App de recetas de cocina Lite Red-Cetario: ahorro de uso de recursos en tiempos de pandemia

Lite Red-Cetario cooking recipes app: less use of resource in times of pandemic

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Resumen

Durante la pandemia de COVID-19, los peruanos permanecieron recluidos, enfrentándose al problema de no disponer de tiempo suficiente para muchas actividades, entre ellas cocinar, lo que se dificultaba por la poca experiencia en el manejo de aplicaciones culinarias o la falta de conocimientos gastronómicos. En consecuencia, se incrementó la descarga de aplicaciones móviles de recetas en los mercados virtuales. Sin embargo, las aplicaciones actuales que existen en el mercado móvil consumen muchos recursos como memoria RAM y almacenamiento de datos, además la necesidad de los consumidores está restringida a operar desde la versión 6.0 hasta la más actual del sistema operativo Android. En esta investigación se diseña e implementa una aplicación móvil lite que puede ser utilizada con versiones antiguas o recientes de los sistemas operativos de los teléfonos Android. Además, esta aplicación móvil presenta recetas de muchos niveles de dificultad, consejos, comentarios, enriqueciendo así el contenido de la aplicación móvil. En esta investigación, aplicamos la metodología SCRUM. El desarrollo y diseño se centra principalmente en diversos tipos de recetas de comida, consejos de cocina, comentarios de retroalimentación que benefician al usuario y autores de la aplicación. Para la validación de la aplicación se utilizó la norma ISO/IEC 9126-1:2001. Como resultado, se obtuvo una calificación positiva en relación con el diseño de la aplicación de recetas de comida, y su aceptación por parte de los consumidores. En conclusión, la aplicación móvil de recetas de comida se diseñó e implementó con éxito, respaldada por la validación de la norma ISO.

Palabras Claves: COVID-19; aplicación móvil de recetas; alimentos; SCRUM; ISO-9126-1, aplicación móvil lite.

Abstract

During the COVID-19 pandemic, Peruvians remained in confinement, facing the problem of having insufficient time for many activities, including cooking, making it difficult because of little experience in managing cooking applications or lack of gastronomic knowledge. Consequently, the download of mobile recipe applications increased in the virtual markets. However, the current applications that exist in the mobile market consume a lot of resources such as RAM and data storage, in addition the needing of consumers are restricted to operate from 6.0 to the most current version of the Android operating system. In this work design and implement a lite mobile application that can be used with old or recent versions of the android phone operating systems. Moreover, this mobile application presents recipes of many levels of difficulty, tips, comments, thus enriching the mobile application content. In this research, we apply the SCRUM methodology, which allows collaborative work between developers. The Unified Modeling Language (UML) was used to structure and clarify the behavior of the mobile application. The development and design of our mobile recipe application is mainly focused on diverse type of food recipes, cooking tips, feedback comments benefitting the user and creator of the app. The ISO/IEC 9126-1:2001 was used for the application validation. As a result of this validation, a positive qualification was obtained regarding to the food recipes application design, and its acceptance by the consumers. In conclusion, the food recipes mobile application was successfully designed and implemented, supported by the validation of the ISO standard.

Keywords: COVID-19; recipe mobile application; food; SCRUM; ISO-9126-1, lite mobile application.

INTRODUCCIÓN

Nowadays, mobile applications have gained such importance that they are considered essential (Holl, K., 2019) only in recent years, a rapid growth has taken place in the mobile industry, and the possible number of many mobile applications are practically in high demand (Suma, 2021), providing to the user at his fingertips a large number of mobile application options at the stores with a wide range of topics, from health and work to entertainment. The emerging of different mobile applications is essential to support our daily activities. In these times, the mobile application diversity helps us to make life easy solving different issues with just a click, stimulate our creativity in choosing the best options in the virtual market, helping us to work faster and optimizing time for different purposes, keeping us in touch with other people, offering us entertainment and facilitating access to information (García, 2019).

