UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS

Collaborative Web-Based Computer-Assisted Bible Translation Software: A Prototype

Presented By

Obadiah Matolo Musau

P56/70685/2007

Project Supervisor

Andrew Mwaura Kahonge

April 2011

A Project Report Submitted in partial fulfillment of the requirement for the award of a Master of Science in Information Systems

Declaration

This Project as presented in this report is my original work and has not been presented for any other university award

Sign ....

Date **11|05|2011**

Name: Obadiah Matolo Musau

Reg No: P56/70685/2007

This project has been submitted as a partial fulfillment of the requirement for the Master of Science degree in Information Systems in the University of Nairobi with my approval as the University Supervisor.

Sign: ....

Date: .....**12|May|2011**.....

Name: Andrew Mwaura Kahonge

 School of Computing and Informatics

 University of Nairobi

ABSTRACT

Defined as the transfer of written or spoken Source Language texts to equivalent written or spoken Target Language texts, translation has been used over the years to reproduce various kinds of texts in another language and making them available to wider reader who may not have understanding of the source language. In this report we propose development of Bible Translation software that automates the entire process of translating the entire Bible from one language to another with minor human intervention, in the form of pre-editing and post-editing to fine-tune the translation fit the target language grammar. The Bayesian Rating is used to show the highest rated product in order. This type of rating avoids a situation where a new translation with 1 vote immediately, and if its rated high, jumps to first place, as its average rating would be the highest.

Bible Translation has become a multi-year exercise that commits a lot of resources just to realize a single translation. Research has shown that translating the Bible using the current manual process attracts huge amounts of money and time especially during the stage of gathering the initial translations from the target language groups who are scattered over long distances, which are isolated by harsh climate with rough terrain and poor infrastructure rendering them inaccessible or even too costly to be accessed and insecure. It s for this reason, a more efficient system is developed. The Translation System takes in proposed translations from users, rates and rank the translations based on their ratings. The system then filters the top two translations which are the most recommended, this is submitted to the team of translators for approval and adoption

ACKNOWLEDGEMENT

DEDICATION

This project is dedicated to my beloved mother Mrs Susan Mwethya Musau for her love and for having taken the pain of bringing me up, my brothers Jeremiah Kioko and Nicholas Kyalo for their financial support during my high school and undergraduate studies, my friends Stephen Mutemi Ikiku for encouraging me to better myself and finally to Mr Paul Kathale and Mr Charles for their support and encouragement

TABLE OF CONTENTS

List of Figures

List of Tables

List of Abbreviations

DFD   *Data Flow Diagram*

DBMS   *Database Management System*

SQL   *Structured Query Language*

PHP   *Hypertext Preprocessor*

ICT   *Information and Communication technology*

Email   *Electronic Mail*

BTL   *Bible Translation Literature*

SSADM   *Structured System Analysis and Design Method*

ERD   *Entity Relationship Diagram*

KSh   *Kenya Shillings*

PREFACE

Chapter 1: Introduction
The chapter provides a brief description about the Bible Translation work and the current challenges facing the process. The main aim of the study and the general objectives of the anticipated system are discussed.

Chapter 2: Literature Review
This chapter covers previous research work carried out prior to the start of the project. It contains a review of the existing translation software and other work that has been done related to the project.

Chapter 3: Methodology
The chapter describes the approach used to develop the proposed system. It covers study of a current system and its problems, and definition of the proposed system's needs and requirements. It also covers Feasibility study to determine whether the project is worth doing before resources are committed to it.

Chapter 4: Systems design
This chapter covers the logical and physical requirements of the proposed systems so as to fulfill the user requirements

Chapter 5: System Implementation:
This chapter covers the creation of a physical layout of the new system as per the system specification produced during system designs. This includes the process of placing the system into operation.

Chapter 6: Discussion, Conclusion and Recommendations
This chapter highlights the success and achievements of the project. It also highlights the limitations and challenges encountered during the project development life cycle. It also includes recommendations and future improvements

CHAPTER ONE: INTRODUCTION

Translation is the action of interpretation of the meaning of a source text, and subsequently producing an equivalent text that communicates the same message in a second language. The source text is the message to be translated where as the language that it is to be translated into is called the second or target language. Subsequently, Bible translation is a process by which the Scripture is translated from the original languages of Hebrews, Aramaic (for the Old Testament) and Greek (for the New Testament) to a second language.

Historical Origin of the Bible and Bible Translation

Christian faithfuls believe that the origin of the Bible is God and that the Bible is a historical book that is backed by archeology, and a prophetic book that has lived up to all of its claims thus far. It is widely viewed as God's letter to humanity collected into 66 books written by 40 divinely inspired writers. In tracing the origin of this great book, research has indicated that there are over 14,000 existing Old Testament manuscripts and fragments copied throughout the Middle East, Mediterranean and European regions that agree with each other. The Dead Sea Scrolls, discovered in Israel in the 1940's and 50's provide phenomenal evidence for the reliability of the ancient transmission of the Jewish Scriptures (Old Testament) long even before the birth of Jesus Christ.

The art of copying the scriptures from the original manuscripts (master scrolls) was done so accurate such that the Hebrew scribes who did the work dedicated their lives to preserving the accuracy of the Holy books to insure manuscript reliability. They were highly trained persons who meticulously observed, counting every letter, word and paragraph against master scrolls and that presence of one error required an immediate destruction of the entire copy.

First Historical Bible translations

Some of the first translations of the Jewish religious law dates back to the first exile in Babylonia, when Aramaic language became the lingua franca of the Jews. With most people not understanding Hebrew and only speaking Aramaic, the Targums - an Aramaic translation of the Hebrew Bible also called Tanakh, were created to allow the common person to understand the Torah as it was read in ancient synagogues. This Tanakh was mainly written in Hebrew with some portion in Aramaic like the books of Daniel and Ezra.

Early translations into Greek and Latin

The Septuagint (LXX) which was a Greek version of the Bible was the first translation from the Hebrew Bible into the Greek. It was later accepted as the Old Testament.

Modern translation efforts

In modern world, statistics show the Bible as the most translated book ever. This has made the Bible to be available in whole or in part to some greater portion of the world's population in a language in which they are fluent. On 31st December 2007, the United Bible Society announced that the Bible was available in 438 languages and portions of the Bible were available in another 848 languages, for a total of 2,454 languages. Most of the today's translations like the King James Version are translations from existing copies of the ancient manuscripts and are not translated from other interpreted texts. The main differences between today's Bible translations and why we have different versions of the same Bible is merely how translators interpret a word or sentence from the original language of the text source.

Historical differences in Bible translations

Hebrew and Greek are the original languages of the Holy Bible, the two have idioms and concepts that are not easily translated. It is for issues such as this that there has always been an ongoing debate on whether it is better to do a **word-for-word** translation or to give a translation that gives a parallel idiom in the target language. Some Bible translations such as the English language Catholic translation, New American Bible, King James Version, New Revised Standard Version and so on are seen as fairly literal translations (or "word for word"); whereas translations like the New International Version and New Living Translation attempt to give relevant parallel idioms.

Research has shown that the further away translators get from word-for-word translation, the text becomes easier to read while relying more on the theological, linguistic or cultural understanding of the translator, which one would not normally expect a lay reader to require. Translators do risk inappropriate spill-over of the source language idiom and usage into the target language translation. But on the other hand, spill-overs have imported useful source-language calques (word or phrase borrowed from another language) and loanwords that have enriched the target languages.

Problem Definition

The Bible Society of Kenya and other Bible Translating Institutions are challenged in many ways in their quest to availing the word of God to different language groups in the language these groups can read and understand. The challenges start being experienced as early as at the point of collecting the initial data for drafting the first translation partly due to the fact that the target language groups are scattered over long distances, which are isolated by harsh climate with rough terrain and poor infrastructure rendering them inaccessible or even too costly to be accessed and insecure. Another challenge is the high operational and maintenance costs incurred in the course of facilitating the team of translators carry out their duties in such vast areas. Combination of these and other challenges make the whole process of translation of Bible take too long, that is, over fifteen (15) years to complete a single translation

Many language groups still lack the Holly Bible written in their own language. Others have outdated and inaccurate translations which have never been completed. The challenges facing Bible translation trigger for an urgent solution. With the Internet and with the rapidly improving computer and mobile penetration, a well designed collaborative Web enabled Bible translation Software, being one of the solutions, is more appropriate for this problem

Problem Justification

As long as the Bible translation work is not complete, and as long as everyone on the face of the earth has not been reached with the word of God, bible translation will never cease. Kenya has 53 language groups. 17 of them have Bibles. 14 have New Testaments and 3 have portions. This means that about 21 language groups are without a single scripture in their language. Recent studies by the Bible Society of Kenya records that it takes on average 12 to 15 years to get a single Bible translation in Kenya

Lack of Funds to spear head the work of translation has remained one of the greatest obstacle in Bible translation. The cost of translating a single verse in the Bible is Ksh.480, the Bible contains 31,101 verses in total; thus making the cost of translating the single Bible to be approximately KSh 17 millions. The methods used in data collection, data processing and subsequent production of the final translation are costly and slow due the manual nature of carrying out the whole exercise. An alternative approach to such a manual process, that is less costly, faster and more convenient for gathering and processing data for translation, is unavoidable. This project proposes the development of an online solution to this problem

Research Objectives

The overall aim of this project was to develop a prototype of a cost effective user friendly web enabled Bible Translating Software.

To achieve this main objective. the following (specific objectives) was carried out

- Study of the challenges (and problems) facing Bible Translation in Kenya
- Study of other collaborative translation software
- Analysis and coming-up with a design of a collaborative Bible Translation Software
- Development and implementation of a prototype system for Bible Translation

Research Questions

This project addressed the following questions:-

- Why the Bible translation has been such a costly multi-year exercise?
- What challenges face Bible translation in Kenya?
- How the challenges facing the current Bible translation process can be solved?
- Which is the best selection criterion to be used to adopt a particular translation?
- How to utilized ICT in Bible Translation especially in Kenya?

Project Scope

The translation platform supports all the functionalities required to successfully translate the Bible

The functionalities include:
- Upload source text for translation. edit or delete
- Functionality to add and change language
- Functionality for users to translate the uploaded text
- Functionality to allow the user rate the translated content
- Functionality to capture translator's details and user authentication mechanism
- A mechanism for retrieving the best translation

Project Benefits

- The Collaborative web-based Bible Translation Software being advanced translation platform will enable translators work much faster and more efficiently as they utilize this innovative approach to translation

- When compared to many other traditional ways of translation and other modern translation services this approach produce translations that are more **natural, accurate and in a cost effectively** manner

- The proposed Translation Software ensures that the target community is fully involved and participates through the web enabled modules that **connect with community members who can view and take part in the translation as well as rate the precision and reliability of the translation.**

- **Ease of management** since most of the processes can be implemented in the proposed software such as enabling content managers to upload source text to the translator, invite volunteer s translators from target community to participate in the selection of the most rated translations to form part of the first Draft Bible

- Produce **Reliable Translations** Community members who are domain experts in their organization can translate content as trusted professionals and rate translations **enhancing the accuracy, reliability of results and Preserve culture**

- By combining machine translations with human translators, the proposed Collaborative Translation Software **speeds up the Translation process** and ensure accurate translations by leveraging existing community members as well as reducing costs of translations

- **The easy-to-use Interface** allows users make full utilization of the Translation software to meet their translation needs This is due to the well designed self-explanatory user interface and that the software has capability to integrate seamlessly with email applications

CHAPTER 2: LITERATURE REVIEW

Translation has been used to transfer written or spoken Source Language texts to equivalent written or spoken Target Language texts. The main purpose of translation is to reproduce different kinds of texts in another language and thus making them available to wider reader. According to Martin Luther. A good translation must be both true and free. faithful and idiomatic. so as to read like an original work: a translator must have familiarity with the original languages. perfect mastery over the vernacular. faith in the revealed word of God and enthusiasm for the gospel

Many Bibles are either translations of the original texts or paraphrases of translations. It is important to understand that all Bibles are the original texts written by the biblical authors who no longer exist. The Bibles we read today were translated or paraphrased from original/ancient manuscripts Greek. Hebrew. or Aramaic. Many existing translations used a strictly literal or literal translation that takes the words from the original manuscripts and translates them literally. or word for word. When a Bible is said to have been translated as thought-for-thought (also Sense-for-Sense). it means that the translator has taken the original words and applied exegesis (a critical explanation or interpretation of a text). which is to say an understanding of the thought behind the words. this is conveyed in the rendering of the verse

Translation Models

According to the Central Institute of Indian Languages. Mysore (2009). a number of the renowned English poet and critic. advocated two model of translation

1. Word-for-word translation Model

Translate each word based on the first definition of such word in a bilingual dictionary. keeping the original word order.

2. Literal translation Model

In response to target language grammar. make minimum adjustments of word order. addition and omission of words. still disregarding the co-text of discourse altogether. It is ideally the segmentation of the Source Language text into individual words and the target language rendering of those word segments one at a time.

Which Model is the best to use?

Word-for-word translation is the most common between the languages of the same family and expressive of the same kind of culture. Literalness should be sacrificed only because of structural and met linguistic requirements and only after checking that the meaning is fully preserved. Importantly. literal translation may be judged unacceptable because of the following situations

- When it gives a different meaning.
- When it has no meaning.
- When it is impossible for structural reasons.
- When it does not have a corresponding expression within the metalinguistic experience of the Target Language (Metalinguistic is a branch of linguistics that studies language and its relationship to culture and society)

Sense-for-Sense Translation Model

Sense-for-Sense translation becomes hardy in most of the translations where the source language and the target language do not belong to the same family. Using word-for-word model, the translation describe the same situation by different stylistic or structural means

Majority of the Systems used to translate from one language to a second language are mostly word-for-word translators

Review of some Collaborative Translation Platforms

Google Translate

This is a free statistically-based translator. It works without the intervention of human translator, and is based on the word-for-word translation model. As at October 2010, Google translate supported translation for about fifty seven (57) different languages

Shortcomings of Google Translate

Research has shown that Google translator can only be used to help the reader understand the general content of the second language but it does not always deliver the accurate translation. It is also noted that it performs better when the text to be translated is shorter but as the text to translate grows big, structural issues of the target language become a challenge.

Example using the Google-translate engine

In the quest for a definitive any Language-to-Swahili translator, Google have developed the English-to-Swahili Translate engine However, this had its own successes and failures. In summary, some of the results are not all that accurate due to its overdependence on one model of translation i.e. Word-for-Word translation model, this is even worse when the two languages do not belong to the same family and culture

A Screenshot of one Translation:

Figure 2.01: Google Translate Engine

Like any other African language, Swahili is a very structured and disciplined language and its translation defies the logic of common language translation algorithms. One solution to solve this problem can be hiring coders who speak Swahili and have the language structure in mind.

Yahoo Babel Fish Translator

It is a web-based translation application which translates text or web pages from one language to another language. Like the Google translator, Yahoo Babel Fish Translator is a word-for-word translator and inherits all the limitations of word-for-word translation just like the Google Translate.

Bing Translator

Previously referred to as Live Search Translator, Bing Translator is a translation application that is provided by Microsoft that translates text or web pages into different languages. In addition to standard text and web page translation, Bing Translator includes a feature that gives it the ability to revert back to the original web page text while translating an entire web page (also called Back Translation).

Machine translation

Machine translation is a process whereby a computer program analyzes a source text and produces a target text without human intervention. In reality, machine translation typically does involve human intervention, in the form of pre-editing and post-editing. This is used in the word-for-word translators where the software compares the source text against pre-stored text in a database (translation-memory). They are much faster since they do not require human intervention but require more testing period before they can be fully trusted.

Computer-assisted translation

Computer-assisted translation, also called "computer-aided translation," or "machine-aided human translation" or "interactive translation," is a form of translation wherein a human translator creates a target text with the assistance of a computer program. This is to say that the machine supports a human translator. The term "Computer-assisted translation", however, normally refers to a range of specialized programs available to the translator, including translation-memory.

Translation software are used to enable a non-native-speaking individuals comprehend web pages published in languages other than his/her language. This type of translation is mostly preferred for projects that deal with sensitive data and where a single error has detrimental effects to the entire project.

Back-translation Technique

Back-translation is a technique that translates translated text back into the original language made without reference to the original text. It is also referred to as **a round-trip-translation.** Back-translation is used as **a quality check on the original translation** by comparing the translation with the original text.

Attributes of a Good Translator

A good translator must have the following attributes.

- Thorough knowledge of the source language, written and spoken, from which he/she is translating
- Excellent command of the target language into which he/she is translating to
- Profound understanding of the etymological (the study of the history of words, their origins, and how their form and meaning have changed over time.) and idiomatic correlates between the two languages.
- A finely tuned sense of when to metaphrase and when to paraphrase, so as to assure true rather than spurious equivalents between the source and target language texts

Translators versus Bilingual Persons

It is widely assumed that any bilingual person is able to produce satisfactory or even high quality document translations simply because they are fluent speakers of a second language. However, this is often not the case. Because of the very nature of the different skills that each possesses, bilinguals and translators are not equally prepared to perform document translations. The ability, skill, and even the basic mental processes required for bilingualism are fundamentally different than those required for translation. Bilingual persons take their own thoughts and ideas and then express them orally in two different languages, sometimes well enough to pass the message to the native speakers in their second language.

