Web Development to Identify Cryptocurrency Businesses in Bogotá Colombia

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Abstract

With software engineering, application development can be optimized, using existing methodologies and models, and taking relevant aspects of some of them, therefore, the article presents a web development in which a hybrid between the Model development pattern is applied View Controller and development in two layers known as Front – End and Back – End programming. The development of the research is carried out by studying a very current topic in the financial market such as the case of "blockchain", which has become a potential tool for international transactions and even as an investment fund. Regarding the research methodology, the project is framed within a type of descriptive research, since it seeks to identify the aspects and requirements necessary for the construction of a web system; which is built from a market study prepared through the survey instrument applied to 98 people who answered questions related to the cryptocurrency market and its importance in the market, as well as the need to have a web application that allows users to identify the cryptocurrency trade in Bogotá Colombia. The software is developed by applying four phases: Inception, elaboration, construction and transition, which are described during the development of the article.

Keywords: Blockchain, cryptocurrencies, software.

1. Introduction

Software products have always been a topic of discussion over time due to the poor quality of some products on the market. For this reason, it is necessary to find a mechanism that allows improving the quality of these products. By applying software engineering, application development can be improved, using currently existing methodologies and models, but that propose the construction of a layered software development model that allows web application developments in which a hybrid is carried out. between the Model View Controller development

pattern and two-layer programming known as Front – End programming and Back – End Programming.

In today's society, coexistence with a digital underworld governed by computer programs is truly palpable. Given this reality, it is necessary to know and have technological tools that allow any company, regardless of its commercial branch, to improve its competitiveness in the market. In this sense [1] "thinks that technologies are a significant contribution to the production, management and management processes within all organizations."

Business organizations, having full knowledge of the position of their brands and products in the markets, do not depend on the fact of production, good performance in their services and commercial channels, but also depend on the good use of information and communication technologies. (Tics),. Therefore, if small, medium and large companies do not adopt this type of initiative, they will not be able to last over time [2].

On the other hand, blockchain technologies have become a potential tool for international transactions and even as an investment fund. Faced with this reality, companies take advantage of the rise of the blockchain platform to adopt payment mechanisms, allowing them to innovate within their commercial transactions and position themselves in the market over those companies that maintain traditional commercial strategies. For [3], not only because a large part of the innovations occur here, but because ICTs are vital to innovate." This research revolves around the development of an application as a means of payment in Bogotá Colombia; applying a hybrid development between the Model View Controller programming pattern and two-layer programming "Front End – Back – End".

2. Reference Framework.

2.1 Background

With the appearance of Bitcoin in 2009, citizens have become interested in adopting this new way of making international transactions and securing their investment funds. This digital penetration into the world's financial and economic systems is revolutionizing the way of doing business, given that it is totally decentralized. Such a situation has contributed to researchers seeking to understand this phenomenon with greater certainty.

In this regard, [4] presented a research project titled "Cryptocurrencies as an Investment Alternative, Risks, Regulation and Possibility of Monetization in Colombia".

[5] They developed a research whose title is "Cryptocurrencies: An investment strategy", this research had the general objective "Determine an investment strategy in cryptocurrencies based on the return-risk relationship". The scope of this research was the conceptualization of cryptocurrencies and the design of an investment model based on Markowitz's mean-variance investment portfolio theory. The research. The researchers managed to provide an investment strategy based on Cryptoassets, under the Markowitz mean-variance model.

Likewise, [6] presented a research whose title is "Use of cryptocurrencies as a means of payment by exporting SMEs.", to qualify for the title of economist at the University of Guayaquil. The

general objective of this research is "Evaluate the feasibility of the use of virtual currencies by Ecuadorian SMEs, as a means of payment, to enhance national and international trade in Ecuador."

