REQUIREMENTS ANALYSIS AND SPECIFICATION

D10

IDEALVis Consortium

http://idealvis.inspirecenter.org/

European Union
European Regional Development Fund

Republic of Cyprus

Structural Funds
of the European Union in Cyprus

ΙΔΡΥΜΑ ΕΡΕΥΝΑΣ ΚΑΙ ΚΑΙΝΟΤΟΜΙΑΣ

Executive Summary

This deliverable defines the requirements and specification of the IDEALVis platform by going through all the gathered and analysed requirements. Gathering of requirements started early in the life cycle of the project accompanying the work of the technical WP3. Additionally, this task demonstrates scenarios and use cases that bring user context to life giving detailed realistic examples of how end-users interact with the system, the services and support that are provided to them and their interaction with other colleagues within their organization. The results will serve as an aid to understanding and clarify user requirements and expectations of the system's functionality and to provide a basis for the definition of the different system features. Moreover, analysis of the interaction requirements needed to specify the Human-Computer interface is also demonstrated through the proposed user interface design. The task also explains the data requirements and the technical requirements that are needed for the successful operation of the platform. An estimated usage analysis of the system is also described, taking into consideration the system's technical environment that the platform will run on, aiming for scalability, availability, security and performance.

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Requirements Analysis and Specification

1 Introduction

This document discusses the system requirements which describe the software to be developed. The system requirements defined here will be used to guide the software development team to ensure that the final product encompasses the required features and functionality. The system requirements were defined after collecting relevant information from different stakeholders as listed in Appendix 1.

The document includes the following information:

- User Roles: discusses the system users along with their roles.
- Use Case Analysis: discusses a number of use case analyses to inform the requirements of the system and its main actors and processes.
- Acceptance Criteria: discusses the state of requirements that marks them as complete.
- Data Requirements: discusses the requirements for the system data structures, following further analysis on the use cases.
- Technical Requirements: discusses the technical aspects the system should fulfil.
- Operational Flow: discusses the navigation flow for all users identified.
- The overall design of the user interface of the platform based on requirement analysis.

1.1 The Overall System Concept

Before moving on with the system requirements it is important to state the project objectives and goals. IDEALVis aims to provide adaptive data visualizations that will facilitate more efficient and effective data exploration and analysis of complex and multivariate business datasets, in order to enable more effective decision making on critical business tasks.

In the context of this project, we aim to adopt best practices from the areas of software development, interface design, data analytics, cognitive psychology, web adaptation / personalization and data visualizations. Specifically, we aim to utilize IDEALVis to:

- Go beyond the state of the art in adaptive data visualization and personalization techniques.
- Identify potential correlations of cognitive factors with data visualizations.
- Create a set of practical design guidelines.
- Develop a novel multi-dimensional human-centered user model.
- Quantify the user experience and understand patterns in the interaction process.
- Evaluate the IDEALVis platform with real end-users.
- Develop an intelligent data analytics component that enhances the efficiency and effectiveness of the data exploration process.
- Design a set of novel personalization rules and adaptive interventions for data visualizations.
- Design and develop an open and flexible user-cantered adaptive data visualizations framework.

2 Use Case Analysis

This section presents various use case analyses aiming to identify the requirements of the system and define the main actors and processes within it. The use case analyses will form the foundation upon which the final system will be implemented.

2.1 System Administrator

The *System Administrator's* primary function relates to managing Admin and Data Protection Officer (DPO) profiles, which includes processes for: *a)* creating new profiles; *b)* viewing data of existing profiles; *c)* editing data of existing profiles; and *d)* deleting profiles.

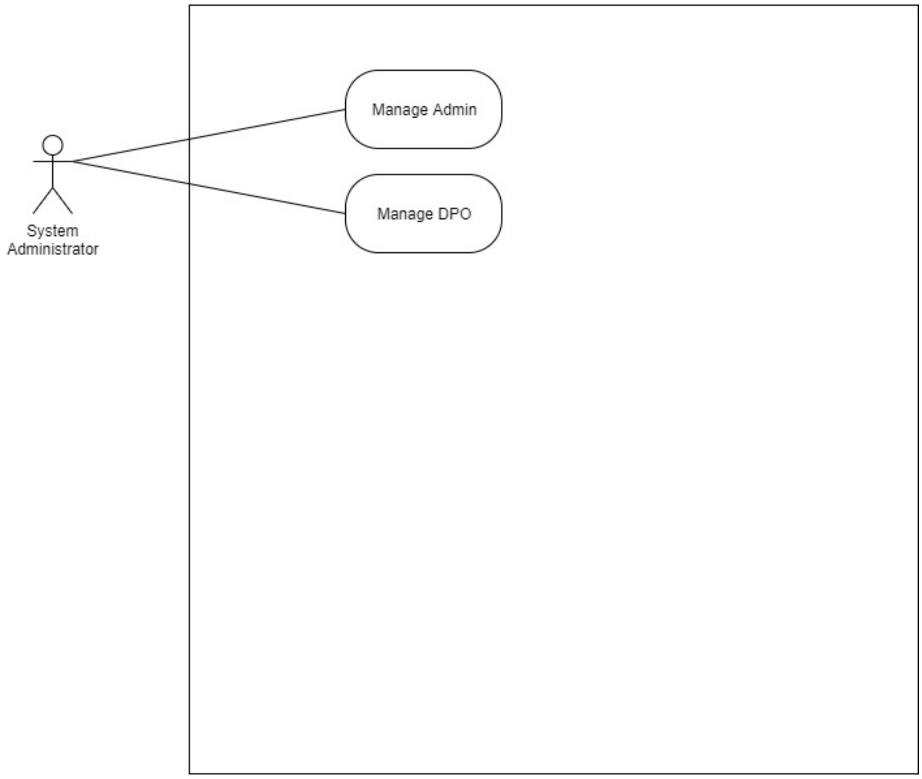


Figure 1: Use Cases for System Administrator Actor

2.2 Admin

The *Admin's* primary functions include: *a)* viewing system statistics in a dashboard page for visually tracking key performance indicators (KPI), metrics and key data points; *b)* managing notification types, *i.e.*, create and view notifications; *c)* managing researchers, *i.e.*, select active and inactive researchers; *d)* viewing researchers; and *e)* managing settings, *i.e.*, view, edit, reset various settings related to general, privacy and security.

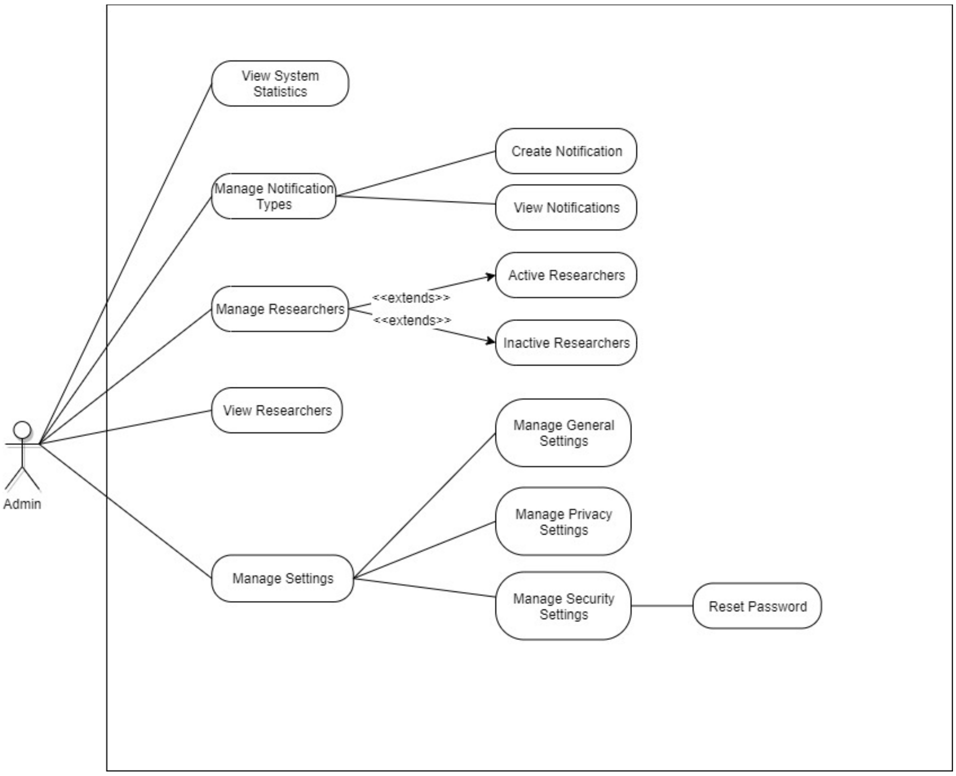


Figure 2: Use Cases for Admin Actor

2.3 Data Protection Officer (DPO)

The DPO*'s* primary function relates to managing privacy claims, *i.e.*, *clear erasure request* and *stop processing*.

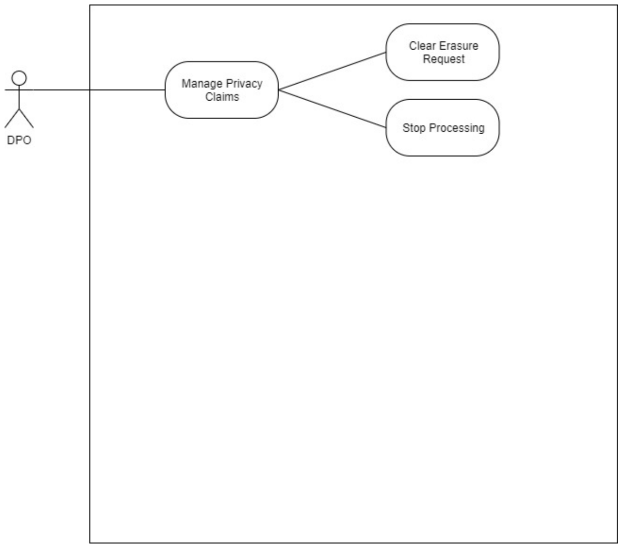


Figure 3: Use Cases for DPO Actor

2.4 Researcher

The *Researcher's* primary functions include: *a)* registering to the system, activating his/her account and completing his/her profile; *b)* managing his/her profile information (*e.g.*, name, email, etc.); *c)* creating research studies, *i.e.*, select open or closed study, as well as managing existing research studies, *i.e.*, publish, edit and view studies and invite participants to the studies;

and *d)* managing settings, *i.e.*, view, edit and reset various settings including general, privacy, security and notifications settings.