In this work, the development and design are based on previous mobile applications that focus mainly on food recipes and cooking. Most of the applications linked to these cuisine topics are aimed at the field of nutrition. In fact, it is estimated that within the "food and exercise" section alone there are more than 5400 applications available (Duarte-Hueros, 2022). In this work we propose the development and design of a mobile recipe application mainly focused on diverse type of food, cooking tips, and comments from the user to improve this application.

A certain group of these mobile applications are built completely native, this means, using the appropriate development tools and the specific languages to a particular mobile platform (R. Abdel Kader, 2019).

The most remarkable thing about natively written applications is that these types of applications are much smaller in size than traditional applications (Cheon, 2021).

However, mobile applications are characterized by redundant source code, which deteriorates the performance of the mobile device, because the developers do not follow a clear structured approach.

Therefore, the objectives of this research are to design and to enrich the content of the mobile application that consumes fewer resources, this means low RAM memory consumption. Consequently, the mobile application allows and benefits the user with diverse food recipes including many levels of difficulty, cooking tips, and recipe feedback comments.

The beneficiaries of our research are people who use recipe books or tutorials to gain access to gastronomic knowledge, and who do not have the hardware resources to process a larger application. It is sought that the mobile application is compatible with the old versions of Android of smart devices.

This research is composed by different sections as follows: Section II explains the literature review: analysis of different investigations linked to this research work; Section III defines the SCRUM methodology theoretically, illustrates different phases that were implemented in this research, as well as this section shows the development of the SCRUM methodology for the Red-Cetario application; Section IV presents the results of this work; Section V illustrates the conclusion of this research; Section VI presents the discussion of this work.

1. Materials and methods

1.1. Literature Preview

(Mukhtar, 2013) in the country of Pakistan, affirmed that it is possible to develop applications using mixed methodologies, the union of the traditional approach with agile approaches Through this mixed approach, it is possible to separate the construction of software in 4 phases. The first phase includes gathering requirements and preparing a stack or backlog. The second phase is focused on the design phase, different software diagrams will be necessary for the next phase. The third phase is the construction phase, elaborated designs and diagrams, the software was built and performed. Finally, the transition stage is concentrated on the testing and deployment through the virtual store, as well as the subsequent maintenance of the software if necessary.

(Negulescu, 2013) in the United Kingdom, developed an Open Project, a comprehensive framework that allows a user to "project" a native mobile application onto a screen using a phone's camera. The advantage of this development is about how the computing load is distributed among all the devices, which makes it very easy to aggregate more requirements. Considering that it is possible to distribute the Open Project workload both on the server and on mobile devices, this approach can be applied to the development of applications that alone generate excessive consumption on the mobile device.

(Min, 2021) in China, suggested a recipe recommendation application by processing and managing large amounts of data in a massive way using appropriate recipe recommendation algorithms. In this work, we proposed the use of recipe applications among the use of few system resources, therefore this could be helpful for the users since large-scale data processing can be done on a cloud server.

(Min, 2017) in the country of China, presented a recipe book focused on the correlation between article and image. They stated three objectives based on: 1) the multimodal cuisine classification, 2) the multimodal recipe image with increased attributes recovery, and 3) the inference of ingredients and attributes of food. All these methodologies are relevant between using a multimodal cuisine classification and abstracting visual information into textual content. According to their results it is concluded that the M3TDBN application incorporates multitasking learning to make different collaborative attributes. The effectiveness of the model mean level and the discovered correlation can be quickly generalized.

(Bischoff, 2018) in the African country, made a mobile application with augmented reality technology used to show traditional recipes and to illustrate the cultural heritage of the dishes Using an augmented or mixed reality methodology. Therefore, the results were favorable when creating an intuitive application with augmented reality technology and having favorable comments from the users.

