

Mobile Technology as a Virtual Assistant at the Museum of the Isidro Ayora Fiscal School

Tecnología Móvil como Asistente Virtual en el Museo de la Escuela Fiscal Isidro Ayora

Fausto Alberto Viscaino Naranjo^{1,*}, Jorge Bladimir Rubio Peñaherrera^{1,†}, and Freddy Patricio Baño Naranjo^{2,‡}

¹Universidad Técnica de Cotopaxi, Ecuador.

²Universidad Regional Autónoma de los Andes, Ecuador.

{fausto.viscaino;jorge.rubio}@utc.edu.ec;freddybn@uniandes.edu.ec

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Abstract—The Isidro Ayora School located in the Latacunga Canton, between Quijano / Ordóñez and Tarqui streets, has a museum that is open to the citizens without any age difference, projecting during the tour in a traditional, monotonous and unconventional way all their art. By this factor the influx of public is very sporadic, which does not allow the development and recognition of the Museum. For the development of the research was applied the hypothetical-deductive method and the analytical, on the other hand was applied the methodology of application development for Smartphones Mobile-D; Through the collection of information that involves field research, it was verified that the Museum does not have technological alternatives that allow the dissemination of the historical-cultural heritage, thus demonstrating that the creation of the virtual guide through mobile technology is the technological solution to improve The user's experience in visiting and disseminating museums; So is the search for the use of new technologies helping to turn a forgotten environment into an interactive and friendly environment. With the implementation of Mobile Technology in the Museum of the Isidro Ayora School, visitors will be able to interact with the art articles displayed and visualize their information on any Android device through a multimedia library by simply scanning the QR code that each contains and In consequence it will allow the innovation, diffusion and recognition of the Museum.

Keywords—Mobile Technology; Museum; QR codes; Mobile-D; Historical and cultural heritage.

Resumen—La escuela de Isidro Ayora ubicada en el Latacunga cantón, entre Quijano/calle Ordóñez y Tarqui, tiene un museo que está abierto a los ciudadanos sin ninguna diferencia de edad, proyectando durante el recorrido de manera tradicional, monótono y poco convencional todo su arte. Por este factor la afluencia de público es muy esporádica, que no permite el desarrollo y el reconocimiento del Museo. Para el desarrollo de la investigación se aplicó el método hipotético-deductivo y el analítico, por el contrario fue aplicada la metodología de desarrollo de aplicaciones móviles para Smartphones-D; A través de la recopilación de información que implica la investigación de campo, se verificó que el Museo no tiene alternativas tecnológicas que permiten la difusión del patrimonio histórico cultural, demostrando así la creación de lo virtual Guía a través de tecnología móvil es la solución tecnológica para mejorar la experiencia del usuario en la visita y difusión de museos; Así que está ayudando a la búsqueda de la utilización de las nuevas tecnologías a un entorno olvidado en un ambiente interactivo y amigable. Con la aplicación de la tecnología móvil en el Museo de la escuela de Isidro Ayora, los visitantes podrán interactuar con el arte artículos de muestran y visualizar su información en cualquier dispositivo Android a través de una biblioteca multimedia simplemente escaneando el código QR que cada uno contiene y en consecuencia permitirá la innovación, la difusión y el reconocimiento del Museo.

Palabras Clave—Tecnología móvil; Museo; Códigos QR; Mobile-D; Patrimonio histórico y cultural.

INTRODUCTION

A museum is an institution that exhibits collections and art galleries that attract thousands of people in general, but these have ceased to be the active exhibition centers becoming passive centers of lesser interest and forgotten (Suar, 2012; Torres Falcón, 2013).

Museums are public institutions that must preserve, study and expose the public to the materials of the collections, dis-

seminate the knowledge that derives from them and generate (Suar, 2012; Torres Falcón, 2013).

The Museums are the axis and thread of the development of the National Plastic, serves as links between the community, art and cultural action, are the reference from which are extracted the symbols or emblems of Ecuadorian art and its mission and fundamental objective is preserve the Heritage and spread its value.