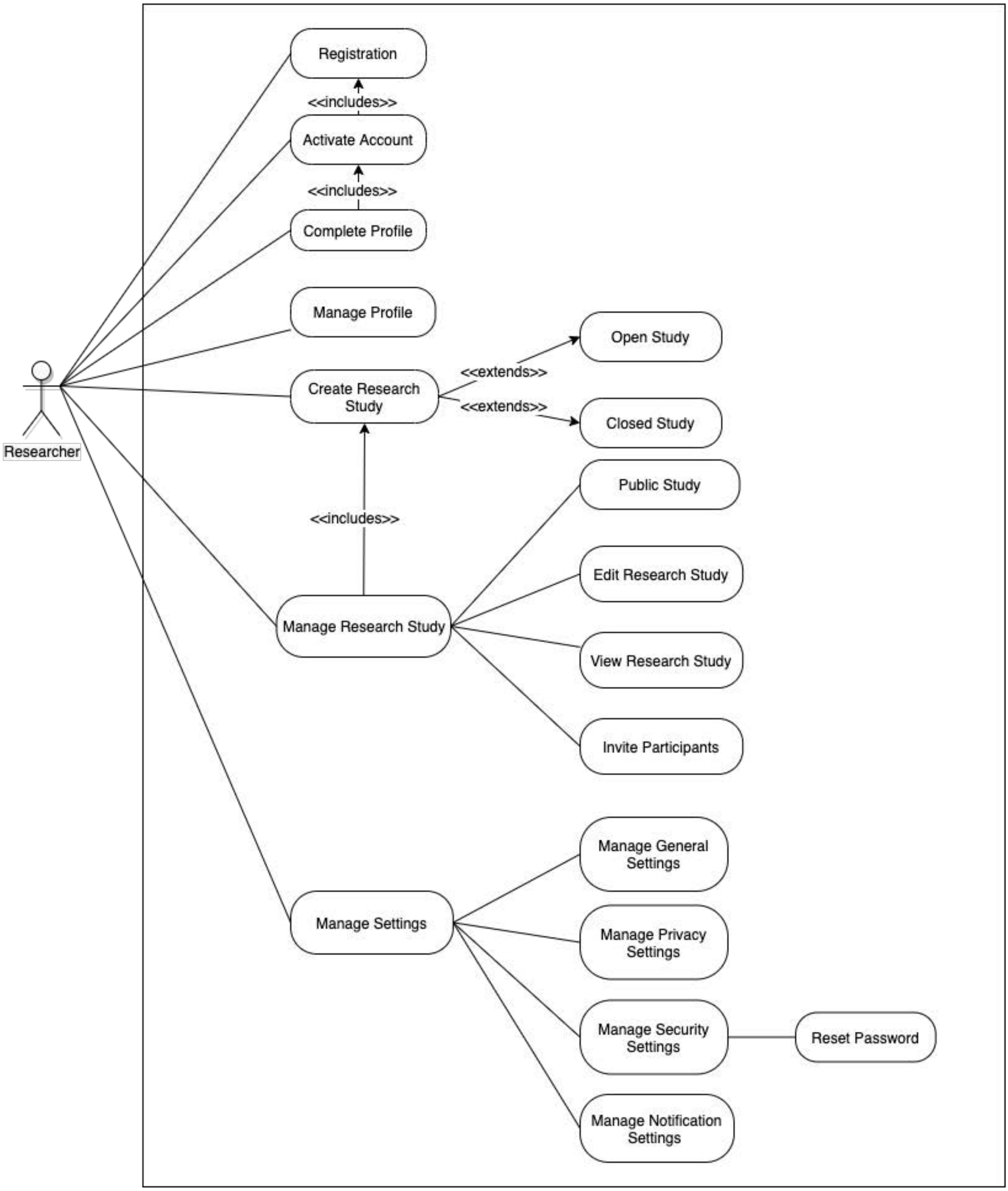


Figure 4: Use Cases for Researcher Actor

2.5 Participant

The *Participant's* primary functions include: *a)* registering to the system, activating his/her account and completing his/her profile; *b)* managing his/her profile information (*e.g.*, name, email, etc.); *c)* enrolling in a study, *i.e.*, receive invitation by link or email, viewing available studies for participation and studies currently enrolled, completing questionnaires and cognitive tests, and viewing study results; and *d)* managing settings, *i.e.*, view, edit and reset various settings including general, privacy, security and notifications settings.

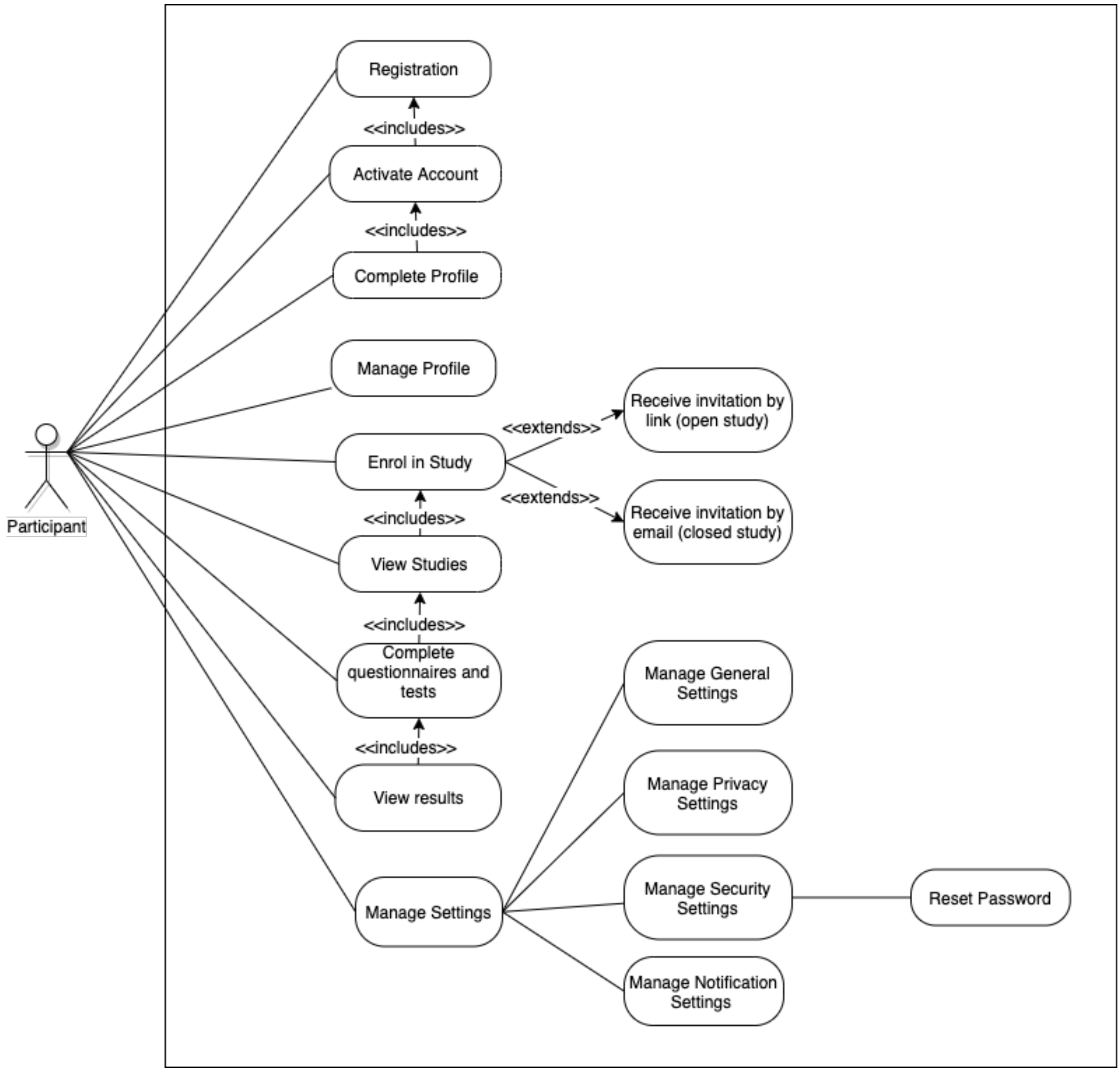


Figure 5: Use Cases for Participant Actor

3 Acceptance Criteria

In this section we illustrate several acceptance criteria that act as predefined requirements that must be met in order to mark a requirement of the system as complete. Also, acceptance criteria will help the team fully understand the conditions that have to be met for each requirement and will also provide a quick system testing solution. Here we break the acceptance criteria of the system into sections of user types. Each user type contains scenarios for which acceptance criteria are created.

3.1 All User Types

Scenario: User faces system error
Criterion: *Given that I'm a system user and I'm performing any action; the system should not contain any bugs or defects. In case any problem appears, it should be appropriately shown to me through the use of error pages and that contain an explanation to the problem.*

Scenario: User signs in with valid credentials
Criterion: *Given that I'm a logged-out user and I'm viewing the sign in page, when I provide my email and password to the login form and click the login button the system should direct me to my dashboard. The system should not take more than 4 seconds to log me in.*

Scenario: User signs in with invalid credentials
Criterion: *Given that I'm a logged-out user and I'm viewing the sign in page, when I provide a wrong email / password combination to the login form and click the login button the system should respond with an error message indicating that there was a problem with authentication.*

Scenario: User logs out of the system
Criterion: *Given that I'm a logged-in user and I'm viewing any page, when I click the logout button the system should redirect me back to the login page.*

Scenario: Signed-out user tries to access a system feature
Criterion: *Given that I'm a logged-out user and I'm viewing the sign in page, when I try to navigate to another page like my Dashboard the system should redirect me back to the login page.*

Scenario: User forgot password
Criterion: *Given that I'm a logged-out user and I forgot my password, when I click the "Forgot Password" link the system should redirect me to the forgot password page. Then the system should be able to receive my email through a form for sending a password reset link to the given email. The system should only send a reset password link to an email that is registered. The email should not take more than 5 minutes to arrive.*

Scenario: User views notifications

Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to see my notifications and also be able to mark them as read. Given that the system has unread notifications it should indicate that notifications are pending.*

Scenario: User language preferences

Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to navigate to a settings page where I change my language settings. I should be able to select from a drop-down list Greek or English. By selecting a language, the web app instantly changes all text to the selected language. I want this setting to be always set for my account even when I log in from another device or network.*

Scenario: User password change

Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to navigate to settings page where I can change my current password to a new password. I should be able to view a form where I can provide my old password and the new password I want to have. The form should require the new password entered twice for making sure the password is correctly entered. Password strength should be forced by the system. The system should not allow me to continue in changing the password if the two instances of the new password provided do not match. The system should also block the operation if the old password entered is wrong. In both cases an appropriate message should be displayed.*

Scenario: User profile update

Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to view a button that takes me to my profile page. The profile page should contain my information like email first name, last name etc. The profile page should also have an image. By clicking an edit profile button, the system should display a form that contains all my profile information. Using this form, I should be able to edit any details I want. Using a save button the system should be able to update my profile accordingly. The system should not allow me to update my profile if any information is missing, and appropriate messages should be displayed.*

Scenario: User profile picture update

Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to view a button that takes me to my profile page. In the profile page I should be able to change my profile picture. By clicking on edit profile button a tab should allow me to navigate to a page where I can select a new picture for my account. The system should allow me to crop the selected picture. The picture should not take more than 10 seconds to upload.*

Scenario: User Data Retrieval

Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to navigate to settings page where I can view all my information held by the system. I should be able to also download this information if I wish to do so.*

Scenario: Account deletion and Stop data Processing
Criterion: *Given that I'm a logged-in user and I'm viewing my dashboard; I should be able to navigate to settings page where using appropriate buttons I should be able to create a request to the system for deleting my account or for stopping the processing of my information. By selecting one of the two choices the system should send me a verification code via email for confirming that the action requested is valid and not done by accident. The email should not take more than 2 minutes to arrive. Once I enter the verification code the system should send me another email informing me that the request is being processed by the system. Once a request is validated another email has to inform me of the request's approval or denial. If a wrong verification code is provided the system should inform me that the code entered was wrong.*

3.2 System Administrator

Scenario: Create an Admin Account
Criterion: *Given that I'm in the role of a system administrator, I should be able to see options for creating new Admin accounts. A form should be provided for entering the basic details of an Admin account, like his / her email, first name, last name etc. and a save button to save it.*

Scenario: Create a DPO Account
Criterion: *Given that I'm in the role of a system administrator, I should be able to see options for creating new DPO accounts. A form should be provided for entering the basic details of a DPO account, like his / her email, first name, last name etc. and a save button to save it*

Scenario: Viewing and editing DPO and Admin accounts
Criterion: *Given that I'm in the role of a system administrator, I should be able to see a list of all DPO and Admin accounts. The system shows the "Search" section in the right top corner of the screen. When I fill in the "Search" field with the details of a user the list filters possible matches. The list shows the number of all displayed accounts. The list should provide buttons on each account record for editing it and also deleting it. By clicking on the delete button on an account record a prompt should be shown for confirming the action. If I click the edit button on an account record, a form is displayed and is populated with the information of the user account I selected. From there I can choose to edit the details of the selected account and click save to change the details of that user account.*