(Ascueta, 2021) in the country of the Philippines, created a mobile application based on the SCRUM methodology. They used tools such as Android Studio, as the integrated development environment (IDE) to be able to edit the project code, debug and test the mobile application. GitHub was the version control tool used to monitor the simultaneous changes of each person involved in the development of the source code. Ascueta, recommended to create all diagrams under each of the views using the 4+1 model to ensure that all the project stakeholder concerns are addressed

(Ramanujam, 2022) developed Floo, a system that aims to automatically reuse (or store) the results of the calculations during the operation of the application to reduce the amount of computation needed M. Ramanujam et. ale. concluded that Floo reduces median and 95th percentile interaction response times by 32.7% and 72.3%.

1.2. Methodology

A. SCRUM Methodology
The SCRUM Methodology was used as an adaptable, iterative, dynamic, versatile and efficient framework, to quickly deliver substantial value throughout the project. Because Scrum ensures transparency in communication and fosters an environment of shared responsibility and continuous progress, this one was used to empower the developer team to give some functionalities of the application in short fragments and in concentrated intervals called "Sprints".

To start the development, the epics was defined as a body of work made up of a set of functionalities or features. These functionalities were broken down into specific tasks (called user stories) based on the needs or requests of customers or end users(M. Ramanujam, 2022).

The entire development project was divided into small, consistent time intervals known as Sprints, which are iterations of a continuous development cycle. Within a Sprint, a certain amount of planned work must be completed by the team and should be ready for review.

Each use case was defined as a description of an interaction between an external actor and a system to achieve a goal from the perspective of a user, the use case explains the behavior of a system in response to a request. Each description is represented as a sequence of simple steps, starting with the goal of the user, and ending when the goal is met (Burgués, 2022).

Before starting the development, the UML Diagrams were intended to visually or represent a system along with its main actors, roles, actions, artifacts, or classes, in order to better understand, alter, maintain, or document information about the system.

UML diagrams and designs were made for the mobile application. The application was developed to be installed on mobile devices such as smartphones, tablets or other portable devices. This application presents a visual interface that meets the requirements of the users (Huang, 2022).

Only a part of the agile methodological framework SCRUM was adopted, through which the different functionalities of the mobile application were implemented. SCRUM simply provides a framework for continuous value delivery, but doesn't say how to go about implementing it, leaving it up to the development team to determine how to do it (Sliger, 2011).

For the taking of requirements, the epics were built, which were later divided into user stories. Likewise, a subdivision of each user story was made into smaller tasks, and these ones were estimated.

The implementation was developed using the SCRUM hybrid approach, proposed by (Mukhtar, 2013). Likewise, in this work diagrams were considered important for its implementation, as well as UML diagrams were built based on the use cases, sequences, activities, collaborations, classes, and databases.

B. **Development of the SCRUM methodology**

In order to distribute the tasks, the SCRUM methodology development process is performed by transforming the requirements in epics. The corresponding epics listed in "Table 1," explain and describe the user in question engaged with the app requirements, and for which reason the user needs the requirements based on the use cases that the mobile application could provide. The development with the SCRUM methodology provides a simple complete background of the mobile application necessities.

Below is a list of the corresponding epics for the development of the "Table 1" application

Table 1. List of epics.

	As	Want to	For
01. User management	User	Register and authenticate in the application	Being able to access more features of the application
02. See recipes	User	See the list of recipes and each of them	Being able to make my dishes
03. Manage profile	User	Modify my profile	Have my data updated
04. Post comments	User	Comment on a recipe	The rest of the users see my appreciation
05. Manage notifications	User	Receive and delete notifications	Notify me of updates or free space

C. **User stories and sprint backlog**

The epics presented in this work were divided into user stories, see "Table 2". Likewise, each user story was subdivided into tasks, and these tasks were estimated using Planning Poker. Planning poker is an iterative process that allows you to estimate the effort it will take to make

user stories. Each estimation effort iteration process at Planning Poker began with a brief explanation from the user or product owner about a user story (Sudarmaningtyas,2020). This estimate is shown in the score column of "Table 2".

Finally, with all the information, the Sprint Backlog "Table 2" was created, based on the score obtained. The backlog tasks were unstacked to form the sprints.