The function of museums in Ecuador is to preserve and publicize in a didactic way and according to modern methods, the materials that comprise their collections of modern art, musical instruments and ethnography (Domínguez, 2012; Merrillas, 2004; Solanilla, 2002). The thematic of museums linked to the fine arts and anthropology, consequently the presentation

*Magíster en Gerencia Informática Mención en Desarrollo de Software y Redes.

†Magíster en Gerencia Informática con Mención en Desarrollo de Software y Redes.

‡Magíster en Docencia de las Ciencias Informáticas.

of their materials to the public must be regulated by a clear message of educational content and a positive social value. In order for museums to comply with this objective, it is necessary to plan several activities complementary to the essential and specific functions of the museum, including research, public services, educational activities and attendance to the requirements of visitors and staff technical and administrative (Herrera et al., 2013; Martínez-Sanz, 2012).

The museums of Ecuador are repositories of the most important Ecuadorian art collections considering that from its foundation one of the objectives was its rescue and diffusion.

These collections are guarded by their museums, distributed as follows:

- **Museum of Colonial Art:** It is a collection of painting, sculpture and applied arts in the X, XV, XVI, XVII, XVII, XVIII centuries spaces during which the process of Spanish colonization took place in the Kingdom of Quito with a duration of 274 years. N it consists of the most renowned works Ecuadorian authors Miguel de Santiago, Gorivar, Legarda, Caspicara, Sangurima, Manuel de Samaniego, Bernardo, Antonio Salas, along with large - scale production of anonymity in Ecuadorian art.
- **Museum of Modern Art:** Contains several collections of Ecuadorian art, in chronology from the nineteenth century where a new iconography was generated aimed at the rescue of the images of the Heroes of Independence, the formators of the republic in politics, sciences , letters and arts; complements this collection with academicism, and the landscaping corresponding to a late romanticism.
- **Museum of Ethnography:** The exhibition starts from a reality. The majority of the Ecuadorian population does not know the geographical location and the number of indigenous ethnic groups that at the moment are settled in the country. We brief news of Salasacas, Otavalos, Cofan, Shuars, Tisaleos, etc. , but we know nothing about its ecological environment, customs, rites, historical-cultural antecedents.
- **Museum of Musical Instruments:** The exhibition, thematic would show the historical and cultural background of certain musical instruments that mistakenly have them as natives of America or Ecuador.
- **Engraving Museum:** In these museums are foundations of Plastic Art, which is drawing, the masters of Ecuadorian art expressed with the line, the shadow and the stain; the importance of the real, classic and abstraction forms of the time.
- **Museum Portrait:** Portrait museums and galleries containing works by artists such as Carlos Rodriguez, Luis Moscoso, Alfredo Mena Camanio, Oswaldo Guayasamin whose interests were to highlight and recognize famous people in the country's culture.

QR Codes

A QR code Quick Response is a bar code used to contain information in a matrix of two-dimensional dots both horizontal and vertical containing information encoded in it, unlike

traditional bar codes, which can only store information in one horizontal dimension (Villa, 2011).

A QR code is a two-dimensional quick response code for storing information of any kind you want, QR codes are common for mobile applications that can decrypt the information they store when scanning the code with a reader (Casanova Pastor et al., 2013; Chatzi and Molina Muñoz, 2014; Aguilera, 2012).

As it is shown in Figure 1 and n each symbol exists a set of modules that do not contain encoded data but information necessary for decoding, are called patterns of function, and there are several types (Aguilera, 2012; Román Graván and Méndez Rey, 2014):

- **Location pattern:** Function pattern that exists in triplicate in the symbol, located in the upper corners and the lower left. They serve to calculate the rotational orientation of the symbol.
- **Alignment Pattern:** Alternate sequence of black and white modules that helps calculate the coordinates of the symbol modules.
- **Timer pattern:** Function pattern that allows synchronization of symbol mapping coordinates to moderate distortions.
- **Separator:** Function pattern formed by white modules, whose width is of a module and that separates the locator patterns from the rest of the symbol.