The researchers studied the reasons why SME entrepreneurs that export products did not adopt cryptocurrencies as a means of payment, therefore, the formulation of their problem was “Would SME entrepreneurs use the PayPal Coin cryptocurrency as a means of payment to increase your sales?” To answer this question, the research was approached with a correlational and explanatory approach, according to [6] PayPal Coin is considered a payment method like the dollar since it is under the legal regulations of the United States Treasury Department. With a poblation of

26,270 SMEs and a sample of 379. The results obtained made it possible to identify the reasons that lead entrepreneurs to not accept these means of payments: because they do not have the facility to make their payments online, because they do not have a credit card or debit or are afraid to send their money by bank transfer to make an online purchase. Another achievement of this research was the awareness of these same businessmen in adopting the virtual currency PayPal Coins, since you do not need to have a credit card, you only proceed to create an account and its support in dollars that it has in order to be able to get coins in this account.

2.2 Conceptual framework

2.2.1 Blockchain

The blockchain or chains of blocks is a series of interrelated blocks that contains information that cannot be adulterated, changed or modified after being accepted into the block since each of these records a consecutive relationship of the previous block [7]. The fundamental role of the blockchain is to serve as a record book, where all transactions made by this chain are recorded. Its main features are the anonymity of the people who have activity in the blockchain and the veracity of each transaction without no intermediary entity, since the network users themselves make this process clear and secure. But the functionality of the blockchain has been so broad that it has been considered a revolution on the Internet where many computer developers have discovered it to support other topics.

2.2.2 Information systems

An information system (IS) is a grouping of data, computer programs, procedures and human resources that allows collecting, recovering, processing, and storing information necessary in an organization. [8] defines an IS as an accumulation of elements that are related to the capture, processing, storage and distribution of information that is very useful as a tool in decision making and process control.

Some ICT specialists differentiate IS from computer systems; computer systems are programs built with a programming language and a database manager and are structured into three large blocks: input, processes and output. On the other hand, IS are not only technological constructions, but they are also social systems.

2.2.3 Web applications

Web applications are computer systems created with programming languages and technologies supported on the web. They also use browsers as a platform for the execution of their scripts. Many web applications require web servers, such as Apache, and database managers such as MySql. The term web applications also refers to storage in the cloud, through the physical support of large servers, where the information is stored and the data is sent to the different client devices in response to a request [9]. This ubiquity is the most powerful aspect of web applications, it only requires an internet connection.

2.2.4 Web system architecture

A Web application makes multiple requests (database queries) to a web server made by different clients that use browsers as a platform. The architecture of a Website has three main components:

A Web server, A network connection and One or more clients.

A web server is software whose function is to respond to requests made by users, a request consists of a query to a database, for example; the query to search for product data. The web server distributes the responses through an HTML page, using the HTTP protocol [9]

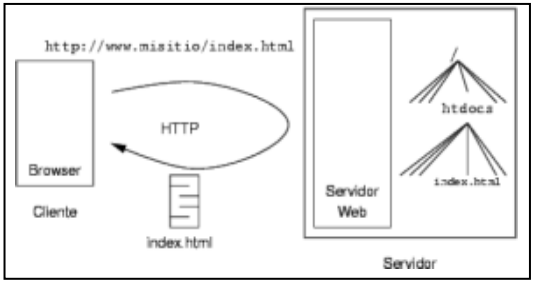

Figure 1. Operation of a web server

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Web applications are based on the Client/Server model managed by web servers, and which use web pages as an interface; but at the same time it uses the model view controller in its design.

Like web servers, web pages are an essential component in a web application, a web page is made up of HTML tags and sometimes JavaScript scripts or any other scripting language, a situation that at the design level is called “Front End” and by a layer of interaction with the database, better known as “Back End”.

2.2.5 Geolocation

[10] defines geolocation as a neologism that refers to the position with which the location of an object or living being is defined in a coordinate system and at a given time.

2.2.6 Cryptocurrency

A cryptocurrency or cryptocurrencies is a digital means of payment, which uses Blockchain technology. Currently, there are different cryptocurrencies, with different names, specifications and value, but they all have their origin in Bitcoin. The traditional monetary system, prevailing to this day, central banks are the organizations that recommend monetary regulations, they have the power to issue more monetary units and establish credit policies. Blockchain-based cryptocurrencies remove the regulations of central banks, and their production of new Cryptoassets is previously fixed. For example, Bitcoin generates a new currency every block is mined. The system is planned to reach a total of 21 million bitcoins approximately in the year 2040 [11].

