed.

Feedback Module:

Task 1: This task will enable the user to send feedback to the insurance company about their claims process. This information will be sent to the respective insurance company in form of email and will also be updated on the back end database.

Test Metric 1: Ease of finding the navigation drawer of the application

Test Metric 2: Ease of finding the feedback module within the drawer of the application

Test Metric 3: Ease of submitting the feedback

Test Metric 4: Appropriate response message after the feedback is sent.

Application Review Module:

Task 1: This gives the user an opportunity to send their review and comments about the application.

Test Metric 1: Ease of submitting the review

About Module:

Task 1: This task will enable the user to read and learn more about the mobile application.

Test Metric 1: Relevance of the information in the page.

PART A: POST APPLICATION TESTING

1. Was there anything unexpected during your interaction with the application?
   - Yes
   - No

   If yes, specify? _____

2. In the application which feature did you like the most, why?

   _____

3. How would you rate the overall performance of the application? Select appropriately

	Poor	Fair	Good	Very Good	Excellent
Ease of Use					
Navigation					
Responsiveness					
Effectiveness					
User Interface					

4. How good is the system in carrying out the following functionalities?

		Poor	Fair	Good	Very Good	Excellent
1	File Claims					
2	Emergency Contacts					
3	Approved Garages					
4	Feedback					
5	About					

5. How fast is the system in responding to actions in the following tasks?

		Poor	Fair	Good	Very Good	Excellent
7	File Claims					
8	Emergency Contacts					
9	Approved Garages					
10	Application Review					
11	Feedback					
12	About					

6. How easy is it for you to learn how use the application to perform the following tasks?

		Poor	Fair	Good	Very Good	Excellent
13	File Claims					

14	Emergency Contacts					
15	Approved Garages					
16	Feedback					
17	App Review					
18	About					

7. Any additional comment?

_____

10.3 APPENDIX C: Post Testing Questionnaire Responses

Table C.1 indicates the overall feedback from the respondents about the performance of the application in reference to the ease of use, navigation, effectiveness, user experience and user interface.

C.1 Overall Performance

	Poor	Fair	Good	Very Good	Excellent
Ease of Use	1	23	44	21	8
Navigation	3	53	27	13	1
Responsiveness	3	25	62	7	0
Effectiveness	0	13	55	26	3
User Interface	0	17	48	32	0

Table C.2 indicates feedback from the respondents based on the responsiveness in terms of speed on the app when an action is taken on the listed modules.

C.2 Application Responsiveness

		Poor	Fair	Good	Very Good	Excellent
1	File Claims	2	27	49	19	0
2	Emergency Contacts	0	22	51	23	1
3	Approved Garages	5	14	56	20	2
4	Application Review	7	29	39	20	2
5	Feedback	5	29	45	18	0
6	About	8	39	37	13	0

Table C.3 indicates feedback from the respondents based on the navigation of the application while using the following modules within the application.

C.3 Application Navigation

		Poor	Fair	Good	Very Good	Excellent
7	File Claims	3	21	42	23	8
8	Emergency Contacts	0	12	54	20	11
9	Approved Garages	2	27	38	30	0
10	Feedback	4	20	44	29	0
11	App Review	2	35	39	21	0
12	About	4	21	40	32	0

Table C.4 indicates feedback from the respondents based on the effectiveness of the application while using the following modules within the application.