The Sprint Backlog defines the work or tasks that a team defines to turn the User Stories (HU) that were selected for a Sprint into a potentially deliverable product increment(Schwaber, 2015)

TABLE 2. Sprint backlog

Epic	HU (User Story)	ID	Task	Score
01	HU01. Register user	01	Make a user register form	1
01	HU01. Register user	02	Make the user model	1
01	HU01. Register user	03	Make the user register service	3
01	HU02. Log in	04	Make login form	1
01	HU02. Log in	05	Make login service	3
01	HU02. Log in	06	Make login cache	2
01	HU03. Log out	07	Make logout service	2
02	HU04. View recipes	08	Make the list of recipes	2
02	HU04. View recipes	09	Make the item recipe	1
02	HU04. View recipes	10	Make recipe model	1
02	HU05. View selected recipe	11	Make the list recipes service	3
02	HU05. View selected recipe	12	Make selected recipe view	4
02	HU05. View selected recipe	13	Make selected recipe subitems	2
02	HU05. View selected recipe	14	Make service to get the selected recipe	2
03	HU06. Update profile	15	Make profile form	4
03	HU06. Update profile	16	Make profile subitems	2
03	HU06. Update profile	17	Make service to update profile	2
04	HU07. Publish comments	18	Make comments form	1
04	HU07. Publish comments	19	Make service to comment recipe	2
05	HU08. Manage notifications	20	Make list notifications view	3
05	HU08. Manage notifications	21	Make view of single notification	3
05	HU08. Manage notifications	22	Make notification model	1
05	HU08. Manage notifications	23	Make service to get notifications	2
05	HU08. Manage notifications	24	Make service to delete notification	2

D. Sprints

Two types of sprints were selected in which the tasks were distributed equally in "Table 3." Each task was assigned with an estimated start and end date to a person who was in charge.

TABLE 3: Sprints

Sprints	Tasks
01	From 01 to 11
02	From 12 to 24

E. Modeling with UML

Use cases are an approach of capturing the requirements of the systems, for instance, what the systems are supposed to process. The main elements are actors and use cases. Users and any other systems that can interact with a subject are represented as actors (ARIS UML DESIGNER, 2023)

The UML diagram of use cases of the application "Figure 1" describes the main activities and interactions of the user.

Figure 1. System Use Cases.
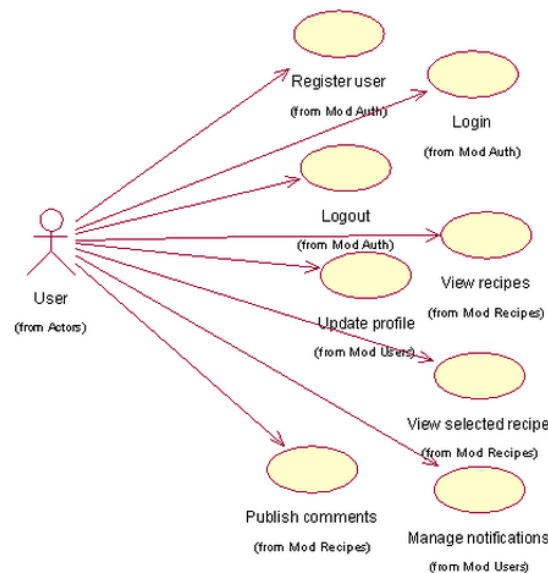
The UML sequence diagram was used to illustrate communication focused on the succession of messages that are exchanged, accompanied by their respective instructions of appearance in the timelines

The UML collaboration diagram was used to communicate elements that collectively achieve a specific task or set of tasks without necessarily having to incorporate details that are irrelevant to the explanation. Collaborations are one way that the UML can be used to capture design patterns

The modeling of the different entities of the application was made through a class diagram. The attributes and methods of each entity were highlighted, as well as the association and cardinality relationships between them.