2.3 Legal framework

To create the legal framework, the researcher took into account international regulations and national regulations in order to have two points of reference.

2.3.1 International regulation

As interest in cryptocurrencies grows and they spread throughout the world, countries begin to see them in a friendly way, which is why several countries are already leaders in adoption, below are the countries that are most permissive with the use of bitcoin:

El Salvador, Switzerland, Singapore, Japan, United States. This has been creating an environment of trust where countries in the region are joining the use of this new technology.

This is the example of Argentina, which, due to inflation and devaluation of the national currency, saw the need to establish a regulatory framework for cryptocurrencies that, if the law is approved, cryptoassets can be used as a means of payment, savings and investment.

In Venezuela the situation is more complex due to the social problems it faces, but a law issued by SUNACRIP can be considered in which it grants legality to bitcoin mining. This new decree regulates the use, distribution, import, and creation of mining equipment in Venezuelan territory, it is titled the "Constituent Decree of Cryptoactives", there is also Decree No. 3355 through which it is created and regulated in detail. the superintendence of cryptoactives of Venezuela and Venezuelan Related Activities "SUPCACVEN", and Decree No. 3353 by which the Treasury of Cryptoactives of Venezuela, S.A. is created. On December 8, 2017, Decree No. 3196 was published by which SUPCACVEN was formally and generically created and the Petro cryptocurrency was legalized, and finally on March 22, 2018, the Decree was published by which the called "Petro Zones", which are places where the use of Petro and digital mining is encouraged [12].

Likewise, this year, the president of El Salvador Nayib Bukelele created and issued recommendations [13] so that the country began to integrate bitcoin into its financial system as a legal tender. The document sets out the background of bitcoin, how it can be used and its current operation. It also mentions 3 important characteristics that it has.

2.3.1 Regulation in Colombia

Colombia has a regulatory sandbox that seeks to prepare and test cryptocurrency transactions. Although the first communications and recommendations from the Bank of the Republic were only warnings to the consumer about the use and exchange of this type of virtual currencies. His first statement was made in April 2014 through a press notice where he stated that: the only legitimate currency in Colombia is the Colombian peso COP. In this sense, it must be understood that Cryptocurrencies, neither Bitcoin nor any virtual currency, have been recognized by the country's legislators or by the central bank, since it does not belong to a similar currency or asset and without the power of commitment, that is, without central authority. With these announcements, the Bank of the Republic made it clear that Cryptocurrencies are not recognized by the International Exchange Regime as currencies, and therefore cannot be used for exchange or commercial exchange transactions or operations, since they are not assets that have support from central banks of other countries, on the other hand it widely affects the operations of the regulated market such as imports, exports, foreign investment, and everything that concerns the Colombian Exchange Regime. From what has been shown, the Bank of the Republic has only been interested in alerting citizens about the use of Cryptocurrencies in commercial activities within the country, but also their use abroad [14].

3. Methodological design.

3.1 Type of study and research method

This research project will be framed within a type of descriptive research, since it will seek to identify the aspects and requirements necessary for the construction of a web system that integrates the “view controller model” software design architectures and back end and Front end developments. End, to locate businesses that accept cryptocurrencies as a means of payment. Descriptive research aims to describe some fundamental characteristics of homogeneous sets of phenomena, using systematic criteria that allow establishing the structure of the phenomena under study, providing systematic information comparable with that of other sources. The researcher can choose to be a full observer, participant observer, participant observer, or full participant [15].

Furthermore, the research will be supported by a field design, since the researcher intends to collect information directly from the primary source with an initial sample of 98 subjects, without experimental intervention. Taking into account the definition of this type of research, it is defined as studies that allow data to be obtained directly from the individuals of the studies in the same temporal and spatial context in which the events occur, excluding any manipulation or alteration of them [16].

3.2 Stages in software development

Software development and its stages make up a discipline that generates many expectations as an important option for software production methods; within which are traditional methodologies and agile methodologies [17].

