



# **UNIVERSIDAD TÉCNICA DEL NORTE**

**FACULTAD DE INGENIERÍA EN CIENCIAS APLICADAS  
CARRERA DE INGENIERÍA EN SISTEMAS COMPUTACIONALES**

## **Scientific Article**

**THEME:**

**CREATION OF A MULTIMEDIA WEB APPLICATION FOR LEARNING  
KICHWA, USING PROGRAMMING LANGUAGE JAVA AND DATABASE  
MONGODB.**

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# CREATION OF A MULTIMEDIA WEB APPLICATION FOR LEARNING KICHWA, USING PROGRAMMING LANGUAGE JAVA AND DATABASE MONGODB.

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## SUMMARY

Universidad Técnica del Norte, as institutional mission has to train excellent professionals, critics, scholars, leaders and entrepreneurs with social responsibility. For this reason, finishing the academic major, the students, must perform a work to demonstrate the acquired knowledge in the classroom, to meet this objective, this work entitled: **“CREATION OF A MULTIMEDIA WEB APPLICATION FOR LEARNING KICHWA, USING PROGRAMMING LANGUAGE JAVA AND DATABASE MONGODB”**, was done to offer a quality tool that teaches Kichwa, this way it developed this project described in the following article.

This article described the problems of Kichwa language, the Project objectives also are to teach the Kichwa and spread the use of this language will disappear.

## Keywords

Kichwa, Multimedia, Education, Software, Culture

## INTRODUCTION

Kichwa is native own language of America, is spoken in the Andean regions of Ecuador's highlands.

There is a high degree of difficulty for people wanting to learn the Kichwa language, since there is no information available to people, let alone digital to provide language teaching. Also kichwa is one of the 50 languages declared endangered by UNESCO, because de new generation of indigenous people has stopped using the language.

## GENERAL OBJECTIVE

Create a multimedia web application for learning kichwa, using Programming language Java and database Mongoddb. This application is called Kichwa Multimedia.

## JUSTIFICATION

Now kichwa is one of the 50 languages declared endangered by UNESCO (“Recuperando la memoria oral del Mindalae Otavalo, artesano y comerciante universal | Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura,” 2010), for his low using and the low transmission of this cultural value in Kichwa speakers people to new generations, also today there are no technological means for teaching Kichwa, Kichwa learning assessment, for this reason is necessary spread the Kichwa language through new and moderns technologies to new generations and general public, and thereby make the Kichwa spoken again in Ecuador.

## KICHWA

Kichwa is an own native language from South America that is spoken especially in the Andean regions of Ecuador.

In 1998, in the Tabacundo parish, Pedro Moncayo city was performed the II ENCUENTRO DE UNIFICACIÓN DEL ALFABETO KICHWA with indigenous organizations participation, officials of Dirección Nacional de Educación Intercultural Bilingüe (DINIEIB), Kichwas linguists and approve the kichwa alphabet with 20 spellings: 17 consonants and 3 vowels.

**Vowels:** A(a), I(i), U(u). Not exist the vowels E (e) – O(o).

**Consonants:** CH(ch), H(h), K(k), L(l), LL(ll), M(m), N(n), P(p), R(r), S(s), SH(sh), T(t), TS(ts), W(w), Y(y), Z(z). Not exist the consonants B (b), C(c), D (d), F (f), G (g), J (j), Q (q), V (v), X(x).