3.3 Admin

Scenario: Viewing research study statistics
Criterion: *Given that I'm in the role of an admin, I want to be able to view a dashboard that has statistics about studies. I want to be able to view the number of total studies, draft studies and canceled studies. The information on my dashboard should not take more than 4 seconds to load.*

Scenario: Create a new Notification Type
Criterion: *Given that I'm in the role of an admin, I should be able to see options for creating new notification types. A form should be provided for entering the name of the notification type I want to create and a save button to save it.*

Scenario: Viewing and Editing Notification Types
Criterion: *Given that I'm in the role of an admin, I want to be able to have access to a list of all the system's notification types. The system shows the "Search" section in the right top corner of the screen. When I fill in the "Search" field with the name of a notification type the list filters possible matches. The list shows the number of all displayed notification types. The list should provide buttons on each notification type record for editing it and also deleting it. By clicking on the delete button on a notification record a prompt should be shown for confirming the action. If I click the edit button on a notification record, a form is displayed and is populated with the name of the notification type I selected. From there I can choose to edit the name of the selected notification type and click save to change the details of that notification type.*

Scenario: Email notification when a new Researcher registers
Criterion: *Given that I'm in the role of an admin, each time a new Researcher registers on the platform I should be able to receive an email notifying me that a new Researcher account has registered so I can activate it. The email should arrive in the first five minutes after the Researcher has registered. The email should not provide any details specific to that Researcher for GDPR purposes.*

Scenario: Activate and Deactivate Researchers
Criterion: *Given that I'm in the role of an admin, I should be able to see a list of all registered researchers. The system shows the "Search" section in the right top corner of the screen. When I fill in the "Search" field with the details of a Researcher the list filters possible matches. The list shows the number of all displayed Researchers. The list should provide buttons on each Researcher record for activation and deactivation of the Researcher accounts. Each record should also display the current activation status. By clicking on the activate button on a Researcher record the researcher account gets activated. By clicking on the deactivate button on a Researcher record the researcher account gets deactivated. When a researcher gets activated or deactivated the system should notify the Researcher through email in less than 5 minutes. A deactivated Researcher cannot enter his/her account until it is reactivated again.*

3.4 Data Protection Officer

Scenario: Managing Data Claims
Criterion: *Given that I'm in the role of an DPO, I should be able to see a list of all data claim requests made by the users. The system shows the "Search" section in the right top corner of the screen. When I fill in the "Search" field with the details of a request the list filters possible matches. The list shows the number of all displayed requests. The list should provide buttons on each request record for approving or denying each of the requests. Each record should contain the type of the user requesting, the name of the user requesting, the date of the request and the current*

status and type of the request. By approving or denying a request the user should receive an appropriate email. When I take an action on any user request the system should inform me with an email whether the request was fully processed by the system. Processing of the request should not take more than 5 seconds.

3.5 Researcher

Scenario: Researcher registration
Criterion: *Given that I'm in the role of a researcher but I'm not yet registered, I should be to select my user type and the system should redirect me to an appropriate registration page. The registration page should contain a form where I can provide my email and password for registering. The system should require my password to be entered twice for making sure it is entered correctly. The system should account for the password complexity. If the email I provide is wrong or it already exists in the system an error message should appropriately inform me. If the passwords do not match an error message should also appear. If I provide all the information correctly on the form and click the register button, then the system should send me an email with a verification code and should redirect me to the login page. The email should arrive in no more than 5 minutes. Once I navigate to the link provided in the email the system should display a form with my email, the validation code and a button for verifying my account. By pressing this button, the system logs me in, but I shall not be able to access any functionality until my account is activated by an admin. An appropriate message must be displayed when I log in the system while the account is not yet activated.*

Scenario: Researcher first time login after activation
Criterion: *Given that I'm in the role of a researcher and my account is activated, when I log in for the first time, I should be able to provide all my profile information before moving on to accessing the rest of the system functionality. A form should be displayed requesting all the mandatory profile information. A save button should save the information and redirect me to my dashboard. If any information is omitted the system should provide an appropriate error message without redirecting me to the dashboard.*

Scenario: Researcher creates Research Study
Criterion: *Given that I'm in the role of a researcher, using a link from my dashboard the system should redirect me on a New page for creating a new research study. When creating a research study, I should be able to provide a name, a description, a publication date and an expiration date for the study. The publication date cannot be later than the expiration date. The interface should allow me to select from a number of research tests. I should then be able to order the tests for specifying the flow of the research study. Finally, I should be able to provide the research study availability. If I select a research study to be open, any participant can access it, if I select the research study to be closed then the interface should allow me to enter the emails of the participants whom are allowed to participate. I should be able to publish the research study using a publish button. On a successful publish of a closed research study the system should inform the allowed participants with an invitation link. The invitation link must not take more than 10 minutes to arrive to all participants inboxes. I should also be able to save a research study as a draft using*

an appropriate button. The system should allow a closed study to take as much participants as the ones registered.

Scenario: View a list of Research Studies

Criterion: *Given that I'm in the role of a researcher, I should be able to see a list of all research studies. The system shows the "Search" section in the right top corner of the screen. When I fill in the "Search" field with the details of a research study the list filters possible matches. The list shows the number of all displayed research studies. The list should provide buttons on each research study record for editing, deleting or copying the invitation link. Each list record should also display the current status, name, description and accessibility status of the research study. By clicking on the edit button on a research study record the system should redirect me to a page for editing the selected record. By clicking on the delete button on a research study record a prompt should be shown for confirming the action. When I click the copy invitation link button a message should confirm the successful operation of the invitation link being copied on my clipboard.*

Scenario: Edit a Research Study

Criterion: *Given that I'm in the role of a researcher, I should be able to edit a research study from the list of all research studies. I should be able to only edit the details of a research study that is not completed. By editing a research study, a form is displayed and is populated with all the research study information. Assuming that all mandatory fields are completed using an update button I should be able to submit the new research study information. If not all fields are correctly completed appropriate errors should be displayed. If a published research study is updated all participants that are taking place in the study should be automatically informed about the changes via email. The system should be able to send the email to all involved participants in under 10 minutes.*

3.6 Participant

Scenario: Participant registration

Criterion: *Given that I'm in the role of a participant but I'm not yet registered, I should be to select my user type and the system should redirect me to an appropriate registration page. The registration page should contain a form where I can provide my email and password for registering. The system should require my password to be entered twice for making sure it is entered correctly. The system should account for the password complexity. If the email I provide is wrong or it already exists in the system an error message should appropriately inform me. If the passwords do not match an error message should also appear. If I provide all the information correctly on the form and click the register button, then the system should send me an email with a verification code and should redirect me to the login page. The email should arrive in no more than 5 minutes. Once I navigate to the link provided in the email the system should display a form with my email, the validation code and a button for verifying my account. By pressing this button, the system logs me in.*

Scenario: Participant first time login

Criterion: *Given that I'm in the role of a participant and my email is verified, when I log in for the first time, I should be able to provide all my profile information before accessing the rest of the system functionality. A form should be displayed requesting all the mandatory profile information. A save button should save the information and redirect me to my dashboard. If any information is omitted the system should provide an appropriate error message without redirecting me to the dashboard.*

Scenario: Logged in Participant joins research study

Criterion: *Given that I'm in the role of a participant, when I receive an invitation email to join a research study, I want to be able to open that link, and view information about the research study like name description and duration. Also, I want to be able to select to join the research study or to simply deny the invitation without joining.*

Scenario: Logged out Participant joins research study

Criterion: *Given that I'm in the role of a participant but I'm not logged in, when I receive an invitation email to join a research study, I want to be able to open that link, and view information about the research study like name description and duration before I log-in. Also, I want to be able to use a login button to login for instantly joining the research study. If I login from the research study join page the system should redirect me to the research study join page again once I login for successfully joining the study.*

Scenario: Not registered Participant joins research study

Criterion: *Given that I'm in the role of a participant but I'm not registered on the platform, when I receive an invitation email to join a research study, I want to be able to open that link, and view information about the research study like name description and duration before I register. Also, I want to be able to use a register button to register for instantly joining the research study. If I register from the research study join page the system should redirect me to the research study join page again once I login for the first time for successfully joining the study.*

Scenario: Participant views a list of research studies

Criterion: *Given that I'm in the role of a participant I want the system to display a list of research studies that I joined my dashboard.*

Scenario: Participant selects from the list of research studies

Criterion: *Given that I'm in the role of a participant, once I select a research study from the list of joined studies, I want the research tests and questionnaires for the research study to be displayed. Each research test/ questionnaire should have a completion percentage next to it with a button that allows me to start or resume the test / questionnaire.*

Scenario: Participant starting a test / questionnaire

Criterion: *Given that I'm in the role of a participant, once I select to start completing a questionnaire or a research test, I want to be able to view appropriate instructions before the actual test or questionnaire begins. Also, I want to be able to see the average time taken to complete the test / questionnaire before starting.*

Scenario: Participant performing a trial test

Criterion: *Given that I'm in the role of a participant, once the research test begins, I want to be able to go through some trial example tests for making sure that I fully understood the instructions. An indicator should specify if the current test is a trial or not. Also, trial tests should indicate whether the answer I provided was correct or wrong. Once the real test begins, the system should indicate with a popup that the trial session is over.*

Scenario: Participant successfully finishing a test

Criterion: *Given that I'm in the role of a participant, once I complete a research test, the system should display some performance statistics. Performance statistics should be relevant to the test undertaken. The system should also provide me with a rank number of how well I did, compared to other participants. A back button should exist for easily navigating back to the dashboard for selecting another test.*

4 Data Requirements

Further analysis of the use cases presented in the previous section reveals the following requirements for data structures:

- User Roles: Description of user roles
    - Id, Name
- User Claims: Information about users' claims
    - Id, User id, Claim type, Claim value
- User Logins: Information about users' login
    - Login provider, Provider key, User Id
- Users: Information about users' security
    - Index number, Email, Email confirmed, Password Hash, Security Stamp, Phone number, Phone number confirmed, Two Factor Enabled, Lock out end date etc., Lockout enabled, Access failed count, Username
- AUDIT_LOGINS: For providing an audit log for logins
    - User Id, Logged in, Logged out
- BUSINESS_ROLE_EXPERTISE_TEST: Answers about Business Role Expertise questionnaire
    - Research Test Id, Research Study Id, Participant Id, Business Role, Working months, Responsibility 1, Responsibility 2, Responsibility 3, Pain point 1, Pain point 2, Pain point 3, Wish 1, Wish 2, Wish 3, Perceived Expertise Part A answer 1, , Perceived Expertise Part A answer 2, , Perceived Expertise Part A answer 3, Perceived Expertise Part A answer 4, Perceived Expertise Part A answer 5, Perceived Expertise Part A answer 6, Perceived Expertise Part A answer 7, Perceived Expertise Part A answer 8, Perceived Expertise Part A answer 9, Perceived Expertise Part A answer 10, Perceived Expertise Part B answer 11, Perceived Expertise Part B expertise two categories, Perceived Expertise Part B answer 12, Perceived Expertise Part B answer 13, Perceived Expertise Part B answer 14, Is draft
- COUNTRIES: Information about the countries
    - Country Id, Country name, A2, A3, Code
- DATA_ANALYSYS_TASKS_TEST: Answers about Data Analysis Tasks questionnaire
    - Research Test Id, Research Study Id, Participant Id, Business Task 1, Business Task 2, Business Task 3, how often you use data visualizations, hours interacting with data visualizations, Requests for data analysis, Frequent request 1, Frequent request 2, Frequent request 3, Use R tool, Use Python tool, Use Sas tool, Use Stata tool, Use

Tableau tool, Use Power Bi tool, Use excel tool, Use other tool, Action 1, Action 2, Action 3, Action 4, Action 5, Action 6, Action 7, Action 8, Action 9, Action 10, other Actions, Frequent Question Dataset, Frequent Question Explore, Frequent Question Relationship, Frequent Classification, Frequent Question Classification, Frequent Question Anomaly detection, Frequent Question Prediction, Frequent Question Composition, Frequent Question Geographical Analysis, Is draft