For the development of the web application, the RUP or Relational Unified Process methodology is used, since it is a methodology that integrates the necessary aspects throughout the software life cycle. The RUP methodology is made up of four (4) phases, these are: Inception, Preparation, Construction and Transition. [18]

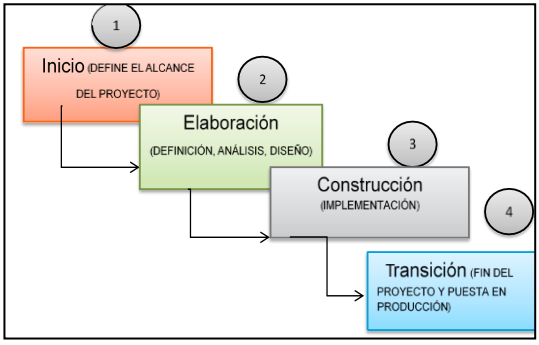

Figure 2. Phases of the RUP methodology

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3.2.1 Startup Phase:

In this phase, the scope and feasibility of the Project is determined. For this research, the objectives to be achieved are: Identify the functional and non-functional requirements of the web application, carry out a feasibility study that includes the technical, operational, legal and cost-benefit analysis aspects, and prepare a schedule for development.

3.2.2 Preparation Phase:

In this phase, the final operation of the product must be understood. To do so, the following objectives must be achieved in this research: Design of the logical architecture of the databases. design of the site navigation map, design of graphical interfaces.

3.2.3 Construction Phase:

The final goal of this phase in building the software.

In this research, the achievement of the following objectives is estimated: Coding of the web application using a programming language such as Php and supporting the data repository in MySql, Creation of use case diagrams, activity diagrams and class diagrams. o Testing of application versions.

3.2.4 Transition Phase:

In this phase, the products must be operational for people's use, so permanent updating will typically be required. In this project the objectives to be achieved are: Start-up in the cloud., Training for application administrator users.

3.3 Technique for data collection

The technique has to do with the steps used by the researcher to acquire data from sources. The techniques also lead to the verification of the problem posed, based on observation [19].

In this sense, the technique used in this research is the survey, which can be defined as a technique that aims to obtain information provided by a group or sample of subjects about themselves, or in relation to a particular topic, generally carried out through through a questionnaire [20].

3.3.1 Data analysis method

For the treatment of the results obtained after the application of the questionnaire, descriptive statistical techniques will be applied such as absolute frequency and frequencies and bar graphs. For this, the Excel program will be used.

3.3.2 Results obtained

Surveys were carried out on a total of 98 people, obtaining the following results.

¿How many times a month do you make purchases online or through mobile applications, such as Rappi?

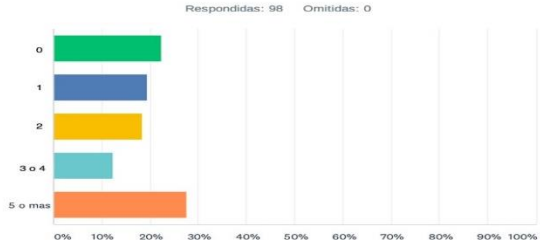

Figure 3. Quantity of online purchases.

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21% of the people surveyed do not make purchases online, while the remaining 79% have made between 1 to 5 or more purchases per month. This suggests that the majority of people have used virtual payment methods, facilitating their transition to new technologies.

¿Do you use or have you used cryptocurrencies?

Figure 4. Use of cryptocurrencies.

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34% of respondents have used or use cryptocurrencies, while the remaining 67% have not. Less than half of the people surveyed have used this payment method, this represents a challenge for the researcher since they must focus on creating an application that is easy to understand and use.

¿Have you paid for products/services with cryptocurrencies?

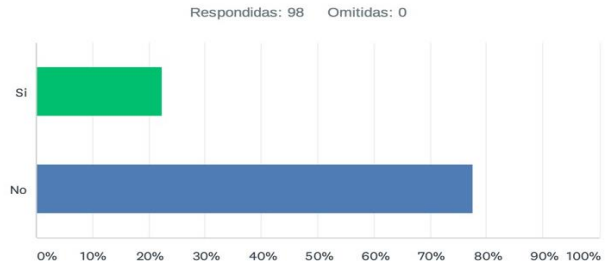

Figure 5. Payment for services with cryptocurrencies

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21% of those surveyed have made purchases using cryptocurrencies as a means of payment, while 79% have not. Like the previous question, these results reflect the lack of trust or lack of knowledge about payments and the advantages that cryptocurrencies bring.

