**Analysis of case study Environmental Sustainability - ICESI**

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| Problem Specification Table | |
|---|---|
| **Client** | ICESI University |
| **User** | Users type visitors, data gatherers or researchers |
| **Functional Requirements** | <ul><li>RF1 - Register 'Visitor' user</li><li>RF2 - Register 'Information Collector' User</li><li>RF3 - Register 'Researcher' User</li><li>RF4 - Link Collectors to a Project</li><li>RF5 - Approve 'Review' Type Evidences</li><li>RF6 - Create Comments</li><li>RF7 - Register Projects</li><li>RF8 - Update project</li><li>RF9 - Delete project</li><li>RF10 - Register of project's evidence</li><li>RF11 - Register evidences review's type</li><li>RF12 - Modify evidence</li><li>RF13 - Deactivate evidence</li><li>RF14 - Register of interest's points</li><li>RF15 - Modify interest's points</li><li>RF16 - Delete interest's points</li><li>RF17 - Map visualization</li><li>RF18 - Query project</li><li>RF19 - Query pillar</li><li>R20 - Query interest's point</li></ul> |
| **Problem Context** | This system aims to facilitate the management and retrieval of information related to pillars, projects, points of interest, and evidence associated with the university's sustainability strategy. The system will contain three user profiles: Visitor, Information Collector, and Researcher, each with specific functions and capabilities. Users will be able to register information, manage projects and evidence, access detailed information, view maps of points of interest, and more. The system interface should be simple and accessible from mobile devices and web browsers. Additionally, the system needs to be flexible and scalable for future functionalities. The prototype should provide key features such as user registration, project and evidence management, user access simulation, and detailed information queries. |
| **Non-Functional Requirements** | 1. Query Performance: The system should be able to respond to queries within a maximum of 3 milliseconds (3 ms). This sets a performance requirement to ensure fast query responses.<br>2. Simplicity and Ease of Use: The system should be very simple, straightforward, and easy to use from mobile devices and web browsers. This implies a focus on usability and user experience.<br>3. User Interface Design: The application's user interfaces should be designed by a UX/UI specialist, which sets a requirement for the quality of the user interface design.<br>4. System Flexibility: The system should be flexible and adaptable to allow for future query implementations for other elements of the system, such as project sponsors or points of interest. This implies a scalable and modular architecture. |

**User:**

| Identifier and name | RF1 - Register 'Visitor' user | | |
|---|---|---|---|
| Summary | This requirement registers a 'Visitor' user with a name and a password. | | |
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | Username | String | Must contain at least 5 characters, and none of them can be special characters. |
| | Password | String | At least 8 characters, with a mix of uppercase letters, lowercase letters, and numbers. |
| Results or postconditions | A new record is generated in the database or storage system that stores the user's information. | | |
| Outputs | **Output name** | **Datatype** | **Format** |
| | "User created successfully!" | String | N/A |

| Identifier and name | RF2 - Register 'Information Collector' User | | |
|---|---|---|---|
| Summary | This requirement registers an 'Information Collector' user with a username, password, full name, email, and phone. | | |
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | Username | String | Must contain at least 5 characters, with none of them being special characters. |
| | Password | String | At least 8 characters, with a mix of uppercase letters, lowercase letters, and numbers. |
| | Full Name | String | Must contain at least one first name and one last name, without special characters or numbers. |
| | Email | String | Format should be user@domain. |

| | Phone | String | A valid number with the appropriate format for the region (+country code/local number). |
|---|---|---|---|
| Results or postconditions | A new record is generated in the database or storage system that stores the user's information. | | |
| Outputs | **Output Name** | **Data type** | **Format** |
| | "User created successfully!" | String | N/A |

| Identifier and name | *RF3 - Register 'Researcher' User* | | |
|---|---|---|---|
| Summary | This requirement registers a 'Researcher' user with a username, password, full name, email, phone, university area, and position. | | |
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | Username | String | Must contain at least 5 characters, with no special characters. |
| | Password | String | At least 8 characters, mixing uppercase and lowercase letters, and numbers. |
| | Full Name | String | Must contain at least a first name and a last name, without special characters or numbers. |
| | Email | String | Format should be user@domain. |
| | Phone | String | A valid number with the appropriate format for the region (+country code/local number). |
| | University Area | String | A valid field of study, research, or work within the university. |
| | Position | String | A valid position within the educational institution. |
| Results or postconditions | A new record is generated in the database or storage system that stores the user's information. | | |
| Outputs | **Output Name** | **Data type** | **Format** |