- DATA_VIS_EXPERIENCE_TEST: Answers about Data Visualization Experience questionnaire
  - Research Test Id, Research Study Id, Participant Id, Use Graph, Use Tables, Use both, Comparison 1, Comparison 2, Comparison 3, Distribution 1, Distribution 2, Distribution 3, Correlation 1, Correlation 2, Correlation 3, Deviation 1, Deviation 2, Deviation 3, Cycle 1, Cycle 2, Cycle 3, Composition 1, Composition 2, Composition 3, Trend 1, Trend 2, Trend 3, Relationship 1, Relationship 2, Relationship 3, Table 1, Table 2, Table 3, Combination, Column chart complexity, Bar chart complexity, Line chart complexity, Area chart complexity, Pie chart complexity, Scatter plot complexity, Bubble chart complexity, Gauge complexity, Radar chart complexity, Frame diagram complexity, Rectangular tree diagram complexity, Funnel chart complexity, Word cloud chart complexity, Gantt chart complexity, Map complexity, Heatmap complexity, Complex visualizations, Simple visualizations, Visual Literacy answer 1, Visual Literacy answer 2, Visual Literacy answer 3, Visual Literacy answer 4, Visual Literacy answer 5, Visual Literacy answer 6, Visual Literacy answer 7 Visual Literacy answer 8, Visual Literacy answer 9, Visual Literacy answer 10, Is draft
- DECISION_MAKING_STYLE_INVENTORY_TEST: Answers about Decision Making Style Inventory questionnaire
  - Research Test Id, Research Study Id, Participant Id, Answer 1, Answer 2, Answer 3, Answer 4, Answer 5, Answer 6, Answer 7, Answer 8, Answer 9, Answer 10, Answer 11, Answer 12, Answer 13, Answer 14, Answer 15, Answer 16, Answer 17, Answer 18, Answer 19, Answer 20, Answer 21, Answer 22, Answer 23, Answer 24, Answer 25
- DP_REQUEST_TYPE: Information about DPO request type
  - Request type Id, Request type name, Comments
- DP_REQUESTS: Information about DPO requests
  - Request Id, Create User Id, Assigned to DPO Id, DPO Request type Id, Create Date Time, Handled Date Time, Status, OTP, Comments

- DPO: Information about DPO
  - DPO Id, First name, Last name, Middle name, Telephone, email
- EMOTION_REGULATION_TEST: Answers about Emotion Regulation questionnaire
  - Research Test Id, Research Study Id, Participant Id, Answer 1, Answer 2, Answer 3, Answer 4, Answer 5, Answer 6, Answer 7, Answer 8, Answer 9, Answer 10, Answer 11, Answer 12, Answer 13, Answer 14, Answer 15, Answer 16, Answer 17, Answer 18, Answer 19, Answer 20, Answer 21, Answer 22, Answer 23, Answer 24, Answer 25, Answer 26, Answer 27, Answer 28, Answer 29, Answer 30, Answer 31, Answer 32, Answer 33, Answer 34, Answer 35, Answer 36
- EXECUTIVE_SKILLS_TEST: Answers about Executive Skills questionnaire
  - Research Test Id, Research Study Id, Participant Id, Answer 1, Answer 2, Answer 3, Answer 4, Answer 5, Answer 6, Answer 7, Answer 8, Answer 9, Answer 10, Answer 11, Answer 12, Answer 13, Answer 14, Answer 15, Answer 16, Answer 17, Answer 18, Answer 19, Answer 20, Answer 21, Answer 22, Answer 23, Answer 24, Answer 25, Answer 26, Answer 27, Answer 28, Answer 29, Answer 30, Answer 31, Answer 32, Answer 33, Answer 34, Answer 35, Answer 36
- EYSENCK_PERSONALITY_TEST: Answers about Eysenck Personality questionnaire
  - Research Test Id, Research Study Id, Participant Id, Answer 1, Answer 2, Answer 3, Answer 4, Answer 5, Answer 6, Answer 7, Answer 8, Answer 9, Answer 10, Answer 11, Answer 12, Answer 13, Answer 14, Answer 15, Answer 16, Answer 17, Answer 18, Answer 19, Answer 20, Answer 21, Answer 22, Answer 23, Answer 24, Answer 25, Answer 26, Answer 27, Answer 28, Answer 29, Answer 30, Answer 31, Answer 32, Answer 33, Answer 34, Answer 35, Answer 36, Answer 37, Answer 38, Answer 39, Answer 40, Answer 41, Answer 42, Answer 43, Answer 44, Answer 45, Answer 46, Answer 47, Answer 48
- LANGUAGES: Information about the system language
  - Language Id, Language name, Original name
- NOTIFICATION_TYPES: Information about the notification types
  - Notification type Id, Notification type name
- NOTIFICATION: Information about the notifications
  - Notification Id, User Id, Notification Subject, Notification Text, Notification Type Id, To user id, Notification URL, Create date, Notification status, Is new, Is archived, Is deleted

- PARTICIPANTS: Information about the participants
  - Participant Id, First name, Last name, Middle name, Telephone, Date of birth, Gender, Nationality Id, Age, Has bachelor, Has PhD, Has master, Organization name
- PASSWORD_RESET_CODES: Information about reset password
  - Aspnet user ID, Reset Code, Is reset, Date added
- PROBLEM_SOLVING_STYLE_TEST: Answers about Problem Solving Style questionnaire
  - Research Test Id, Research Study Id, Participant Id, Answer 1, Answer 2, Answer 3, Answer 4, Answer 5, Answer 6, Answer 7, Answer 8, Answer 9, Answer 10, Answer 11, Answer 12, Answer 13, Answer 14, Answer 15, Answer 16, Answer 17, Answer 18, Answer 19, Answer 20
- RESEARCH_STUDY: Information about research studies
  - Research Study ID, Study name, Description, Creator Id, Status, Join Code, Publication date, Expiration date, Closed
- RESEARCH_STUDY_ALLOWED_PARTICIPANTS: Information about people allowed to participate in each research study
  - Research Study ID, Participant Email
- RESEARCH_STUDY_PARTICIPANTS: Information about which Participant, participates in which Research Study
  - Research Study ID, Participant Id
- RESEARCH_STUDY_TESTS: Information about the tests in research studies
  - Research Study ID, Research Test ID, Test order
- RESEARCH_TEST: Information about the tests
  - Research Test ID, Test Id, Test acronym, Description, Test link, Is active, Allow resubmission
- RESEARCHERS: Information about the researchers
  - Researcher Id, First name, Last name, Middle name, Telephone, Date of birth, Gender, Nationality Id, Age, Organization name
- RESOURCE_MANAGER: Information about resources in English and Greek languages
  - Resource category, Resource key, Language, Resource value
- SYSTEM_SETTINGS: Information about system settings
  - Name, Value
- TEST_ANSWER: Information about test answers

  - Research Study ID, Test Question Id, Participant Id, Answer String, Answer Int, Start date time, Response date time, Response time MS, Is correct, Correct answer
- TEST_QUESTION_TYPES: Information about test question types
  - Test question type ID, Type name
- TEST_QUESTIONS: Information about test questions
  - Research Study ID, Test Question Id, Question number, Is demo, Question name, Uses metadata, Test question type Id, Correct, answer
- TEST_QUESTIONS_METADATA: Information about the test questions metadata
  - Test Question Id ,Meta String1, Meta String2, Meta String3, Meta String4, Meta String5, Meta Number1, Meta Number2, Meta Number3, Meta Number4, Meta Number5, Meta Binary1, Meta Binary2, Meta Binary3, Meta Binary4, Meta Binary5, Meta Link1, Meta Link2, Meta Link3, Meta Link4, Meta Link5, Meta String6, Meta String7, Meta String8, Meta String9, Meta String10, Meta Number6, Meta Number7, Meta Number8, Meta Number9, Meta Number10, Meta Binary6, Meta Binary7, Meta Binary8, Meta Binary9, Meta Binary10, Meta Link6, Meta Link7, Meta Link8, Meta Link9, Meta Link10
- USER_TYPE: Information about the user's role
  - User type Id, User type description
- USERS: Information about the users
  - User Id, Aspnet user Id, User type Id, Status validated, Status active, Language Id, Email activation Id, Email is activated, Filestream Id, User photo, Show background, Accepted terms, Accepted privacy, Show instructions
- VISUALIZATION_TYPES: Information about the visualization types
  - Visualization Id, Visualization name

The relationships between the identified entities can be seen in the miniature Entity-Relationship Diagram presented in the Figure below. The complete (high resolution) Entity-Relationship Diagram is provided in Appendix 2.

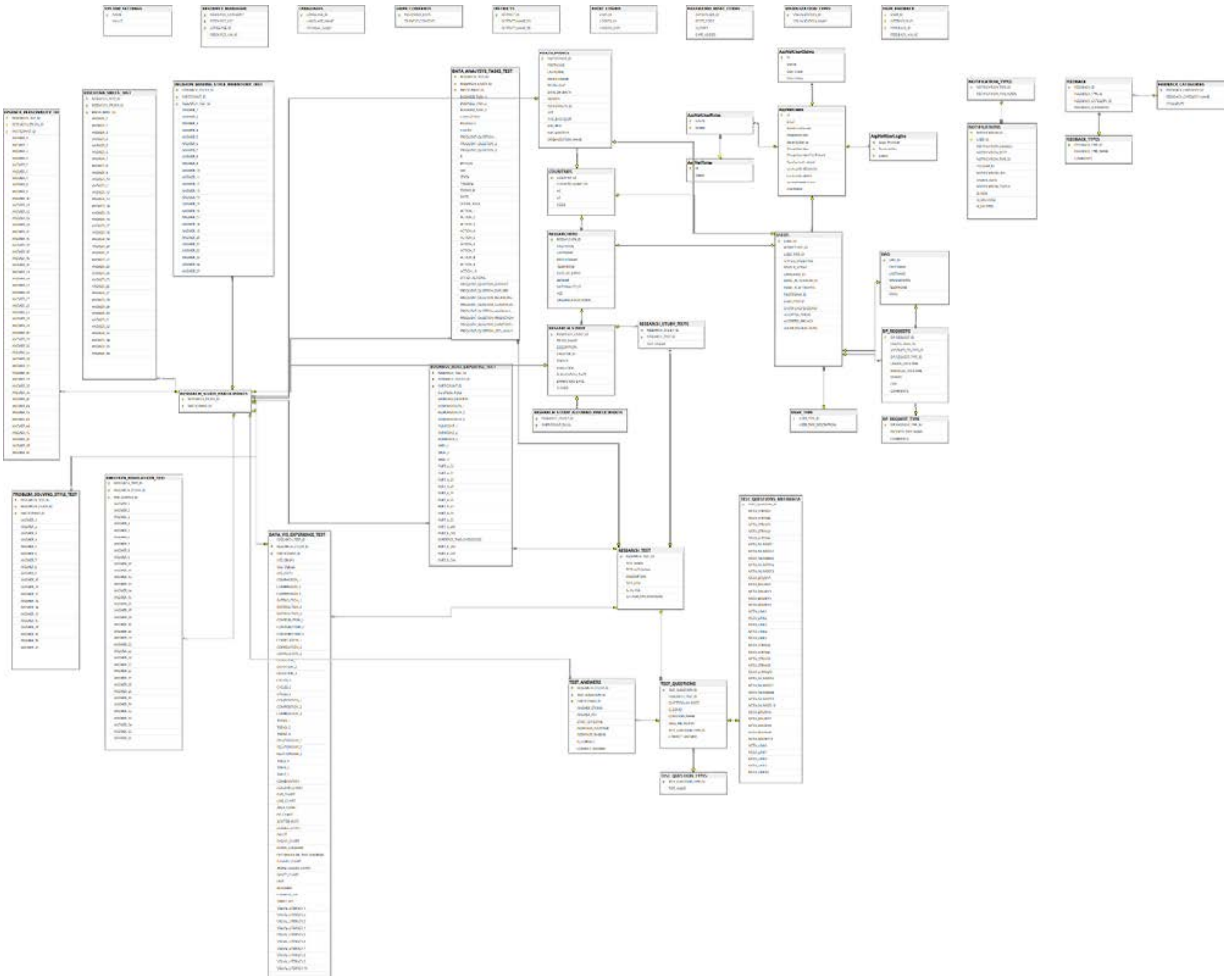


Figure 6: Entity/Relationship Class Diagram

5 Technical Requirements

This section discusses the technical aspects and requirements that the system should fulfil. By technical requirements we are referring to performance-related issues, reliability issues, security issues, availability issues etc. All technical requirements are a result of a thorough usage analysis done. Moreover, this section discusses the technology stack required by the system for its proper operation.

