Mobile Application Design: Caries Health Care for Children

https://doi.org/10.3991/ijim.v16i21.33967

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Abstract—Cavities are a recurrent problem in a large part of the population, since they not only occur in children, but also in adults. However, it is known that children are the most affected because they do not maintain good oral hygiene, in addition to being exposed to the consumption of foods with high sugar content. That is why the design of a mobile application was developed with the objective of preventing caries in children, promoting good oral hygiene habits in children. The mobile application basically teaches the child, with the help of 3D avatars, the correct way to brush their teeth. It also uses the smartphone camera as a mirror during brushing, in addition to capturing a photograph of the teeth. In this way it performs the analysis by applying artificial intelligence to diagnose whether the patient has symptoms of tooth decay. In addition, the application provides virtual bonuses to progress and unlock new interactive features; in this way, it captures the attention because it maintains an interest of the child to continue using the application. For the development of the prototype, the agile Scrum methodology was used because it presents an orderly structure and allows for adaptability. In addition, it offers a wide variety of graphical tools and strategies capable of displaying information in a structured way.

Keywords—caries, design, mobile application, oral hygiene, scrum methodology

1 Introduction

Caries is a disease that occurs from childhood to adulthood, this problem is increasing due to poor oral hygiene habits, causing intense pain caused by infection. That is why the following research seeks the implementation of a mobile application focused on improving the oral hygiene habits of children, in order to prevent tooth decay and improve their quality of life. For this reason, research was carried out inquiring about projects and studies focused on oral health to highlight their results, thus finding possible improvements for the future.

According to World Health Organization (WHO) estimates, caries is present in 60%-90% of school children and 100% of adults worldwide [1]. In Germany, for example, caries is present in 14% of 3-year- old children and in 19% of 12-year-old children, and

their diagnosis indicates that they have multiple untreated lesions. Therefore, in these cases, medical intervention is required for further treatment [2].

This disease has always been present in Peru. National epidemiological studies of caries in primary teeth have been carried out. The most recent study was conducted between 2012 and 2014 where it was obtained that, the data tell us that children between 3 to 5 years of age have a caries prevalence of 76%, and between 1 to 3 years of age the prevalence is 46%. However, this result may be underestimated, since the criteria of the WHO and initial injuries were not taken into account [3]. In addition, a study to assess the prevalence of caries was carried out in the district of Pilcomayo, province of Huancayo. There were 230 students from different state schools; where the schoolchildren were between 6 and 12 years old. The analyses and examinations were carried out following the WHO recommendation indexes and the result was that the prevalence of caries was 96.8%. This indicates that it is a disease that is still present today [4].

The following research seeks to present a solution to the problem of caries in children, as demonstrated by several studies. Tooth decay is a worldwide problem, It is therefore necessary to use the technological tools at our disposal to combat this disease. As we all know, the cell phone is a device present in our daily lives and children are no strangers to this technology. That is why by using it correctly it is possible to create an interactive game that is not only able to capture the infant's attention, but also to create an interactive game, but also learns how to improve their dental health, which is beneficial because it prevents tooth decay.

The objective of this research work is to present a solution to this problem by designing a mobile application to take care of children's health. For this purpose, the Scrum methodology was applied to present the prototypes in a systematized way by means of a sprint.

The research is structured as follows: in section 2 the review of the literature is carried out, in section 3 the methodology carried out, where each stage is explained; Section 4 shows the results and discussions based on the findings of other authors with the research; furthermore, in section 5 the conclusions and future work.

2 Literature review

In this section, the positions of the different authors who have researched the topic of caries health care in children were discussed. This made it possible to make a diagnosis of the current state of research on the topic under investigation.

The application of technology in the medical field innovates at every turn; with this in mind, the ToothSOS application was created for mobile platforms, whose objective is to provide information regarding dental trauma to professionals and patients. The said app was launched in April 2018, since then it has had 47,725 downloads. As a result, the first month there were more downloads and in Europe there were more and more downloads. Finally, it is concluded that the mobile application continues to generate public interest [5]. However, advertising should be more intense to increase its popularity. Also, dental professionals should encourage the patient to use the application to stay informed and avoid traumatic dental problems.