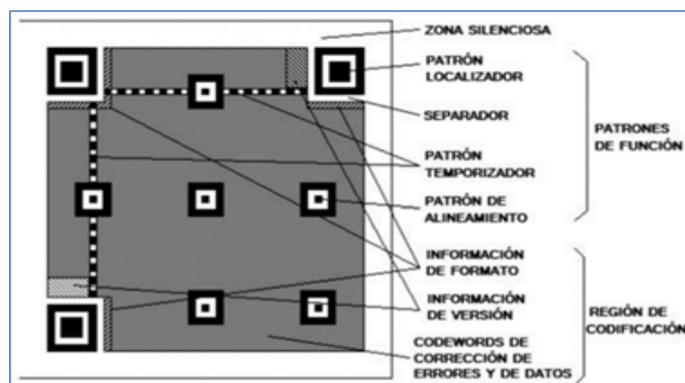


Figure 1. Cooperation of the QR Code.

Source: http://www.onbarcode.com/qr_code/

Mobile-D Methodology

The Mobile-D methodology appears in response to the need to have a very fast development cycle for very small equipment, for which different methods and agile development techniques are used in a short time.

Mobile-D is a methodology whose approach and characteristics make it especially suitable for the mobile device market, where requirements are constantly changing and software is required at the right time. By focusing on small workgroups and due to its rapid rate of development, production costs are reduced and makes it accessible to businesses with limited resources due to their low staffing requirements (Herrera et al., 2013; Gasca Mantilla et al., 2014).

Mobile-D is based on Extreme Programming (practice), Crystal Meth (scalability) and Rational Unified Process (coverage). It is based on the following nine main elements (Balaguera, 2013; Herrera et al., 2013; Gasca Mantilla et al., 2014):

- Gradual elimination and stimulation: The projects are carried out in the iterations of which each one begins with a day of Planning.
- Architecture Nonlinear architecture line approach is used along with the architectural patterns and Agile Modeling.
- Mobile Test Driven Development: Test-first approach is used in conjunction with automated test cases.
- Continuous Integration: Effective SCM practices are applied through multiple means.
- Par Programming: Encoding and testing are performed in pairs.
- Metrics: Few essential metrics are rigorously collected and used for feedback and process improvement purposes.
- Software Improvement Process: Post-iteration workshops are used to continuously improve the development process.
- Off- Site Client: Client participates in planning.
- User-centered: Emphasizes identifying and meeting the needs of end users.

Evidently there are other museological scenarios that are located in specific contexts within university institutions, in institutes and in college. Obviously many of these scenarios do not have a system capable of providing adequate interactivity so that the visitor can appreciate the resources in them.

The new information and communication technologies, together with the so-called interactivity, offer museums great possibilities to revive the desire to attend them and to strengthen the diffusion and transmission of knowledge.

The main objective of this work is to develop a virtual guide with QR codes for Android Smartphone for the museum of the Isidro Ayora School aimed at the general public that visits the museum with which the visitor can obtain complete information of any object exhibited when scanning the QR code it contains.

MATERIALS AND METHODS

Through bibliographical research was compiled in training in different sources such as scientific articles, books, theses, official documentation of the museum, which helped select the information needed to carry out the investigation.

Through field research, information was collected on the reality related to the Isidro Ayora School Museum, in order to obtain concise data of the object of study.

Mobile-D Methodology

The Mobile-D methodology has 5 phases that are (Balaguera, 2013; Gasca Mantilla et al., 2014):

- Exploration
- Initialization
- Production

- Stabilization
- Tests

On the basis of arguments of various authors for the purpose of exploration is the development and implementation of the project, to thereby implement virtual ed gu is established as proposed in relation to software development starting from the initial requirements.

To do so Stakeholders setting is performed: The purpose of this task is to establish the stakeholders.

Initialization: in this stage all the information obtained on the project is gathered and the tasks to be carried out in the subsequent phases are planned. Production: in this phase are designed, developed and implemented all the functions that the software needs, will be done once per function. The functions are documented in Story card, which the detail from the point of view of the customer.

Stabilization: after creating a function this integrates with the rest of the software. The stabilization stage ensures that each new aggregate works correctly with the rest of the software, and is performed for each new function developed.

Test and correction: in this last phase the complete software is tested in search of unexpected errors, in order to solve them and deliver a final product as complete and stable as possible.

