**Mobile application for capturing geological field information**

Elaborated

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# Introduction

The Geonote geological information storage system is designed based on de needs of conservation and administration of geological projects. Managing to maintain a logical order in the form of capture and presentation of information, giving access to all the information captured from your mobile device.

For the creation of the system, the requirements expressed by the client and the change requests that were proposed were taken into account. All of the above is described in this document, in the same way the process that was carried out to achieve a good software engineering process is described step by step.

# Problem statement

## 2.1 Configuration management application

In order to carry out a successful project, the decision was made to use the configuration management (CM), in this way to achieve a system that meets the needs of the client.

The project administration is described below.

## 2.2 Budget

To prepare the project is considered necessary to have the following resources

* 6 team members.
  + 1 project leader with a salary of $ 25,000 per month.
  + 2 designers and analysts with a salary of $ 18,000 per month
  + 2 programmers with a salary of $ 15,000 per month
  + 1 tester with a salary of $ 14,000 per month which will only be necessary over the last 4 months of the project
* 3 mobile android devices for testing.
* A budget of $ 688,000 for the development of the application.

Based on what was presented in project completion within 6 months it is expected.

## 2.3 Human resources

The following table identifies all personnel that have responsibilities regarding to system configuration management.

|  |  |
| --- | --- |
| **Role** | **Name** |
| Project manager | Omar Cordova |
| Analyst | Omar Cordova |
| Designer | Omar Cordova |
| Developer | Omar Cordova |
| Tester | Omar Cordova |

**Project manager**

It is responsible for obtaining requirements and dealing with the client, in addition to coordinating the activities between the development team, the visible face of the work team before the clients.

**Analyst**

Analyze and organize the requirements by priority, he decides what requirements can be developed and which are not feasible.

**Designer**

Responsible for modeling requirements, creating interfaces and database.

**Developer**

Project developer based on requirements modeling.

**Tester**

In charge of finding the system errors for correction, test the system for its exit to the client or its return to the development phase.

## 2.4 Baseline

## 2.4.1 Introduction

Geology is the science that studies the planet earth, focusing primarily on the analysis of its composition and structure, to establish the dynamics of the processes taking place on the planet, the specialists in this area of study are geologists, who perform their I work through field trips to collect as much information as possible. The information obtained is written in their field books, which over time become an important information bank, but this tool has a great disadvantage since they are paper, so the loss of information is very common if not care is taken; Therefore, the development of a digital field book, will allow its users to store geological information in the field, facilitating the capture and management of geological data, maintaining an order and safeguarding the information obtained.

# 2.4.2 Purpose

Based on the needs of a secure storage for geological information, the Geonote system will facilitate the protection of the geological information obtained during the field work, avoiding the loss of relevant data and the management of geological projects, the system will take the concept "field book", from which the main functions will be taken, to be implemented and improved.

# 2.4.3 Scopes

The mobile application abstracts the concept of the field book, allowing the storage of surface geological projects, following a unique flow to capture the geological information in the field and storing the information in the cloud.

# 2.4.4 Limitations

* The system functions in android devices 7 or higher.
* You only have a specialized form on surface geology.
* You may upload up to 10 photos per form.
* The device must contain at least 1 GB of memory available.

# 

# 2.4.5 Audience

The proposed software will target geological and geophysical community, as system will specialize in this area of ​​knowledge, counting vocabulary of these branches of study.

The system is recommended for students or amateurs to the study of earth sciences, since they would provide a real alternative to show all data that can be obtained by a geologist on field experience.

# 2.4.6 Modules

The system will have to develop the following modules:

**Capture module**

The capture module will allow users to capture information in the field of written and photographic way.

Forms automatically get information such as date, time and geographical location (latitude and longitude), if the user wishes can make a sketch about a photograph or a blank background.

**Connecting to the cloud**

The connection module to store projects in the cloud so that they are available at all times if the user needs.

**Reports generation**

The system will make reports organizing information based on the characteristics of the data, which will locate an important data quickly and easily, reports will be generated in PDF format.

# 2.4.7 Technologies to be used

For the development of the system it has decided to use it was decided to use the Python programming language being a multiplatform language which has a native database of SQLite language and we will rely on technology development Kivy interfaces.