¿Have you ever searched on Google or any other search engine to see which businesses accept cryptocurrencies as a means of payment?

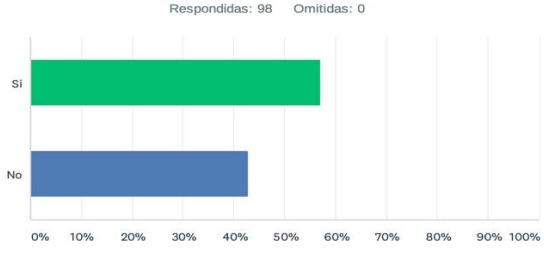

Figure 6. Search for services on the internet

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59% of those surveyed have searched on the internet to see which businesses accept cryptocurrencies as a means of payment, while 41% have not done so. More than half of the people surveyed are interested or interested in cryptocurrencies, searching on Google where they can buy, sell or exchange them for goods or services.

¿ Would you use an application that allows you to find businesses that accept cryptocurrencies as a means of payment around you?

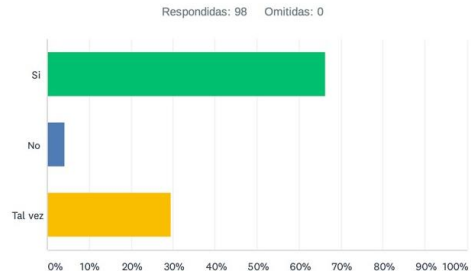

Figure 7. Possibility of using the application

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68% of those surveyed would be willing to use an application that allows them to find businesses around them that accept alternative payments, while 29% are open to the idea, and 3% would not use it. This response shows the approval that an application of this type would have, more than 90% would be willing to use it or try it.

¿Do you know a store or commercial establishment that accepts cryptocurrencies as a means of payment?

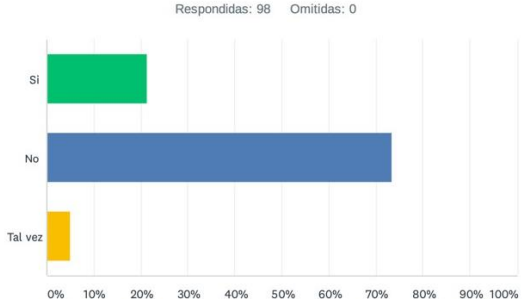

Figure 8. Knowledge of commercial establishments

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72% of those surveyed do not know places that accept cryptocurrencies as a means of payment, while 21% do, and 7% are not sure. When examining the responses obtained, the lack of information about places that accept alternative payments can be evident.

¿Do you provide services or own an establishment? If the answer is YES, would you accept Cryptocurrencies as a means of payment?

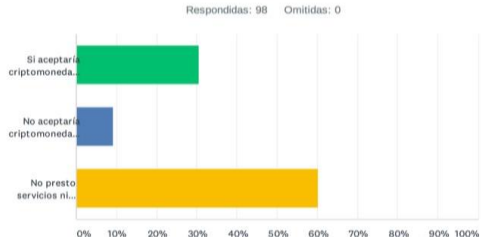

Figure 9. Owners and services

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Of 98 people surveyed, 9% would not accept cryptocurrencies as a means of payment, while 31% would accept them, 60% are not sellers nor do they own a commercial premises. It can be seen that 40% of those surveyed owned a business or provided a service; that specific group was very open to the option of accepting alternative payments.

Select the type of device selected for the survey.