Translators are persons who are able to read and understand or retain somebody else's ideas then render them accurately, without exclusion, in a way that conveys the original meaning in an effective way and without distortion in another language. Thus, translators must be excellent readers in a source language and excellent writers in a target language. It's clear that best translations come from persons who are translating from their second language into their native language, as it is rare for someone who has learned a second language to have total fluency in that language

Translation versus Interpreting

Interpretation is the facilitation of oral or sign-language communication, simultaneously or consecutively, between two, or more speakers who are not speaking, or signing, the same language. Translators convert written texts from one language into another. Translators are not interpreters. Interpreters convert spoken language. Of course there is a relationship between these two occupations, however their requirements are very different. Most good translators don't add upto good interpreters where as many good interpreters are at best mediocre translators. Translators are language professionals. They are applied linguists and competent writers, diplomats, and experts in specific areas. Translators need to be more sensitive to both the cultural and social differences that exist in their languages and also be capable of addressing these issues when translating

Challenges in Translation

Currently, translation is faced with a number of challenges. Some of these challenges are discussed below:

Cultural Challenges

As it is in scientific and technical fields such as dentistry, culture can differ from one country to another or even within a country. Since language reflects these differences, it is not always possible to translate word-for-word. Translators must explain, elucidate, bridge the gaps, and make the foreign reader at home with a text that is not from his or her own culture. This means that the translators must first learn and understand the structure of the target language before they can begin translating.

Time and Budget pressures

Translators need to strike a balance between two things: fidelity to the source text and readability in the target language. This may not be easy especially when performed under constraints of time and budget pressures. The best translators do appreciate the very challenge of transporting a point, a thought or an idea across cultural and linguistic boundaries. Much time and money is consumed in the process of building a worthwhile translation.

Bridging the gaps

To translate something (say a proverb, saying etc) that does not exist in the other language is one of the most demanding tasks. Dictionaries don't offer complete solution but only offer solutions for the most well-established terms. But when dealing with new information, one may be forced to **create a new term** or leave it in the source language and put in a translator's note, explaining what the term means

Structural differences, Grammar and Problems of ambiguity

These are the problems that originate from structural differences between languages and multiword units like phrase. Another problem would be the grammar because there may rise several constructions of grammar in the source language that are poorly understood, in the sense that it is not clear how they should be represented, or what rules should be used to describe them. Thus the precise meaning depends heavily on context

Some words lack an equivalent translation when one wishes to remain in the same grammatical category. Though this is debatable, particular words may remain untranslatable

The collaborative Bible Translation Platform

This is a hybrid translation model that incorporates three translation models, namely the word-for-word translation model, literal translation model and machine translation, so as to produce a more accurate translation with a final human touch to make the translation more natural and flowing. It also ensures the translation is compliant with the structural and grammatical requirements of the target language. The Translator works by allowing a human translator translate texts on the website as it is designed to support and facilitate the process of translation

CHAPTER 3: METHODOLOGY

SYSTEM ANALYSIS

Overview

In the previous chapter. a review was done on different translation models that have been used to translate source text into a second language. We have also reviewed the strengths and challenges of each model. We have also found out that there is no translation that is 100% perfect.

This chapter focuses on the current operations of the Bible Translation right from the onset of a particular Bible translation project to the production of a translated version of the Bible for that particular language group. Based on the challenges and limitations of the current Bible translation process. we will come up with the functional requirements of the proposed solution.

The Structured System Analysis and Design Method (SSADM) was used in the development of this project mainly in the analysis and design stages. SSADM is a waterfall based method used to analyse and design information systems.

Research Methodology

During fact-finding. the methods used included Document Review. Questionnaires and face-to-face interviews

Analysis of the Current System

In order to identify the process and the challenges facing the current Bible translation process. a fact finding was done at the Bible Society of Kenya through interviews and Questionnaires. Bible Society of Kenya was selected because it is the society that deals with the production and distribution of Bibles in Kenya. Most important to note is that this is a prototype and further survey and analysis is recommended for the system to encompass the full functionality. Other key information was obtained through the internet. journals and books

Requirement Analysis

Manual Process

The current (AS-IT-IS) system is purely a manual process which is executed as follows:

Step 1:

Data gathering process for translation from target language group by physically visiting the target community

Step 2:

This step involves discussions on the draft translations gathered in step1 It involves the following teams

- *Exegetical* that deals with the meanings
- *Language consultants* who are experts with qualifications in fine arts
- *Translators*
- *Reviewers* who are professionals or guardians of the language from that particular community

The teams come-up with the first print of the draft Bible.

Step 3:

The draft Bible (version one) is then distributed to the target community for feedback especially on topographical errors

Step 4:

A second reprint (final version) is produced which incorporates the feedback from the previous step
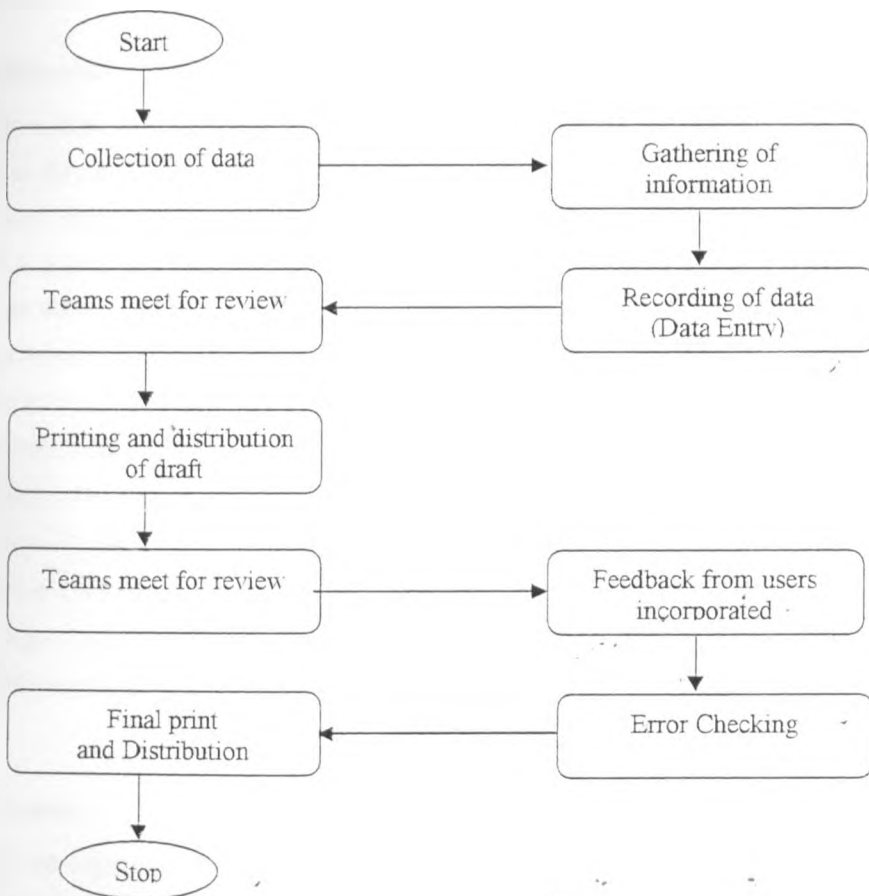
Flow Chart of the Manual process

Figure 3.01 Workflow diagram of the manual process

It was found out that it takes 15 years from the time the translation process starts to the time the process is completed at a cost of seventeen (17) million Kenyan shillings

Advantages of the current manual process

The system offers several advantages which include employment opportunities to various people involved in gathering data. data entry clerks and proof reading personnel It is also viewed as a way of getting approval and acceptance by the local community by involving them in the process of translating their own version of the Bible

Disadvantages of the manual process

1 Extra work of capturing data into the system for printing
2 Does not significantly reduce time required to produce a complete translation
3 High cost of operations related to translation
4 It is prone to errors and inaccuracy due the manual process that has no proper checks for errors.
5 Lacks portability. flexibility and utilize a smaller part of the target group

The proposed system may not solve all these problems but it will go a long way in addressing a great number of them

User requirements of the New System

The current system will make use of the latest technology to assist in the process of translation. Of more important is the use of the web technology to host and avail the system to users This makes it more flexible. easily accessible. portable and scalable Users of the new system upload translation text via web pages which is then processed and at the same time rate other translation with a view of cutting down the time it takes teams to review and agree on which translation to adopt It also helps reduce translations that are more erroneous or meaningless It also tries to give a human touch to translation which is recommended besides use of translation memories which can be used in future on similar or related projects

Problem Requirement list include to:

- Design a system that can reduce administration and operational cost.
- Design a system that is more accessible and secure to use
- Design a system that encourages more user satisfaction
- Design a system that can enable management and other administrative teams query for useful information and ad hoc reports

The New System

Translators can login online and submit their translation in which ever part of the world Translations and information such as translator's details are stored on online database and validation of the data is done before storage Users can access translation updates online. edit and rate the content The system has well

designed interface with supporting information that makes it easier for users to make maximum use of the system

Administrators can upload script online and manage the site online Upon registration. the system automatically validates and approves the users to ascertain they are genuine subscribers Once approved. users can login to the system/website and participate in verse translation A confirmation message is displayed after successfully submitting your translation Users can edit their profile online and change password as soon as the need arises. Lost passwords can be recovered through a simple recovery procedure which is secure where new passwords are sent to the users email account hence maintaining privacy

The Bayesian rating algorithm that is implemented in the system ensures that the rating/ranking of translations is as fairer as possible The algorithm takes into consideration the number of votes for each translation such that if a translation receives very few votes. then these votes count less than when it has many votes This means the more the votes a translation receives. the higher the weight of these votes

Project Deliverable

A working prototype and complete source code of the program

Disadvantages of the new system

- User sensitization on the existence of the translation software may take longer time.
- Users training especially to those that are not computer literate may attract some costs
- Cost of internet services

Hardware and Software Requirements for the Proposed System

To fully implement the proposed software. the following will be required

- Computer or mobile phones with internet capability
- Web authoring tools
- MySQL server
- Apache for web server
- PHP for scripting.
- Standard web browser

Benefits of the proposed system

- Reduced operational costs
- Reduction of the time it takes to come up with a draft translation

- It shortens the process of Bible translation since the team of experts can rely on the rating algorithm to select the most recommended translations
- Flexibility and faster decision-making process

Rating Algorithms

As the number of resources on the internet increases every day, so do the solutions to deal with this amount of data increase? A number of mechanisms have been developed to order internet resources in terms of their importance and usefulness. One such a mechanism for prioritizing internet resources is by the use of a Rating System. On average, majority of the rating systems are based on mathematical calculations of the rates given by the users of such resources. The challenge with such systems is that the reliability of such users is not taken into account. This means that the system must be developed in such a way so as to provide more useful information about the users in order to be reliable. Such information may include: how the users relate with the subject being rated or even their knowledge in that domain

On average, when dealing with a more sensitive and important data, it is ideal to use the real "human rating" of resources and one that takes into account the information about users and their expertise levels in various domains. This may be subjected to further scrutiny of the content to prove it's genuinely. Rating systems therefore help to determine electronically and/or mathematically whether a certain option is reliable against other many options

Review on Rating Algorithms

A wide variety of approaches to resource rating have been devised on the internet which differs in terms of how they are implemented. Some use simple algorithms to compute the rating for a resource as a basis for selection while other use more complicated algorithms to arrive at the best rating
A good rating algorithm must take into consideration the following two parameters:
- The number of rates per user
- How many times a resource has been rated

Simple mathematical algorithms

The most primitive and popular type of rating algorithm is based only on simple mathematical calculations. Such algorithms take a count on all rates and compute the overall rating out of that Data (Arithmetic Mean). The challenge with this approach is that it can introduce biasness especially where the population size is not considered. It's also too simple and unreliable. However, it is mostly used because it is much easier to implement and use. These algorithms are efficient since they don't involve complex formulae, so even a large scale system will have no performance problems when calculate ratings. In addition, the manner in which they work is clear and comprehensible for users.

Complicated Rating Algorithms

These algorithms are more complicated to both understand and implement. They provide multiple mechanisms that calculate various dependencies between users or resources

According to a user study made by Muzaffer Ozakca and Youn-Kyung Lim, users do not treat rating as a major factor when making decisions. This is partly due to lack of trust to users giving those rates. Almost every Web 2.0 webpage uses at least one type of rating. For example, YouTube uses the **interactive rating (1-5 stars)**. The Digg.com focuses on simple **"thumbs-up" or "thumbs-down" ratings** for sites

Google PageRank

This is one of the most popular rating systems. Almost each website on the Internet is being rated by this algorithm and then ordered into a ranking. The ranking enables Google Search Engine to arrange websites into a sorted list of results. This is the best example of a system with time-varying network where it is based on the relations (hyperlink) between websites change every second

It is an online page checker which is used to rank web pages using the link analysis algorithm which assigns a numerical weighting to each element of a hyperlinked set of documents. Link analysis is a subset of network analysis and is used to provide the crucial relationships and associations between very many objects of different types that are not apparent from isolated pieces of information. PageRank reflects the users view of the importance of the web pages and the pages that the user believe are important pages receive a higher PageRank thus appear at the top of the search results displayed on the search engines

Proposed Rating Algorithm

For the proposed system to achieve the intended purpose of producing the most accurate translation, an appropriate algorithm must be devised that will eliminate the challenges of:
- Biasness
- Over reliance on one translator
- Reliability of the users

The issue on reliability of the users is however dealt with at the system level where the users are authenticated by the system administrator thus ensuring the translations come from reliable, trustworthy and genuine translators. The objective is to take advantage of the larger community to be able to gather information that is more reliable in spite of the fact that some users may be untruthful. The proposed system will make use of the **Bayesian Algorithm** which is an advancement of the **interactive rating 5-star algorithm**, a mathematical algorithm which computes the Bayesian Rate (BR) using weighted mean

The Ranking Procedure

The procedure involves

- Calculating the rate given by users for a given translation
- Comparing translations to avoid selecting similar translations. if two translations happen to be the same. the system drops one then picks the next translation in that order
- Compute the Bayesian Rate
- Rank the translation based on the Bayesian Rate
- Pick the two most rated translations

The Algorithm

Using the 5-Star Rating Algorithm. Participants rate the translated scripts on a scale of $0 - 5$ where each rate is allocated a certain amount of points

Rating	Points
Excellent	5
Good	4
Satisfactory	3
Not Satisfactory	0

Table 3.010 Ratings.

Dealing with Biasness

The main problem with 5-Star rating algorithm is that it can be easily skewed if there are a less number of votes where the 1-5 stars will boost the vote to a 5 star rating. To address these issues. the **Bayesian Rating** is applied which makes use of the Bayesian Mean

Bayesian Formula versus Simple Average

In this section. we take a comparison between Bayesian Rating and other known rating techniques that have been used to calculate the final value of user-rated web content such as a simple average. Bayesian Average is an improvement of the simple average formula by combining arithmetic mean with an algorithm that weighs a user's number of votes that is. number of user's votes to average number of votes per user. This eventually yields a more accurate value of the importance or quality of the content as decided by the users.

Bayesian Formula

$$\bar{x} = \frac{Cm + \sum_{i=1}^{n} x_i}{C + n}$$

Legend:

$\bar{x}$ - Bayesian Average

C - The average number of ratings for all translations shown with number of ratings greater than Zero

m - The average unweighted rating for all translations shown with number of ratings greater than Zero

$\sum_{i=1}^{n} x_i$ - The sum of all ratings given to this Translation

n - The number of ratings given to this Translation

C is used as the magic weight in this formula. The higher C, the more the votes it takes to influence the Bayesian. Bayesian rating is superior to a simple average because the Bayesian rating scales the scores based on variable C

Example

Translations form users were selected randomly and then rated by users. The ratings were further ordered using the two rating algorithms: using Bayesian Rating and using simple Average rating. The results were tabulated as below:

Dataset													
Verse: In the beginning God created the heavens…													
Translation	Rating												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R 10	… R 23	Total Votes	Poi
Mwambililyo ni Ngai niwoombie itu	3	5	3	4	3	4	4	5	3	5	… 4	23	108
mbee Ngai niwoombie itu	5	5	5	5	4	4	5	5			…	8	38
Ngai niwoombie mundu	5	4	4								…	3	13
Ngai niwoombie itu mwambililyo ni	5	5	0								…	3	10
mbeeni ngai	5	0	3								…	3	8
mbee Ngai niwombie itu	5	4	4	5							…	4	18
mbai niwoombie itui mwambililyo ni	0	0									…	2	0
mbee Ngai niwoombie ituu											…	0	0

Table 3.011: Dataset

Further analysis of the results yielded the following results:

Verse ID	Translation ID	Translation	Points	Vote Count	Average	Bayesian Average
1	1	Mwambililyoni Ngai niwoombie itu	108	23	4.696	4.430
1	2	mbee Ngai niwoombie itu	38	8	4.750	4.199
1	3	Ngai niwoombie mundu	13	3	4.333	4.131
1	4	ngai niwoombie itu mwambililyoni	10	3	3.333	3.594
1	5	mbeeni ngai	8	3	2.667	3.489
1	6	mbee Ngai niwombie itu	18	4	4.500	3.994
1	7	mbai niwoombie itui mwambililyoni	0	2	0.000	2.666
1	8	mbee Ngai niwoombie ituu	0	0	0.000	0.000

Table 3.012: Average versus Bayesian Rating

Further, the two most highly rated translations from each category were picked and forwarded to a team of language experts for further consideration. Here, a set of eight (8) translations from both categories (rated by Bayesian and by average) was presented to the team of experts. The experts were requested to rate each pair of the translation. The following dataset was generated;

	Rating Type	verse 1	verse 2	verse 3	verse 4	verse 5	verse 6	verse 7	verse 8	Average Score
Expert 1	B.R.	4	3	3	5	4	4	5	3	3.88
	S.A	4	3	2	4	3	3	2	3	3.00
Expert 2	B.R.	5	5	3	5	4	4	4	5	4.38
	S.A	3	4	3	4	4	4	3	3	3.50
Expert 3	B.R.	4	3	3	4	3	3	2	3	3.13
	S.A	3	4	4	4	3	5	2	2	3.38
Expert 4	B.R.	4	4	5	3	4	4	5	4	4.13
	S.A	3	4	4	4	3	4	4	3	3.63
Expert 5	B.R.	3	3	2	4	3	3	2	3	2.88
	S.A	2	3	3	2	2	2	3	3	2.50
Expert 6	B.R.	4	3	3	4	4	3	4	4	3.63
	S.A	4	4	3	4	4	4	3	3	3.63
Expert 7	B.R.	4	4	4	4	3	4	3	5	3.88
	S.A	3	2	4	3	2	3	3	3	2.88
Expert 8	B.R.	3	4	4	4	3	4	5	4	3.88
	S.A	2	3	2	3	2	2	2	3	2.38