On the other hand, a problem that plagues us today is the fact of going to the dentist regularly. The patient usually feels this need when he/she is in severe pain. This is why the use of an application whose purpose is to maintain communication between dentist and patient remotely sounds an attractive proposition [6], For this reason, the following article presents a model of a mobile health application called iGAM, whose objective is to improve the communication between the dentist and the patient. The methodology used consists of 5 steps: User stories, Case study, Functional Requirements, and the non-functional ones in order to speed up the development of the software project, then a survey of 18 people, between 18 to 45 years old, was carried out and they were asked to take a picture of their mouth area every week, this procedure was carried out during 1 month [7]. At the end of this procedure, it was concluded that iGAM improves the exchange of patient check-up information and is useful when consultations are not carried out in person.

On the other hand, the use of virtual reality (VR) in the medical field has been used to prepare the patient to live experiences before or during an intervention, However, this technology is not widely used in dentistry, However, it can play a key role in climate control based on dental experiences. In order to carry out this research, a study of eight electronic databases was carried out and the following results were obtained; the application of VR is successful [8], since it is a distracting factor in patients and this generates a decrease in pain. It is also a method of preparing the patient before an operation [9]. Finally, it is concluded that VR has been used indirectly in dentistry, however, there are not many studies focused on the subject, which is why high-quality clinical studies are recommended to evaluate the use of mobile applications to improve the dental treatment experience.

The following article aims to analyze caries prevention apps in order to report on their content, availability, purpose and characteristics. To carry out this process, the Mobile App Rating Scale tool was used to compare and analyze the data. Applying these strategies, 562 apps from Google Play were analyzed and finally it is concluded that these apps focus on oral hygiene and target young people. In addition, they provide a large amount of information focused on specific patients [10]. However, the effectiveness of decreasing dental caries cannot be assured, so prior professional evaluation is required before using any app.

Smartphones are very powerful tools that make our daily tasks easier and there are several applications focused on health, specifically dental. For this reason, in the following article an investigation of these applications was carried out; for this purpose, several databases were used and the following keywords were filtered out: “smartphone”, “app” y “dentistry”. As a result, 215 applications were obtained on Android, iOS and Windows [10]. Most of these apps were not valid for dental institutions, it is therefore concluded that most of these apps are developed for clinical practice and lack information to guide the patient.

It is known that children have computational thinking, which is why they develop skills at a very early age in the handling of technology, specifically in the use of the smartphone and mobile applications [11], which is why in the following article the CAMBRA-KIDS application was developed; which was created for the systematic

management of dental caries among preschool children. The method used was data collection and analysis using R studios, which is a Windows application. They also applied descriptive statistics to evaluate the algorithm and usability [12]. Finally, it was concluded that, the application works well in the algorithm designs employed. The risk management method was adequately guided, it is for this reason that it is concluded that, the CAMBRA-kids application is applied and used in the field of children's oral health care management.

On the other hand, as mentioned above, as mentioned above, tooth decay is a worldwide problem that afflicts many students. Because of this, a study was carried out involving a dental health mobile application in order to see the results in elementary school students. The test was carried out with 158 children between 10 and 12 years of age, with the help of a research specialist [12]. The students took a survey at the beginning, then received the treatment and indications according to the application, after two months, a survey was conducted and the results were as follows: comparing the two results, in the initial and final stages, it is concluded that the research helps to determine that using the application as a teaching method improved the knowledge and performance of students with respect to dental health education [13].