**Table 1:** Kichwa Alphabet

Letter	Pronunciation
A (a)	A
CH (ch)	CHA
I (i)	I
H (h)	HA [ja]
K (k)	KA o [ga]
L (l)	LA
LL (ll)	LLA
M (m)	MA
N (n)	NA
Ñ (ñ)	ÑA
P (p)	PA
R (r)	RA
S (s)	SA
SH (sh)	SHA
T (t)	TA
TS (ts)	TSA
U (u)	U
W (w)	UA

Y (y)	YA
Z (za)	ZA

**Source:** Own

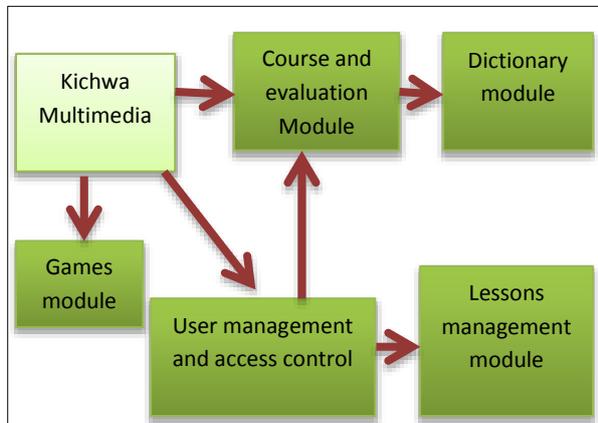
The vowels and consonants that not exist in kichwa, it can be applied in the names of people; cities, countries and others own nouns that coming another language.

## SCOPE

The Kichwa Multimedia application contains five modules:

- ✓ Kichwa Multimedia content management module, with only administrator access, the administrator must following the processes of this application, In the module it can insert new lessons, edit and visualize exist lessons.
- ✓ Kichwa – Spanish – English dictionary module, open with any users, is kind of like any language dictionary, this module contains all Kichwa words translate to Spanish and English that exist en the Academia de la Lengua Kichwa del Ecuador (ALKI).
- ✓ Module with games in Kichwa, it's contains crosswords, drag and drop games, it's open any users.
- ✓ Courses and evaluations module, it's available for any users, with the Kichwa Multimedia content, it is perform 2 courses: the first course is kind of like Book2 web page in [www.book2.de](http://www.book2.de), and the second it's divided into levels, at the end of each level the user owe to shall submit an evaluation and get a minimum score, to activate the next level, The both courses are available Spanish to Kichwa or English to Kichwa, if the user wants to save the approve course, it's going to register and login in this module using the respective user and password.
- ✓ User management and access control module, it's only for administrator, the

administrators can manage all users of application.



**Illustration 1:** Application modules

**Source:** Own

## DEVELOPMENT METHODOLOGY

It is choose the Extreme Programming (XP) methodology, because it's the most agile methodology and less documentation, the development application does not require much documentation compared with real business systems; and the same reason require the lees programming.

**In the first phase:** Project planning, it will be performed.

**User Stories:** Meetings with the client who will remain manifest the requirements to be met by software.

**Release planning:** It is a planning when the developer and client establish the ideal time for implementation of user stories, priority to be implemented and the user stories that implemented in each version of program.

**Iterations:** All project that following X.P methodology, it is divide in iterations approximately 3 weeks duration. At the start the clients be select the define user stories in the "Release planning" that will implement.

**Project speed:** The project speed is a measure that represents the quickness project development.

**Pair programming:** The X.P methodology advises the pair programming because increases the productivity and quality of software.

**Daily meetings.** It is necessary that developers meeting every day and explain their problems and new ideas.

**In the second phase:** Design, it will be performed.

**Simple designs:** It is design no functional prototypes of application.

**Refactor:** It is improve and edit the structure and encode created code without altering their functionality

**In the third phase:** Encode, it will be perform.

The encoding should be sticking to coding standards. Standards program maintains consistent code and facilitates understanding, and scalability.

Create test to prove the performance all implemented codes.

It is suggest a working model repositories code where couples programmers published every hour their codes implemented and corrected with the test he must pass. In this way the rest of programmers who need foreign codes will always work with the latest versions. To maintain a consistent code, publish a code into a repository is a unique action for each pair of programmers.

Code optimization should always be left for last. We must make it work and make it right later can be optimized

**In the fourth phase:** Tests, it is will perform:

The use of test to check the operation of the codes that we will implement.

It is will create applications that perform the test with a specific development environment for test.