| | | | |
|---|---|---|---|
| | "User created successfully!" | String | N/A |

| Identifier and name | RF4 - Link Collectors to a Project | | |
|---|---|---|---|
| Summary | In this requirement, the investigator will associate collectors with a specific project by entering the project they want to be associated with and the collector's identification number. Only an investigator can perform this function. | | |
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | Project Name | String | Must be an existing project name. |
| | Collector Name | String | Must be an existing collector name. |
| Results or postconditions | The program will validate whether the information collector provided correct information to be responsible for a specific project. | | |
| Outputs | **Output Name** | **Data type** | **Format** |
| | Confirmation | String | "The collector has been associated with the project." |

| Identifier and name | RF5 - Approve 'Review' Type Evidences | | |
|---|---|---|---|
| Summary | From a pending review-type evidence, an investigator can approve it to make it available to the public. Only an investigator can perform this function. | | |
| Appetizer | **Inputs name** | **Data type** | **Valid values conditions** |
| | Evidence ID | String | Must be an existing pending review-type evidence ID. |
| | Approve or Disapprove | Boolean | Must be one of the two valid values: Yes or No. |
| Results or postconditions | If it's approved, the status of the evidence will change to "available," so that the review can be viewed by users. | | |
| Outputs | **Output name** | **Datatype** | **Format** |
| | Confirmation Message | String | "Your evidence is now available!" or "Your evidence has not been approved." |

| Identifier and name | RF6 - Create Comments |
|---|---|

| Summary | A visitor creates a comment on a specific point of interest. | | |
|---|---|---|---|
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | X Coordinate | Int | Must be the coordinate of an existing point of interest. |
| | Y Coordinate | Int | Must be the coordinate of an existing point of interest. |
| | Visitor ID | String | Must be an existing ID. |
| | Text | String | Must be greater than 30 characters. |
| Results or postconditions | The comment will appear in the comment box associated with each specific point of interest. | | |
| Outputs | **Output name** | **Datatype** | **Format** |
| | Displayed Text | String | N/A |

## Projects:

| Identifier and name | RF7 - Register Projects | | |
|---|---|---|---|
| Summary | A project is registered, and it must be created by an investigator. It includes a name, a start date, an end date, a status, and a list of collectors linked by an investigator. | | |
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | Name | String | Must be at least 8 characters. |
| | Description | String | Must be at least 30 characters. |
| | idPilar | String | Must be one of the valid IDs: 1 for biodiversity, 2 for water, 3 for solid waste treatment, and 4 for energy. |
| | Start date | Date | Must be a valid date and fall within the system's date range, format DD/MM/YYYY. |
| | End date | Date | Must be a valid date and later than the start date, format DD/MM/YYYY. |
| | Status | boolean | Must be one of the two valid states: Active or Inactive. |
| Results or postconditions | If the data is correct, a project is created with the entered information. | | |
| Outputs | **Output name** | **Datatype** | **Format** |
| | Confirmation Message | String | "Project created successfully!" |

| Identifier and name | RF8 – Update project | | |
|---|---|---|---|
| Summary | This requirement aims to modify the attributes of the project specified by the user. | | |
| Inputs | **Inputs name** | **Data type** | **Valid values conditions** |
| | Name | String | Only entered if it needs to be modified. Must be at least 8 characters. |

| | | | |
|---|---|---|---|
| | Description | String | It is only entered in case you want to be modified. It must be at least 30 characters. |
| | Collector List | Array | It is only entered in case you want to be modified. It is a list of collectors linked to the project. They must be existing IDs. |
| | idPilar | String | It is only entered in case you want to be modified. It must be one of the valid IDs: 1 for biodiversity, 2 for water and 3 for solid waste treatment and 4 for energy. |
| | Start date | Date | It is only entered in case you want to be modified. It must be a valid date and be within the date range in the system, format DD/MM/YYYY |
| | End date | Date | It is only entered in case you want to be modified. It must be a valid date and be greater than the start date, format DD/MM/YYYY |
| | state | boolean | It is only entered in case you want to be modified. Must be one of two valid states: Active or Inactive |
| Results or postconditions | If the data entered is valid, the pillar can be modified if a project was entered incorrectly, project status, name, identifier, description or start date and end date. According to what the user wants to modify. | | |
| Outputs | **Output name** | **Datatype** | **Format** |
| | Confirmation | String | "Project modified successfully!" |

| Identifier and name | *RF9 – Delete project* | | |
|---|---|---|---|
| Summary | This requirement will allow you to delete a project. Only an investigator can perform this function. | | |
| Appetizer | **Inputs name** | **Data type** | **Valid values conditions** |
| | Name | String | Must be an existing project name. |
| Result or Postcondition | Allow the researcher to delete the project and the components it contains. | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Confirmation | String | "Project "…" successfully removed!" |