SCRUM Methodology

Scrum is a framework for creating complex software and deliver it in time to a simpler way, which will enable you to create excellent software by applying a set of guidelines to be followed by work teams and using specific roles (Balaguera, 2013; Gasca Mantilla et al., 2014).

The SCRUM Roles are as follows:

- Product Owner (product owner): Is in charge of the project and ensures that the Scrum team to work properly.
- Development Team (the development team): A multidisciplinary team and self organized, its main task is to build the product that the Product Owner specifies.
- Scrum Master: He is responsible for that team members follow the process properly and to remove obstacles to the team reach the goal of sprint.

Scrum methodology has different phases which are:

- System planning: the planning phase is an ongoing process where the goals are set, strategies, activities and resources needed to achieve the stated objectives. Before starting the software development project it is necessary to perform a series of previous activities such as the collection of requirements so that the work team can understand the business context of the software, which will influence the successful completion of the project.

Requirements Analysis : This phase is identified from data collection techniques and empirical methods needs of the client or user, from these requirements start the whole process of system development.

- Design: This phase is where the structure of the proposal is done by setting the final ranks of the same, necessary resources is determined to carry out this research.

- Construction and Testing: the system is developed and tests are carried out to check the level of acceptance and possible failures to solve them.
- Implementation: the installation and construction of the system with the use of programming languages, database managers and other necessary tools.

RESULTS AND DISCUSSION

Results of data collection

From the field methods applied the following result was obtained: 66 respondents on use and application of cellular technology has to be 100 % using mobile devices 83 % using cell and 17 % Tablets however it is evident that mobile devices are considered essential and indispensable for a person in their everyday life, as can be seen in Figure 1.

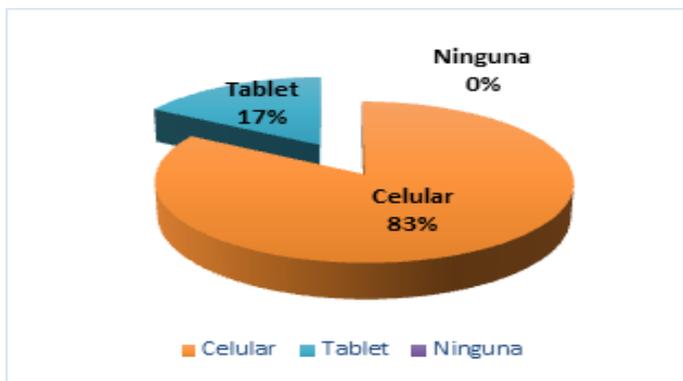


Figure 2. Mobile device type that are available.
 Source: Prepared by the authors.

According to Figure 2, 83 % of respondents surf the internet through their mobile device, compared to 17 % who say they do not know how to surf the internet with this type of technology.

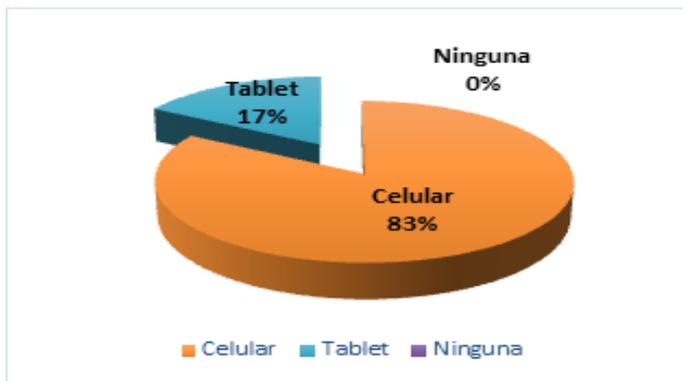


Figure 3. Navigability internet via a mobile device.
 Source: Prepared by the authors.

Obviously those who frequently visit the Internet through their mobile devices, have a tool that facilitates the management of the Museum’s information, that is, they have the communication channel and present the technologies like the Smartphone to access the information.