It is be subjected to tests of different types of system omitting the most trivial methods.

It is should be created that will test code before implementing

An important point is to create tests that have no dependent code in the future assessed. It is create the future abstracting test code in this way will ensure the independence of the test on the code that evaluates.

Using the test is suitable for observing refactoring. The tests allow verifying that a change in the structure of a code does not have to change its operation.

**Accept testing.** The above mentioned test used to evaluate the different tasks that has been divided a user story. To ensure the final performance of a given user story must be created "Accept testing"; this test are creates and using by clients to check all user stories.

## JAVA PROGRAMMING LANGUAGE

Java is development by Sun Microsystems in 1995, it is for all platforms, it is performed in GNU GLP/Java community process license and the features are:

- ✓ Object oriented.
- ✓ Distributed
- ✓ Interpreted
- ✓ Robust
- ✓ Sure
- ✓ Have a neutral architecture
- ✓ Multithreading
- ✓ Garbage Collector
- ✓ High Performance
- ✓ Dynamic

- ✓ Allow connection with all databases

## FRAMEWORK JSF

The Java Server Faces technology is a framework for user interface components on the server for Web applications based on Java technology.

The main components of Java Server Faces Technology are:

- ✓ API (Application program interface) for representing user Interface components and managing state, event management, server side validation and data conversion.
- ✓ Libraries programming models and well defined labels that considerably ease the burden of building and maintaining web applications with user interfaces on the server.
- ✓ Load components in a page by adding components labels.
- ✓ User interface components in a page linking with the server data.
- ✓ User Interface with components reusable and extensible.
- ✓ Save and reset the user interface status.

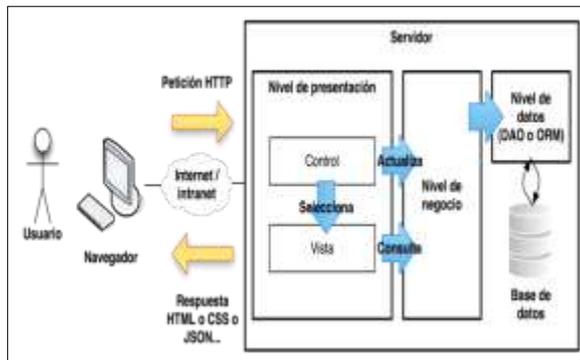
## BEAN CLASSES

Java classes are associated with user interface components used in a particular page. In addition to defining a constructor with no arguments, like all JavaBeans components should make a Bean class also defines a set of properties of the components of user interface and a set of methods that perform a component.

## SOFTWARE DEVELOPMENT ARCHITECTURE

It is the general structure of a web application in which the interaction of different components, connectors, constraints, relationships and principles that manages the design is determined.

The MVC (Model View Controller) design, implementation organized in three separate models, the first is a model that represents the application data and business rules, the second is a set of views that represents input forms and information output, the third is a set of drivers that processes user requests and controls the flow of execution of the system.



**Illustration 2:** Design pattern MVC

Source: Own

## WEB DESIGN

It is an activity that involves planning, design, construction and implementation of websites. It is not simply an application of conventional design, because it requires consideration of navigability, interactivity, usability, information architecture and interaction of media such as audio, text, image, video and links.

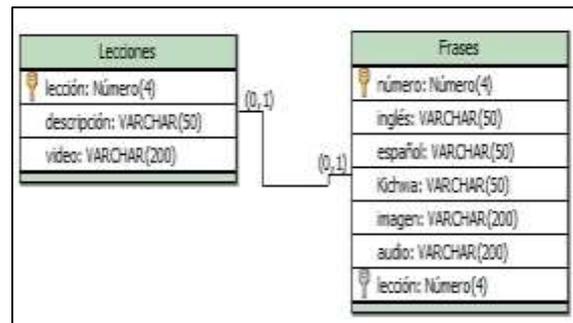
## ENTITY-RELATIONSHIP DIAGRAMS

An entity relationship diagram is the physical representation of a database model which allows implementing an easier way.