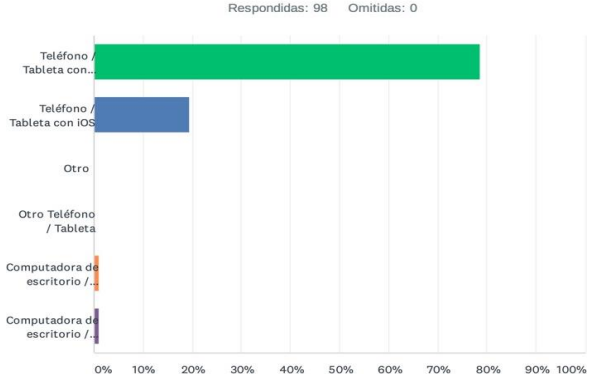

Figure 10. Type of device used in the survey

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98% of people used their cell phone to answer the survey, while 2% answered it from a computer. With technological advances, access to technology is made easier and Smartphones have the same or better capabilities than computers. For this research, which is focused on the development of a responsive web application, it is necessary for the majority of users to use Smartphones.

Select gender of the person surveyed

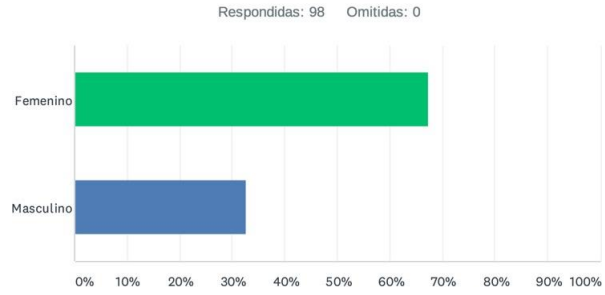

Figure 11. Gender of the person surveyed

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68% of the people surveyed were women and the remaining 32% were men.

Select the age range of the person surveyed

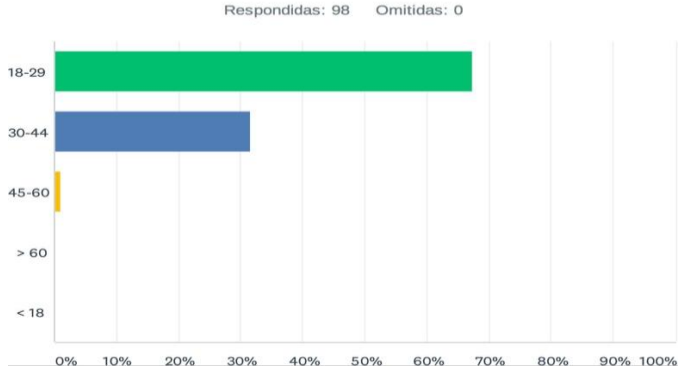

Figure 12. Age range of people surveyed

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68% of the people surveyed were between 18 and 29 years old, while 31% of the people were between 30 and 44 years old, and the rest of the people were in the range of 45 to 60 years of age.

4. Project development.

4.1 Start Phase.

In this part, the functional and non-functional requirements of the application are developed.

Table 1. Functional requirements

ID	Descripción requerimiento
R001	El sistema debe permitir el registro de un usuario solicitando: Nombre*, Email*, Celular, Contraseña* y autorización envío de información(checkbox).
R002	El sistema debe permitir recuperar clave olvidada de usuarios
R003	El sistema debe solicitar al usuario permiso para habilitar GPS.
R004	El aplicativo debe permitir a un comerciante agregar comercios.
R005	El sistema debe tener una lista de roles.
R006	El aplicativo debe permitir a los administradores mostrar lista de los comercios que están en espera de ser aprobados
R007	El aplicativo debe permitir a los administradores mostrar una lista de los usuarios
R008	El aplicativo debe permitir a los usuarios administrar los datos de su perfil.
R009	El aplicativo debe permitir administrar comercios
R011	El sistema debe mostrar las ultimas noticias del mercado de criptomonedas.
R012	Los comercios deben estar divididos por las siguientes categorías: Restaurante, Cafetería, Hoteles, Deportes, Entretenimiento, Supermercados, Moda, Belleza, Tecnología, Mecánico.categorías: Restaurante,

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Table 2. Non-functional requirements