After we carried out an initial modeling through the UML class diagram, these entities (recipes, user, ingredients, steps, materials, comments and notifications) began to form

relational database schemas in "Figure 2". The database schema describes the relation between entities transformed into tables, recipes and their components: ingredients, steps, materials, comments. Also, the datatype for each attribute of entities was placed there.

Figure 2. Database Diagram made in Erwin Data Modeler.
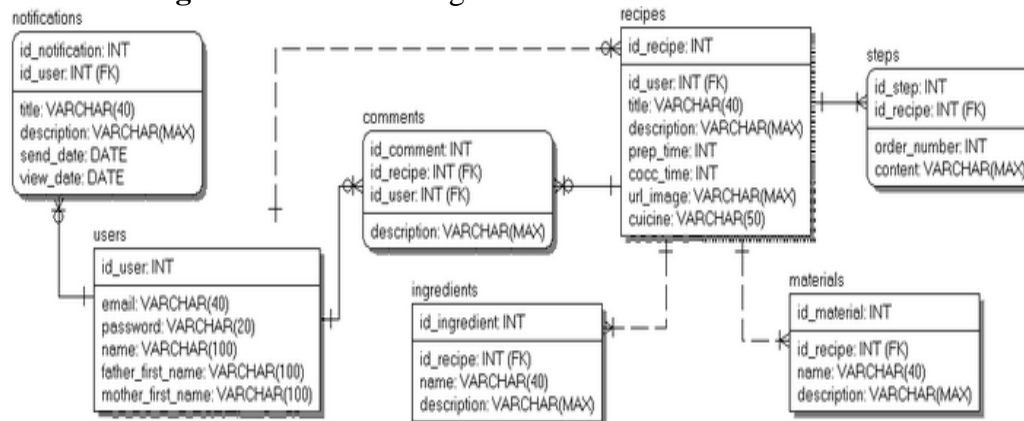
For each use case, the activity diagrams were built. An activity is the specification of a behavior parameterized as the coordinated sequence of subordinate units (OMG,2017). This activity was performed at the beginning of each sprint in order to understand the casuistry of the application. The activity diagram illustrates and includes one of the different processes of the mobile application, like user registration, login, logout, view recipes list, view selected recipe, update profile, post comments, and manage notifications.

After the data modeling was performed, this information of activities was applied to make a preliminary design of the views that were shown at the end of the process, and to see how these views would look like, considering the existing entities.

F. User interface design

According to (Jauharul, 2021) before developing the interface, it is necessary to establish the value of the system prototype during the development process. In this works, we established a detailed prototype as a reference for future development of the current system.

The design of the views of the application or prototype was made using simple components in a mockup creation application. Each element of the mockup design is abstract and does not define in a concrete way the final design will be the same because it depends on the development team and its experience on design and programming. In this work, we consider important parts of the mockup design, such as the attributes of the entities, and the buttons that will start each of the use cases.

G. Implementation

The development of the application was implemented using the Android Studio and the Kotlin language as the main tools. The use of Kotlin language was considered because it increases the quality of the generated code, mainly because its null-safety guarantees (Oliveira, 2022). Picasso library was used for the display of images, or the okhttp library was considered for the consumption of web services. In addition, we generated and published a GitHub platform (Ignacior, 2023) containing more details of the recipe application for versioning and development control.

The list of recipes was made by setting up a web service made in PHP language and with a MariaDB database.

H. Tests

The Red-Cetario mobile application was subjected to different tests based on the ISO/IEC 9126-1 (Iso, 2001) standard, which allowed directing the evaluation process of the mobile application with six characteristics: Functionality, Reliability, Usability, Efficiency, Maintainability, Portability. These characteristics guarantee the verification and validation of all the functionalities considering the user experience and the type of application.

In addition, we consider a test plan document in "Figure 3" as a support instrument to compile the different tests of the mobile application. We fulfill the aim of evaluating the results, as well as indicating to each of the developers the functionalities that were not in accordance with the User Stories. The tests evidence collection is illustrated in "Figure 3" as a data matrix.