5.1 Usage Analysis

This section describes the various system usage patterns that are expected to be taken by all the user types. This analysis helps us identify the possible load that is expected to be taken by the system.

Usage Topic	Description
Number and Type of Users	This platform will be served by a Business to Employee deployment, meaning that each Employee (Directors, Data Analysts, Managers) will have a user account. The system should at least accommodate for 200 concurrent connections at a time. User types include Participants, Researchers, Admins and Data Protection Officers. The majority of registered accounts in a system Instance will be of Participant type, therefore a close look on the actions performed by Participant accounts is required.
Active and Inactive Users	Active users represent registered users that are logged in and are operating the system whereas Inactive users represent registered users that are logged out. This measurement presents a ratio of activity patterns of active and inactive users. The expected rate is 70% of the users to be in concurrent operation while the rest 30% being inactive.
Usage Patterns	Usage patterns aim to illustrate how different user types will access the system. The peak usage times of the system will be during working hours i.e. 09:00 AM – 17:00 PM. Moreover, user expected connectivity duration is expected to be Very High for Participants, Low for Researchers and very Low to Rare for Administrators and Data Protection Officers.
Usage Growth	User growth for this type of system strongly depends on the recruitment of new employees within a company. For accommodating the needs of any company, the system will implement appropriate Administration controls for allowing the Activation and Deactivation of user accounts.
User Transactions	User transactions are the tasks to be performed by each user type, this was illustrated in the Use Cases in Section 2. Moreover, the Participant user types that accumulate most of the active accounts in the system are expected to intensively use the system in 2-hour intervals with 30 minutes of each interval mostly being inactive, as data analysis tasks also require interpreting results given by the platform.

5.2 System Requirements - Non-Functional Requirements

System Quality	Description
Availability	By availability we are referring to the systems' *uptime.* The system aims to achieve a *99.9%* availability which results in only 9 hours of possible downtime per year.
Performance	All user types should expect a reasonable response time upon login, typically no greater than 4 seconds. Moreover, all page requests should not take more than 4 seconds assuming a healthy connection to the server. The system should be also able to perform more than 500.000 Queries Per Hour assuming appropriate hardware is provided.
Scalability	The system should be able accommodate the instant addition of new users. Moreover, the system should be able to expand and make use of newly developed services that can work with existing ones in a graceful manner. Finally, the system should be interoperable, so it can be integrated with other existing software products, i.e. for data integration.
Security	All users should be required to authenticate before using any platform service. Moreover, each user type should be authorised to perform actions related to his/her role. All users should perform email verification before being able to use the system. Researcher users should be allowed access by the Admin of the system. The system should log all actions taken by users and any errors generated by the system.

5.3 Technical Environment of the System

The system needs to be interoperable and compatible with other existing services. For that reason, we have chosen to use a framework that supports REST APIs. The core of the system is built on ASP .NET Web Forms, a framework that allows us to build web applications using Web APIs and Event handlers. The said technology is built to run on Windows Servers and specifically on the IIS express server. The next important component in the systems technical environment is the database. The database system chosen for the platform is Microsoft SQL Server. We assume that the system will follow the SOA (Service Oriented Approach). We have selected this development approach for eliminating future development, maintenance and scalability constraints. SOA aims to organize system components according to the services they provide and according to business processes. Each of the services represents a clear and well-defined function that fulfils a purpose, while each service operates separately from the platform that is using it. Moreover, the SOA approach has multiple other benefits that support our design and development processes. Most importantly SOA allows for a loosely coupled design as each major component is a separate service that communicates with the platform through the use of interfaces, implemented by web services. Also, this approach allows for reusability and location transparency since the platform calling the services knows nothing about how each service is implemented. Since communication between services happens through the use of web services (API's) the SOA approach allows for each of the services to be language / framework agnostic, meaning that we can have a service running on C# code and another service running on Python.

The proposed approach allows for more platform scalability as each service can be hosted on a different machine that operates separately from the others, allowing for a different server setup and configuration that is applicable to that service. Finally, SOA allows for a more resilient platform that minimises the chance of the whole system going down, since if a service has a problem the whole system is not affected directly but instead some functionality will be.

6 Operational Flow

This section provides a preliminary view of the navigational flow of all the platform users. After landing on the platform's Login Page (INDEX), all new users will have to go through the Sign-Up process by completing a Sign-Up form and by agreeing to the platform's terms and conditions. After completing the Sign-Up process, users will have to wait for the activation of their profile, in order to be able to Login to the platform.

Account activation will work hierarchically. Admins will be activating Researchers Accounts. At the first Logging In, Participant and Researcher users will need to complete their personal profile information. After completing their profile, they will be automatically directed to their Dashboard Space.

Each User Group will be able to perform global tasks as well as specific tasks and view specific controls on their Dashboard. These actions and controls are explained below:

- Admin will be able to View Statistics, Manage Notifications, Activate Researchers and Manage settings.
- Researcher will be able to Complete their Profile Information, Edit their Profile, View Notifications, Manage Research Studies and Manage Settings.
- Participant will be able to Complete their Profile Information, Edit their Profile, View Notifications, View / Complete Research Studies and Manage Settings.
- DPO will be able to Complete their Profile Information, Edit their Profile, View Notifications, Manage Privacy Claims and Manage Settings.

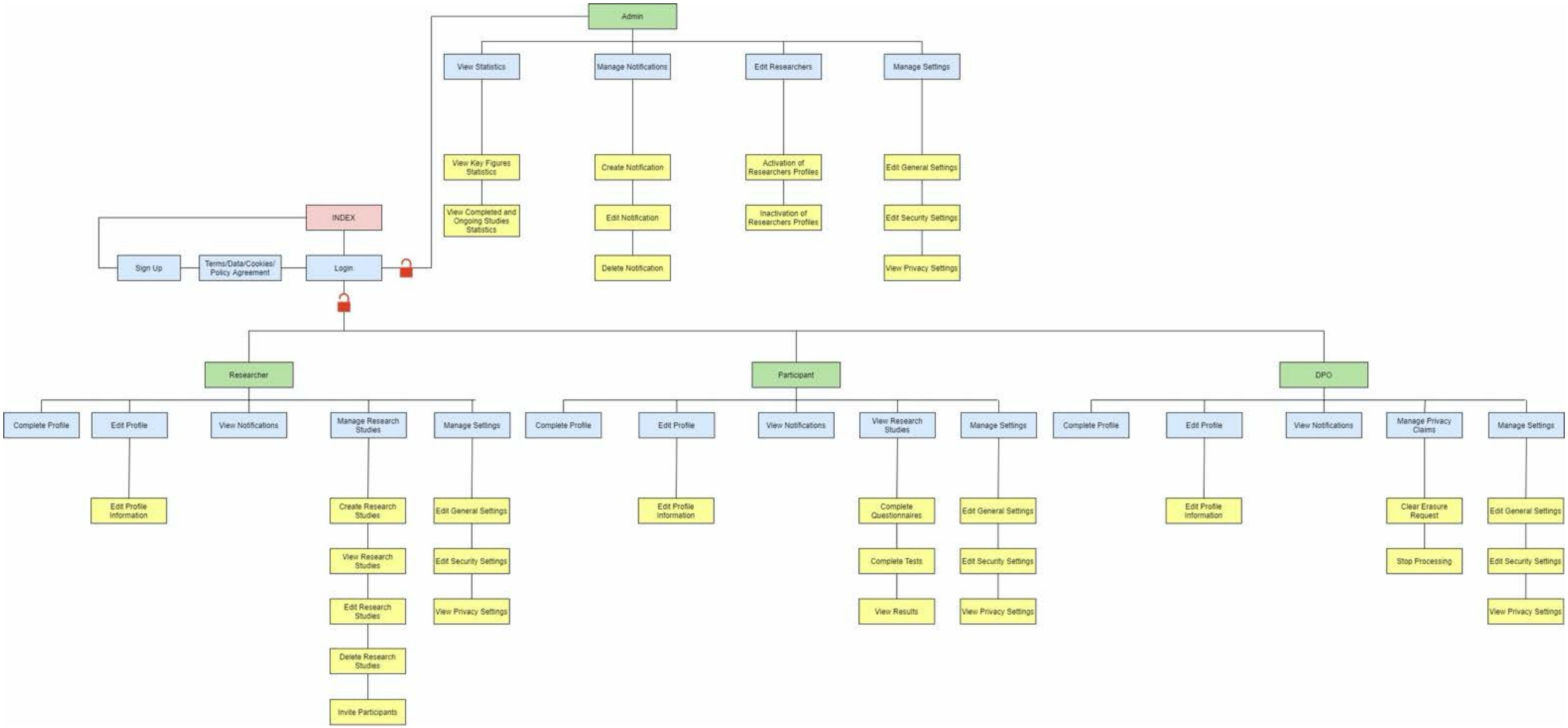


Figure 7: Navigation Flows for All Actors

7 User Interface Design

This chapter provides screenshots of the overall design of the User Interfaces (UI) of the actual platform, according to User Experience (UX) and Web Design principles and trends.

It is important to note that both, UX and UI, were designed after analyzing the requirements collected and according to the Use Cases and Navigation Flow shown above and Activity Flows presented in Section 12 of this report.

7.1 User Experience and User Interface

In order for the platform to be easy to use and delightful to interact with on any device, fundamental UX principles were considered while designing the components of the UI interfaces. In UX, graphics, layout, text, and interactive elements work together to present the user with an experience, not just present them with information.

Overall, the UX proposed includes simple language, instead of technical terms, and the UIs were designed by having in mind both, functionality and aesthetics. Throughout the design, users are pushed to achieve their goals in short time and without too much thinking. Operating parts stand out and convey correct information to users, who can operate the interface mainly based on life experiences and instinct, without extra learning. Figure 8 present the wireframes based on which the UIs of the Web App were designed.