ID	Descripción requerimiento
R001	El sistema debe encriptar las contraseñas usando un sistema de hash.
R002	El sistema debe mostrar una lista de marcadores (marker) en un mapa.
R003	Se debe tener una lista de comercios los cuales se podrán filtrar por categoría, nombre y localidad.
R004	El sistema debe encriptar las contraseñas usando un sistema de hash.
R005	El aplicativo debe mostrar la información del comercio en el mapa.
R006	El aplicativo debe permitir calificar un comercio.
R007	El aplicativo debe permitir cambiar los colores de fondo del aplicativo.
R008	El sistema debe tener una base de datos.
R009	La interfaz gráfica del aplicativo debe ser intuitiva y fácil de utilizar.
R010	El sistema debe funcionar con hasta 1000 sesiones concurrentes.

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4.2 Preparation phase

In this phase the researcher will understand the final operation of the product by designing the logical architecture of the application and the graphical interfaces.

4.2.1 Use Case Diagram.

In the following use cases, the researcher will make a description of the steps and/or activities that were followed to develop the information system. The interactions that took place between the system and its actors will be detailed.

The following use case relates the flow of information for the administration of the websites.

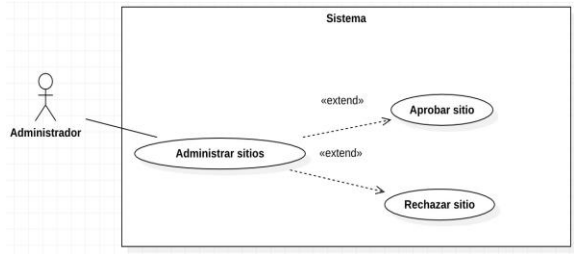

Figure 13. Manage websites use case

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The documentation of the use case diagram is displayed in the following table.

Tabla 3. Caso de uso admininistar sitios web

Caso de uso	Administrar sitios web
Actor principal	Administrador
Actores secundarios	Base de datos
Descripción	El actor principal puede administrar los comercios registrados en el sistema.
Flujo básico	El actor principal selecciona la opción “administrar comercios” en el menú principal. El sistema abre una ventana nueva mostrando ellistado de sitios registrados en el sistema. Los sitios se muestran divididos por categorías: en espera, rechazados, aprobados. El actor puede seleccionar entre: rechazar o aprobarsitio.
Flujo alternativo	El actor puede salir de la ventana en cualquiermomento.
Requerimientos especiales	El actor solo puede administrar los usuarios del grupo “Usuario, Comerciante”
Condiciones previas	El actor debe haber iniciado sesión en el sistema. El actor debe pertenecer al grupo “Administrador”.

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The following use case relates the flow of information to add websites.

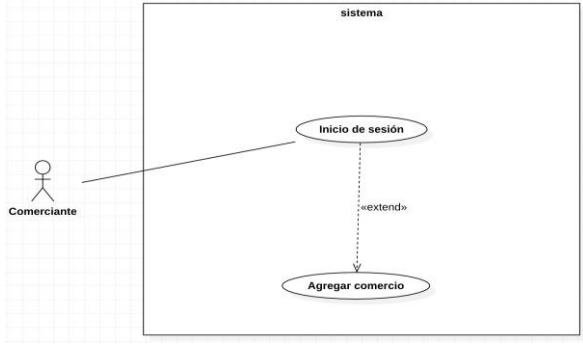

Figure 14. Add websites use case

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The detailed explanation of the previous use case is listed in the following table, where you can see the steps of the basic flow and the alternate flow for the main actor “Merchant”.

Table 4. Use case add websites

Caso de uso	Agregar sitio
Actor principal	Comerciante
Actores secundarios	Base de datos
Descripción	El actor principal puede agregar nuevos sitios al mapa.
Flujo básico	El actor principal selecciona la opción “Agregar sitio” del menú de opciones. El sistema muestra una ventana con los inputs :ciudad,,nombre comercial, categoría, rut, teléfono, email registrado en rut, dirección. El actor da clic en el botón “confirmar”. El sistema muestra un mensaje de confirmación.
Flujo alternativo	El actor puede salir de la ventana en cualquiermomento.
Requerimientos especiales	El sistema debe usar el API de google maps paraobtener las coordenadas geográficas del sitio que se agrega
Condiciones previas	El actor debe haber iniciado sesión en el sistema.