Within NoSQL database, there is not concept of Tables or relationships, for this reason all about relationships is done in the programming of the application, the fields of the records are designed before being programmed.

Stressing that the Kichwa multimedia application uses a NOSQL database (MongoDB), for a facility when programming then described diagrams Entity relationship of each module.

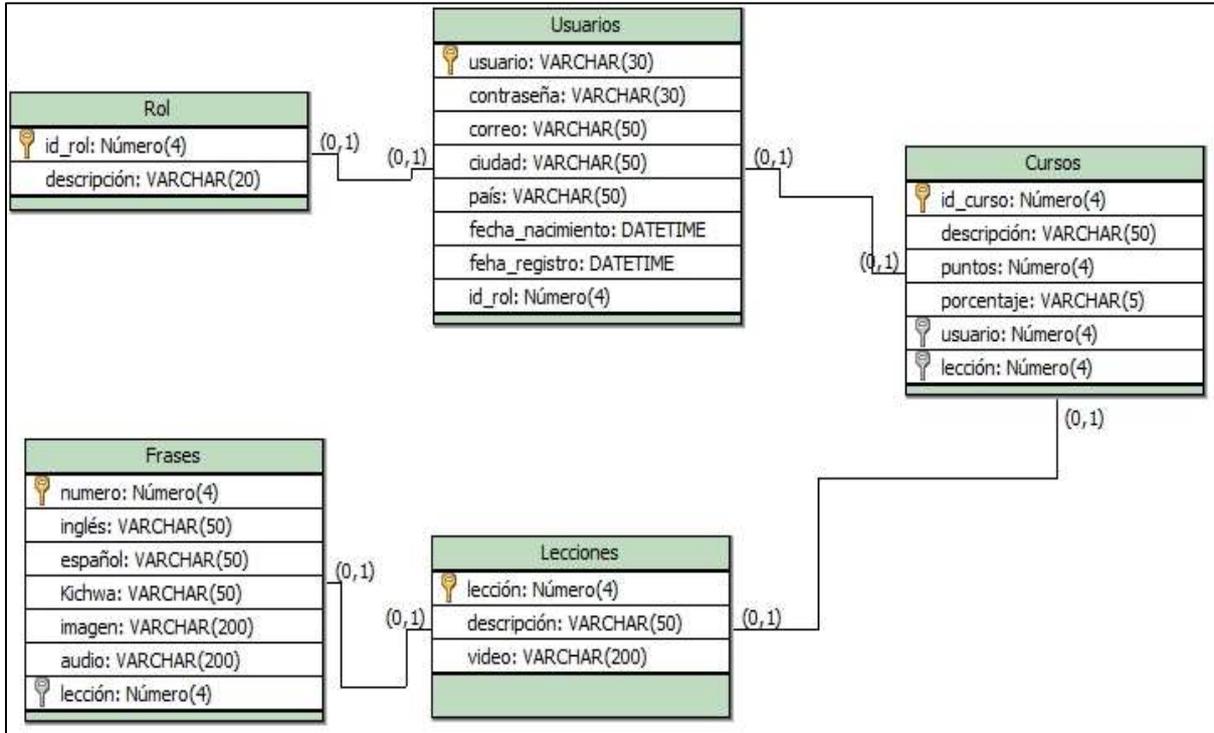
### Entity – relationship diagram module: Kichwa Multimedia content management



**Illustration 3:** ER Diagram: Kichwa multimedia content management

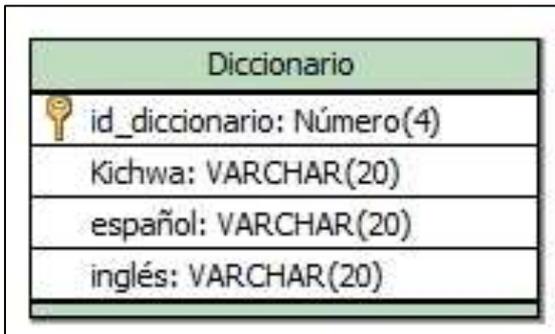
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**Entity – relationship Diagram module:  
courses and evaluation**