Expert 9	B.R.	3	4	4	3	4	4	4	4	3.75
	S.A	3	3	3		3	2	3	2	2.71
Expert 10	B.R.	3	3	2	2	3	2	3	3	2.63
	S.A	3	2	3	3	2	3	2	2	2.50

Table 3.013: Summary of Experts Ratings

The following chart shows the performance of each rating algorithm based on the expert's ratings.
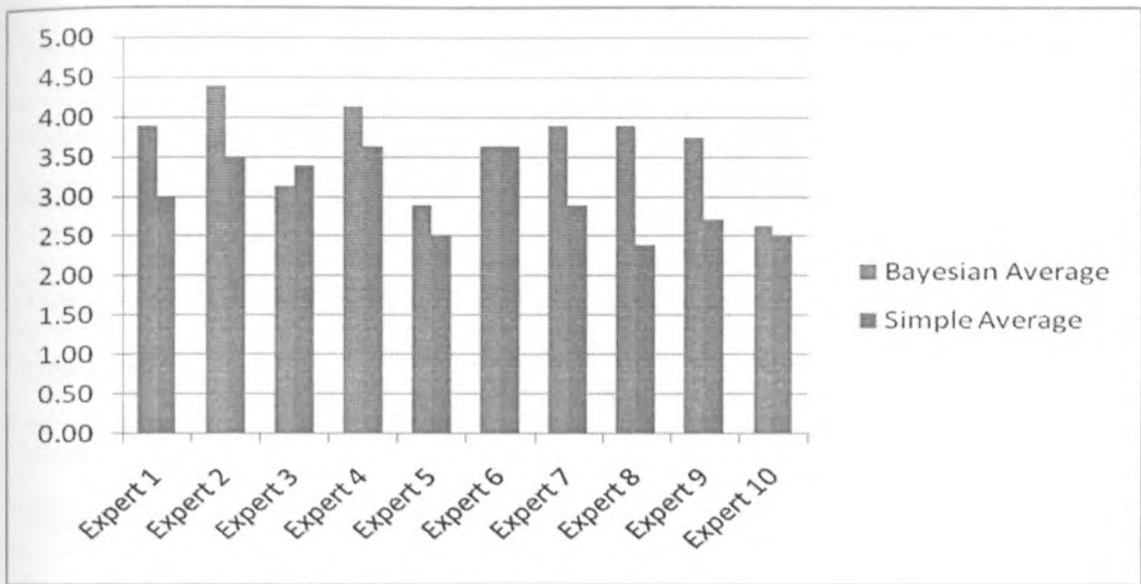

Table 3.014: Chart of Experts Ratings

Conclusion

From the results, it was found out that the Bayesian Rating scored higher than the simple average in rating web content. Bayesian Rating is more preferred by experts than simple average because it is produced more accurate rating. Statisticians and website developers prefer to use Bayesian when showing the highest rated product in order than simple average because it avoids a situation where a new translation with a single vote (or very few votes) immediately jumps to first place if its rated high as its simple average rating would be the highest. Simple Average Rating is the ration of Total Rating to Total Number of users Who Rated the item. The average rating alone doesn't tell the number of customers (wisdom of the crowd) who contributed to that rating. By knowing the number of votes a translation/item has received makes the results much more meaningful. We should lend more weight to a rating when an item has been rated by more users than when rated by self or few users. A small number of votes increase the chance that the overall average rating may be inaccurate though not arithmetically but inaccurate in the sense that the data doesn't reflect a true consensus of the greater majority. By including the number of ratings, it lets us evaluate the average rating data of each translation not only on its own, but in relation to all the other translations. Thus the more

times translation has been rated. the more believable the data. and thus the more relative weight we place upon its average rating.

Sample Form:

Question:

Rate the following translations on a scale of 1 to 5 where 1 is poor and 5 is excellent.

Verse 1: in the beginning god created the heavens...

Translations	Rating used	Expert's Rating				
		1	2	3	4	5
Mwambililyoni ngai niwoombie itu	Bayesian					√
Mbee ngai niwoombie itu	Average			√		

Verse 2: the Lord is my shepherd, I will not want.

Translations	Rating used	Expert's Rating				
		1	2	3	4	5
Yeova ni muithi wakwa, ndikaiwa ni kindu	Bayesian					√
Yeova ni muithi wakwa, ndikaiwa	Average				√	

Verse 3: for the Lord watches over the way of the righteous, but the way of the wicked will perish

Translations	Rating used	Expert's Rating				
		1	2	3	4	5
Nikwithiwa Ngai nusuviaa ala alungalu, indi nzia ya athe nikaa	Bayesian			√		
Nundu Ngai nusyaiasya ala alungalu, indi nzia ya anthe ikaa	Average			√		

Verse 4: rejoice in the Lord always, and again i say rejoice. Let your joy be known to all.

Translations	Rating used	Expert's Rating				
		1	2	3	4	5
Tanaina nthini wa Mwiaii na ingi ningwasya tanaai. Utanu wenyu wonanywe kwa andu onthe	Bayesian				√	
Tanaina nthini wa Mwiaii na ingi níngwasya tanaai. Muyo wenyu	Average				√	

umanyike kwa onthe						

Verse 5: so when you see standing in the holy place, the abomination that causes desolation, spoken of through the prophet daniel, let those who are in Judea flee to the mountains

Translations	Rating used	Expert's Rating				
		1	2	3	4	5
Indi yila mwiona uthatu ula uthilikasya uungamite vala vatheu, uia uwetetwe ni mwantani Danieli, aia me Yudia masembe iimani	Bayesian				√	
Na yila mwiona ula uthatu uthilikasya uungamite vala vatheu, otondu waneeniwe ni mwantani Danieli, eka ala me Yudia masembe iimani	Average			√		

Table 3.014: Sample Form

Translation memory

The website has an inbuilt translation memory to assist the translator by proposing suggestions when translating. Translation memories are online databases that stores texts that have been previously translated so as to aid human translators.

How Translation Memories work

The source text is broken into segments, during translation, the system looks for matches between segments and the source half of previously translated source-target pairs stored in a translation memory, and presents such matching pairs as translation candidates. The translator can accept a candidate, replace it with a fresh translation, or modify it to match the source.

Suitability of Translation Memory

Translation memories are suited on texts that are highly repetitive. In the Bible, most verses that appear in the Old Testament appear in the New Testament hence this technique is quite helpful for translating the Bible and other previously translated document. If translation memory system is used consistently on appropriate texts over a period of time, it can save translators considerable work.

Benefits of Translation Memories

- They ensure that the translated texts are consistent
- They help accelerate the overall translation process, since translation memories can remember previously translated material hence translators have to translate it only once
- Reduces the costs of long-term translation projects, that is to say documents needs to be translated only once and can be used several times

CHAPTER FOUR: SYSTEM DESIGN

The application is build using PHP as the scripting language and implemented using the CodeIgniter Application Development Framework which is much faster and provides a rich set of libraries for commonly needed tasks thus reducing the amount of code needed for a given task.

System Flow Chart

The chart below displays the flow of data throughout the system
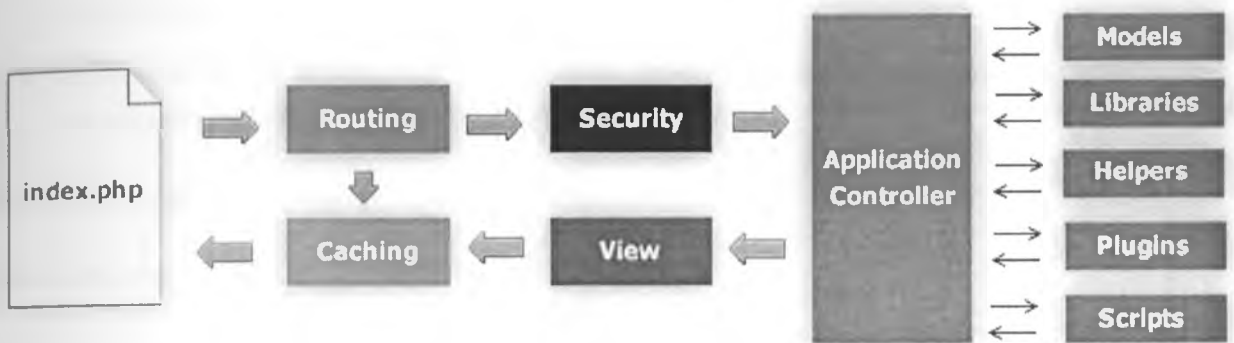
Figure 3.02: System Flow Chart

Explanation:

Model-View-Controller

The system is based on the Model-View-Controller development pattern. This model is a software approach that separates application logic from presentation. In practice, it permits web pages to contain minimal scripting since the presentation is separate from the PHP scripting.

- The **Model** represents the data structures. Typically the model classes will contain functions that help retrieve, insert, and update information in the database.

- The **View** is the information that is being presented to a user. A View will normally be a web page, but here, a view can also be a page fragment like a header or footer.

- The **Controller** here serves as an bridge between the Model, the View, and any other resources needed to process the HTTP request and generate a web page. A Controller is simply a class file that is named in a way that can be associated with a URL.

26

- The index.php serves as: front controller and initializing the base resources needed to run.

- The Router examines the HTTP request to determine what should be done with it.

- If a cache file exists, it is sent directly to the browser, bypassing the normal system execution.

- Before loading the application controller, the HTTP request and any user submitted data is filtered for security.

- The Controller loads the model, core libraries, plug-ins, helpers, and any other resources needed to process the specific request.

- The finalized View is rendered then sent to the web browser to be seen. If caching is enabled, the view is cached first so that on subsequent requests it can be served.

Dataflow Diagrams

Context Diagram

Figure 3.03: Context Diagram
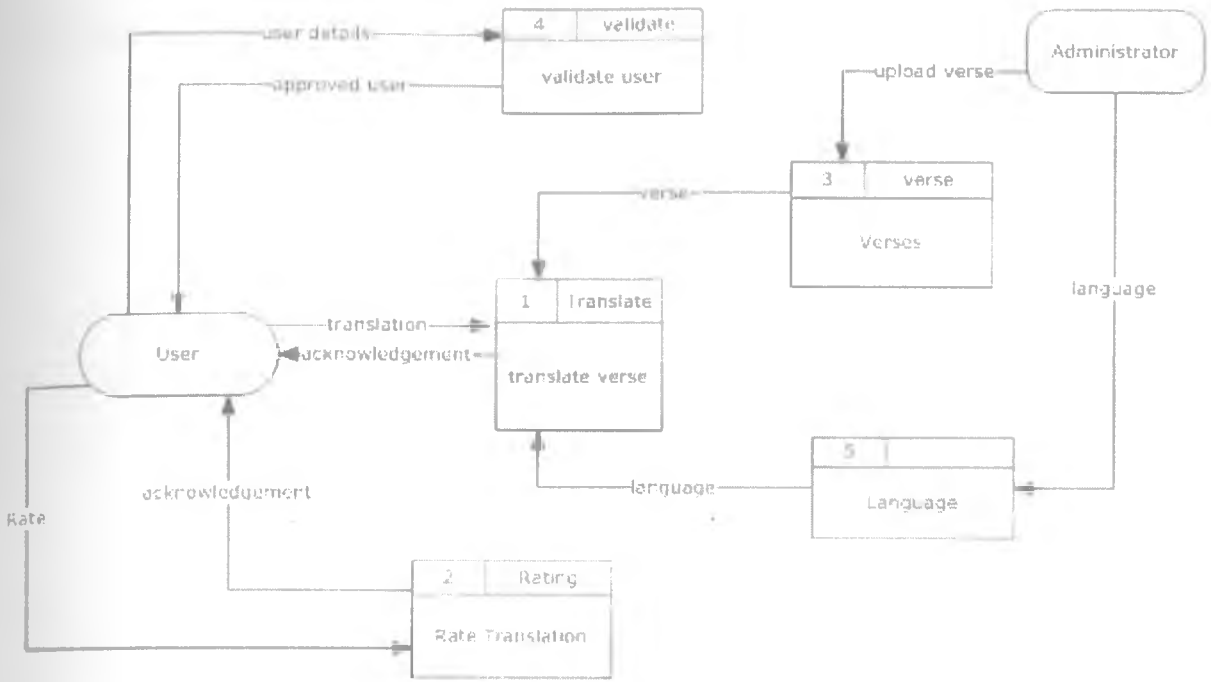
Figure 3.04: Level 0 DFD
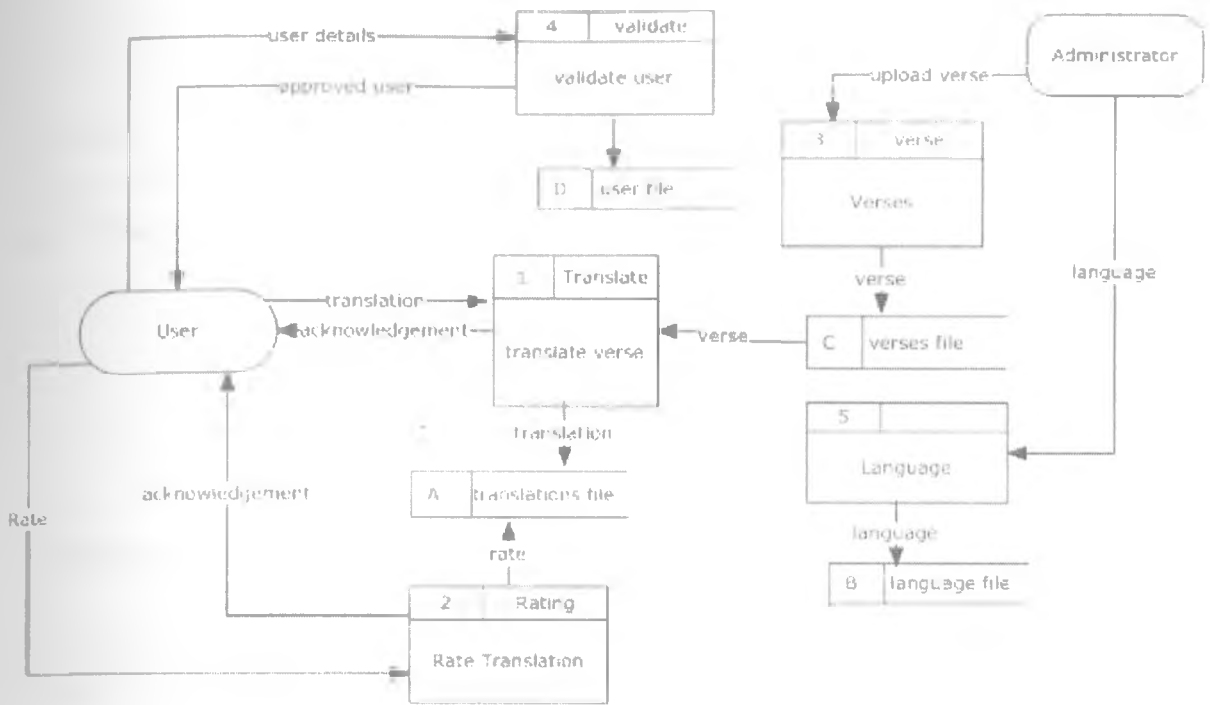
Figure 3.05: Level 1 DFD

Use Case Diagrams

Use Case Diagrams are a set of scenarios that describe the interaction between the user (referred to as actor) and the system. It helps in identifying the primary elements and processes that make up the system. The primary elements are termed as actors where as the processes are termed as use cases. Use Case Diagrams are simple to understand and they form a great storyboard for user meetings. More importantly, use case diagrams are used to define the requirements of the system being modeled.

Elements of a Use Case Diagram
Actors:

This element portrays any entity (or entities) that perform certain business roles in a given system which in essence are the actual business roles of users in a given system.

29
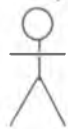
Use Cases:

This is a visual representation of a distinct business process in a system. It is shown as an ellipse in a use case diagram as shown below.