Figura 3. Test data matrix of the Red-Cetario application.

| Identification CP	Module	Type	Characteristic	Sub-Characteristic	Test Case Description	Steps	Expected Result	Result	Ev
CP-001	PlayStore	Positive	Portability	Easy instalation	Validate that the Red-Cetario application can be installed from the PlayStore platform, correctly on the mobile device	1. Go to PlayStore. 2. Search Red-Cetario application. 3. Touch install button.	When pressing the Install button, the Red-Cetario application must be installed on the mobile device.	OK	https H_9
CP-002	Register	Positive	Functionality	Security	Validate that the user can register in the application	1. Enter the application 2. Select the menu on the right at the top of the screen 3. Select Sign In 4. Select Register 5. Complete the data and Register	When pressing the Register button, the new user must be registered in the cloud and a correct registration message should appear.	OK	https pou2 Dz
CP-003	Authentication	Positive	Functionality	Security	Validate that the user can log in to the application	1. Enter the application 2. Select the menu on the right at the top of the screen 3. Select Sign In 4. Complete the fields with the user's credentials	When the Start Session button is pressed, the user's session must remain active, indicating this with a message indicating that the user has been authenticated, also indicating	OK	https IZMk 29P

Each element of the data matrix in "Figure 3" presents a series of steps to be executed, as well as their respective validations to determine whether the application passed or failed the different tests.

The test data matrix described in "Figure 3" shows the identification for each test case, the test case module , the types as an expected result of whether the test passed or failed, the characteristics are tested following the ISO/IEC 9126-1 standard criteria, the descriptions of the test cases, the steps to replicate the test cases, the results after testing, and the evidences of the results with one of the twelve demo videos.

I. User manual

Before carrying out the deployment of the Red-Cetario, a user manual in "Figure 4" was implemented. This manual describes the main functionalities of the recipe application, either in a general and independently way for each view.

Figure 4. Graphic views of the application manual.
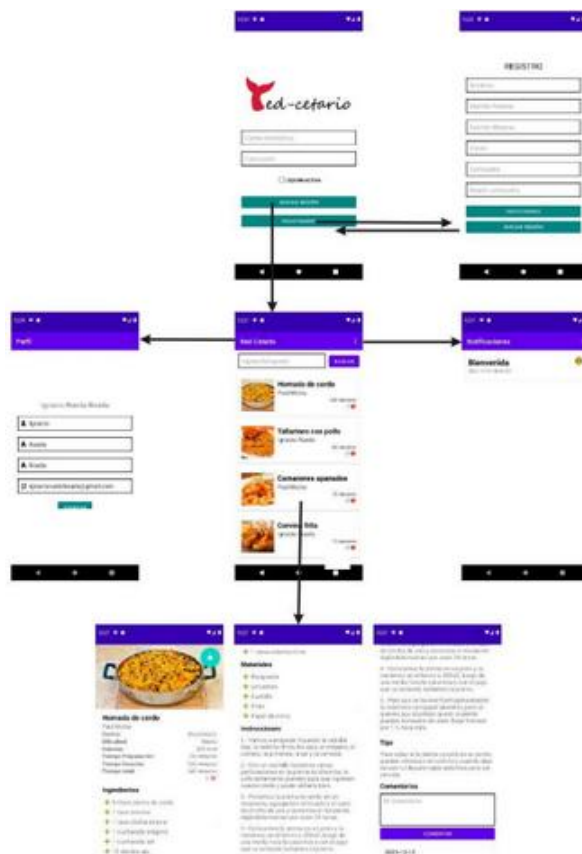
In "Figure 4", for each view of the application, a description of the screen was included. The descriptions are based on which module said view belongs to, a description, the components of the view, a table with possible alert messages and a description of contextual help.

2. Discussions

The design and implementation of the food recipes mobile application during the COVID-19 pandemic in Peru tends to be an interesting option to attract users with different food preferences. The data obtained from the survey shows a positive reception and high acceptance among users, suggesting that the application effectively meets some of the needs and cooking preferences that Peruvians faced during the confinement.