Mobile applications coexist with us facilitating daily tasks, in the educational field is also used in order to improve the teaching of students, also areas such as Science, Technology, Engineering, Mathematics, also known as STEM are important for education because it provides benefits to adapt to the modern and globalized world in which we live day by day [14][15], which is why in the following research a questionnaire was conducted to a medical school in order to measure their knowledge in the use of mobile applications [16]. The study tests through questions about the use of mobile applications in the medical environment as a tool to facilitate manual processes during a medical intervention. The conclusions reflected in the results were as follows: the devices provide greater convenience and portability compared to standard systems. In addition, they provide advantages that would be of great help in medical environments [17].

It is also well known that teachers are constantly faced with challenges, since they are always reinventing their teaching methods, for this reason the use of mobile devices as a teaching method for dental students was evaluated. For this purpose, 56 students from the medical school were interviewed [18]. In order to provide an educational alternative, a mobile application was developed for the management of traumatic dental injuries. After a week, they conducted a questionnaire to evaluate the satisfaction of teaching using this method. As a result, 90% stated that the application helped to improve their understanding of the topics, and that access to information was fast and efficient [19]. Finally, it is concluded that mobile learning is efficient and effective when applied to dental education.

In dentistry, radiographic information is a challenging process, since the whole process is based on an image; where the pathology must be completely identified. For this reason, a mobile application called" PantoDict" was developed to provide information about panoramic X-rays [20]. For this reason, two groups were evaluated, both of which practiced taking these radiographs with the aid of the application. At the end of the semester, a test was given to assess their knowledge and skills. It was found that the

group that used the application performed better on their test than the group that was taught in the traditional way [21]. Therefore, it is concluded that with the use of the application the students improved the experience of capturing to write reports on panoramic radiography. Therefore, the use of mobile applications in education is useful for teaching and learning.

According to the aforementioned research, several applications focused on health have been created, these applications are useful to perform some diagnoses or calculations in moments, in the same way there are applications that improve the teaching of students in their respective areas, however, in the area of dentistry this fact is observed to a lesser extent, Therefore, the development of an application focused on taking care of the oral health of children would be beneficial because it would have a tool with the ability to improve their quality of life, on the other hand, it encourages companies and researchers to continue investigating and deepening in the subject for future research.

3 Methodology

As a methodology, we chose to use the agile methodology Scrum because it is flexible and adapts to changes that may arise during the project. changes that may arise during the project. Scrum follows an iterative and incremental linearity, also follows the principles of process development, starting with the analysis, then acquiring the requirements, designing and then delivering and developing the product. During this process Scrum allows for minor adjustments to the approach, is therefore known for applying agile management [22]. Because of the above-mentioned benefits, Scrum was chosen for the following reasons see Figure 1.

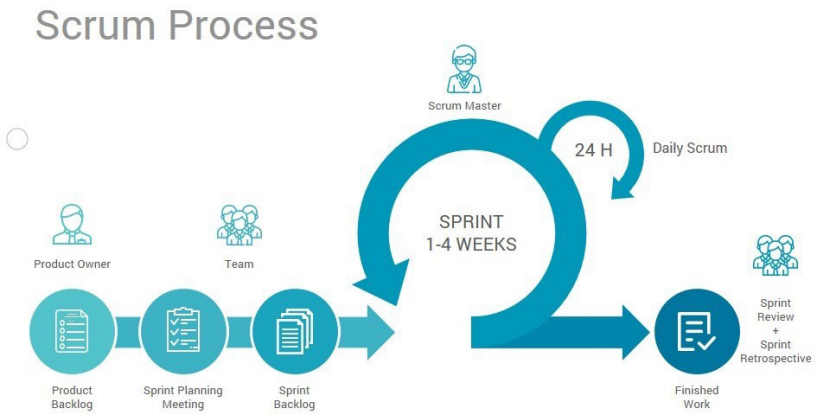

Fig. 1. Scrum flow

Taking Figure 1 as a starting point, this process was adapted to the research work, due to the fact that the work team is made up of 2 people, thus speeding up the process for the creation of the information shown below, the following phases were defined to be followed.

3.1 Scrum development structure

Requirements stage. User requirements were obtained, identifying their needs and adapting them to the system.