Figure 5.07 Use Cases

System Boundary:

It is used to define the scope of the yet-to-be system. It defines the limits of the system and is shown as a rectangle spanning all the use cases in the system

Use Case Diagram of the Proposed System
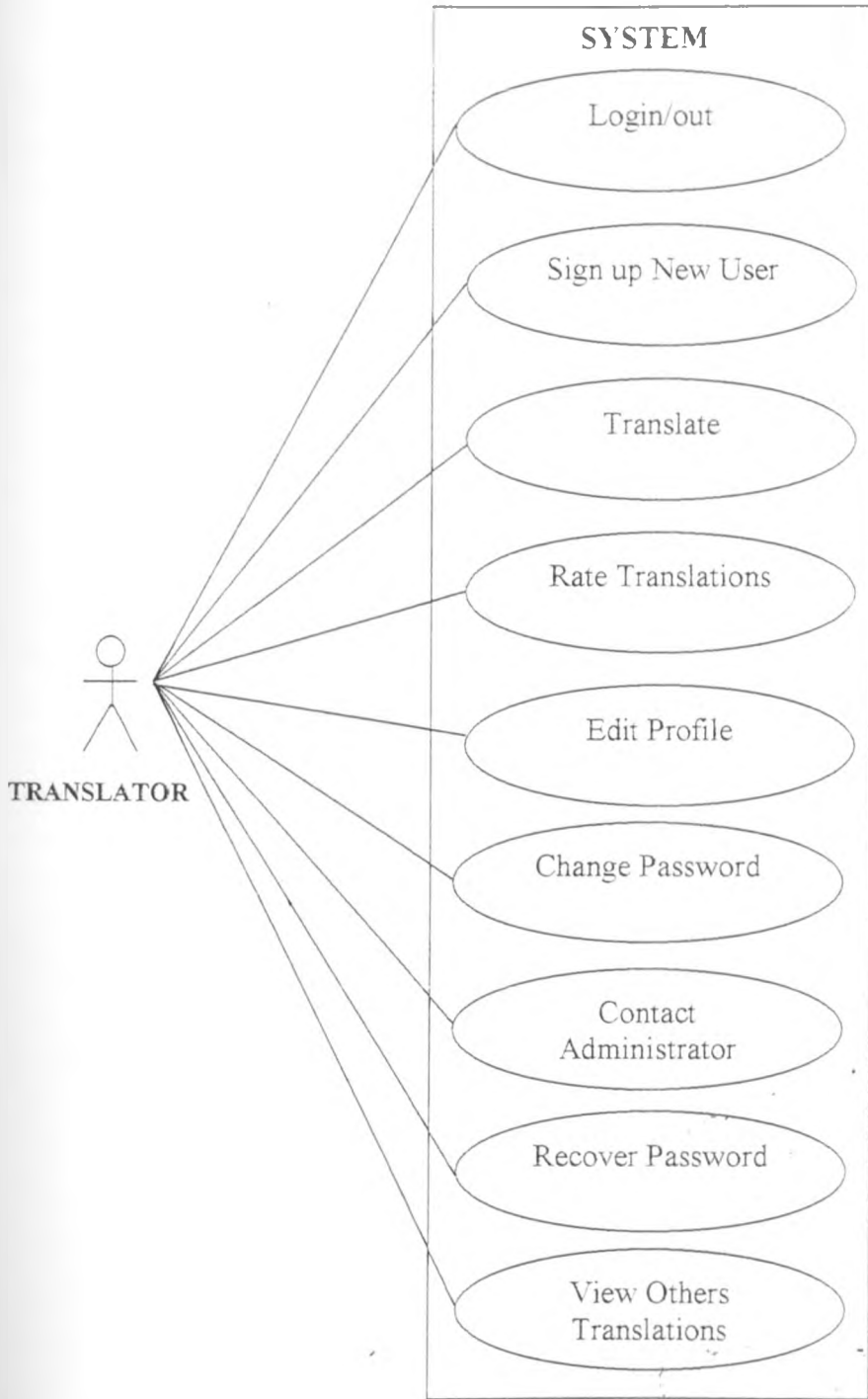
Figure 3.08: Use Case Diagram for users

Use Case Diagram of the Proposed System
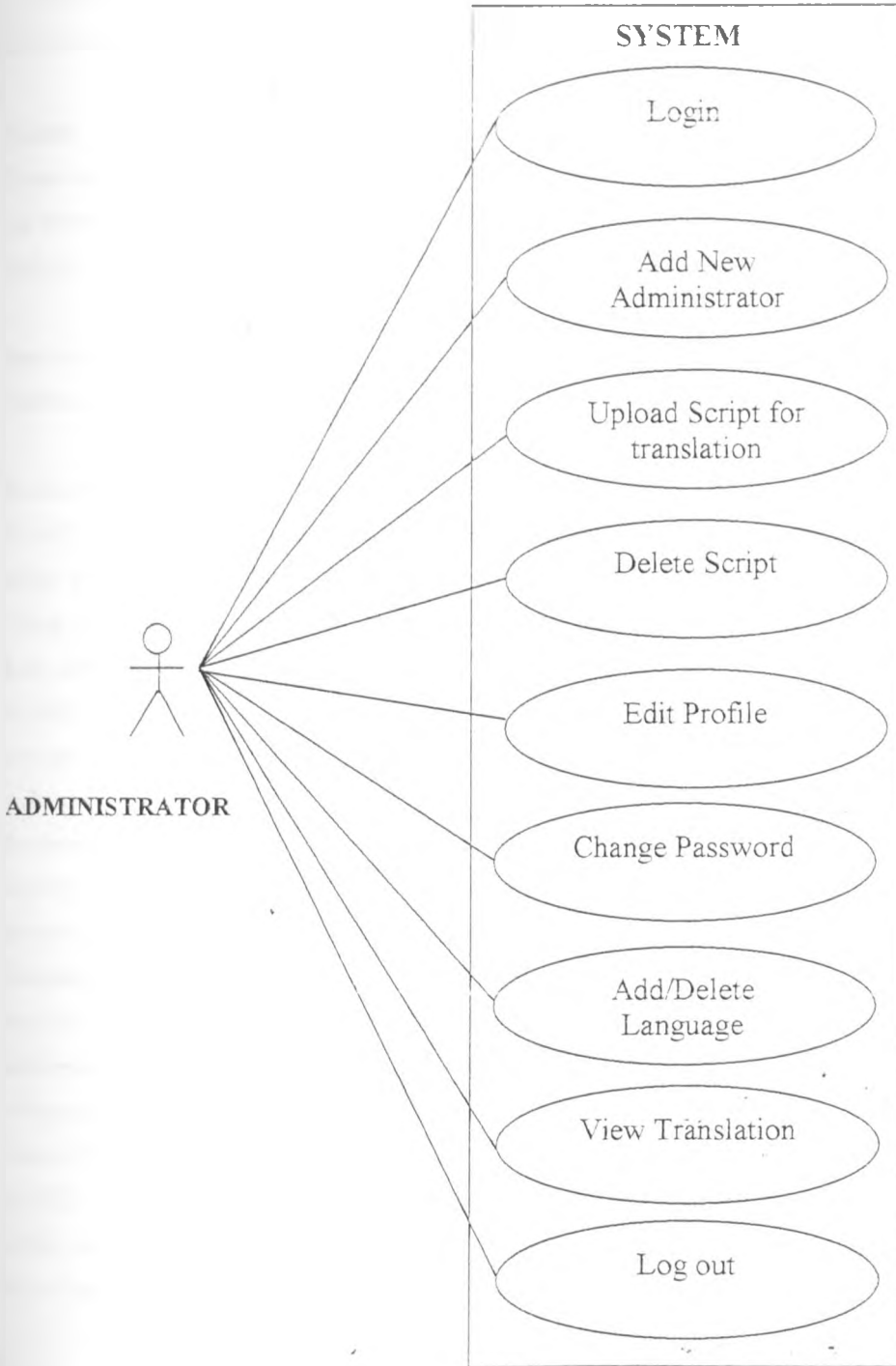
Figure 3.09: Use Case Diagram for Administrators

Database Structure of the Proposed System

A database in simple terms is a way to electronically store, manage and retrieve data as per user requirements. The two main structures of the proposed database are the Tables and Indexes

Tables

These are structures that store the data in a database. A table is composed of Fields (or Columns) and Rows (or Records). Each field in the database has a data Type associated with it. Field names and types are defined when you create a table

Indexes

Indexes do not store data and are not used directly. They are used to speed up certain search operations

Back-end Database: MySQL

MySQL is the preferred database system used to implement the database. MySQL support primary keys, along with key indices which allow speed up queries and constrain input

Using MySQL in a project comes with a number of benefits as discussed below:

Low cost: Open Source

MySQL is an open-source system that allows developers can use it at for free, it is also an extensible, open storage database engine and integrates seamlessly with a number of programming languages and other web-based technologies

Performance

MySQL is a clear leader in terms of performance and also because of its stability; many internet powerhouses like Yahoo use it as their back-end database

Security

MySQL comes packed with adequate security mechanisms. It operates over known IP port which unfortunately attracts intruders but it allows one to change ports just in case the default port becomes too vulnerable.

Cross-Platform

MySQL has cross-platform capabilities allowing developers to develop and deploy on windows server, Linux server or an apple server among others. This gives the developer a lot of versatility when choosing server hardware. It also has capability to easily move between platforms

Entity Relationship Diagram (ERD)
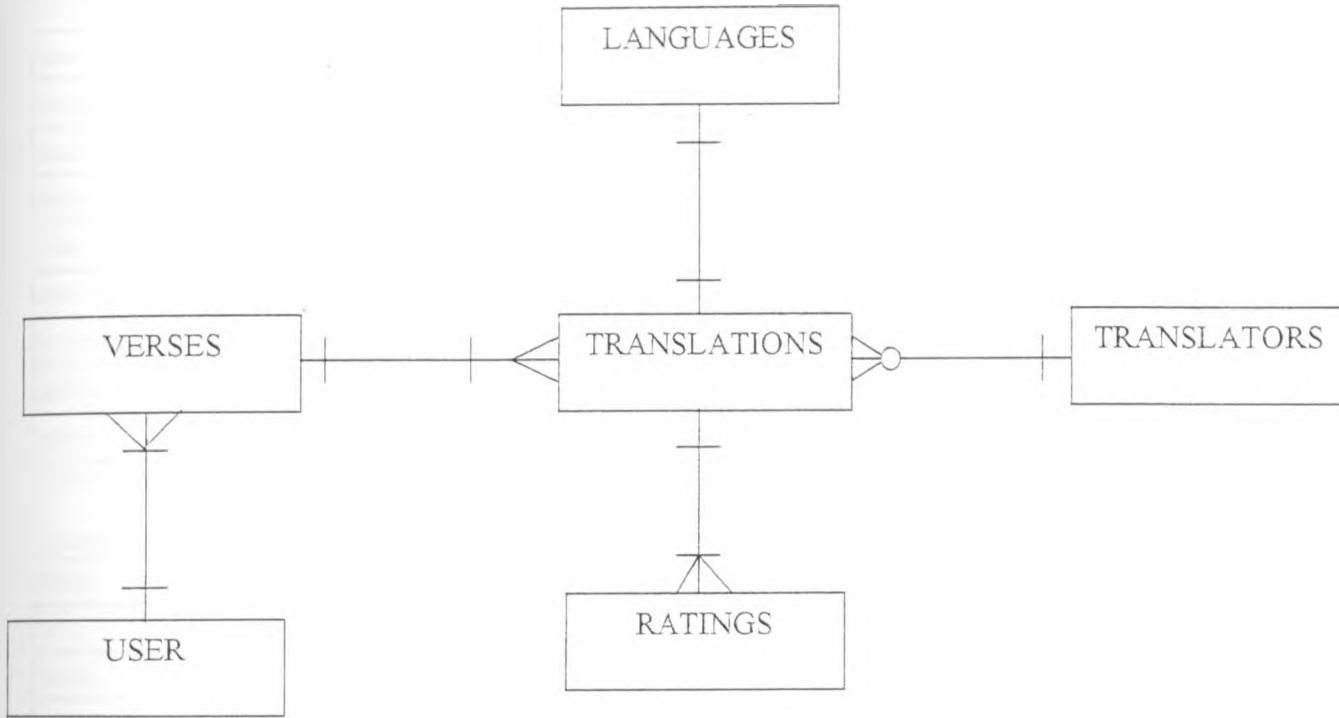
Figure 3.10: ERD

DATABASE STRUCTURE

Languages

Field	Type	Null	Default	Comments
id	int(3)	No		
name	varchar(150)	No		
active	int(2)	No	1	

Table 3.02: Languages

Ratings

Field	Type	Null	Default	Comments
id	int(3)	No		
name	varchar(20)	No		
points	int(2)	No		

Table 3.03: Ratings

Translations

Field	Type	Null	Default	Comments
id	int(5)	No		
verse_id	int(5)	No		
user_id	int(5)	No		
language_id	int(3)	No		
translation	varchar(500)	No		
points	int(6)	No	0	
vote_count	int(6)	No	0	
average	decimal(10.3)	No	0.000	
bayesianaverage	decimal(10,3)	No	0.000	
active	int(2)	No	1	
edits	int(2)	No	0	

Table 3.04. Translations

Translators

Field	Type	Null	Default	Comments
id	int(5)	No		
name	varchar(150)	No		
email	varchar(150)	No		
tel	varchar(30)	No		
location	varchar(100)	No		
tribe	varchar(50)	No		
age	int(3)	No		
residence	varchar(150)	No		
username	varchar(100)	No		
password	varchar(150)	No		
active	int(2)	No	1	

Table 3.05: Translators

Users

Field	Type	Null	Default	Comments
id	int(4)	No		
name	varchar(200)	No		
email	varchar(150)	No		
username	varchar(100)	No		
password	varchar(150)	No		

Field	Type	Null	Default	Comments
super	int(2)	No	0	
active	int(2)	No	1	

Table 3.06: Users

Verses

Field	Type	Null	Default	Comments
id	int(5)	No		
title	varchar(150)	No		
text	text	No		
by	int(3)	No		
active	int(2)	No	1	

Table 3.07: Verses

CHAPTER FIVE: SYSTEM IMPLEMENTATION

Overview

This chapter will discuss the implementation of the prototype in terms of the technology used in system development the programming language used during the coding phase, testing, installation of the system and documentation, then finally maintenance and system support.

Programming Language

The system is implemented using the PHP programming Language. The language is more robust and portable to various platforms It can interact with many databases and it is also the most preferred language for developing web enabled applications

Application Development Framework.

The application development used to develop the proposed system is CodeIgniter which acts as a toolkit for building websites. CodeIgniter is an open source web application development framework for PHP language It is preferred for programmers with a good working knowledge of Object Oriented Programming language CodeIgniter makes development easier, quicker and even more fun by providing rich set of libraries for commonly needed tasks, simple interfaces and logical structure to access libraries It also comes with the following advantages:

- It has wide compatibility with the standard hosting accounts that run a variety of PHP versions and configurations.
- It requires nearly zero configurations
- It eschews complexity, favoring simple solutions

CodeIgniter uses the Model-View-Controller (MVC) design pattern to organize the application

Platform

The Windows environment was the chosen platform to implement this project.

Database

MySQL database was chosen to implement the system due to its adaptability to many platforms

Prototype Development

The system development involved developing each module independently. Later, the modules were then integrated together and then testing was done. The system modules are discussed below.

Translate Module

The module enables translators view the source text (verse) before they translate them to the target Language.
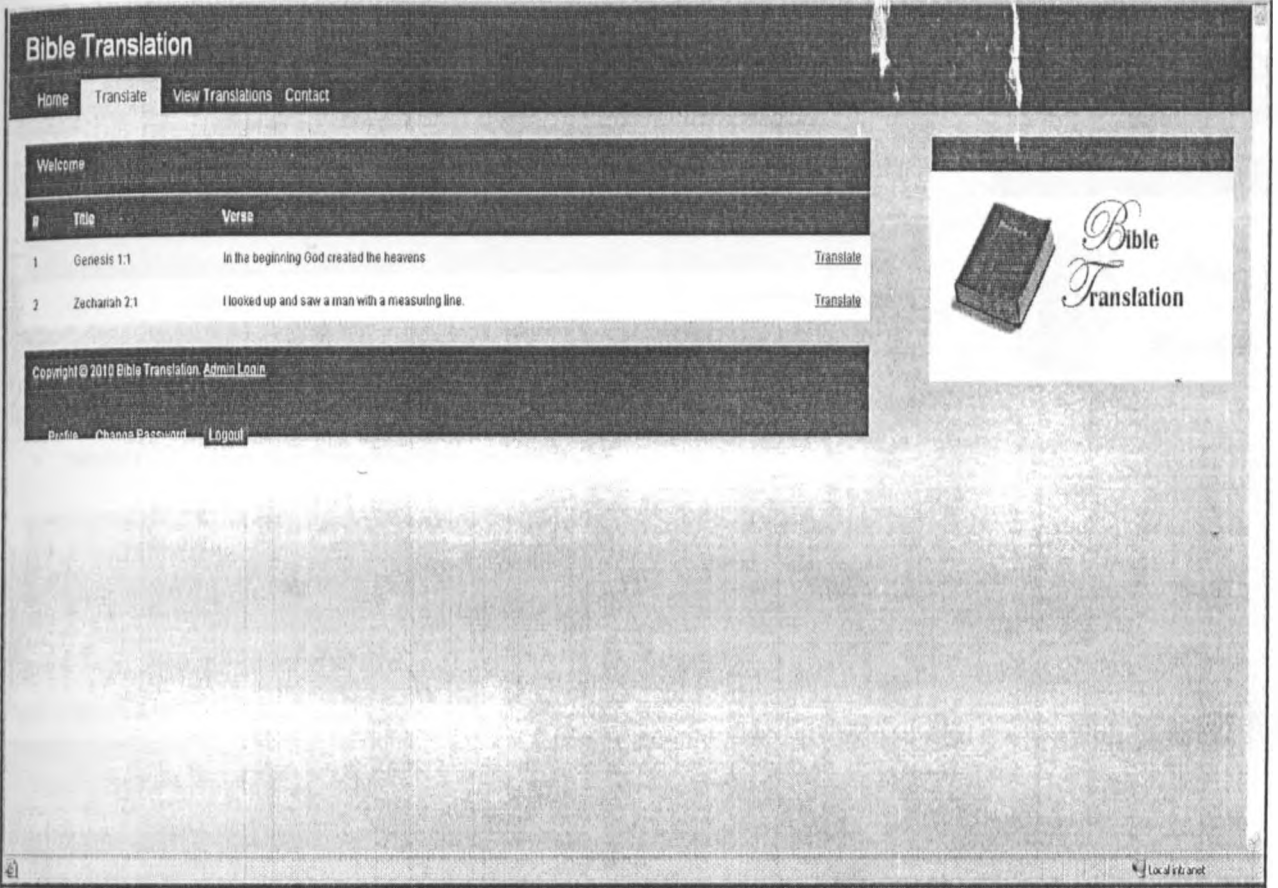
Figure 5.01: Translation Page

View Translations Module

This page allows the user to view related translations for the same verse before rating them.

Figure 5.02: View Translations Page

Rate translations

Figure 5.03: Rate Translations

Login module:

This module has both the administrative login page and the normal user login screen. The user can also recover password through the password recovery sub module or even change password.

For a new user, the user can sign up by filling an online form and submitting.

Log in window

The following user graphical interface is used to input the user log in details. This is so for users already in the system.