Technology Kivy allows us to make android applications easily and flange us different tools to correct errors before generating a final application or use your area Kivy evidence launcher, which is an application that lets you run files python on a android device and verify the operation of the application before creating the final application.

# 2.4.8 Use cases

UC1: Start of work

The graphical interface will ask the user, his name and type of work, after they are added the system will show a form in which it will automatically show the latitude and longitude using the GPS of the device.

UC2: Type of land:

The user should choose the first type of land and the system will show the possibility of adding one or two more.

Type of land:

* Sedimentary
* Volcanic
* Intrusive
* Metamorphic

UC3: Land type income:

Based on what is selected in UC2, the system must show the type of land selected for each type of land, whether primary, secondary or additional.

If two or more types of land have been selected, you must enable an extra form to place the type of cutting arrangement between both types of land.

UC4: Creation of sketches

The system will allow users to take photographs or place a white background to draw on the selected surface and highlight or create visual information.

UC5: Cloud connection

At the end of the capture and having captured the information without error, the system must store the form in the cloud and store it in the corresponding work library.

UC6: Library Visualization

 The system should give the possibility to consult the information of old libraries that are in the cloud, these should be displayed on a screen showing the ordered information and setting aside the options to edit, delete and report.

UC7: Modification

Once the information is displayed and the edit button is pressed, the system will activate the fields that can be edited, including latitude, longitude, date, granularity types, among others to be defined by the user.

UC8: Report generation

Once the information is displayed, the user will press a button to generate the final report, which should be on a standard type sheet and in a stylized format, the information will be displayed in an orderly manner and with its respective image if it was captured.

UC9: Graphical statistics

The user can generate statistical reports, based on the geographical points of an area and delimiting the report to a period of time.

# 2.4.9 System Requirements

**Functional Requirements**

|  |  |
| --- | --- |
| **Identifier** | **Requirement** |
| REQ1 | The system must show the geological coordinates at the time of starting the capture |
| REQ2 | A list of land types must be displayed to be selected by the user |
| REQ3 | The system must show a capture field for land type and allow up to 3 different land types to be captured.  Type of land:   * Sedimentary * Volcanic * Intrusive * Metamorphic |
| REQ4 | The system will allow the capture of photographs for the creation of sketches |
| REQ5 | The system must store the information in the cloud once the user completes the form and saves the information |
| REQ6 | Once the information is stored, the user can create a report of the captured. |
| REQ7 | The user can delete the information |

**Non-Functional Requirements**

|  |  |
| --- | --- |
| **Identifier** | **Requirement** |
| REQ10 | The system will have a section of frequently asked questions to ask questions |
| REQ11 | The system will have a minimalist interface |
| REQ12 | The system will have backgrounds in blue and gray tones |
| REQ13 | The system will have a friendly and intuitive interface |

## 2.6 Schedule

This section broadly illustrates the provision of time for the development of the software project.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | August | September | October | November | December | January |
| Analyst |  |  |  |  |  |  |
| Desing |  |  |  |  |  |  |
| Developer |  |  |  |  |  |  |
| Tester |  |  |  |  |  |  |

# Change request specification

This section addresses the proposed changes to the system, mentioning their status and why the changes were accepted or not.

|  |  |
| --- | --- |
| CR- Number | 01 |
| CR-Title | Mapping of the points studied |
| CR- Description | The system will show a map that marks those points where geological information has been collected and can filter through time periods |
| Date | 24/ OCTUBER /2019 |
| Requirement time | 2 weeks |
| Requirement human resource | A programmer, a tester, a designer and project manager |
| Requirement budget | $20 000 |
| Impacted Modules | REQ5, REQ1 |
| Liability person | Omar Cordova |
| Risk detected | Delay in project delivery |
| Opportunities | New tool for a graphical stadistic |
| Priority | Deferred |
| Decision | Approve |
| Reason for the decision | This new module is a good for the system |

Luis: It was beneficial for the system to have a statistics module.