Definition of user stories. To define the user stories, an analysis of the requirements previously obtained was carried out, then a list was made of the stories that the team will develop and include in the backlog to improve the project's life management.

User stories prioritization. After listing the user stories it is necessary to prioritize each of them, that is, to identify those stories with the highest value during development, taking into account the client's needs. In this way, a hierarchy is created.

Analogous estimation. After having correctly ordered each user history, Scrum organizes the team's effort through a chart called analog estimation. Then quantify with the help of the team the working time for the development of each user story. This takes into account the time and resources for development.

Creation of the product backlog. The Product Backlog is a table that organizes the user stories, the priority, estimation and development time. It is adaptable to the application of each project. The development is done in conjunction with the development team and the Product Owner [23].

History points. The History points are obtained from the analogous estimation table, because it defines the level of complexity of each user story, the points obtained are added up, thus indicating the history points [24].

Feedback. At the end of each Sprint, Scrum invites you to perform an analysis of your work, to identify the advantages and disadvantages of the development and feedback the information commenting on the improvements to be developed to improve the next sprint.

3.2 Development of the methodology

Kotlin programming language. Kotlin is an invaluable programming language for developing mobile applications, using integration of activities and services and with the help of programming text editors it is possible to create an application from scratch and be published for Android devices [25].

Android studio. Android is known to be an operating system based on Linux, is open source, which implies that we all have access to the code to make modifications. On the other hand, we have the Android Studio program which allows us to make mobile applications easily, because it structures useful tools for development, in addition to including an intuitive editor. IntelliJ IDEA's contribution makes it even simpler to create Android applications [26].

FireBase. It is a Google Web Platform for mobile and web applications. In 2014 Google acquired the platform, and is currently its main development; it has its own database; various Api's to facilitate access for programmers; various types of authentications and several services [26].

Balsamiq. Balsamiq is a web application and software to design your mobile, web and cross-platform applications. To design the application, the tool was used to show the application and the objective of the team's development [27].

Development architecture. The development architecture is shown in Figure 2, which shows the process followed to carry out the functionalities.

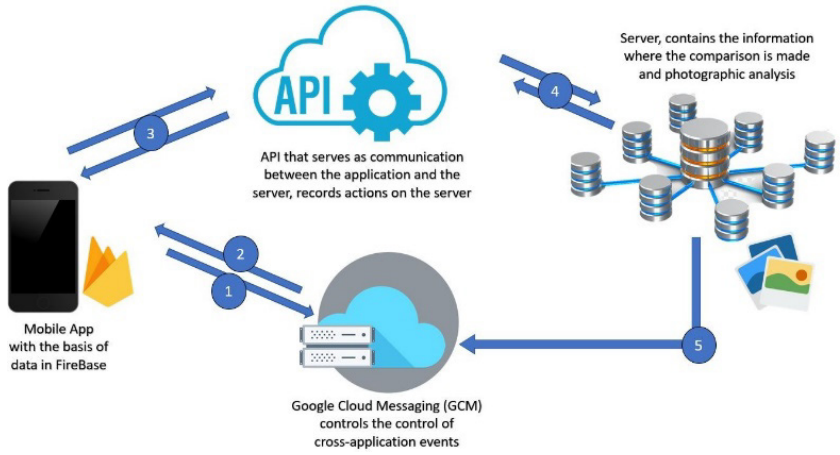

Fig. 2. Development architecture

3.3 Case study

Start-up stage

Identification of requirements: Table 1 shows the requirements obtained from the survey, based on the questions asked and suggestions made by the respondents, six fundamental requirements were obtained.

Table 1. List of requirements

N°	Requirements
R1	The application must have a previous registration to be able to save my process in the game.
R2	The application should have a simple and easy to understand interface so that the child can use the app on their own.
R3	The application should allow the child's mouth to be scanned at any time, in order to be able to evaluate the state of the child's teeth whenever the user wants.
R4	The application should teach the child how to brush his/her teeth correctly so that he/she maintains a good oral health habit.
R5	The application must have an attractive system with benefits so that the child feels motivated to continue brushing his/her teeth.
R6	The application should clearly display the results of each scan in order to be informed about the status of the child's teeth.