Registered Translators Login Screen
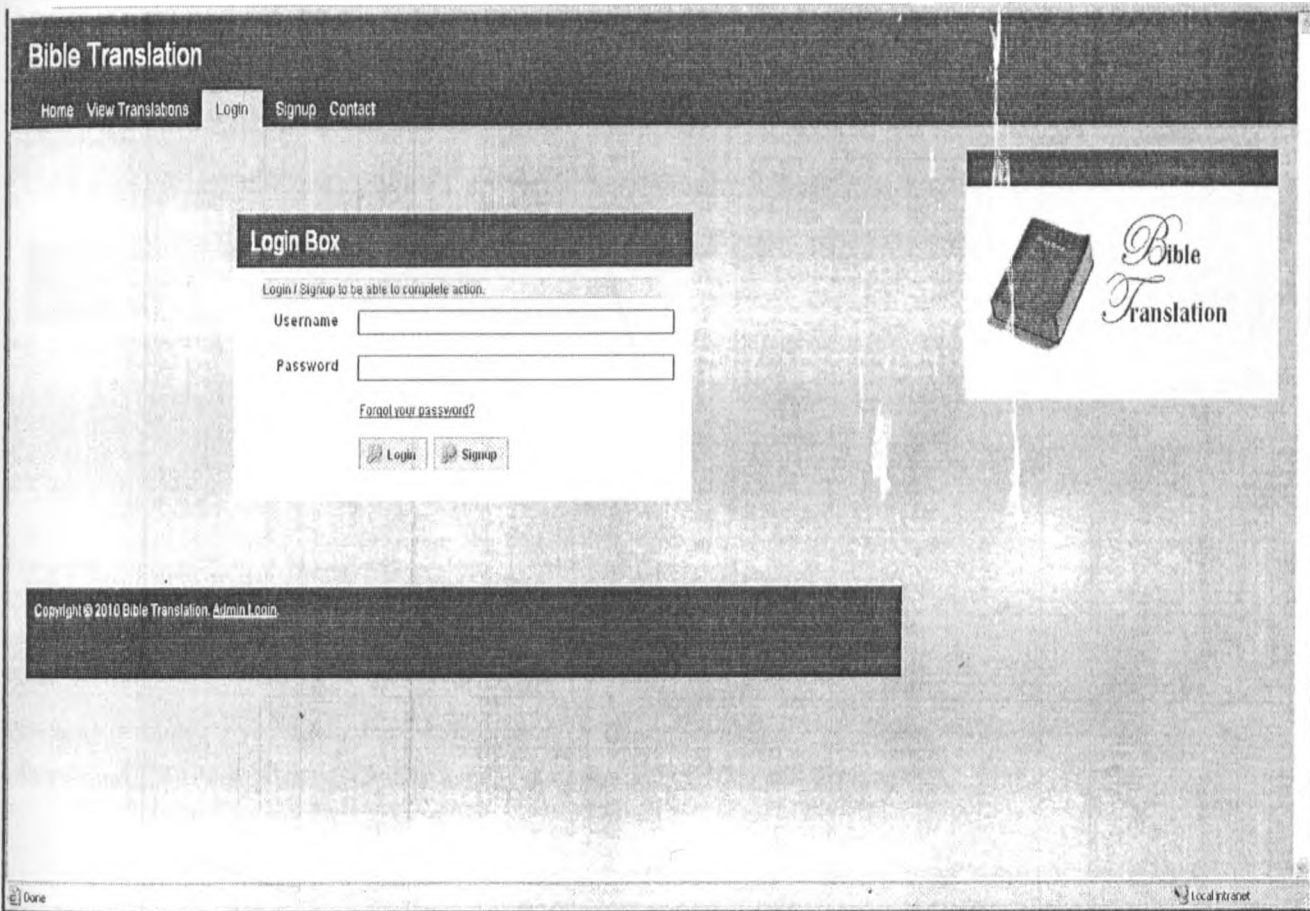
Figure 5.04: Registered Translators Page
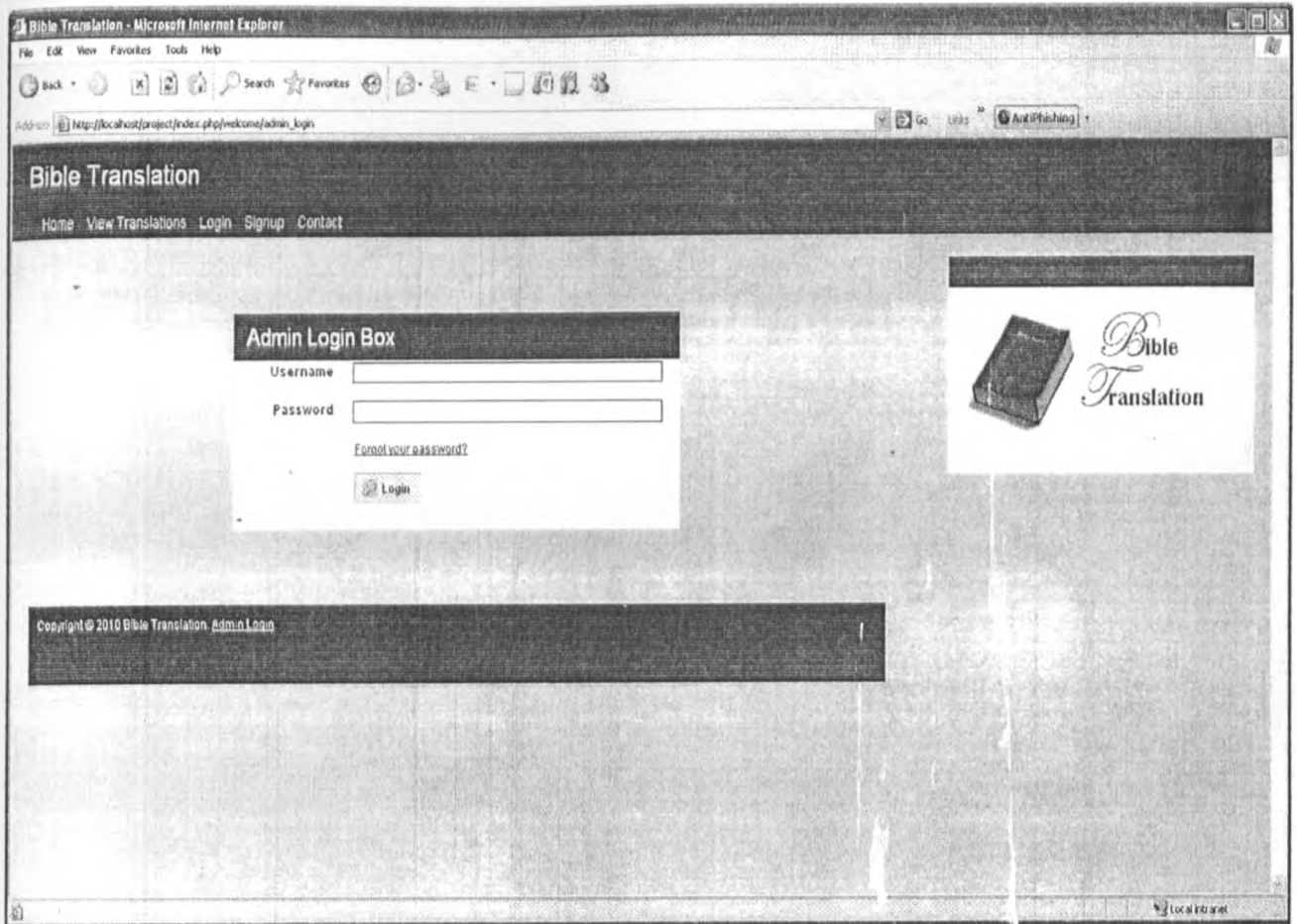
Figure 5.05: Admin Login Page

Verse Module

This is an administrative page that allows the administrator to upload text/verse for translation. It also allows him/her to manage other verse or remove them from the system and view reports.
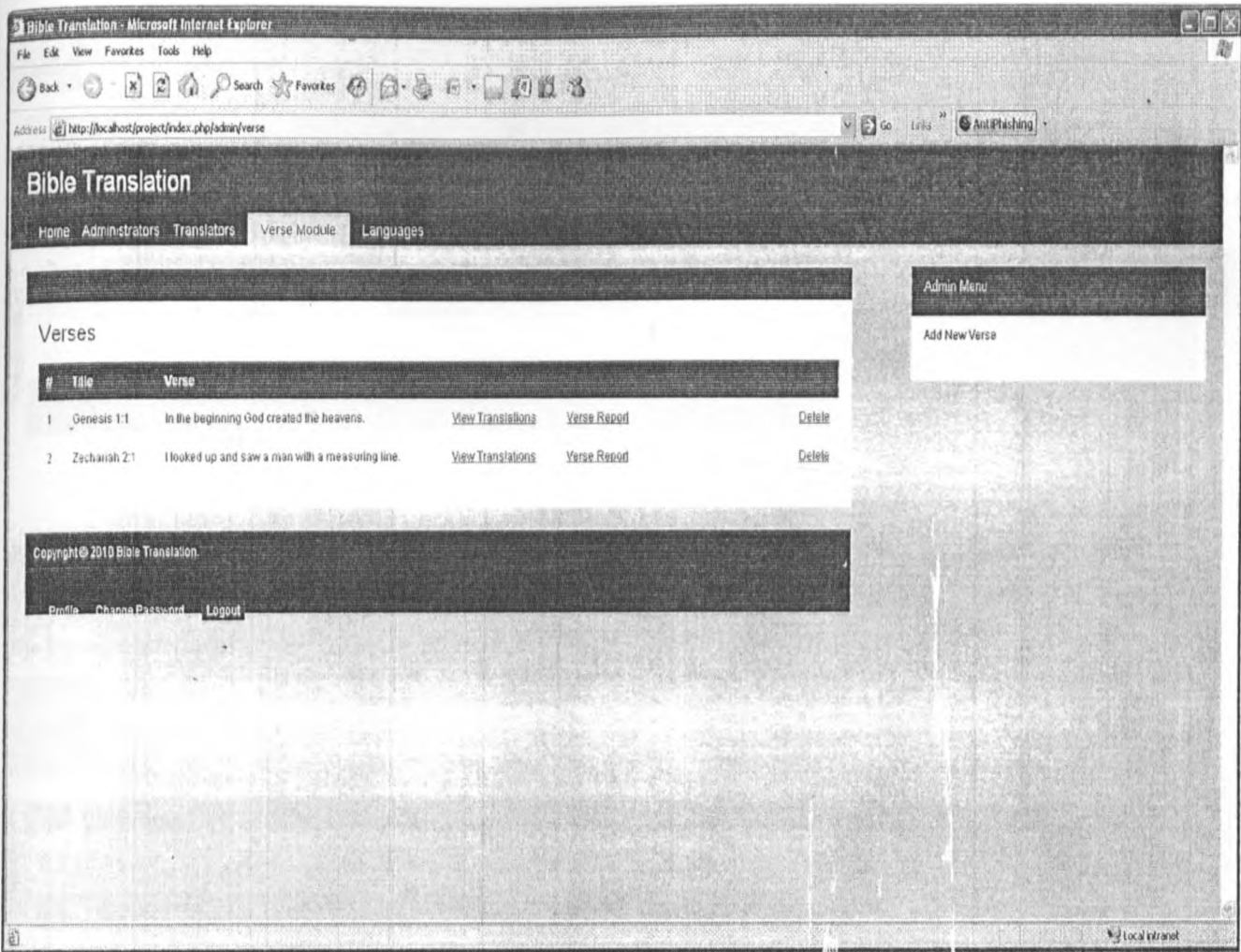
Figure 5.06: Verses Page

Manage Administrator's and Translators Pages

This page enables administrator to view and add new administrators to the system.

If the administrator is a super user, then he/she can remove other administrators from the system.
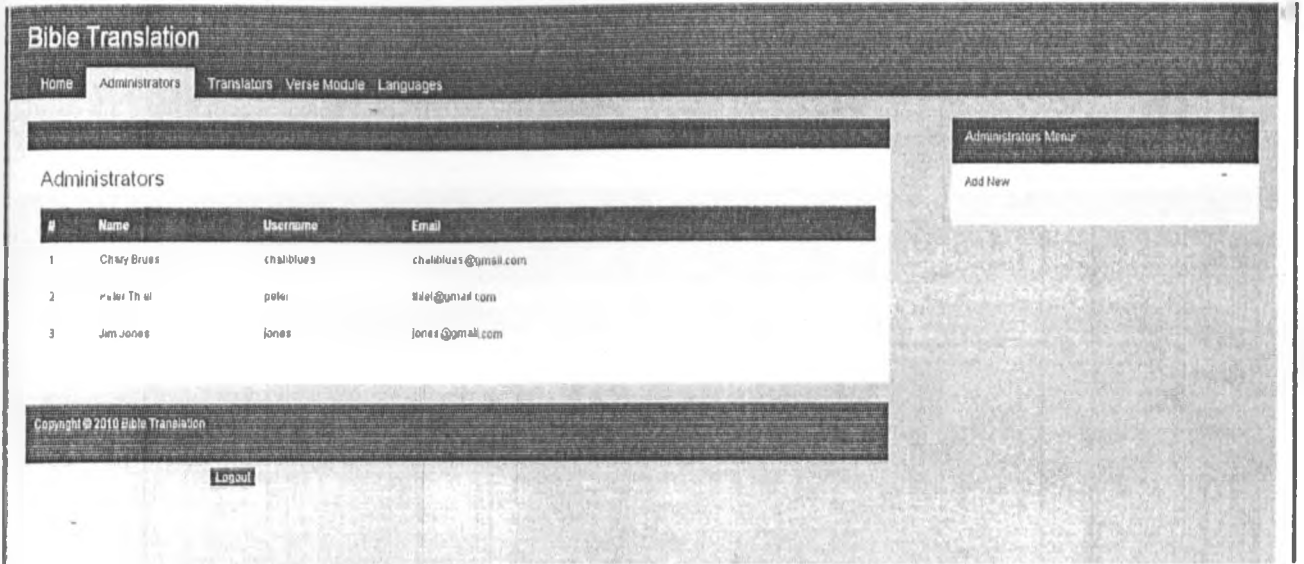
Figure 5.07: Manage Administrators Page

Manage Translator's Page
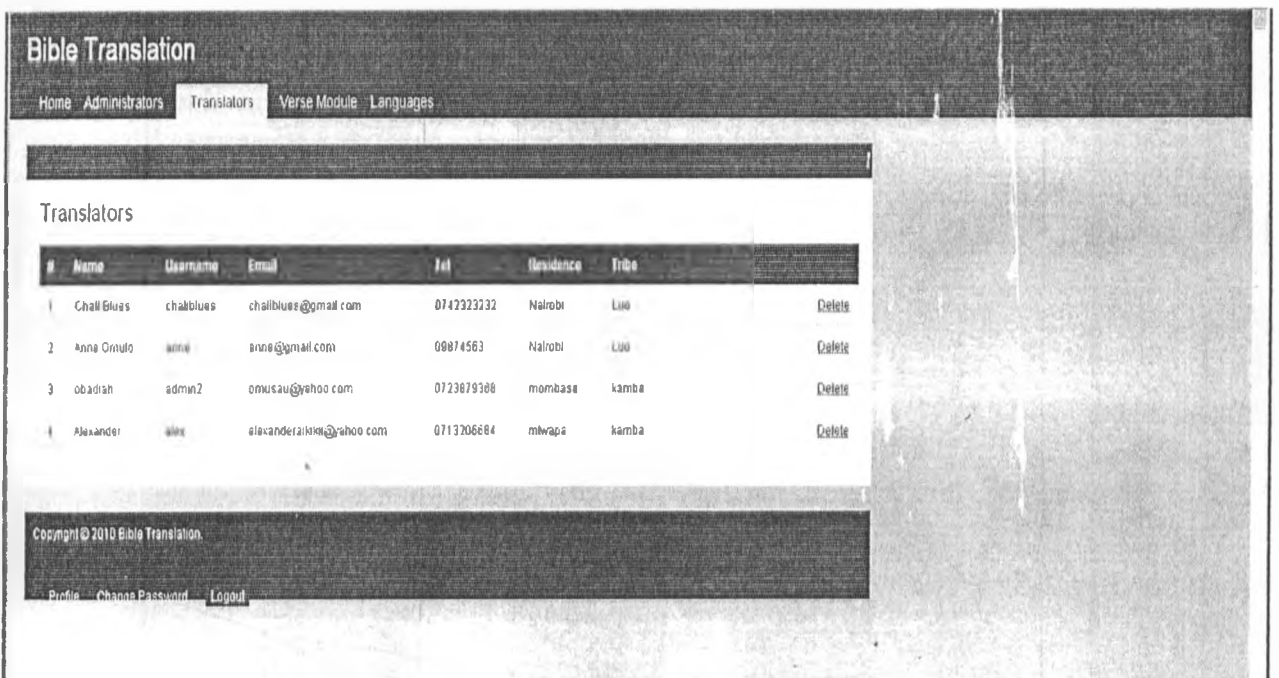
Figure 5.08: Manage Translators Page

Language's Module

Allows the administrator to add or delete languages.