**Evidence:**

| Identifier and name | RF10 – Register of project's evidence | | |
|---|---|---|---|
| Summary | The program allows users with the "Investigator" role to record evidence, which can be files in audio, video, image, text or results reports. Each piece of evidence must be associated with a specific project through its identifier and, in some cases, optionally, with a point of interest. | | |
| Appetizer | **Inputs name** | **Data type** | |
| | Project id | String | Must be an existing ID. |
| | Name | String | It must not contain numbers or special characters. |
| | Description | String | Must be a string of valid characters. |
| | Registration date | Date | It must comply with the dd/mm/yyyy format. |
| | namePilar | String | It is an optional entry. Must be an existing ID. |
| | File URL | String | It is an optional entry. They must be URLs of files in audio, video or image format. |
| Result or Postcondition | If all data entered by the user is valid, the evidence is successfully recorded within the associated project. Otherwise, an error message will be displayed and the evidence will not be recorded. | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Confirmation message | String | "The evidence has been recorded successfully" |


| Identifier and name | RF11 - Register evidences review's type | | |
|---|---|---|---|
| Summary | This requirement registers a review based on a previously created project, taking into account data such as name, description, the address of the files, the list of evidence and point of interest. Only a collector or researcher can perform this function. | | |
| Appetizer | **Inputs name** | **Data type** | **Valid values conditions** |
| | Project id | String | Must be an existing ID. |
| | Name | String | It must be at least 8 characters long. |

| | | | |
|---|---|---|---|
| | Description | String | It must be at least 30 characters. |
| | Registration date | Date | It must comply with the dd/mm/yyyy format. |
| | namePilar | String | It is an optional entry. Must be an existing ID. |
| | state | boolean | When created it is automatically in pending status |
| | URL list | Array | They must be valid addresses. |
| Result or Postcondition | If the data entered is correct, the evidence becomes pending until approved by an investigator. | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Confirmation message | String | "Successful creation, now your review is pending approval" |


| Identifier and name | RF12 – Modify evidence | | |
|---|---|---|---|
| Summary | The system must allow users with the "Investigator" role to modify the information of evidence associated with an existing project or point of interest. To do this, it is allowed to change details such as the descriptive name, description, related files (if applicable), the associated project identifier and the name of the associated point of interest. Only an investigator can perform this function. | | |
| Appetizer | **Inputs name** | **Data type** | **Valid values conditions** |
| | id Evidence | String | Must be an existing ID. |
| | New descriptive name of the evidence | String | It must not contain numbers or special characters. Additionally, the name must be unique and not match the name of other evidence existing. |
| | New description | String | It must be a string valid characters. |
| | New file URL (If applicable) | String | They must be file URLs in audio, video or image format. |
| | New projectid | String | The identifier of the project to which it is associated must already be registered in the database of system data. |
| | New idPointInterest | String | It must be registered in the system database. |
| | Registration date | Date | It must comply with the DD/MM/YYYY format. |
| Result or Postcondition | The user only has to enter the data they want to modify. If the data entered by the user is valid, the information of evidence is updated successfully. Otherwise, an error message is displayed and the changes are not saved. | | |

| Departures | Output name | Datatype | Format |
|---|---|---|---|
| | Confirmation message | String | "The evidence has been successfully updated" |

| Identifier and name | RF13 - Deactivate evidence | | |
|---|---|---|---|
| Summary | The system aims to allow users with the "Investigator" role to disable/deactivate evidence associated with a specific project. | | |
| Appetizer | **Inputs name** | **Data type** | **Valid values conditions** |
| | id Evidence | String | Must be an existing ID. |
| | disabled | Boolean | It must be true to be valid. |
| Result or Postcondition | The system will indicate whether the removal of project evidence was successful or not. The system will return a boolean value that informs the investigator user about the result of the operation | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Confirmation message | String | [success/failure] |