- User stories: Table 2 shows the user stories obtained thanks to the aforementioned requirements.

Table 2. User stories

N°	User Stories
H1	As a user, I want the App to allow me to log to save me progress during the game.
H2	As a user, I want the App to have an intuitive and interactive interface so that the infant can use the applicationwithout the help of an older adult.
H3	As a user, I want the App to have the functionality to detect whether or not my child has cavities in order to keeptrack of the child's oral health.
H4	As a user, I want the App to teach my son how to brush properly so that he can practice and maintain this good habit.
H5	As a user, I want the App to somehow awaken my son's attention, so that the habit of brushing his teeth is not lost overtime.
H6	As a user, I want the App to show me the results of the tests it performs on my child so that I can take him/her to adentist in case there is any sign of caries.

Planning stage

- User stories prioritization: Table 3 shows the prioritized user stories, i.e., the team performs the hierarchy depending on what it considers necessary for the prompt operation of the application, in this case the main story is the H3 because it is the main functionality of the application.

Table 3. User stories prioritization

User Stories	
H-U	***Priority***
H3	1
H6	2
H4	3
H2	4
H5	5
H1	6

- Analogous estimation: The following Table 4 shows the analogous estimate listed by user stories and numbered 1 to 13. For reference, the word" Login" is used, which refers to the level of complexity of the development of each story, for example, H1 is located in column 1, on the other hand, H2 is located in column 2, which indicates that H2 has twice the complexity of development of H1, the same logic applies to the other stories.

Table 4. Analogous estimate

	1	**2**	**3**	**5**	**8**	**13**
H1	Login					
H2		Login				Login
H3					Login	
H4			Login			
H5				Login		

- History points: Figure 3 shows a chart to determine the user story points, for this purpose it has been decided to divide the project development into three Sprints. Each part is a deliverable. For example, in Sprint 1, H3 and H4 were distributed in this way because in the Prioritization Table 3 both stories have the highest priority. On the other hand, the score obtained is 18 points because Table 4 shows that H3 is ranked 13 and H6 is ranked 5, The same process applies for Sprint 2 and Sprint 3. The History points indicate the complexity of each Sprint, and also help us to buy each Sprint and to determine the development time.

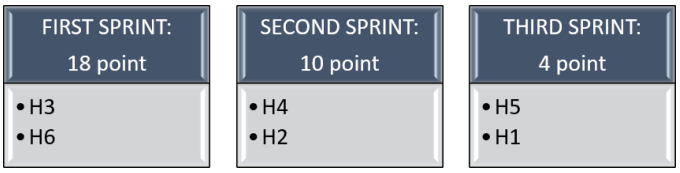

Fig. 3. History and speed points

- Creation of the product backlog: It was decided that the estimated time for the creation of the application is 3 months. Table 5 shows that it is divided by Sprint, in addition to the duration for its development.

Table 5. Sprint backlog

Interface	Duration
Mobile application to prevent tooth decay	3 months
Sprint 1: Tooth scanner	4 weeks
Sprint1: Results	1 week
Sprint 2: Brushing tutorial	2 weeks
Sprint 2: Interface	2 weeks
Sprint 3: Progress functionality	2 weeks
Sprint 3: Login	1 week

Table 6 shows the Product Backlog of the project; it is also ordered by user stories. The Priority obtained from Table 3 and the complexity score from Table 4 are also shown.