Figure 5.09: Languages Page

Contact Administrator Module:

Allows users sent feedback to the administrator.
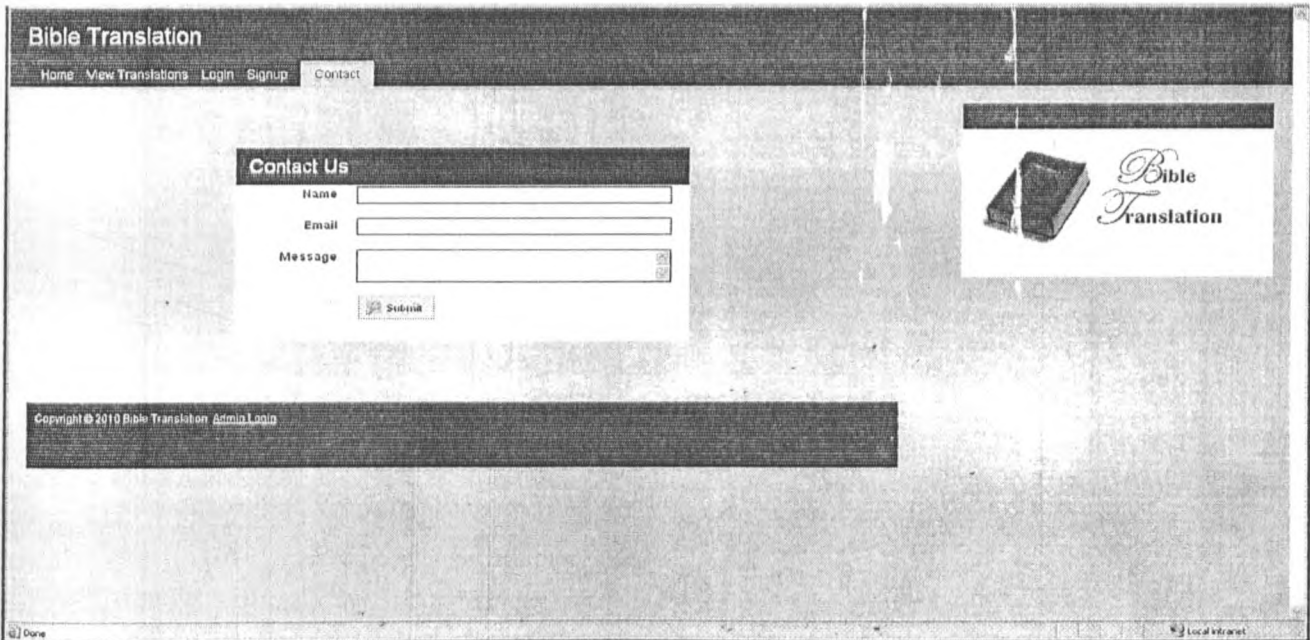
Figure 5.10: Contact Page

44

System Testing

Module Testing

The white box and black box testing were done on each module were in the white box testing. walkthroughs were performed on the source code to get rid of any syntax errors on the code and improve its quality for easy readability In black box testing, test data was applied to each module for testing and the actual results were compared with the expected results

This helped detect any errors especially logical errors and run-time errors and the necessary corrections were done

Integration Testing

After integrating all the modules together, testing was done to check for any incompatibilities However, no incompatibilities were detected

System Testing

System testing was done and this provided proof that the system was ready for deployment

CHAPTER SIX: DISCUSSION, CONCLUSION AND RECOMMENDATION

Summary of the Project

This research project began with a study of the current Bible translation process and the challenges affecting Bible translation in Kenya. This was done through discussions and constant meetings with the staff at the Bible Society of Kenya. Telephone conversations were also used to clarify issues especially with Bible Translation Literature (BTL) staff at Ruiru-Thika. Taking into consideration the enormous challenges affecting the translation process, a solution to develop a more versatile solution was born which involved development of a web-enabled module to assist in translation

It is based on the requirements from the translators that a prototype was developed then implemented. User testing to ascertain usability and workability of the prototype was done

Achievements

At the onset of the project, the following were the objectives for this project and the achievements in each:

- To study the challenges and problems facing Bible Translation in Kenya – the challenges affecting Bible translation were identified and documented, the proposed system was developed with these challenges in mind so as to address them. This has been captured in the new system
- To study other collaborative translation software - literature review was done on existing collaborative translation software's that deal with translation and documented. The advantages and shortcomings of each of this collaborative translation software's were listed
- To analyze and come-up with a design of a collaborative Bible Translation Software - analysis of the user requirements was done and the design of the proposed system was done and documented.
- To develop a working prototype for the collaborative Bible Translation Software - a web application development framework was used to develop the proposed solution. This was done as per the design. Implementation of the prototype was done to test its workability and found to be workable

Other achievements

From the developer's side, the following was achieved:

- Being able to complete the project and implement the solution is an achievement itself.
- The developer has gained a lot of experience in the development of web applications

Challenges

Quite a number of challenges came across the way. Some of these challenges include:

- Hosting the prototype system for testing attracted some cost implications since most of the free hosting sites on the internet were not that reliable.

46

- A transfer to work in another working station in another town in the middle of the project somehow caused some delays to the project to the completion of the project.

Suggestions for further research

- Further research needs to be done on how to sensitize the user on the existence of the translation software in order to make maximum use of it.

- Since this is collaborative software, further research need to be done on how to come up with fully automated Bible translation software that does not require any human intervention yet error free.

- More research to be carried on how to building translation memories for future use on related projects or for disaster recovery in case of disaster or loss of data.

Conclusion

Though a challenging undertaking, it was my joy to automate process of translating the Bible. With the advancements in the mobile technology which has boosted internet access through the handheld devices, the website can be accessed everywhere, by anybody, at anytime and make their contributions online, and in return, the cost of translation will definitely go down and suggestions can be received instantly and as such the duration for translating the Bible will be drastically reduced

Bibliography

Targums	An Aramaic translation of the Hebrew Bible also called Tanakh
Calques	W or phrase borrowed from another language
Exegesis	A critical explanation or interpretation of a text
Metalinguistic	A branch of linguistics that studies language and its relationship to culture and society.
Etymological	The study of the history of words, their origins, and how their form and meaning have changed over time
Metaphrase	To translate literally (word-by-word) or literal translation (line by line)
Bilingual	Individuals that are able to take their own thoughts and ideas and express them orally in two different languages, their native language, and a second language.
Dentistry	Dental technology

REFERENCES

Addam G. 2010, *CodeIgniter 1.7 Professional Development 1st Edition*

Anakriti. *About Translation.* viewed 10 September 2010. http://www.anukriti.net About_translation.asp

All about God. *who wrote the Bible- evidence from God*, viewed 20 October 2010.
http://www.allabouttruth.org/who-wrote-the-Bible.htm

Bauer, E., & Kohavi, R. (1999). An empirical comparison of voting classification algorithms: Bagging, boosting, and variants. *Machine Learning*, 36, 105–139.

Bauwens,L.,Lubrano.M.,andRichard.J-F.1999.*Bayesian Inference in Dynamic c Econometric Models*, Oxford University Press, Oxford.

Biblica, *translation*, viewed 14 November 2010, http://www.biblica.com/scripture-ministry/translation
BTL, welcome *to Bible Translation and Literacy*, viewed December 2010, http://www.btlKenya.org

Cussens, J. (1993). Bayes and pseudo-Bayes estimates of conditional probabilities and their reliability. Proceedings of the European Conference on Machine Learning (pp. 136–152). Springer Verlag.

Chen, M-H. 1994, Importance-Weighted Marginal Bayesian Posterior Density Estimation. *Journal of the American Statistical Association*, 89.818-824.

David R., The origin of God, viewed 10 December 2010, http://www.learntheBible.org/the-origin-of-god.html

Dr. Art Langer, *The Art of Analysis, devotes considerable space to Normalization*. Springer-Verlag Telos (January 15, 1997).

Geweke, J.1989, Bayesian inference in Econometric Models Using Monte Carlo Integration.
Econometrica,57,1317-1340.

Geweke, J.1996, Bayesian Reduced Rank Regression in Econometrics. *Journal of Econometrics*, 75,127-146.

Kass. R.E., and Raftery. A.E.1995. Bayes Factors. *Journal of the American Statistical Association.* 90. 773-795.

Mahmoud O 2007. Translation procedures, strategies and methods. viewed on 20 December 2010. http://translationjournal.net/journal//41culture.htm

Newton. M.A.. and Raftery. A.E., 1994, Approximate Bayesian Inference by the Weighted Likelihood Bootstrap. Journal of the Royal Statistical Society ,Ser.B,56,3-48.

Phillips, P.C.B., and Ploberger, W.1996, An Asymptotic Theory of Bayesian Inference for Time Series. *Econometrica*, 64,381-412.

Somya T.P.. *Translation process,* viewed 14 October 2010. http://www.articlealley.com/article_1359810_15.html

The Wisdom of Crowds, *Implementing a Smart Ranking Algorithm*, viewed 5 April 2011. http://leedumond.com/blog/the-wisdom-of-crowds-implementing-a-smart-ranking-algorithm

Tsurumi.H.. and Wago, H.1996, A Bayesian Analysis of Unit Root and Cointegration with an Application to a Yen-Dollar Exchange Rate Model. inT.B.Fomby(ed.).Advances in Econometrics, vol.11B, JAIpress. Greenwich. CT.
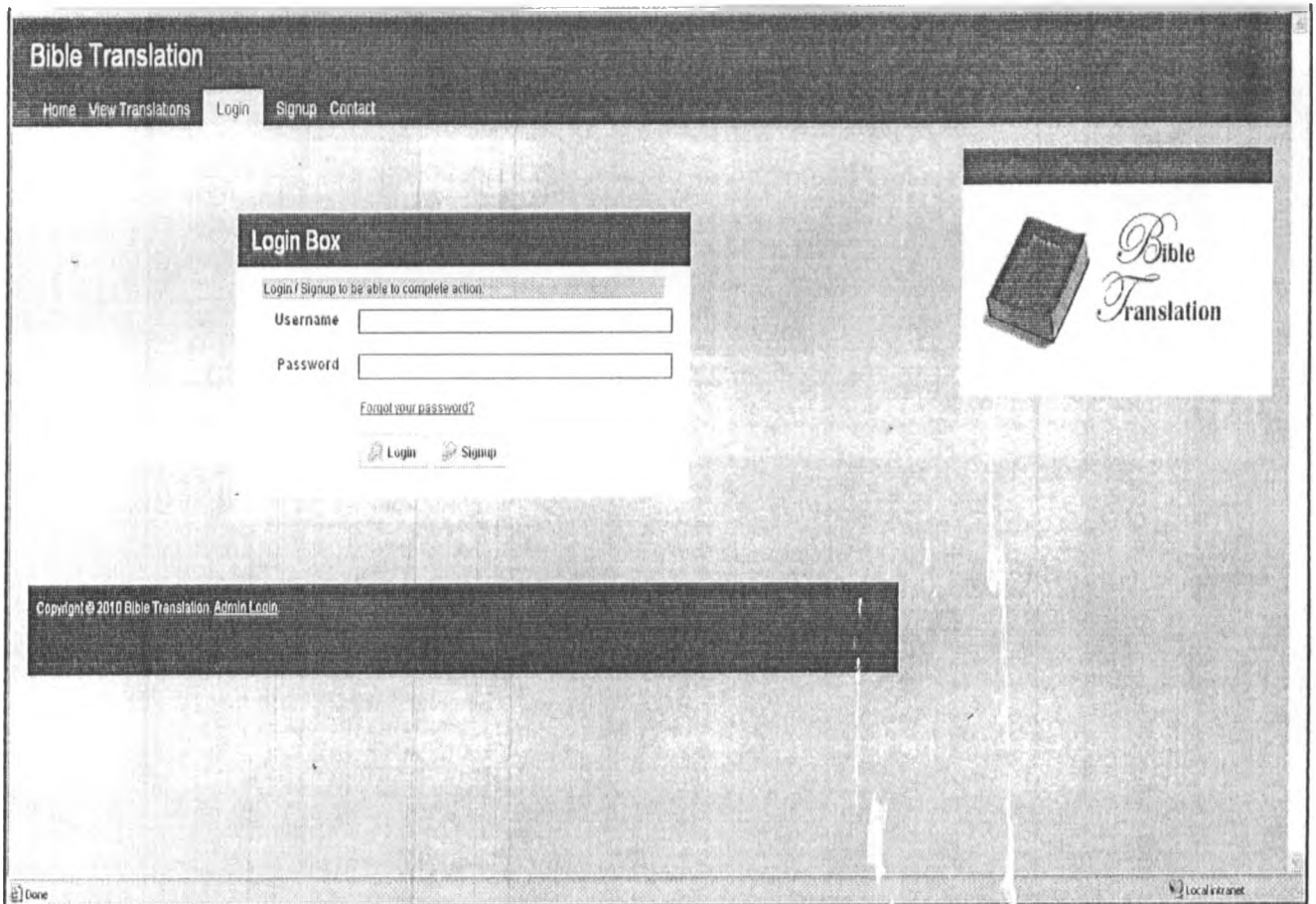
User Manual

The translator's website has several features which are discussed below.

Login

➤ From the main window, click login tab. The following page will be displayed.

➤ Enter username and password in the spaces provided

➤ Click login button or tab the Enter key

Note: If you entered wrong username or password or both, an error message will be displayed.

Sign up

If it is your first time to log in to this website, you will be required to create an account.

➢ Click the sign up tab on the main window or sign up button on the log in window. The following window will be displayed.

➢ Enter the required details.
➢ Click signup button to submit the details.
➢ A confirmation message will be displayed.

Note: The system will display a warning message if the mandatory filled are not correctly fi led.

Translate Verse

➢ Click the translate tab on the main window.

The following window will be displayed;
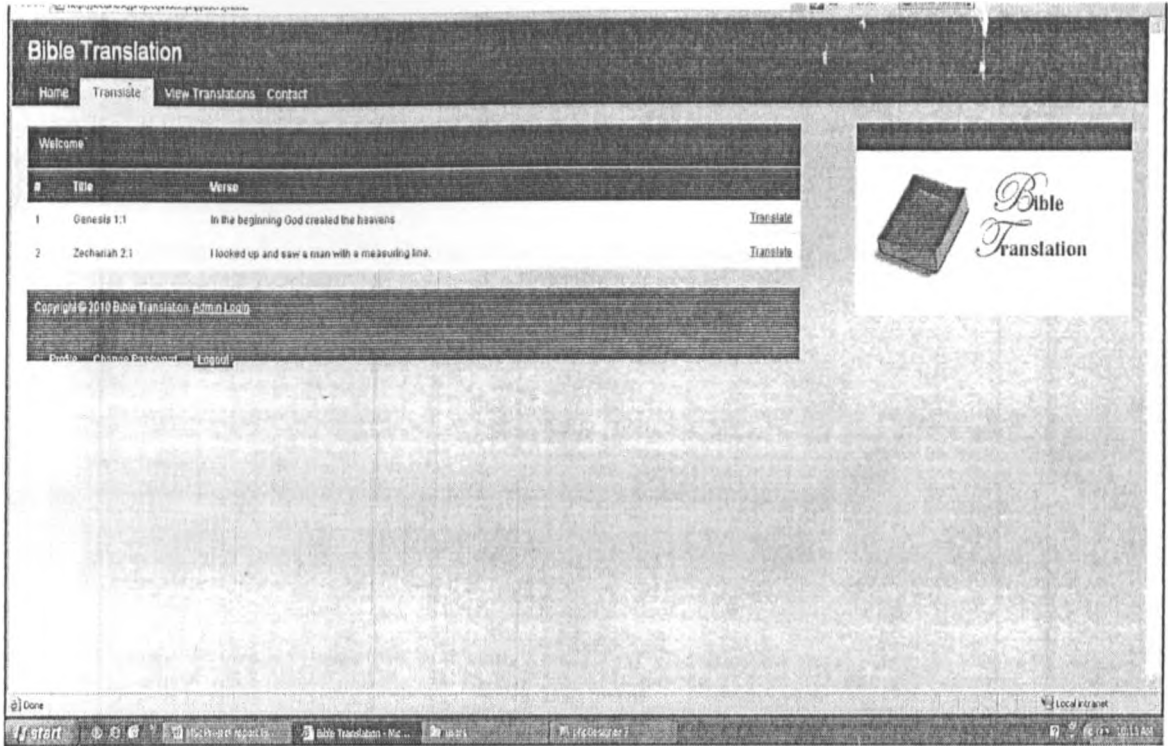
➢ Select the verse to translate then click the translate link at the end of the verse.

The following window will be displayed.
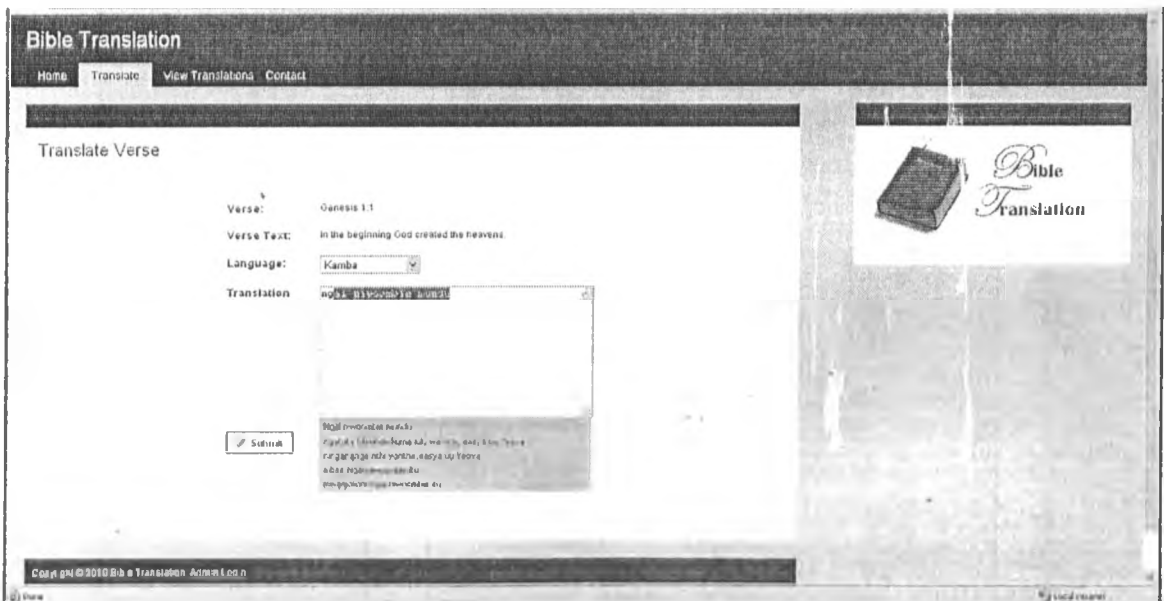
➢ Select the language to translate to.
➢ Enter your translation in translate textbox provided.