Alberto: It would be a good business opportunity and with little risk.

|  |  |
| --- | --- |
| CR- Number | 02 |
| CR-Title | Connection with INEGI |
| CR- Description | At the disposition of the Mexican government, the data collected from each study must be shared with INEGI. |
| Date | 24/ OCTUBER /2019 |
| Requirement time | 2 WEEKS |
| Requirement human resource | Programer, project manager, Designer |
| Requirement budget | $50 000 |
| Impacted Modules | REQ-05 |
| Liability person | Omar Cordova |
| Risk detected | IF the change doesn’t make the app will not be displayed in Mexico |
| Opportunities | ------------------------------------------------------------ |
| Priority | Critical |
| Decision | Approve |
| Reason for the decision | It’s necessary for the system |

Luis and Alberto said “It is necessary for the system to work in the country.”

|  |  |
| --- | --- |
| CR- Number | 03 |
| CR-Title | PC-program |
| CR- Description | Develop a desktop version of the application |
| Date | 24/ OCTUBER /2019 |
| Requirement time | 2 months |
| Requirement human resource | Programmer, project manager, designer, tester |
| Requirement budget | $300 000 |
| Impacted Modules | New modules |
| Liability person | Omar Cordova |
| Risk detected | Time and bugged to high |
| Opportunities | New tool for the user, some user can be comfortable whit this version |
| Priority | Deferred |
| Decision | Disapprove |
| Reason for the decision | The CR is unrealistic |

All Team: The requirement is unrealistic and would take more time as it would be a new tool.

# 3.1 New module

**Graphical statistics**

The system can generate statistics for de geological points according to the time to select.

**Connection with INEGI**

According to government regulations, the system must have a connection to the information captured in the system. In this way, the information collected can be consulted by INEGI.

# 3.2 New Use cases

UC10:

The user will have the ability to produce statistics based on the geographic information of a given area, in a variable time range.

UC11:

INEGI will be able to consult the information stored in the system.

# 3.3 New requirements

|  |  |
| --- | --- |
| REQ8 | Create a connection script for INEGI systems. |
| REQ9 | Create a script for creating limited statistics for a time entered by the user. |

# Configuration control

Software and hardware components can be updated and released to the general public very frequently. It is anticipated that these updates will be handled through the configuration control process, or the configuration control board, and will be initiated by project team members. These changes can be initiated by project team members or customers. The work team will meet as necessary to review change requests.

The work team:

* Approve specific procedures to encourage customers to identify improvements and send change requests
* Agree criteria to prioritize, evaluate and approve or disapprove change requests
* Approve a prioritized list of changes that will be made in the current production version
* Set schedules to issue each new version and ensure that each new version is properly tested and documented before issuance.

## 4.1 Criteria of approve or disapprove

Below are the criteria that must take to approve or disapprove the changes:

Approve

* The cost associated with the change request must be covered by the customer.
* The change in requirements should not take more than 10% of the project time.
* The change request must be realistic and possible to make.
* The change request must not violate any law of the country’s penal code.
* The change request must be approved by the work team.
* Agree on criteria for prioritizing, evaluating, and approving or disapproving change requests
* Set schedules for issuing each new version and ensure that each new version is adequately tested and documented before issuance.

Disapprove

* The change request should not affect the operation of the system.
* The cost is not covered by the customer
* The new requirement affects the finished modules.
* The new requirement affects the finished modules.
* When the change request implies to modify the project no more than 10%
* The change request does not affect the project delivery times by 5%.

# Status accounting

A detailed monitoring of each configuration element will be carried out. The monitoring will be carried out by the Project and Configuration Managers. The use of an automated system is likely, but not fully defined at this time.

The paper records of the Change Request forms will be kept in a project notebook. All change request activity will be recorded in the Monthly Technical Status Report required of all assigned tasks. They will also be discussed and distributed in regular project meetings.

# Conclusion

Learning about software configuration allows us to know how to take a project from start to finish, ensuring the quality of the system and adequate management of time and resources.

It allows us to know the changes and draw the lifeline of a requirement in addition to establishing guidelines that help us to draw the lifeline of the project and maintain a backup allows us to ensure that the system always remains functional

# References

[1] E. A. Bersoff, “Elements of Software Configuration Management”, in 1984, IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, VOL. SE-10, NO.

[2] F. J. Buckley, “Implementing a Software Configuration Management Environment”, computing practices, February 1994, page 56-91.