Table 6. Product backlog

User Stories	Priority	Estimate
H1: I As a user, I want the App to allow me to log to save my progress during the game.	6	1
H2: As a user, I want the App to have an intuitive and interactive interface so that theinfant can use the application without the help of an older adult.	4	2
H3: As a user, I want the App to have the functionality to detect whether or not my child has cavities in order to keep track of my child's oral health.	1	13
H4: As a user, I want the App to teach my son how to brush properly so that he canpractice and maintain this good habit.	3	8

H5: As a user, I want the App to somehow awaken my son's attention, so that the habitof brushing his teeth is not lost over time.	5	3
H6: As a user, I want the App to show me the results of the tests it performs on my child so that I can take him/her to the dentistin case there is any sign of caries.	2	5

After creating the user stories, prioritizing them for development and finally estimating the effort or time required for their development, the application was prototyped [28],[29],[30], thus developing the user stories according to the user's requirements.

4 Results and discussions

4.1 Sprint presentation

This stage shows the prototypes created divided by the Sprint of the project, in each image it specifies to which user story it belongs.

First sprint. The first Sprint has a total of 18 story points, this deliverable addresses H3 and H6. H3: As a user, I want the App to have the functionality to detect whether or not my child has cavities in order to keep track of my child's oral health. As the H3 shows the aesthetics and interface of the scanning functionality, the child with the help of the camera will capture a photo at the end of the brushing, this image is compared in the database with people who already have cavities. In this way, and with the help of artificial intelligence, it is possible to analyze the child's teeth and detect whether or not he or she has caries. All this is shown in Figure 4.

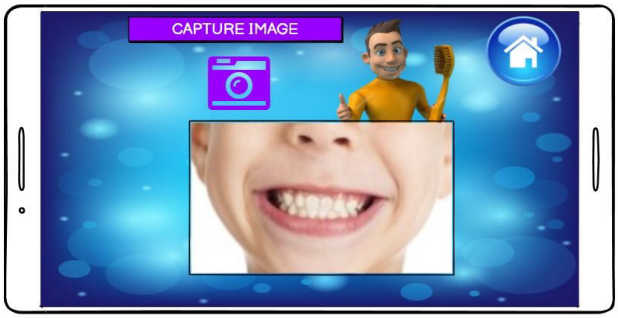

Fig. 4. Software architecture

H6: As a user, I want the App to show me the results of my child's tests so that I can take him/her to the dentist in case there is any sign of caries. As indicated in H6, it shows the interface of the obtained results. After the scan analysis, the part where the child may have caries is indicated and automatically detected, the diagnosis is also made followed by the recommendations to be followed, which vary according to the result. All this is shown in Figure 5.

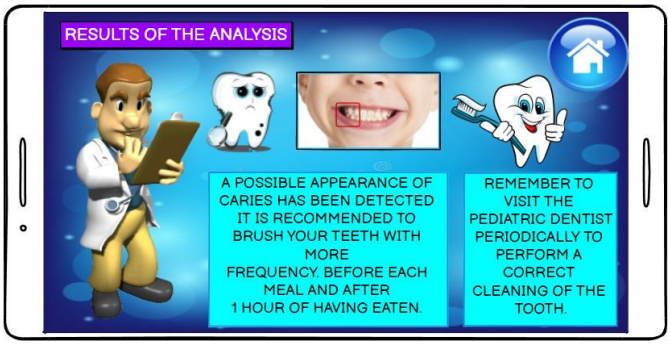

Fig. 5. Results report

Second sprint. It has a total of 10 story points, this deliverable addresses H4 and H2. H4: As a user, I want the App to teach my son how to brush properly so that he can practice and maintain this good habit. As indicated in Story 4, it shows us the interface where the child with the help of the camera, which will use it as if it were a mirror, will brush the children at the same time as the 3D character. This character will indicate the procedure for a good brushing, the child will have to imitate it. In addition, it has a counter, which indicates the time of each brushing. All this is shown in Figure 6.

Fig. 6. Brushing simulation

H2: As a user, I want the App to have an intuitive and interactive interface so that the infant can use the application without the help of an older adult. As indicated in H2, it shows the home interface, where you can access the application's functionalities and options, suchas" Play" (start brushing)," Settings" (general game settings)," Detector" (analyze your teeth by capturing a photograph)," Characters" (login to select your avatar or unlock them). All these are shown in Figure 7.