As part of the investigation, people working in the museum were consulted to inquire about the level of acceptance in this regard, the opinions were as follows:

- Integrating ICT in the Museum of the Isidro Ayora School: it is considered of great importance since it will allow to have data of the goods and with an adequate codification.
- On the change from a traditional museum to a modern museum: it is considered very important since it allows to be abreast with the technological advances.
- On the implementation of the virtual guide at the Museum of Isidro Ayora School: It is very interesting as guide in the dissemination process information Museum, with only scanning the QR code you can access all the information items belonging to the museum.

In summary it is stated that the change from a traditional museum to a modern museum can keep pace with technology and thus the integration of ICT in the Museum to store all information of the pieces in turn maintain the assets in an orderly and updated effectively with the implementation of the Virtual Guide to the Museum will promote access to information, providing the ability to achieve the goals set by the Museum, by implementing it will get more recognition as an institution Emblematic, arousing the interest and concerns in visitors, so you have greater recognition at provincial and national level considering that the lands of Cotopaxi, were preferred land for Atahualpa.

Results on the development of the system

The developed system consists of a client-server application (JJGenQR) responsible for managing everything that will contain the virtual guide, the generation of QR codes and the entire inventory of the museum, among other things and secondly an application is also developed Smartphone (JJQR), which is to be responsible for providing information about the museum the visitor can search, will have a Geo referential space to indicate where the museum and QR code reader, which will provide the possibility of obtaining is all the information that you want to know more related to the object of your interest, among other things.

A. Some results of the SCRUM methodology for the Client-Server application:

- List of functionality for client-server application:
- The JJGenQR application initialization will present a window for entering the system.
 - The administrator can manage all information in the application server.
 - The application server will get JJGenQR history visit the mobile application JJQR.
 - The secretary can manage information through the privileges granted by the administrator.

Functional Requirements Manager

- Login to the System.
- Register Information.
- Register Users.
- Update Users.
- Delete Users.
- Search Users.
- Manage Category.
- Manage Article.
- Register Guest.
- Search Statistics.
- Manage Category.
- Manage Article.

Nonfunctional requirements

- Performance requirements.
- Security requirements.
- Maintenance requirements.

Application Architecture:

It has been necessary to use the client - server architecture, because the user interacts directly with the application and it should be noted that it is a desktop application as shown in Figure 3.



Figure 4. Application architecture.
Source: Prepared by the authors.

Implementation:

In Figures 4, 5 and 6, several screens of the system are shown, once implemented, Figure 4 shows the QR code generated by the system.

B. Some results of the Mobile-D methodology for the Smartphone application:

Establishment of Stakeholders:

- Students of the Isidro Ayora School.
- External and occasional people.
- Authorities, administrators, teachers, workers of the Isidro Ayora School.

Establishment of the Project:



Figure 5. Main System Screen.
Source: Prepared by the authors.



Figure 6. Display related to categories.
Source: Prepared by the authors.



Figure 7. Statistics related screen.
Source: Prepared by the authors.

It implements a virtual guide by means of QR codes for Android Smartphone, that allows to innovate the interaction of a visitor with the historical-cultural and social heritage of the museum of the Isidro Ayora School, allowing the user to scan a QR code of a certain article can access to the information of said article, since it will have relevant data such as the name, description, characteristics, photographs and multimedia content, if applicable, in this way the visitor can simultaneously access the article of their interest, achieving

the information desired.

To achieve system communication Smartphone with QR Code states and also the QR code links to the data of each article from the server application which is responsible for generating QR codes, it will contain all stored information of the article, the connection will be through WI-FI technology.

System Analysis:

The following are the necessary requirements to be able to make use of the virtual guide:

- It must have a Smartphone with Android API version 9 2.3.3 (Gingerbread) operating system onwards.
- You must have a desktop computer with OS Windows 7 onwards, with a minimum hard disk of 250Gb.
- You will need a WI-FI network.
- Both the server application and the mobile application must meet intuitive usability requirements.
- Errors that could occur through the established communication between scenarios will be minimized.

Software Resources:

- Android Studio
- Web Services
- Database
- Database administrator
- JGenQ
- It is necessary to mention that the generator QR code server application must be running.