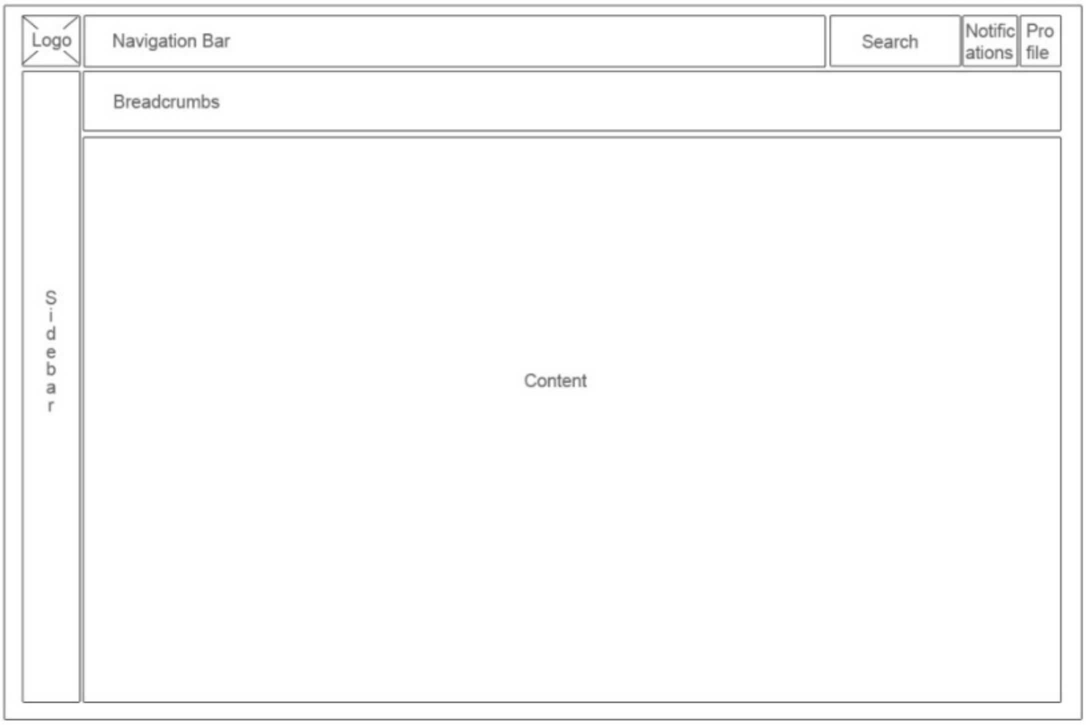


Figure 8: Web App Wireframe

The following subsections provide more detailed information on the design of the UI, and on how the different User Groups will interact with the interface, in order to navigate and achieve their goals.

7.2 Visual Design

The design approach used for designing the system's UIs is "flat" and minimalistic. This new design trend is an answer to the need for more simplicity in a world with an overflow of information. Everything that is superfluous has been removed from the design. It therefore has a very clean and crisp 2D look. The elements designed are simple and without any 3D effects (e.g. without too many shadows, bevels, embossing, gradients etc.). The typography used is simple and the colors are lively. The following Mood Board (Figure 9) presents the color palette (produced based on the colors of the current IDEALVis logo), typography, buttons and form fields used throughout the system.

Figure 9: Mood Board

8 Web Landing Page

To access the platform from a browser on the Web, users will need to visit the project's landing page. This will be a one-page website including information regarding the project's scope, objectives and the consortium. In addition, the landing page will include a link to enter the platform. The design of the landing page (Figure 10) follows the "flat design" approach too and a very similar Mood Board.

Figure 10: Web Landing Page

9 User Login and Sign Up

The following subsections provide information on the Login and Sign-Up procedures that users will have to go through, before they start using the platform through the Web. The Login procedure will be followed by returning users, while the sign-up procedure will be followed by new users.

9.1 Web App Login and Sign up

A desktop or a tablet user will enter the platform space where he/she will need to provide his/her details (email address and password), in order to Login/sign-in to the system. Figure 11 presents the Web App Login Page, which was designed to include a "Keep me Logged in" checkbox that users will be able to check if they would like the system to keep them authenticated in case they close their browser application or tab, and a "Forgot Password" link that users will be able to use to reset their password.

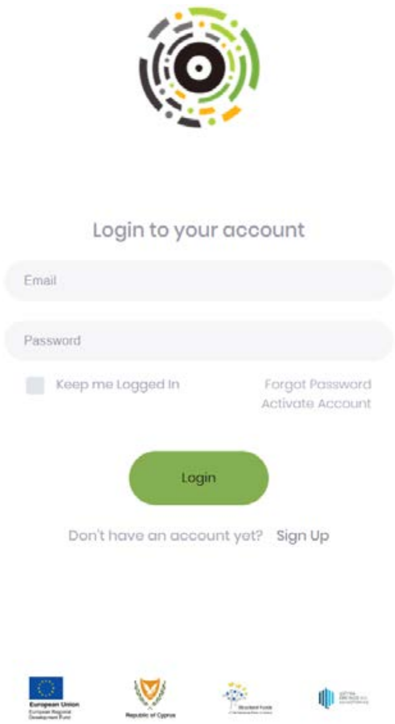


Figure 11: Web App Login Page

On this screen, a first-time visitor who is a Participant or Researcher and does not have an account will have the ability to select Sign Up. By clicking Sign Up, the user will be redirected to a new page where he/she will have to select whether he/she wishes to sign-up as a Participant or a Researcher (Figure 12).

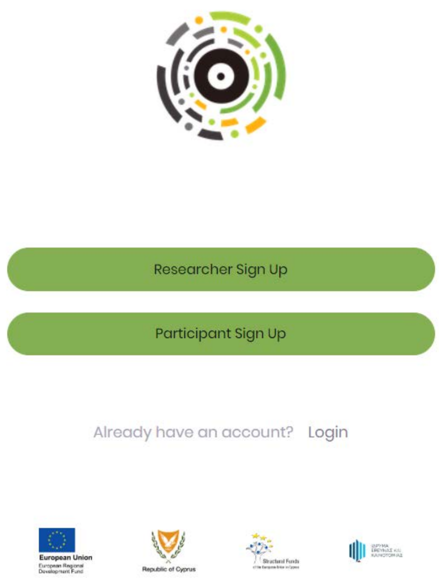


Figure 12: User Category Sign Up List

According to the above selection, the user will be moved to the appropriate form where he/she will have to fill-in his/her details, agree to the platform's terms, conditions and privacy policy, and click the submit application button, in order for the sign-up enquiry to be sent for approval. Figure 13 presents the sign-up form. After completing the sign-up form, an email will be sent to the user’s email account with a unique activation code, in order to activate their account. A relevant notification message (Figure 14) is also shown to inform the user that his/her account has been created and that an account activation code has been sent to his/her email. In case the user does not activate his/her account, he/she will not be able to access the IDEALVis platform. Figure 15 illustrates an example alert message indicating to the user that has not activated his/her account yet.

It is also worth mentioning that by clicking on the bold text "Terms and Conditions", "Privacy Statement", or “Security Tips”, the user will have the ability to view the terms and conditions (Figure 16), the privacy statement (Figure 17), and the security tips (Figure 18), respectively, through a pop up message.

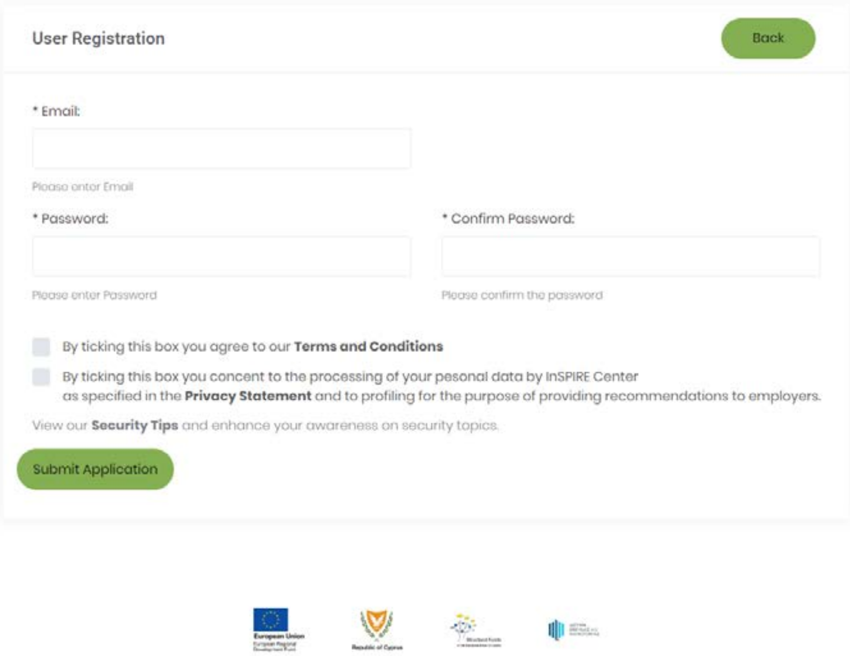


Figure 13: Sign Up Form with Submit Application Button

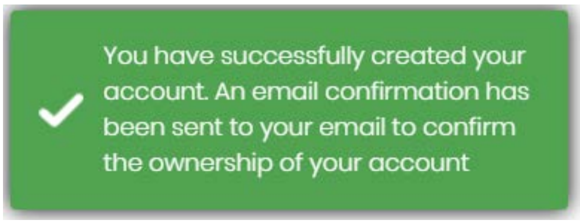


Figure 14: Alert message after successfully creating an account in the IDEALVis platform

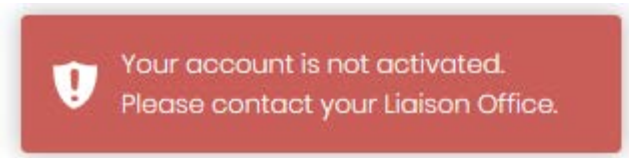


Figure 15: Alert message indicating to the users that they have not activated their account through their email