➤ Click submit button.

Note: As you translate, the website will give possible suggestions, you can either select them or ignore.

View Translation

➤ Click view translation.

The following window will be displayed showing all translations for a particular verse.

Rate Translation

➤ On the view translation window, click the dropdown list at the end of each translation and select your rating.

➤ The system will automatically recalculate the average rate and order the translations according to their Bayesian rating.

Note: The ratings are listed to the left top corner of this page.

Editing translation

The user can edit their translation up to a maximum of three times. To do this;

➤ On the view translation window, click edit link next to the translation you want to edit. The Edit Translation page appears;
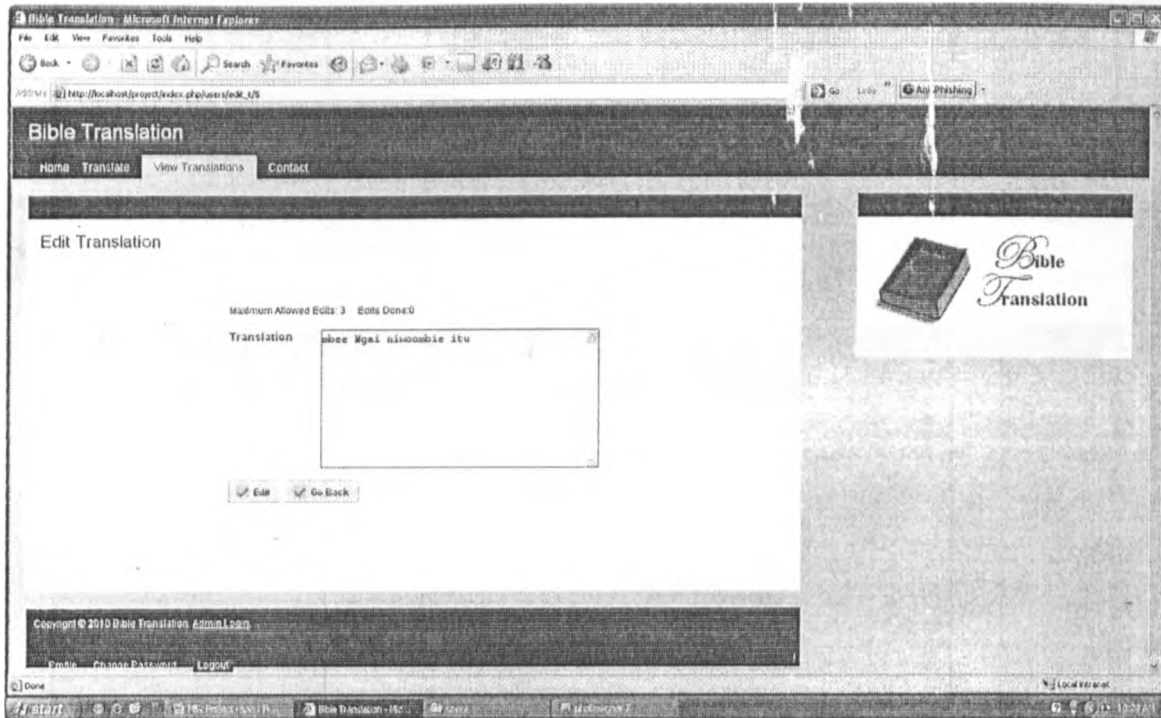
> Make your corrections then click the Edit button to submit the changes.
> You can click Go Back button to revert back to the previous page without any changes

View Profile

> The user can view his/her profile by selecting the profile link at the bottom of the pages. The following window is displayed;
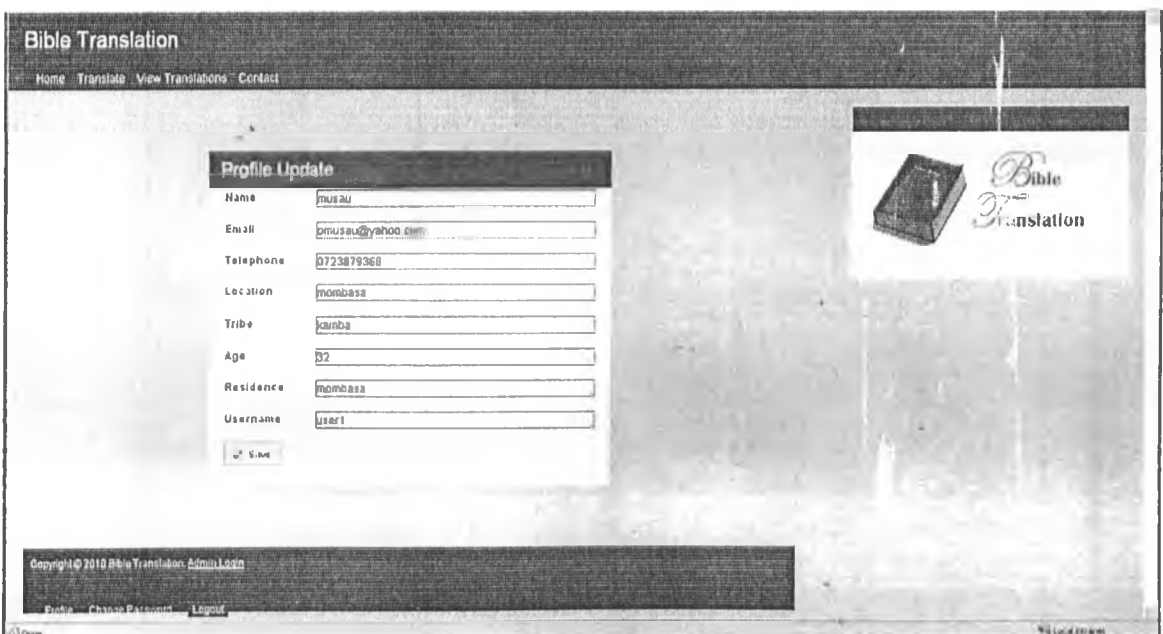
- ➢ Make any necessary changes
- ➢ Click save button.

Note: The system will request the user to login again afresh after changing the profile

Change Password

- ➢ Click the change password link at the bottom of the page.

- ➢ Enter your new password
- ➢ Reenter the new password in the Confirm password text area
- ➢ Click submit button.

Password Recovery
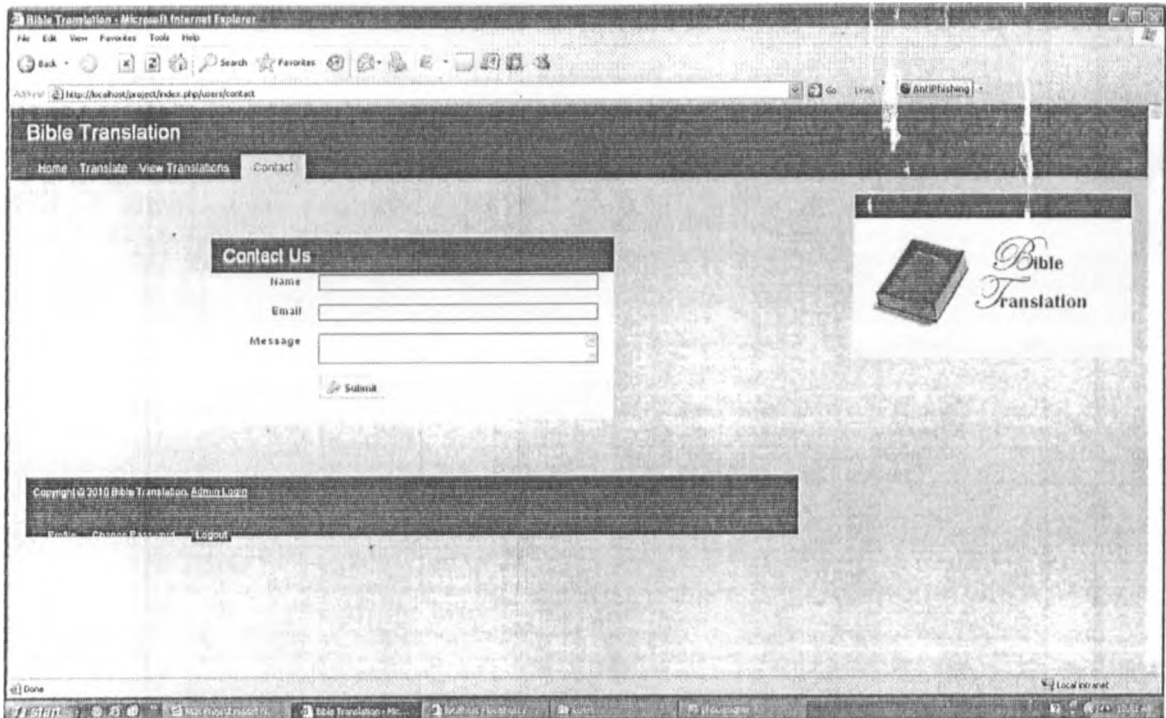
- ➢ On the log in window, click forgot password link

- ➢ Enter your email account
- ➢ Click submit button
- ➢ An electronic mail will be sent to your inbox containing a new password.
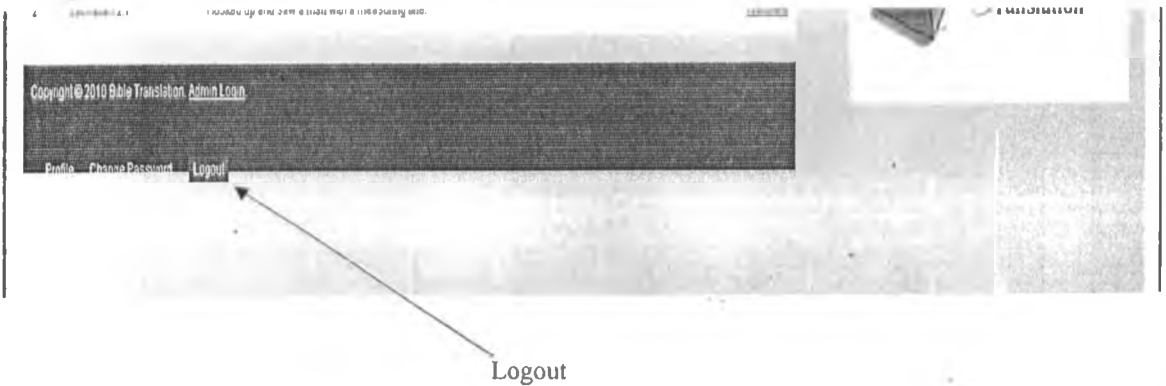
Contact us page

➢ Click the contact tab from the main window

➢ Enter your name, email and message
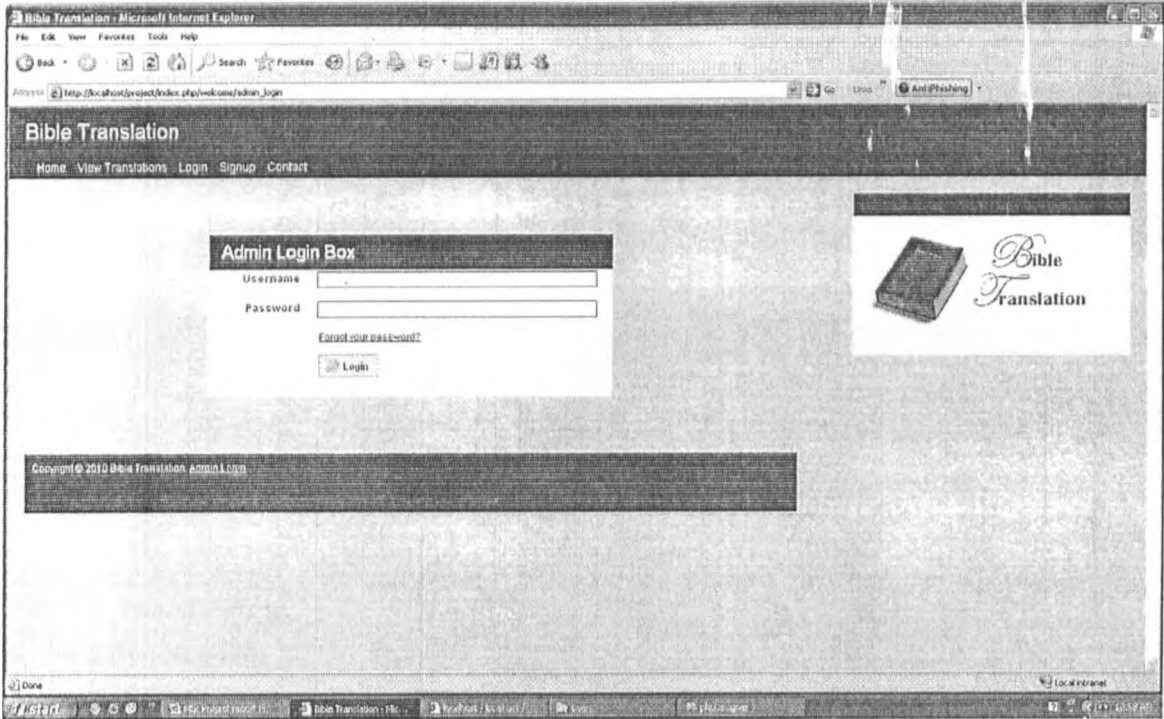
➢ Click submit button.

Logout

➢ Click the logout link at the bottom of the page

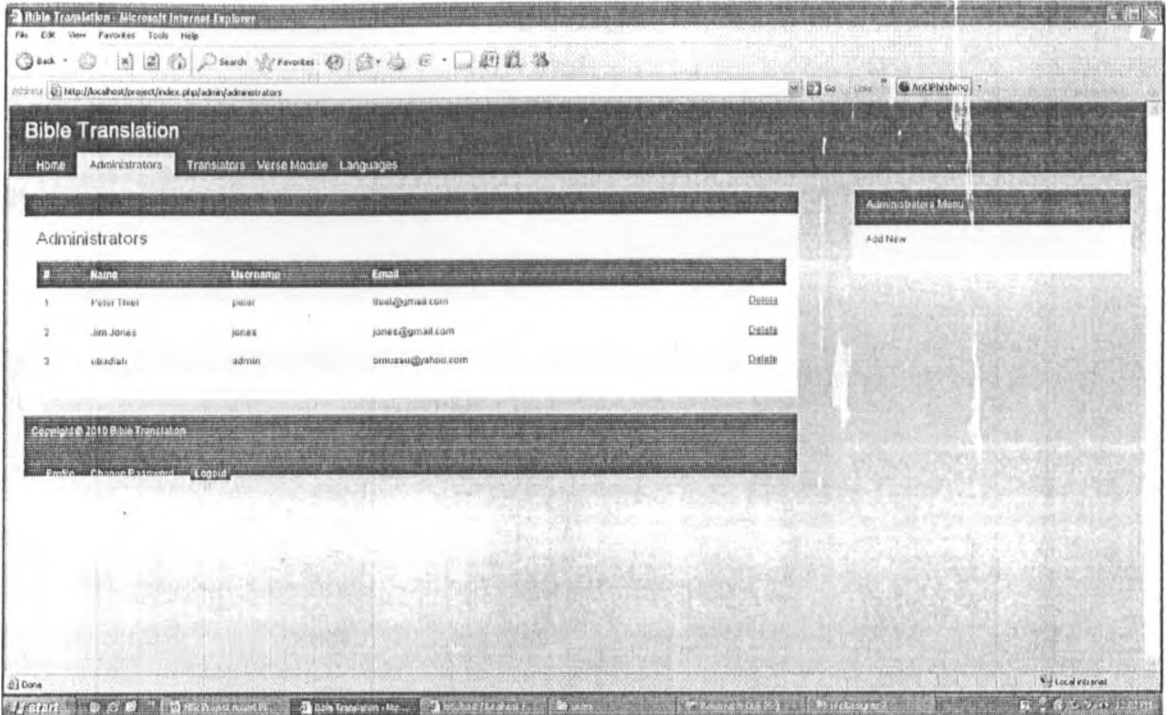Logout

Administrative Pages

Administrator login

➢ From the main window, click admin login tab at the bottom of every page. The following page will be displayed.