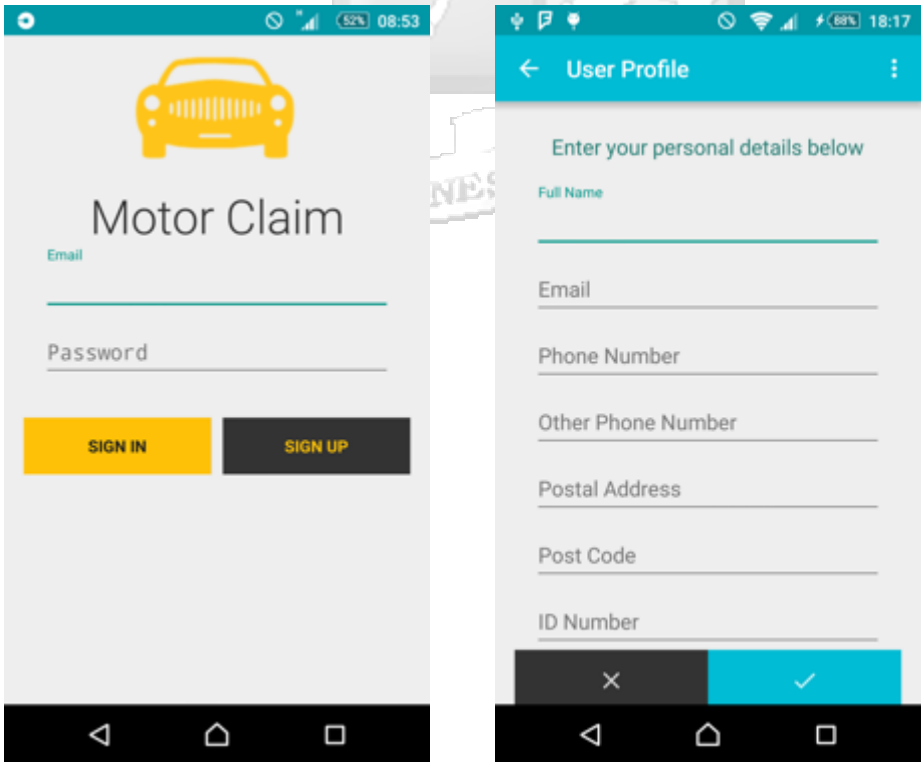
C.4 Application Effectiveness

		Poor	Fair	Good	Very Good	Excellent
13	File Claims	1	23	44	21	8
14	Emergency Contacts	0	9	45	33	10
15	Approved Garages	5	30	47	15	0
16	Feedback	2	21	63	10	1
17	About	3	34	48	12	0

10.4 APPENDIX D: MotorClaim Customer Sign In/Sign up

Sign Up and Registration

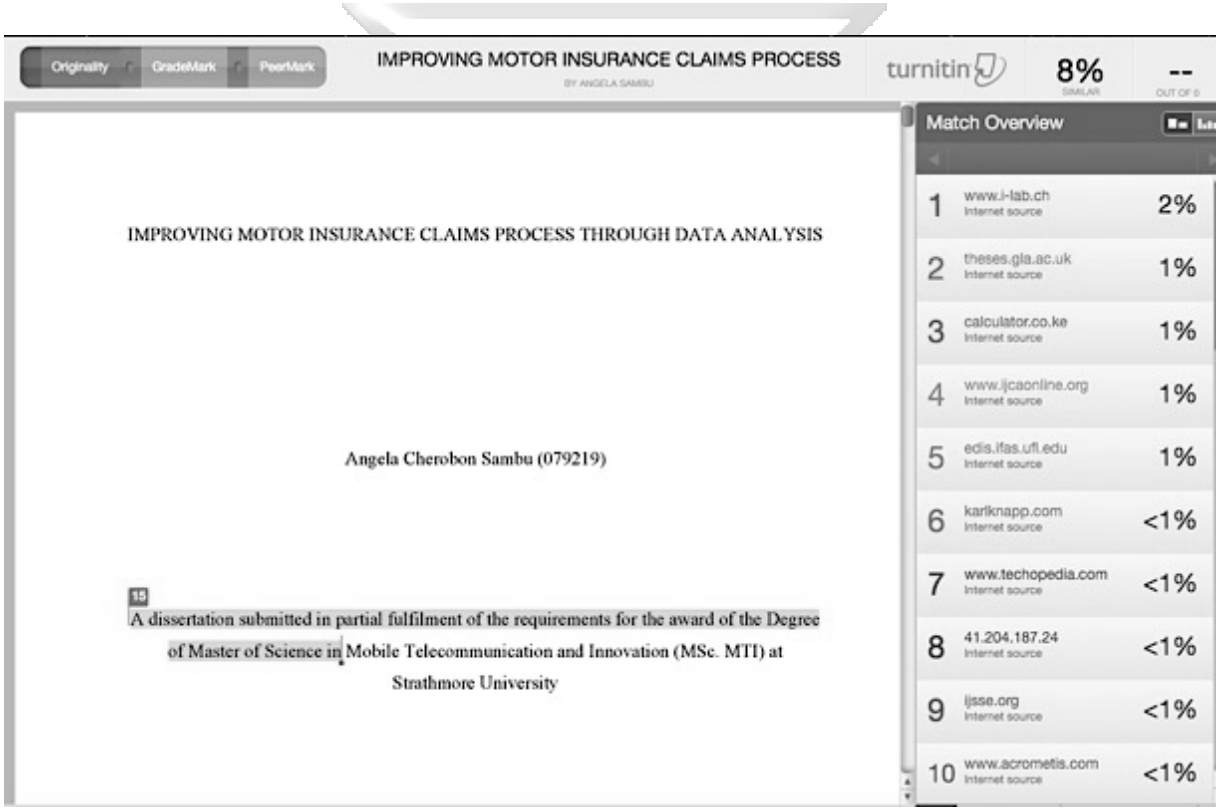
The screenshot below (Figure D.1), shows login/registration page which loads the first time the application is launched. In case it's a new user, they will be required to register their contact and policy details but existing users can login with their user credentials.



D. 1 Login and Registration

The application only requires the user to login once unless they choose to logout. This will help reduce complexity for the user since they might need to access the app while they are offline. Sign up details can also be updated by the user later such as the policy number and insurance company in case those details change. The application registration fields presented to the customer will consist of data about the customer that is normally captured by the insurance companies in Kenya in case the user had an accident and wishes to get a settlement from the company. This data is consistent across the various insurance companies and thus all users will record the same details regardless of the company their policy belongs to.

10.5 APPENDIX E: Turn It In Report



E. 1 Turn It In Report

Figure E.1 shows the researcher paper's Turn It In report with an analysis of the similarity of the paper.