Fountain. Authors

4.3 Construction Phase

4.3 1 Entity relationship model

An entity relationship model is a data model made up of entities and their respective relationships. The researcher uses this model to know the schema of the database before coding it. The following figure describes the entity relationship model of the application; design that allows the researcher to get a clearer idea of the structure of the database, due to the description made of the entities, their relationships, data types and properties.

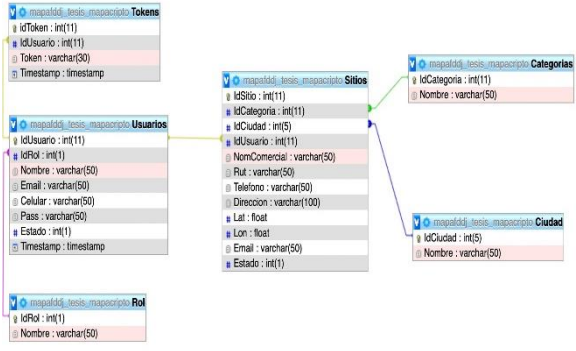

Figure 15. Entity Relationship Web Application Model

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4.3.1 Design of graphical interfaces

The following image shows the graphical interface of the “Home” page, this is the screen that the user sees when entering the application for the first time.

Figure 16. Home page Crypto Map

Fountain. Authors

The following image shows the graphical interface of the “Open” page map¨, there you can see a map of the city with thumbtacks on it, these are the businesses that accept payments with cryptocurrencies.Figure

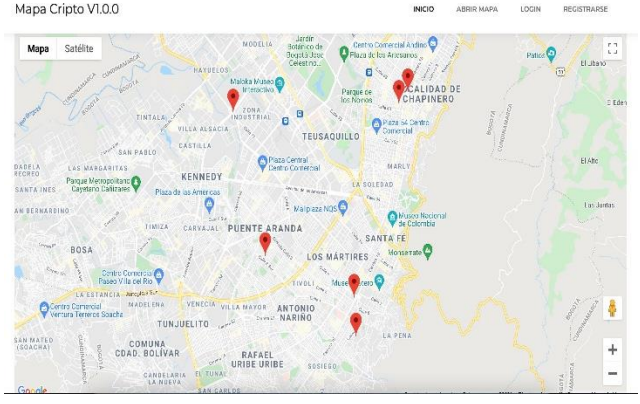

Figure 17. Main page Crypto Map

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ABelow is the image of the graphical interface corresponding to the "Manage Sites" page, there you can see a list of all the businesses that are in the database, the system allows you to approve and reject.

[21]

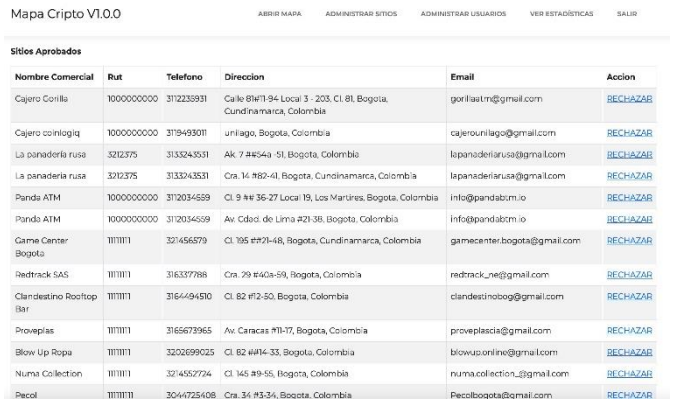

Figure 18. Manage Sites page.

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5. Conclusions

Some advantages that this development gives to the people who are going to use it are the following:

1. The software created allows people interested in the bitcoin market to spend their cryptocurrencies.

2. By adding a business to the map, a merchant benefits from greater exposure on networks, increasing the sales of their business.

3. The software is 100% responsive, which, through a mobile device, allows you to reach the exact location of the site.

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