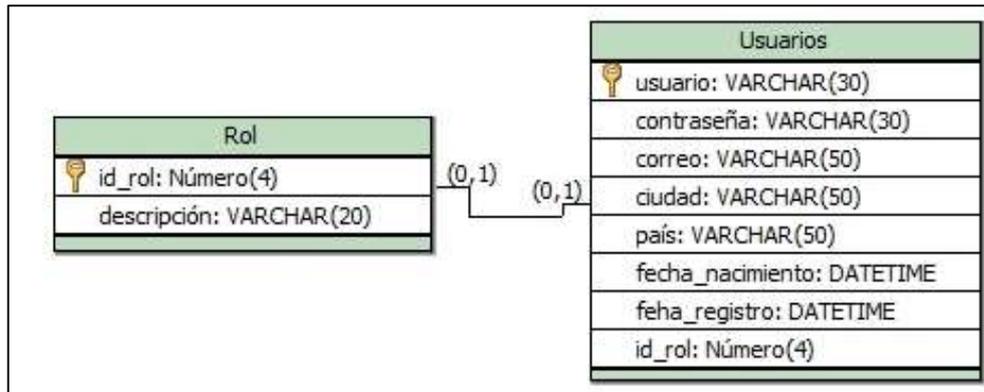
**Illustration 4:** ER Diagram: Courses and evaluation  
Source: Own

**Entity – relationship diagram: Dictionary management**



**Illustration 5:** ER Diagram: Dictionary management  
Source: Own

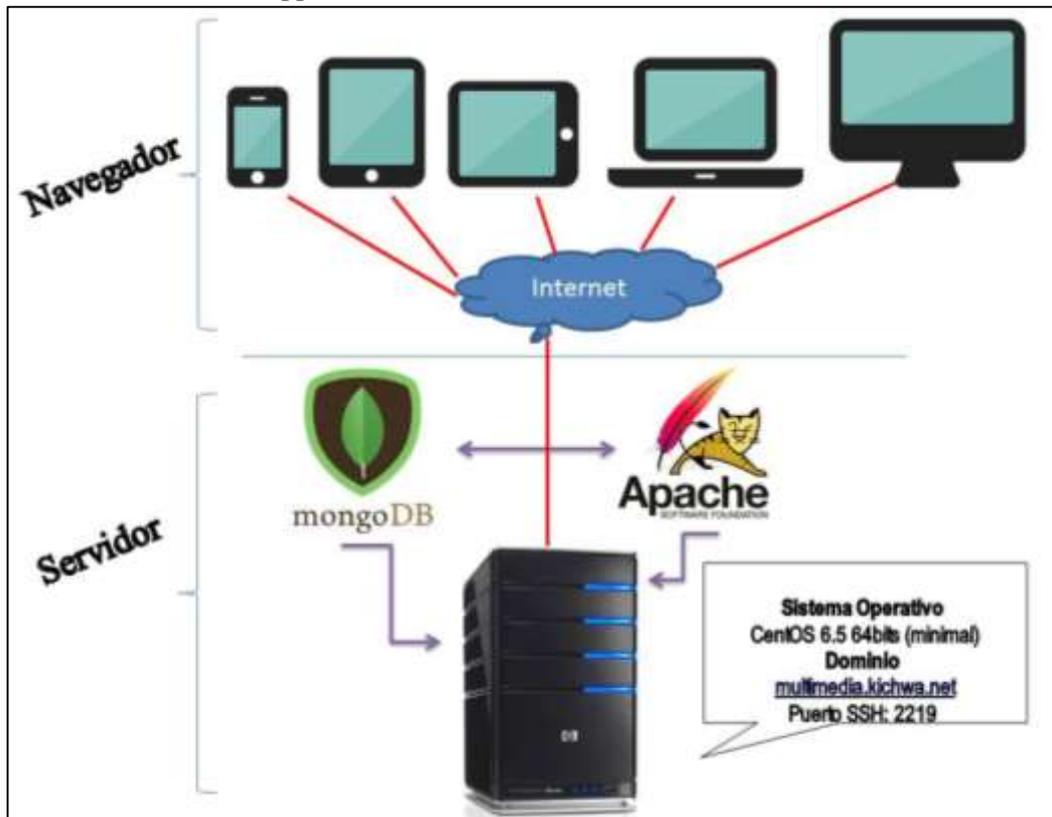
**Entity – relationship diagram module: User management and access control**