Fig. 7. Application home

Third sprint. It has a total of 4 story points, this deliverable addresses H5 and H1. H5: As a user, I want the App to somehow awaken my son's attention, so that the habit of brushing his teeth is not lost over time. As indicated in H5, it shows the interface of the available and unlockable characters in the game. For this purpose, a point system was applied, which are obtained depending on how many brushings the child performs during the day. Each character has a unique design, and the scoring system is a motivation for the child to want to brush his teeth. All of this is shown in Figure 8.

Figure 6 shows the home tab where the user will go on to select the symptoms they present. In Figure 7 shows the diagnostic view that identifies the intelligent system. Finally, Figure 8 shows the view of the acquisition of knowledge by the intelligent system, in which only administrators or specialists in the field have access.

Fig. 8. Selective food section

H1: I As a user, I want the App to allow me to log to save my progress during the game. For Story 1, is to perform a login which allows registration or login via Gmail or Facebook. This is shown in Figure 9.

Fig. 9. Login

4.2 Analysis of the survey conducted for the creation of user stories

In order to define the requirements, a survey was carried out among 40 parents of the Santa Rosa school, located in the district of Caraballo, Lima - Peru. Using the Google-Forms tool, a questionnaire was created and answered to streamline the survey process. The answers had only two options" true" and" false" and the option to make a comment at the end of each question. Table 7 shows the questions asked. This is shown in Figure 10.

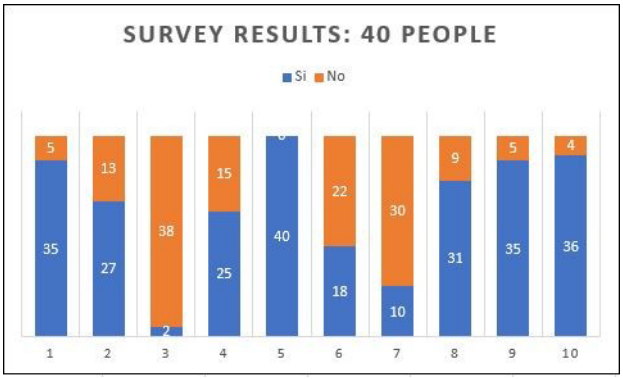

Fig. 10. Questions asked to respondents

Table 7. Survey

N°	Survey Questions
1	Have you or your child ever had cavities?
2	Do you know how to prevent cavities?
3	Do you know any application to prevent cavities?
4	Does your child brush their teeth regularly?
5	Do you or your child have a smartphone?
6	Do you visit a dentist regularly?
7	Do you know the techniques of tooth brushing?

8	Do you think it's feasible for an app to help your child brush their teeth?
9	Do you consider that the problem of caries is very frequent?
10	Would you try the app to prevent cavities?

Analysis of the survey conducted. Thanks to the survey, results were obtained which help to determine the functional requirements of the application in the best possible way. Likewise, the following conclusion was reached:

- Out of 40 people, 38 said they do not know of an application to prevent cavities, which is normal because there are currently very few dental health-oriented applications.
- In question 5, out of 40 people, all of them have a smartphone, either the parent or the child. This is beneficial because they would have no problem using the application and trying it out.
- In question 6, out of 40 people, 22 of them do not visit the dentist. This is worrying because it is essential to maintain good dental health, and the use of the application would be more beneficial in these cases.
- Finally, in question 10, out of 40 people, 36 agree to test the application and see its effectiveness. It is therefore concluded that the treatment, follow-up and control of the use of the application can be carried out without complications.

4.3 Experts results regarding the application design

In Table 8, in order to evaluate the design of the application, the evaluation of the expert professors in mobile development of the University of Sciences and Humanities was carried out. The answers to each question had 3 alternatives: 1 low, 2 medium and 3 high, all of them obtained an average score of a minimum of 2 and a maximum of 3, which means that the proposal is accepted by the experts as validated.