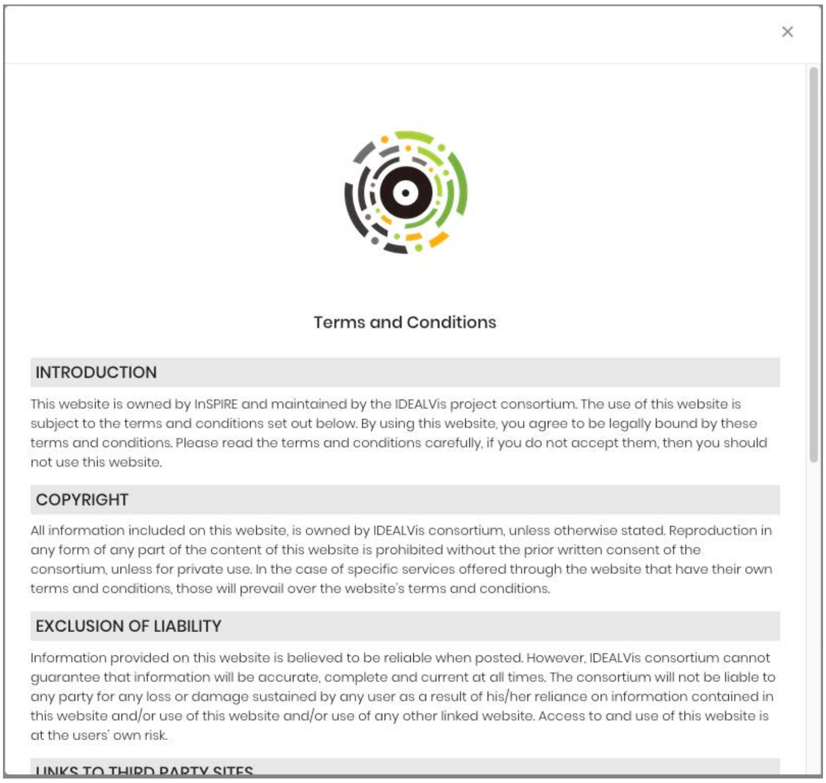


Figure 16: Terms and Conditions pop up window

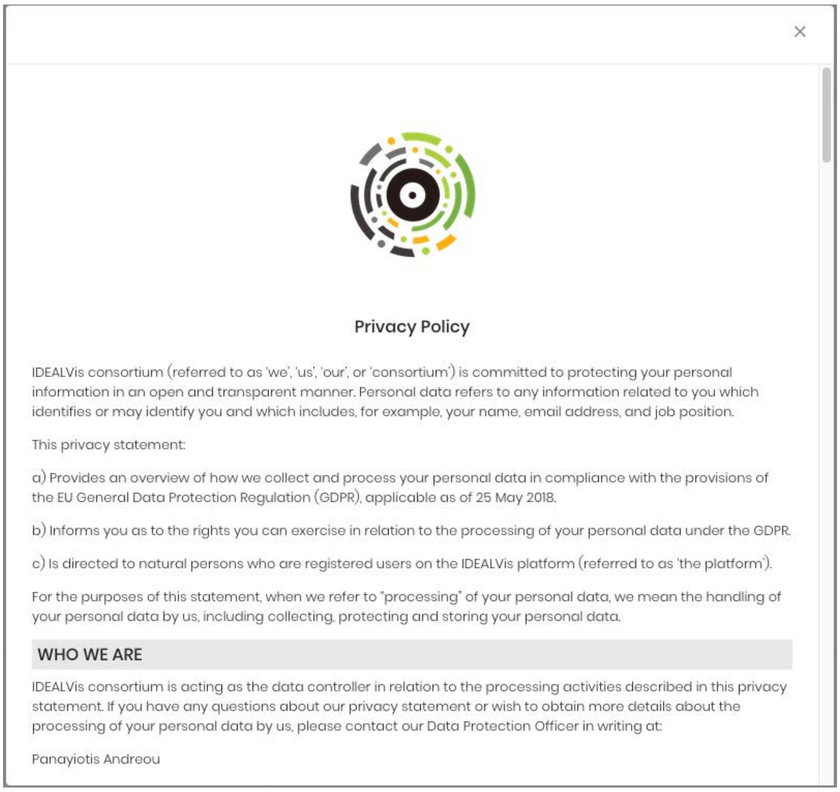


Figure 17: Privacy Policy pop up window

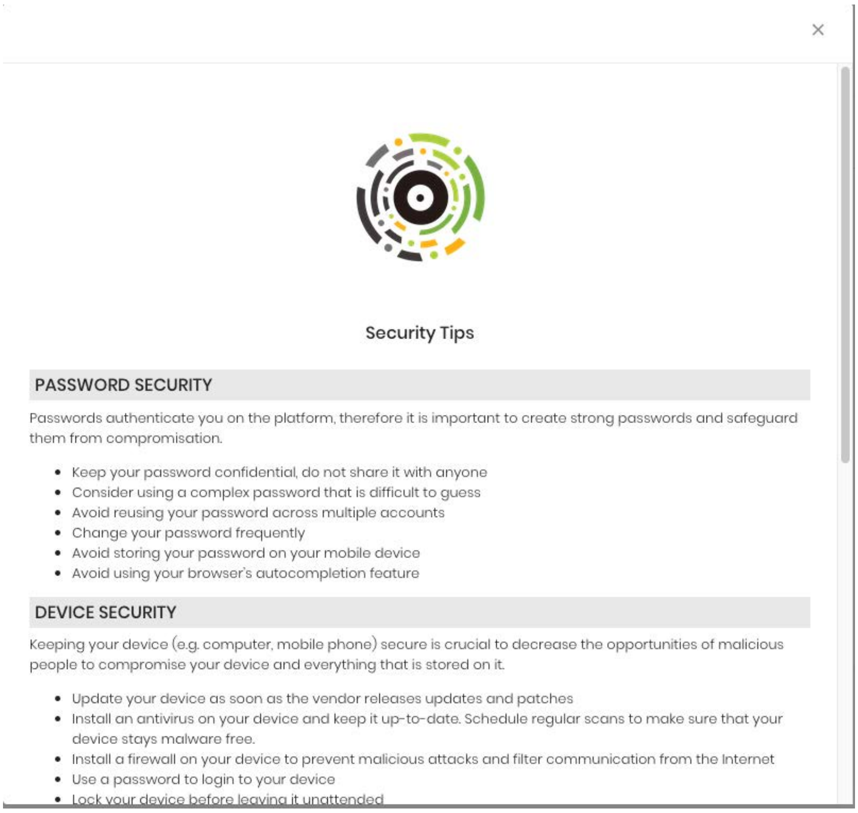


Figure 18: Security Tips pop up window

Furthermore, after the users activate their account, they will be redirected to a user profile form in which they are required to enter more information about themselves. Figure 19 illustrates an example user profile registration form for entering information in the user profile (e.g., full name, gender, Organization name, etc.).

Once the form is filled in correctly and the application is submitted, if the user account is of Participant type, then the user will be logged in. In case the account is of Researcher type, then the user will receive a pop-up message that his/her registration to the system is pending approval and that he/she will be notified by email once the registration request has been approved. The Registration Pending Approval message is presented in Figure 20.

Once this message is viewed, the Researcher will have to wait until an Admin validates their user profile. Once the account is validated, the user will receive a relevant email, and can then start accessing and using the system.

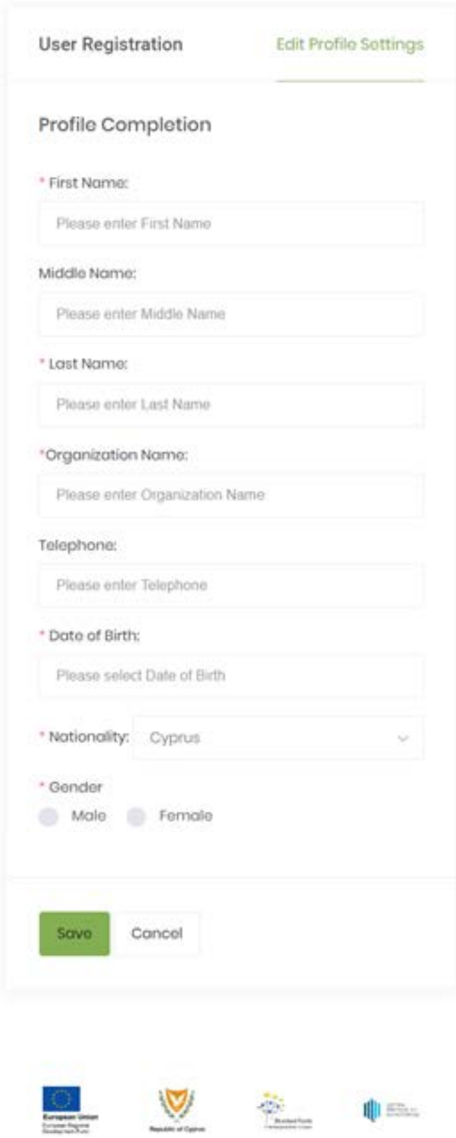


Figure 19: Registration form in which users fill in information about themselves to create their user profile

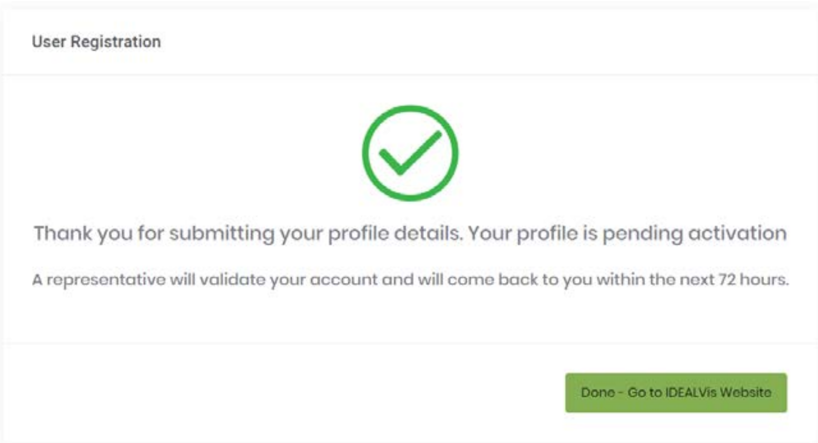


Figure 20: Registration Pending Approval Message

The activity flow that illustrates the functionality of the "Login", "Registration" and "Reset Password" of the platform is presented in Section 12 of this report.

10 Navigation Menus

The following subsections provide information on the Navigation Menus and Navigation Links available to each User Group/Actor after their profiles are activated and after a successful Sign In/Login. The Navigation Menus were developed according to the actions that each User Group/Actor should be able to perform within the system.

10.1 Participant Web App Navigation Menu

By using the Navigation Menu, **Participants** who are successfully Signed In into the platform will have the ability to explore the Participant Dashboard. Figure 21 presents the Participant Web App Navigation Menu.

Figure 21: Participant Web App Navigation Menu

10.2 Researcher Web App Navigation Menu

By using the Navigation Menu, **Researchers** who are successfully Signed In into the platform will have the ability to explore the Researcher Dashboard and Management. The Management navigation link will be a drop-down list with the option to create and view research studies. Figure 22 presents the Researcher Web App Navigation Menu.

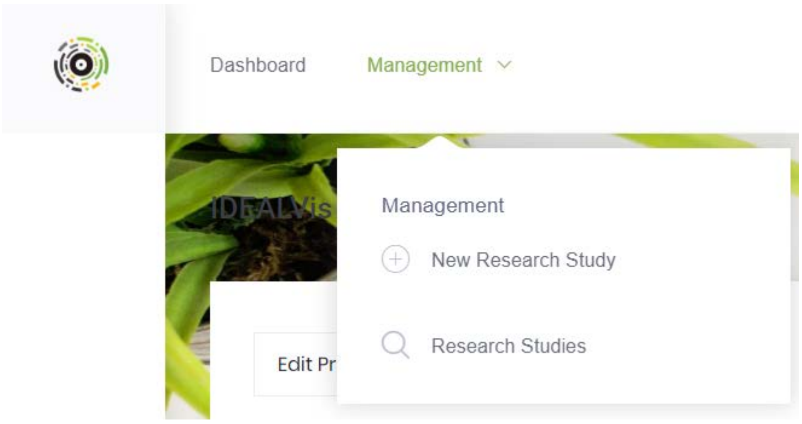


Figure 22: Researcher Web App Navigation Menu

10.3 Admin Web App Navigation Menu

By using the Navigation Menu, **Admins** who are successfully Signed In into the platform will have the ability to explore the Admin Dashboard and Administration. The Administration navigation link will be a drop-down list with the option to manage users (activate researchers) and manage data (notification types) . Figure 23 presents the Admin Web App Navigation Menu.

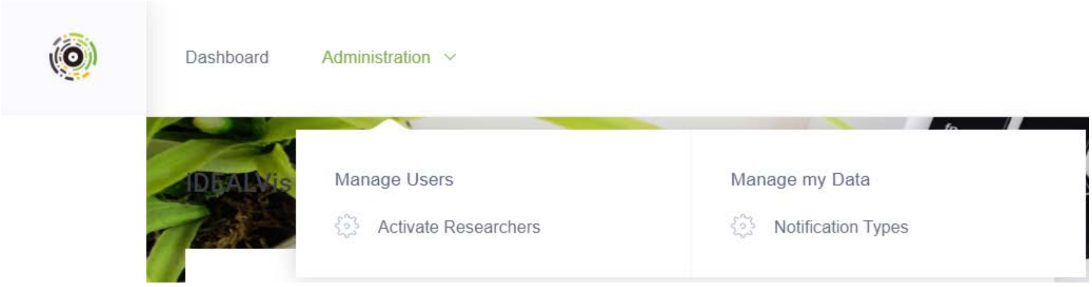


Figure 23: Admin Web App Navigation Menu

10.4 DPO Web App Navigation Menu

The DPO User/Actor will only be able to manage requests related to Privacy and Data. In particular, this user will only be able to explore a section called Manage Account Requests. Figure 24 presents the DPO Web App Navigation Menu.

Figure 24: DPO Web App Navigation Menu

11 Page/Screen Graphics & Design

Pages were designed for the main screens/pages that all User Groups/Actors will have to go through in order to achieve their goals through the Web App. At this point, it is important to mention again that these pages were designed based on the Use Cases and Navigation Flows shown in Section 2 and Section 6 respectively. Moreover, in order to avoid duplication of work, pages that should include similar or slightly altered graphics and components to the pages presented in this report were not designed. In other words, the components, graphics and elements included in the pages that are presented throughout this report should be enough for creating all the pages/screens of the IDEALVis Platform.