The implementation of a virtual user manual was revealed as a wise decision, since it facilitated the understanding and use of the main functionalities of the Red-Cetario application. In this way, the user experience with the application was improved, as well as the user's general satisfaction when interacting with the application was satisfied.

Functional testing on various devices, both emulators and physical devices, ensured that the application was compatible with a wide range of configurations and versions of Android operating systems. Because of the diverse configurations and different Android versions, the creation of the Red-Cetario application facilitated greater accessibility and availability of the app to a wider audience. Likewise, the launch of the application in the Google Play Store was fundamental for its diffusion and users' consumption.

The survey results indicated in this work shows a high demand of people interviewed referring to recipe books or reading similar recipe applications. Consequently, the survey results support the relevance of the Red-Cetario recipes mobile application.

Since a significant percentage of people interviewed consider the creation of a tool (such as an app) for recipe visualization as feasible, it strengthens the viability and long-term potential

of the application, which could translate into increased usage and recognition of the application in the future.

The ISO/IEC 9126-1 was a standard guide to perform diverse tests for the application, guaranteeing quality before deployment of the application and exposing some errors or problems like invalid recipes data or invalid logins that could be solved.

Regarding the hybrid SCRUM methodology with UML used for the development of the project, it has proven to be effective in allowing collaboration within developers in order to achieve the proposed objectives.

The use of UML diagrams helped to accelerate the whole development process providing a general overview of the mobile application requirements. Also, it should be noted that the attempt to apply more diagrams could have contributed to some delay in the development time of the application but contributed to a greater understanding of the mobile application by the entire development team.

We expected that this Red-Cetario mobile application will serve as the basis for future improvements and updates to enrich the contents and user experiences. In future works, the Spanish Red-Cetario mobile application could display recipes in different international languages.

3. Results

Finally, and before displaying the application in a digital store, a user manual was implemented. This manual describes the main functionalities of the application (mentioned in Table 2), either in a general and independent way for each view Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

3.1. About the application

The execution of the application was verified on different devices, both emulators and physical devices with the performance of different tests at the functional level.

As a result of using the SCRUM methodology, modeling the mobile application with UML, and testing the low resources usage and functionalities with the ISO/IEC 9126-1, we launched the Red-Cetario application to the Google Play Store.

3.2. About the survey

In this investigation, Google Forms was used as a tool to get information from mobile users before starting the development of the mobile application. Our survey form collected the information of 50 users interviewed based on their preference in using a recipe book or any cooking tool information. The statistics results illustrate that 34% of the people interviewed indicated that they very frequently use a recipe book or any virtual cooking tool information, 80% of the people considered very important the comments section generated by the application because the users could provide any feedback regarding the different food recipes, 76% of the people interviewed considered very relevant to visualize the recipes without having to log in on the application, 84% of the people interviewed find useful the creation of a virtual tool for viewing recipes as feasible.

4. Conclusions

The proposed Red-Cetario application is a free mobile app where diverse cooking recipes are published.

This application was carried out based on the corresponding analysis of similar recipe applications, as well as a study of the use of this type of applications through a survey that included only the target audience needs.

Also, the ISO/IEC 9126-1 standard was very useful for testing some of the attributes of Functionality, Reliability, Usability, Efficiency, Maintainability and Portability of the Red-Cetario mobile application.

Therefore, we built an easy-to-use system that consumes few system resources, using a hybrid methodology including the use of SCRUM and UML. The Red-Cetario application shows recipes, notifications, comments, and an evaluation through Google Play Store.

Finally, we concluded that the use of an appropriate research methodology, the use of SCRUM, and UML as part of a hybrid development methodology, the inclusion of the gathering requirements and system designs, and the use of the collaborative development in sprints contributed to the development of the Red-Cetario mobile application during COVID-19 pandemic. Therefore, we fulfilled the objective of obtaining a recipe application with low consumption of resources, as well as this application could be potentially used in Android operating systems devices among any mobile version.

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