Planning Architecture:

The architecture will consist of layers, each layer represents a separate and well defined process that facilitates the exchange of information between different levels:

Presentation Layer: JJQR mobile application is displaying the data obtained by using the JGenQR objects and server is in charge of generating the data, this layer communicates with a ically business layer. The visitor interacts with the mobile QR code reader (JJQR) when scanning a QR code to access the information contained in that code.

Business Layer: Also called business logic is where the user's requests are received and the responses are sent after a process, this is where all the rules to be fulfilled are established. This layer communicates with the presentation to receive the requests after it is managed to the data layer, finally the results are returned. The business layer will support all forms of data access is for this reason that constitutes the importance of logic operation of the generator application JGenQr codes. The JGenQr application receives the request of the visitor and is responsible for implementing the process logic and data access rules to allow the exchange of information.

Data Layer: This is where the data resides to which they receive requests for storage or retrieval of information from the business layer. The data layer is incorporated in the server database, together with the system manager MySQL database.

Design GUI of Application Mobile: In Figures 8, 9, 10, 11, 12 and 13, different images Smarthphone application constituting GUIs users of this application are observed.

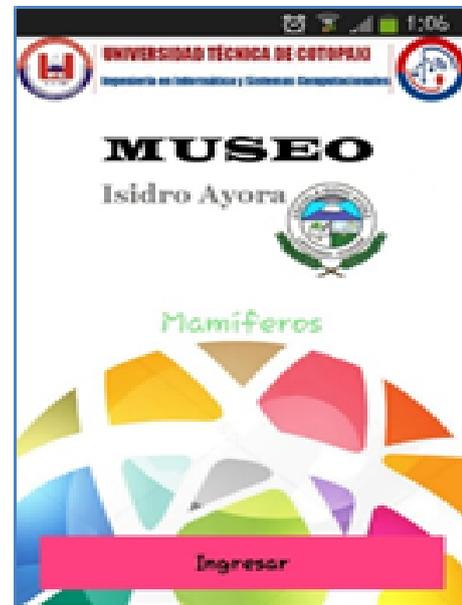


Figure 8. Application Start Screen.

Source: Prepared by the authors.

System Test Phase:

For the test of the system will be applied tests of white box and black box whose objective will be to verify the operation and consistency of the application, at the same time it has made expositions of the Museum in her the use of the mobile application for this the relevant for carrying out the test, it will permit management to determine the validity or falsity of the application.

White box test:

- **White box test 01:** Presentation of the application (Code used).

As shown in Table 1, communicating correctly with the server and the database is established, demonstrating the functionality of the system.

- **White box testing 02:** Scan QR Code.

Evidenced in Table 2 that the application is able to Escanear QR codes from the Smarthphone installation.



Figure 9. Screen qr code scanning.
Source: Prepared by the authors.



Figure 10. Scan Item Data Screen.
Source: Prepared by the author.

Table 1. Connection test case.

Test Case: 1	Check connection			
Purpose	Check the connection of the mobile application with the server and the database			
Prerequisites	The device ID, date, and system time must be automatically captured			
Input Data	System Attributes	Expected result	Obtained result	Result
	-	Confirmation Message Error message	Expected result	Success
Steps	The system checks automatically when the application starts			

Source: Prepared by the authors.

Table 2. QR scan test case.

Test Case: 2	Scan the QR code article EIA Museum			
Purpose	The camera detects a QR code			
Prerequisites	The Smartphone must have the minimum version of Android 2.3 onwards			
Input Data	System Attributes	Expected result	Obtained result	Result
	- Camera Permission - Qr code detects a	- Activate the camera - Capture information containing a QR code	Expected result	Success
Steps	- Select the SCAN option - Wait until the camera on the mobile device is activated - Focus the camera on a Qr code			

Source: Prepared by the authors.

■ **Black Box Test:**

In the following it will be analyzed from the functional point of view without taking into account the internal structure of the application ie the source code, it will evaluate the external aspects of the system as interfaces, integrity or system performance using a certain set of input data and so observe the outputs that occur for which the following results are presented below:

- By pressing the Enter button the application verifies if the user is connected to the Museum Network of the Isidro Ayora School, once verified then can send the data of the device so that it can be stored in the database as a visitor with device mobile.
- Once verified the connection to the server the application will send a welcome message to the Museum Isidro Ayora means that it is already fully available to interact

with the QR codes found in each article of the Museum.