## Points of interest:

| Identifier and name | RF14 - Register of interest's points | | |
|---|---|---|---|
| Summary | The application must allow you to create points of interest, that is, physical locations on the organization's map related to projects in the sustainability area of the ICESI University. Only researchers or administrators can register points of interest. The coordinates based on a matrix that simulates the map of the University and a photo are received as input to easily identify its location. | | |
| Appetizer | **Inputs name** | **Data type** | **Valid values conditions** |
| | Point of interest name | String | It must not contain numbers or special characters. |
| | X coordinate | Int | It must be a coordinate in (X,y) format appropriate to the map matrix. |
| | Y Coordinate | Int | It must be a coordinate in (X,y) format appropriate to the map matrix. |
| Result or Postcondition | If all entries are valid, the app will create a unique QR code, and save the entered data creating a point of interest. | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Confirmation message | String | "Your point of interest has been successfully created!" |
| | QR code | String | N/A |

| Identifier and name | RF15 - Modify interest's points | | |
|---|---|---|---|
| Summary | The application must allow you to create points of interest, that is, physical locations on the organization's map related to projects in the sustainability area of the ICESI University. It receives as input the coordinates based on a matrix that simulates the University map and a photo to easily identify its location. | | |
| Appetizer | **Entry name** | **Datatype** | **Condition valid values** |
| | idPuntoInteres | String | The ID must be unique, generated automatically and not have been previously used. |
| | New point of interest name | String | It must not contain numbers or special characters. |
| | New Coordinate | Int | It must be a coordinate in (X,y) format |

| | | | appropriate to the map matrix. |
|---|---|---|---|
| Result or Postcondition | If the entries are valid, the selected attributes will be modified. | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Confirmation message | String | "Your point of interest has been modified" |
| | New QR code | String | The QR code generated from the changes made |

| Identifier and name | RF16 - Delete interest's points | | |
|---|---|---|---|
| **Summary** | The system must allow authenticated users to delete points of interest. To do this, the researcher selects the point of interest that they want to eliminate and confirms the action. | | |
| **Appetizer** | **Entry name** | **Datatype** | **Valid values condition** |
| | nameInterestPoint | String | The ID must be unique, generated automatically and not have been previously used. |
| **Result or Postcondition** | The selected point of interest has been removed from the system. | | |
| **Departures** | Output name | Datatype | Format |
| | Deletion confirmation | string | "The point of interest has been removed" |

| Identifier and name | RF17 - Map visualization | | |
|---|---|---|---|
| Summary | This requirement shows the points of interest of the university. They are represented on a 20x20 map using x, y coordinates. The evidences shown depends if user wants to filer by pillar or project. | | |
| Inputs | **Entry name** | **Datatype** | **Valid values condition** |
| | filterOpt | int | Must be 1 for pillars or 2 for projects |
| | idPillar or idProject | int | Must be existent pillars or projects |
| Result or Postcondition | The map is displayed on the screen. | | |

| | Output name | Datatype | Format |
|---|---|---|---|
| Outputs | Map | Matriz | Map |

## Queries:

| Identifier and name | RF18 - Query project | | |
|---|---|---|---|
| Summary | The user enters the project they wish to consult. The system searches for it and displays the corresponding information and lists. | | |
| Inputs | **Entry name** | **Datatype** | **Condition valid values** |
| | Name | String | Must be an existing project name. |
| Result or Postcondition | Based on the name, the program will display the results. From the option, the database provides the corresponding ID, and the program displays the information according to the links of the respective ID. On the other hand, if you investigate with the project ID it brings the project information directly. | | |
| Outputs | **Output name** | **Datatype** | **Format** |
| | Project information | String | |
| | Amount of associated evidence type review | String | |
| | Amount of associated evidence of other types | String | |

| Identifier and name | RF19 – Query pillar | | |
|---|---|---|---|
| Summary | The system must allow users to consult detailed information on a strategic pillar of environmental sustainability. When performing this query, the pillar information and a list of the projects associated with said pillar must be displayed as output. | | |
| Appetizer | **Entry name** | **Datatype** | **Condition valid values** |
| | Pillar name | String | It must be one of the valid names. |
| Result or Postcondition | The application will show the pillar information and the list of projects associated with it. | | |
| Departures | **Output name** | **Datatype** | **Format** |
| | Pillar information | String | |
| | List of associated projects | String | |

| Identifier and name | R20 – Query interest's point | | |
|---|---|---|---|
| **Summary** | The program must allow the user to consult general information about any point of interest based on its name. | | |
| **Appetizer** | **Entry name** | **Datatype** | **Condition valid values** |
| | Point of interest name | String | It must not contain numbers or special characters. Additionally, you must already be registered in the system. |
| **Result or Postcondition** | If all the data entered by the user is valid, the system will show the general information of said point of interest and the number of comments. Otherwise, it displays an error message. | | |
| **Departures** | **Output name** | **Datatype** | **Format** |
| | Point of interest information | String | [Name of point of interest]: [General information] |
| | Number of comments | Int | Comments: [Quantity] |