➢ Enter username and password in the spaces provided
➢ Click login button or tab the Enter key
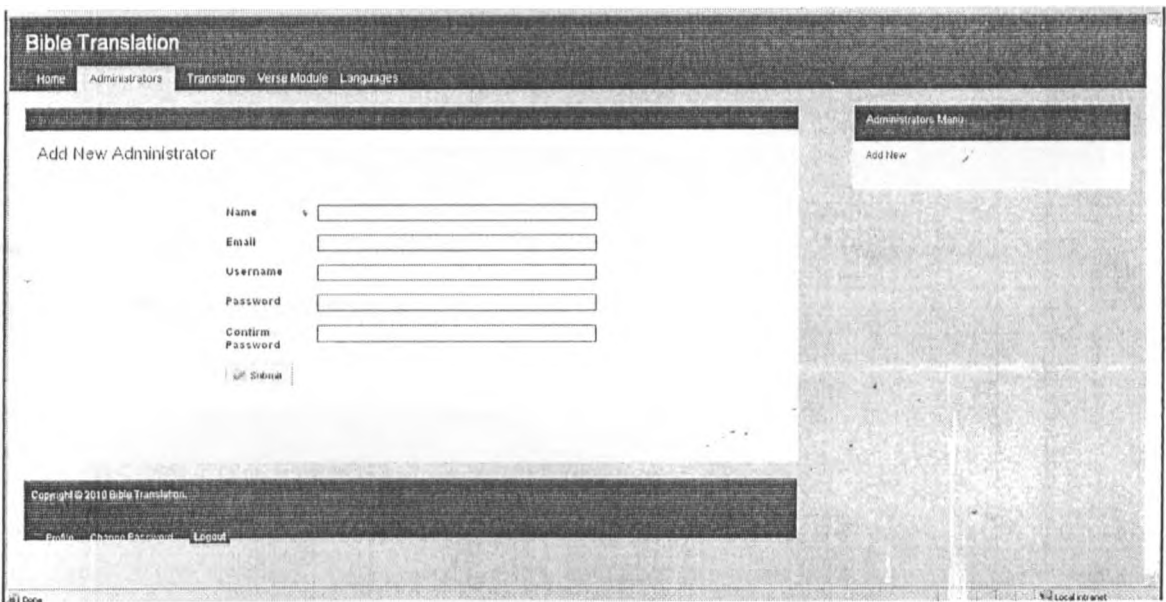
View Administrators

➢ Click the administrators tab

Note: Only the super user has the privileges to delete other administrators from the system.
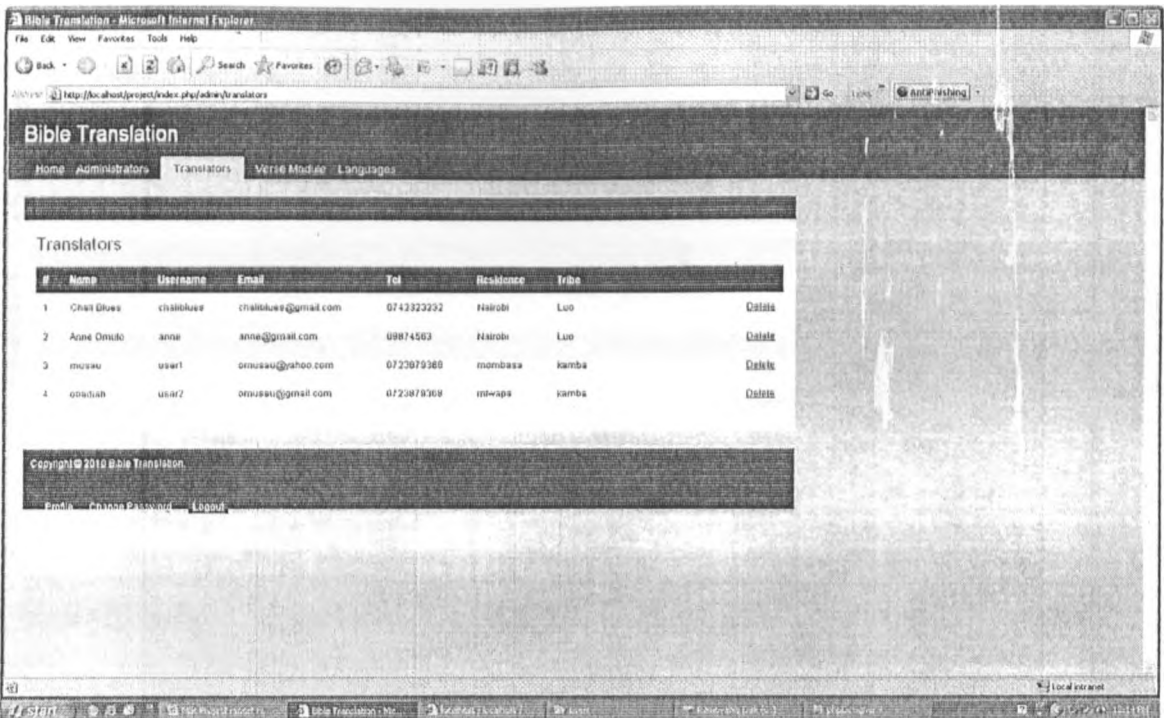
Add New Administrators

➢ Click Add New link

➢ Enter the administrators details

➢ Click the submit button.

Remove Translators

➢ Click the translators tab

➢ Identify the translator to remove then click delete option

The translator will be removed from the list.

View/delete verses

➢ Click the verse module

➤ To delete a verse, click the delete option adjacent to the verse.

View/Delete translations

➤ Click the view translations option next to the verse

➤ To delete a translation, click the delete option next to the translation.
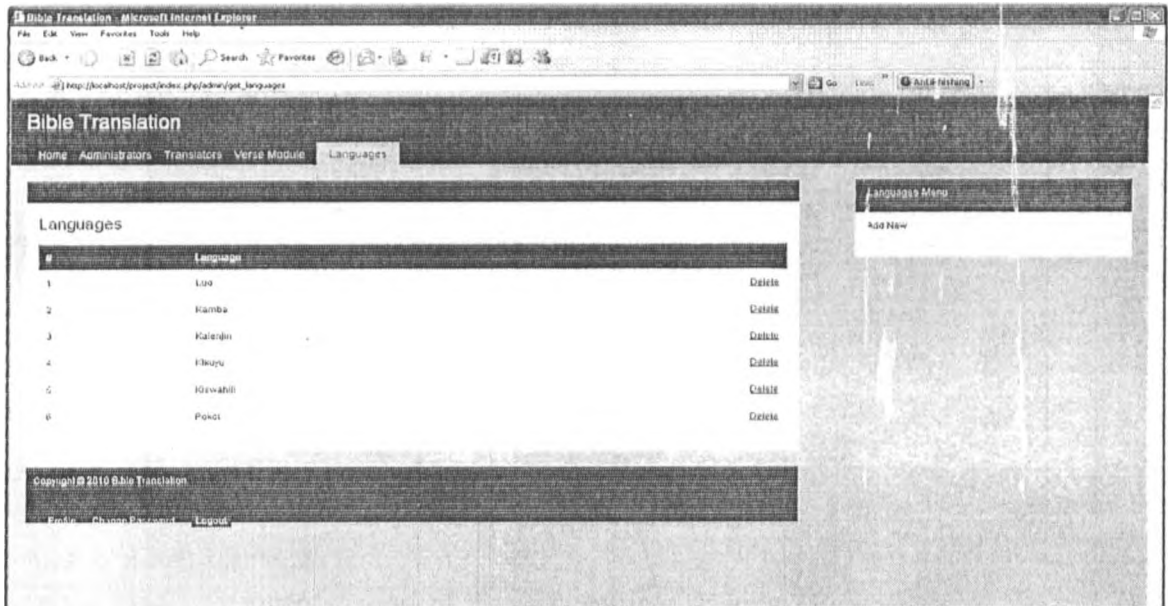
Upload New Verse

➤ Click the Add New Verse option
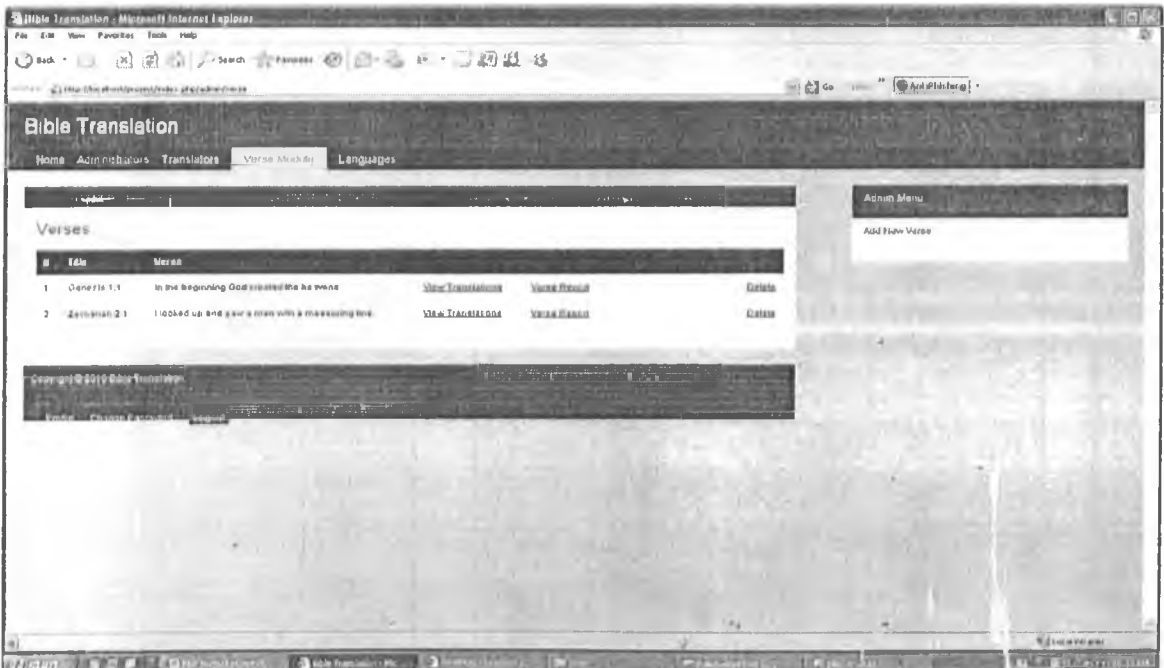
- ➢ Enter the title and verse
- ➢ Click the submit button to upload
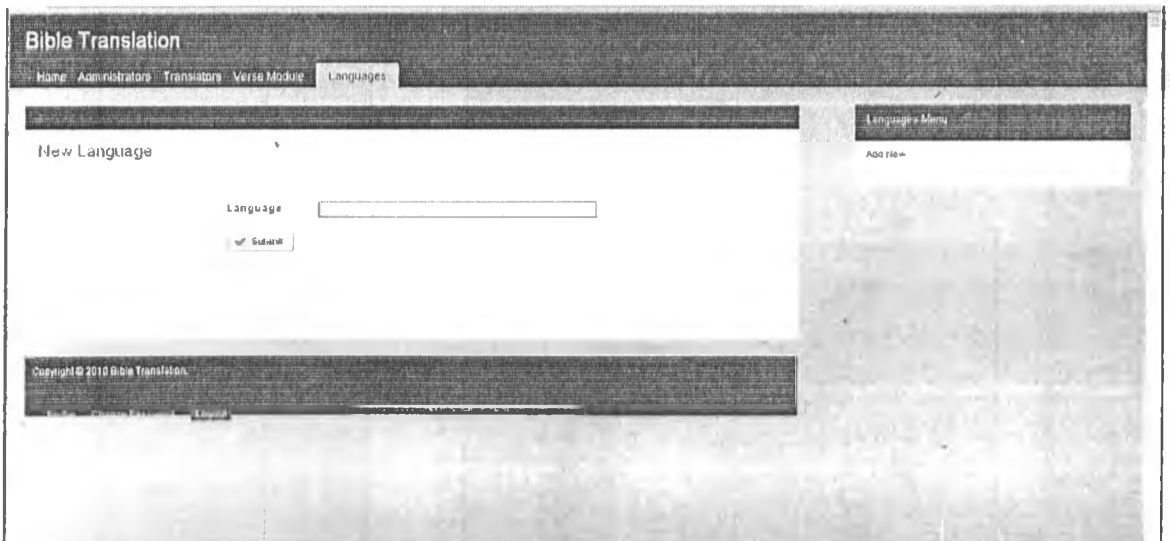
View/delete Languages

- ➢ Click the languages tab

- ➢ To delete the language, click the delete option next to the language.

Add New Language

- ➢ Click the Add New option

- ➢ Enter the language name.
- ➢ Click submit button.

Source code

Translation Page

```php
function home()
{
        $this->load->model('users_model');
$data['verses']=$this->users_model->get_verses_t();
$this->load->view('users/index',$data);
}
function get_verses_t()
{
$active=1;
$this->db->where('active',$active);
$query=$this->db->get('verses');
    $count=1;
    $data='';
    $data.=
    '<table class="table">
    <tr>
    <th>#</th>
    <th>Title</th>
    <th>Verse</th>
    <th class="last"> </th>
    </tr>';
    foreach($query->result() as $row)
        {
            $data.=
            '<tr class="odd">
        <td>'.$count.'</td><td>'.$row->title.'</td><td>'.$row->text.'</td><td class="last"> <a
href="'.site_url().'/users/translate/'.$row->id.'">Translate</a></td>
        </tr>';
        $count++;
        }
        $data.='</table>';
```

```
        return $data;

    }


View Translation Page
function view_translation($id)
    {
        $this->load->model('users_model');
        //set session
        $this->session->set_userdata('v_id',$id);
        $data['translation']=$this->users_model->get_translations_l($id);
        $this->load->view('users/view_translate',$data);

    }
//get translations for those logged in
    function get_translations_l($id)
{
        $this->db->order_by("bayesianaverage", "desc");
        $query=$this->db->get_where('translations',array('verse_id'=>$id,'active'=>1));
          //Get the verse data
            $query3 = $this->db->get_where('verses', array('id' => $id));
            foreach($query3->result() as $row)
    {

                $verse_title=$row->title;
                $verse_text=$row->text;

            }
            $result='';
            $result ='<b>Verse:</b> '.$verse_title;
            $result.='<br/><b>Verse Text:</b> '.$verse_text.'<br/>';
        if($query->num_rows()<1)
        {
            return $result.'<h1>No translations of this verse was found.</h1>
            <a href="'.site_url().'/users/translate/'.$id.'">Translate this verse.</a>';
        }
        else
        {
            $result.=
            '<table class="table">
        <tr>
```

```php
<th>#</th>
<th>Translation</th>
<th>Language</th>
<th>Translator Name</th>
<th>Bayesian Average</th>
<th>Total Votes</th>
<th></th>
<th class="last"> </th>
</tr>';
$count=1;
   foreach($query->result() as $row)
   {
     //Get the language
     $query2 = $this->db->get_where('languages', array('id' => $row->language_id));
     $lang = $query2->row_array();
$language= $lang['name'];
//Get the translator name
$query4 = $this->db->get_where('translators', array('id' => $row->user_id));
     $trans = $query4->row_array();
$name= $trans['name'];
//Check if translator is allowed to edit
if($row->user_id==$this->session->userdata('trans_id'))
{
       $edit='<a href="'.site_url().'/users/edit_t/'.$row->id.'">Edit</a>';
     }
     else
     {
       $edit='';
     }
     $result.=
     '<tr class="odd">
  <td>'.$count.'</td><td>'.$row-
>translation.'</td><td>'.$language.'</td><td>'.$name.'</td><td>'.$row-
>bayesianaverage.'</td><td>'.$row->vote_count.'</td><td>'.$edit.'</td><td class="last"> <form
method="post" action="'.site_url().'/users/rate/'.$row->id.'">'.$this->get_ratings_n($row-
>id).'</form></td>
     </tr>';
```

65

```php
    $count++;
        }
        $result.='</table>';
        return $result;
    }
}
//Rate the verses
function rate($id)
{
    if($this->input->post('ajax')=='1'){
        $id=$this->input->post('id');
        $rating=$this->input->post('rating');
    }
    else
    {
        $rating=$this->input->post('rating');
    }
    //Do the rating
    $this->load->model('users_model');
    $result=$this->users_model->rate($id,$rating);
    if($this->input->post('ajax')!='1')
    {
        if($result==1)
        {
            $flash_message= '<div class="notice">You have successfully rated the selected
translation.</div>';
            $this->session->set_flashdata('flash_message',$flash_message);
            redirect('users/view_translation/'.$this->session->userdata('v_id'));
        }
        else
        {
            $flash_message= '<div class="error">An unexpected error occurred. Please try again.</div>';
            $this->session->set_flashdata('flash_message',$flash_message);
            $this->translate($id=$this->session->userdata('verseid'));
        }
    }
    else{
```

```php
        if($result==1)
        {
            echo 'true';
        }
        else
        {
            echo 'false';
        }
    }
}
function rate($id,$rating)
    {
        $num_rows=0;
        $query1 = $this->db->get_where('translations', array('id' => $id));
        //$query = $this->db->get('mytable');
        foreach ($query1->result() as $row)
        {
            $verse_id= $row->verse_id;
            //$n_voted=$row->vote_count;
        }
        //get number of translations
        $num_rows=$this->users_model->translated_rows($verse_id);
        $sumvotes=$this->users_model->total_votes($verse_id);
        $sumpoints=$this->users_model->total_points($verse_id);

        foreach($query1->result() as $row)
        {
            $points=$row->points;
            $vote_count=$row->vote_count;
        //$sumavg=$row->average;
        }
        //Add 1 to the vote count and add the rating to the points
        //$AvgNumOfRatingsForAll=$sumavg/$vote_count;
        $points=$points+$rating;
        $vote_count=$vote_count+1;
        //get parameters for Bayesian Rating
        $sumvotes=$sumvotes+1;
```

67

```
$sumpoints=$sumpoints+$rating;
 if($vote_count<=0)
   {
    $average=0;
   }
 else
   {
      $average=$points/$vote_count;
   }
 //check division by zero
 if($num_rows<=0)
   {
    $AvgNumOfRatingsForAll=0;
    $AvgRatingForAll=0;
   }
 else
   {
      $AvgNumOfRatingsForAll=$sumvotes/$num_rows;
      $AvgRatingForAll=$sumpoints/$sumvotes;
      $TotalRating=$points;
      $RateCount=$vote_count;
   }
$numerator=($AvgNumOfRatingsForAll*$AvgRatingForAll)+$TotalRating;
$denominator=$RateCount+$AvgNumOfRatingsForAll;
if($denominator==0 ||$numerator==0)
   {
    $br=0;
   }
 else
   {
      $br=$numerator/$denominator;
   }
/*BA = ((AvgNumOfRatingsForAll * AvgRatingForAll) + TotalRating) / (RateCount +
AvgNumOfRatingsForAll)
Where:
RateCount is the number of ratings given to this translations - $vote_count
TotalRating is the sum of all ratings given to this translations - $points
```

AvgNumOfRatingsForAll is the average number of ratings for all translations shown (where RateCount > 0) $sumvotes/$num_rows

· AvgRatingForAll is the average unweighted rating for all translations shown (where RateCount > 0) $sumpoints/$sumvotes */

```
//Update the table
    $data = array(
    'points' => $points,
    'vote_count'=>$vote_count,
    'average'=>$average,
    'bayesianaverage'=>$br
    );
    $this->db->where('id', $id);
    $result=$this->db->update('translations', $data);
    return $result;
}
```