Table 8. Prototype validation by experts

Dimensions	Questions	Mean
Usability	Is the application interaction friendly?	2.5
	I felt very safe using the application?	2
	Did you find the system cumbersome to use?	2
Design	Is the design suitable for use by children?	2
	Is the use of colors and shapes didactic and eye-catching?	2.5
	Do you consider the design of the results to be reliable?	3
Interaction	Is the interaction to access the functionalities intuitive?	2.5
	Is the navigation system of each section, correct?	2.5
	Do you think the relationship between the app and the user will be friendly and interactive?	2.75
Applicability	Do you think the app will lead to better health habits in children?	2.75
	Did you have a positive impact when you saw the design of the app?	3
	Is the application interaction friendly?	2

4.4 Methodology comparison

The following Table 9 shows a comparison between methodologies considered for the preparation of this project. They are comparisons of different methodologies. This allows you to have a broad and critical overview for your selection.

Table 9. Comparison of methodologies

Methodologies			
Criteria	***SCRUM***	***RUP***	***XP***
Description	Model characterized by active integration into project activities	Involves a sequential process with rules-governed standards	Programming-oriented model, focuses on development projects
Type of Review	As the project progresses, revisions are made, at the end of each activity a product improvement is assigned if necessary.	The review is performed after an activity, the review can be performed several times until the product is perfected, each phase depends on the previous one.	The review is frequently performed in conjunction with the functional tests of the process.
Objectives	Focused on projects with complex environments, fast results and for projects that can generate changes during their development.	Focused on development projects, because it requires a large amount of information for its optimal development, oriented to business process automation.	Prioritizes results, its objective is based on accounting results: time, quality, scope and cost.
Stages	Planning Assembly Development Release	Start Elaboration Construction Transition	Define roles Estimate effort Choose what to build Schedule Repeat
Characteristics of the model	Integration and commitment of the project with the team, the client is also involved in the process.	It has a schematic and incremental structure.	Focuses on system programming and development.

After making the comparison together with the team, we chose to use the Scrum methodology, as it is better suited to our objectives, since the goal is to present the IoT prototype in a short period of time, and the work is based on teamwork. Unlike the RUP methodology, since it is used for projects with more corporate information, also the realization of each stage is late. And finally, the XP methodology focuses on programming, so it would not apply in this case, since it is not the objective of the research.

In summary, the research work was carried out through prototype proposals for implementation. However, the authors [8] and [9] indirectly proposed in their research that VR could be used in the area of dentistry. In other words, the use of emerging technologies in the dental sector is important, since it allows the optimization of its processes. In addition, the author [13] conducted a study for children aged 10 to 12 years with specialists in the field. On the other hand, the research carried out was carried out for children between 3 and 12 years of age, since the demand for study was at that age.

5 Conclusion and future work

In conclusion, this research work successfully represented the design of a mobile application to encourage good hygiene habits in children. Thanks to the Balsamiq design tool, the prototype of the application was developed; breaking down each part in a clear way. Likewise, the functionalities and requirements of the users were correctly analyzed by means of a survey. In the same way, thanks to the agile Scrum methodology, the stages of the project were developed in a clear and orderly manner. In addition, with the help of the graphs included in it, it was essential to efficiently communicate the information, in addition to considerably improving their development together with their work team. One limitation of the research was when conducting the interviews, since those involved did not have time to conduct them, including the children's parents.

In the future, it is expected that researchers or health-related entities may contribute to this research by implementing the mobile application. The development of the application will be beneficial especially for children, since they are the most vulnerable to the appearance of caries, and therefore, the most harmed. This is why it is expected that this application will be implemented in the dental field, where it will be implemented as a treatment to be followed to improve the dental health of children.

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Article submitted 2022-07-12. Resubmitted 2022-08-08. Final acceptance 2022-09-27. Final version published as submitted by the authors.