- After the user has pressed the Scan button, a screen will open where the camera of the device will be activated presenting a message that says that it is looking for the data that contains that QR code.
- When the button is pressed video, a screen on which is superimposed a message informing you are removing the video (Streaming) and that the video is being charged will appear.
- When the button is pressed sound, a screen on which is superimposed a message informing being extracted sound (Streaming) and that the sound is charging appears.

■ **User tests:**

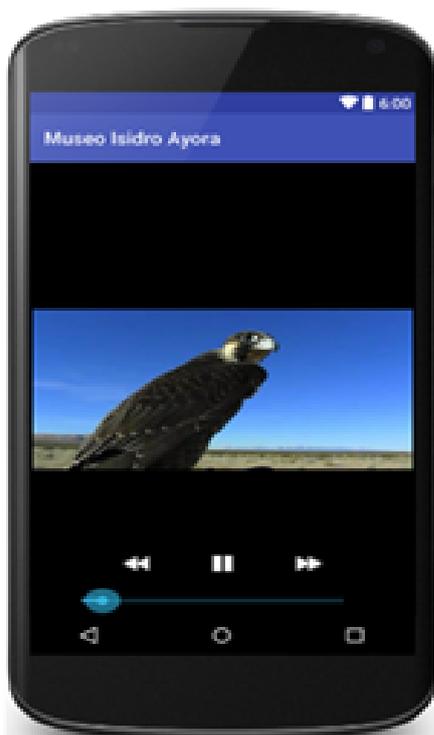


Figure 11. Video screen.

Source: Prepared by the authors.

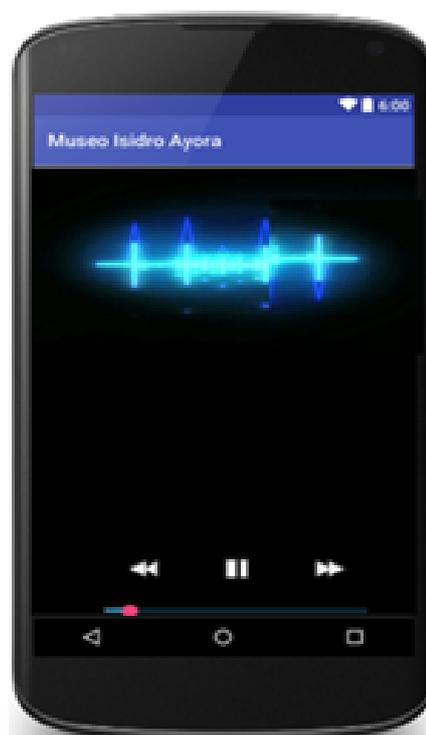


Figure 12. Sound Screen.

Source: Prepared by the authors.

To apply the user test have been applied tests of students of the Isidro Ayora School to those who have been given a Tablet each and has been able to observe the following:

1. Users have very quickly recognized the icon of the museum and this is important since you should familiarize yourself with the icon and all the content that exists in the application.
2. The user has been delimited the modes of entry, making the navigability of the application as easy and usable for all types of visitors.
3. Users have shown that the Main Menu is easy to understand so a user has first reviewed the help option.
4. Users the first time I pressed the button to scan did not know how to locate the device, but when already placed the device on a code could see that no matter how you locate because the application detects the QR code immediately.
5. Users have scanned many articles from the application so they have become familiar with the application.
6. In the same way the users in each scanned code review the videos with great curiosity and with more reason the sounds especially in the area of animals.

CONCLUSIONS

Thanks to the information that refers to the mobile and desktop applications for the JAVA platform, sufficient theoretical bases were obtained for the realization of the research, which facilitated the friendly and successful development of the applications.

In a mobile application usability is a key factor which implies the implementation of specific, short and quick tasks so Android has proven to be stable enough to withstand transactionality information items that exist in the School Museum Isidro Ayora.

The use of the Mobile-D methodology allowed the rapid and timely development of the application allowing a quick and functional product to be obtained thanks to the fact that it is an agile, evidence-based methodology.