**Illustration 6:** ER diagram: User management  
**Source:** Own

**WEB APPLICATION IMPLEMENTING**

The next graph illustrates the hardware and software components that work for the proper operation and use of the web application.



**Illustration 7:** Physical architecture of application  
**Source:** Own

For admission to the Web application only requires a web browser with Internet access, enter:

<http://multimedia.kichwa.net/>

## RESULTS

With the deployed application, “Runa Pacha” association obtained the following benefits:

Impact	Result
Economic	Saving supplies
Environmental	Reducing paper usage
Social	Motivating the people to learn Kichwa language

## CONCLUSIONS

- ✓ The Kichwa has suffered many distortions; and has done that is losing the cultural value of language.
- ✓ The Kichwa should continue growing and generating more own resources to support and implement new cultural strengthening projects successfully.
- ✓ The use of teaching methods allows a high quality material for users.
- ✓ The different investigation tools meet with necessary functions, facilitating certain types of work.
- ✓ Throughout the development of the project many features of the tools discovered it was not known, use these features in a correct manner makes certain jobs in the project.
- ✓ The use of agile software development methodologies allows in the future making changes easily and quickly as possible, taking into account the new requirements that are needed to develop, for customer satisfaction.
- ✓ The " Kichwa multimedia " web application developed with modern and free tools, allowing users to learn the Kichwa language in an easy and

interactive way through the Internet for free.

- ✓ The architecture used for application development, is scalable which let you add new modules and services in the future.
- ✓ It should take into account the support of the application in the future, because if in the future you want to scale new functionalities in the application, these changes may be more expensive.
- ✓ The design of the web application is very clear and precise, allowing new users to access and manipulate it without any complications.
- ✓ Develop a project to strengthen my cultural identity; I implied that the works are more powerful than words.

## ACKNOWLEDGEMENTS

The indigenous cultural association “**Runa Pacha**” (‘Los seres humanos de la Tierra’), (‘Humans of Earth’), whose provided me and oversaw the contents throughout the application development; and all my teachers, who in every moment of my student life they shared their knowledge and professional experiences.

## RECOMENDATIONS

- ✓ Having the support of many experts in the subject, this will help make the right decisions during the course of the project.
- ✓ Understand the true cultural value of the Kichwa language.
- ✓ Perform comparative methodologies language teaching and choose the most feasible.
- ✓ Use tools with stable versions.
- ✓ When installing tools cater much to the policies and conditions of use, the lack of this can lead to disagreements in the Developer.

- ✓ Studying the tools to use, lack of use of tools during application development can generate loss of time and resources.
- ✓ For the correct development of an application, follow a methodology and have them a daily schedule and meet to detail.
- ✓ In the development of the application to conduct joint tests with the end user, making a careful feedback, as the end user who uses the application will therefore always have the reason.
- ✓ When designing user interfaces, you must follow standards that will help the development of these, and as a result the end user acceptance is obtained.
- ✓ During testing and deployment of the web application, document all important, relevant and necessary data, this refers to the users and passwords that are commonly used in each software, forgetfulness of these can cause problems and downtime.
- ✓ Develop technological projects to further strengthen the Kichwa language.

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