To collect information Isidro Ayora Museum chose to use methods of external support provided details of existing items in the same museum that were of great assistance in inventorying them. With the creation of the virtual guide of the Museum it was possible to show the increase of interest in knowing it contributing in the dissemination of Cultural Heritage and in the use of technologies.

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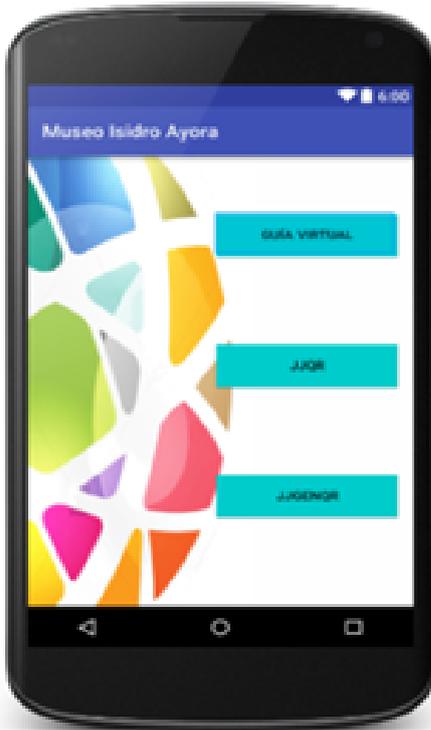


Figure 13. About Menu screen.
Source: Prepared by the authors.

```

@Override
public void onSuccess(int statusCode, Header[] headers, byte[] responseBody) {
    if (statusCode == 200) {
        try {
            JSONArray jsonArray = new JSONArray(new String(responseBody));
            for (int i = 0; i < jsonArray.length(); i++) {
                JSONObject jsonObject = jsonArray.getJSONObject(i);
                String id = jsonObject.getString("IDARTICULO");
                String descripcion = jsonObject.getString("DESCRIPCIONARTICULO");
                String categoria = jsonObject.getString("CATEGORIA");
                JSONArray jsonArray2 = new JSONArray(jsonObject.getJSONArray("GALERIA").toString());
                for (int j = 0; j < jsonArray2.length(); j++) {
                    JSONObject jsonObject2 = jsonArray2.getJSONObject(j);
                    String url = jsonObject2.getString("URL");
                    String nombre = jsonObject2.getString("NOMBRE");
                    String descripcion2 = jsonObject2.getString("DESCRIPCION");
                    String categoria2 = jsonObject2.getString("CATEGORIA");
                    String codigo = jsonObject2.getString("CODIGO");
                    String cantidad = jsonObject2.getString("CANTIDAD");
                    String descripcion3 = jsonObject2.getString("DESCRIPCION");
                }
            }
        } catch (JSONException e) {
            e.printStackTrace();
        }
    }
}

@Override
public void onFailure(int statusCode, Header[] headers, byte[] responseBody, Throwable error) {
}
}

```

Figure 15. Scan QR Code.
Source: Prepared by the authors.

```

@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.home);
    btnAcceder = (Button) findViewById(R.id.btnIngresar);
    //comol=(TextView) findViewById(R.id.lblComoIniciar);
    lblFecha = (TextView) findViewById(R.id.lblFecha);
    lblIdCel = (TextView) findViewById(R.id.lblId);
    String date = (DateFormat.format("yyyy-MM-dd hh:mm:ss", new java.util.Date()).toString());
    String android_id = Settings.Secure.getString(getApplicationContext().getApplicationContext().getContentResolver(), Settings.Secure.ANDROID_ID);
    lblFecha.setText(date);
    lblIdCel.setText(android_id);
    random = (TextView) findViewById(R.id.random);
    soundPool = new SoundPool(2, AudioManager.STREAM_MUSIC, 0);
    if (timer != null) {
        timer.cancel();
    }
    timer = new Timer();
    task = new MyTask();
    timer.schedule(task, Integer.parseInt(RTTime.toString()), DELAY);
}

```

Figure 14. Presentation of the application (Code used).
Source: Prepared by the authors.

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