11.1 Dashboard and Main Header

The Dashboard will be the first page/screen that all users will be viewing after a successful login. The information presented on the Dashboard will be automatically tailored, according to the User type. Mainly, the Dashboard area will include the profile, statistics or studies and notifications concerning the actor's/user's engagement with the platform. In addition, through the Web App's Dashboard area (Figure 25, Figure 26), actors will be able to access the main header of the platform that includes the navigation menu, their notifications, the search function and actions related to their account and profile (view profile, manage security settings, view Frequently Asked Questions (FAQs), ask for support and logout). Figures 25, 26, and 27 present the Admin Dashboard, Researcher Dashboard and Participant Dashboard, respectively. The Admin Dashboard shows key figures as well as completed and ongoing studies. The Researcher Dashboard presents the user's profile and his/her notifications. The Participant Dashboard shows the user's profile, the studies and his/her notifications.

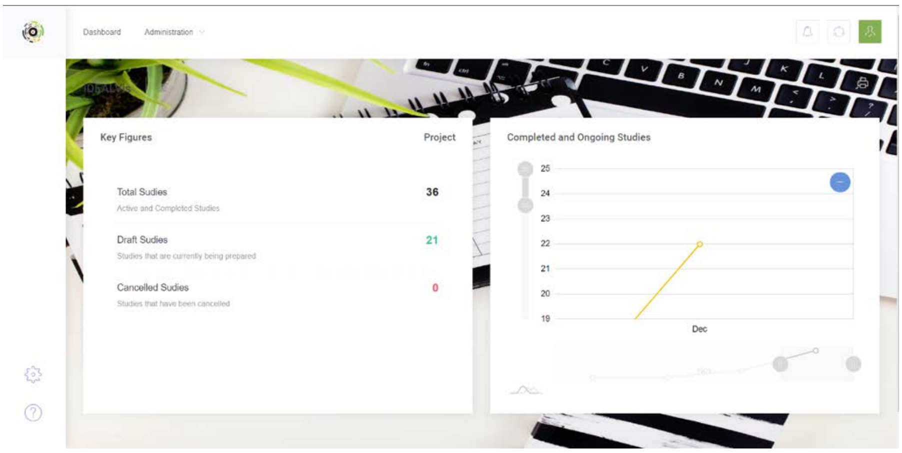


Figure 25: Admin Web App Dashboard with Main Header

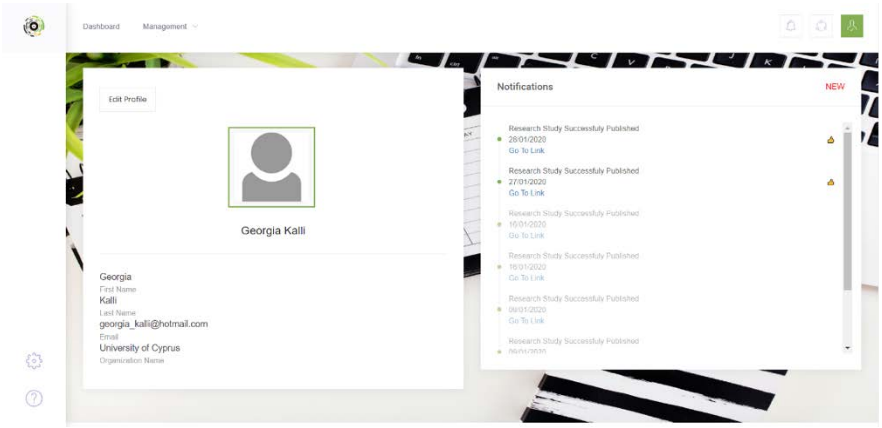


Figure 26: Researcher Web App Dashboard with Main Header

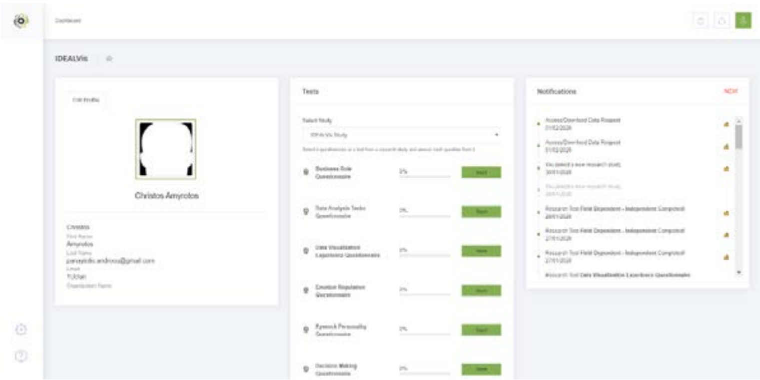


Figure 27: Participant Web App Dashboard with Main Header

11.2 Profile

As explained earlier in Section 11.1, by clicking on their profile picture from the main header or Dashboard page, users will be able to view their profile.

By selecting "View Profile" from that drop-down list, users will be moved to their profile page. This page will be provide information about the user, including personal information (First name, Last name), contact information (email) and Organization. Figure 28 presents a participant's Profile page as designed for the Web App.

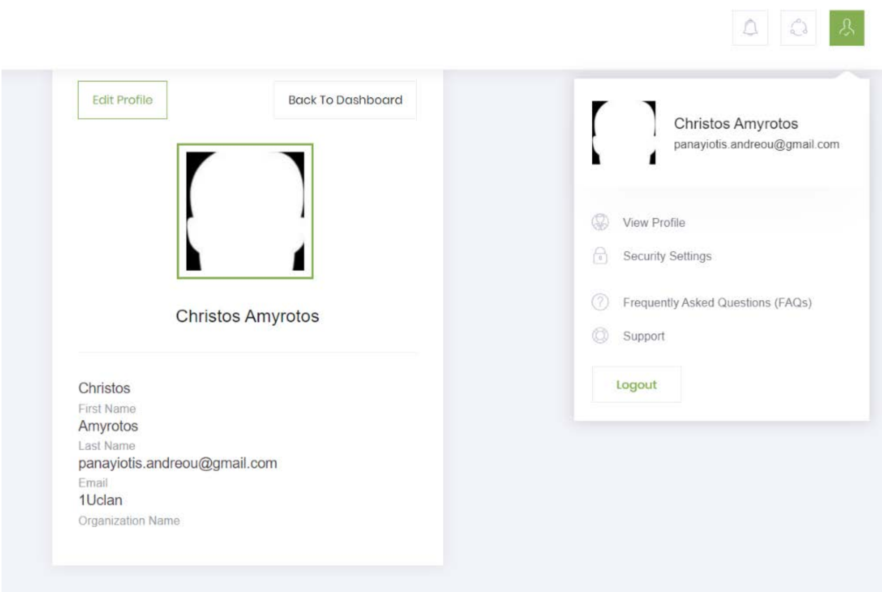


Figure 28: Web App Participant Profile Page

11.3 Edit Profile

As previously presented in Section 11.1 by clicking on their profile picture from the main header or from the Dashboard page, users will be able to view their profile and select the "Edit Profile" option. This action will be taking users to the "Edit Profile" page, where they will be able to edit their personal information by updating the form fields (Figure 29). On this page, participants will also be able to update their profile image (Figure 30).

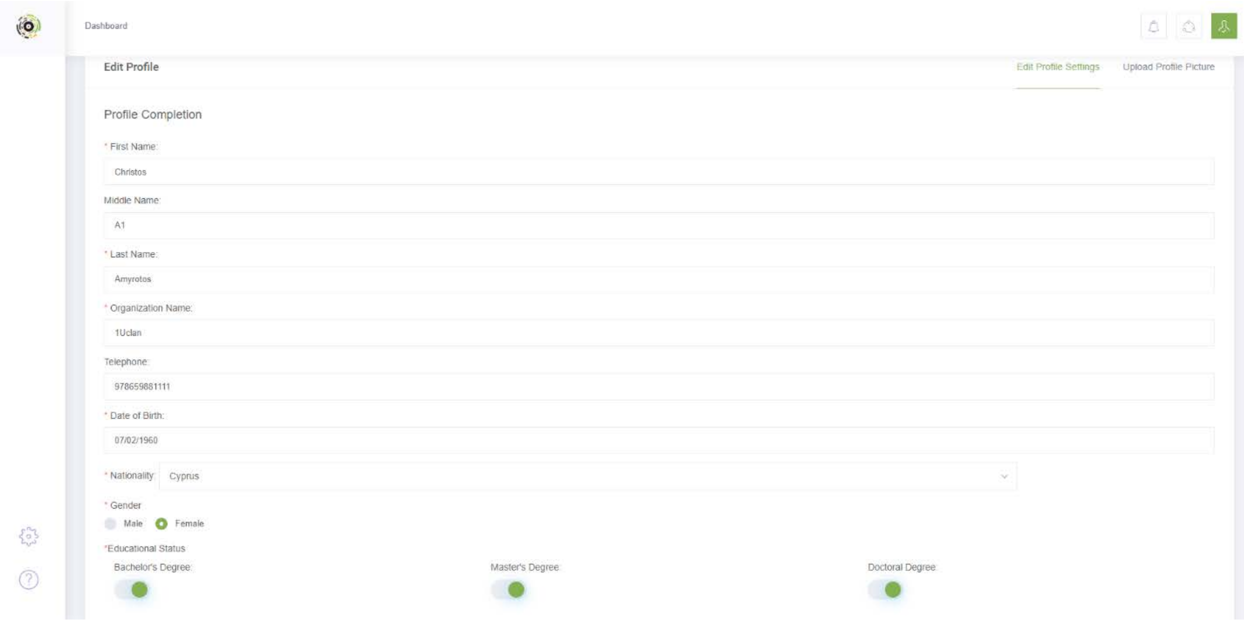


Figure 29: Web App Edit Profile Page

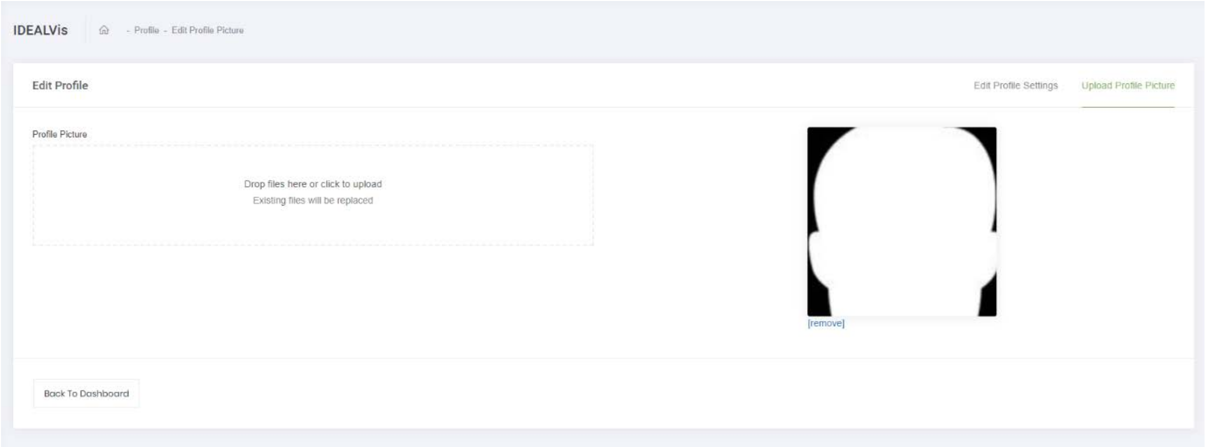


Figure 30: Web App Upload Profile Image

11.4 Manage My Data

As explained in Section 11.1, by clicking on settings from the left bottom side of the Dashboard, users will be able to select the "Privacy Settings" option. This action will be taking users to the "Manage My Data" Page, where they will be able to access the information and personal data that the system stores about them, download copies of their information to keep or to transfer to other devices, edit their information, view how their personal information is processed by the system, request the system to stop processing their data or even request to delete their account and information.

All of the above actions are strongly connected to GDPR requirements. Moreover, link buttons will be assigned to each one of the abovementioned actions. Figure 31 presents the Web App Manage My Data Page.

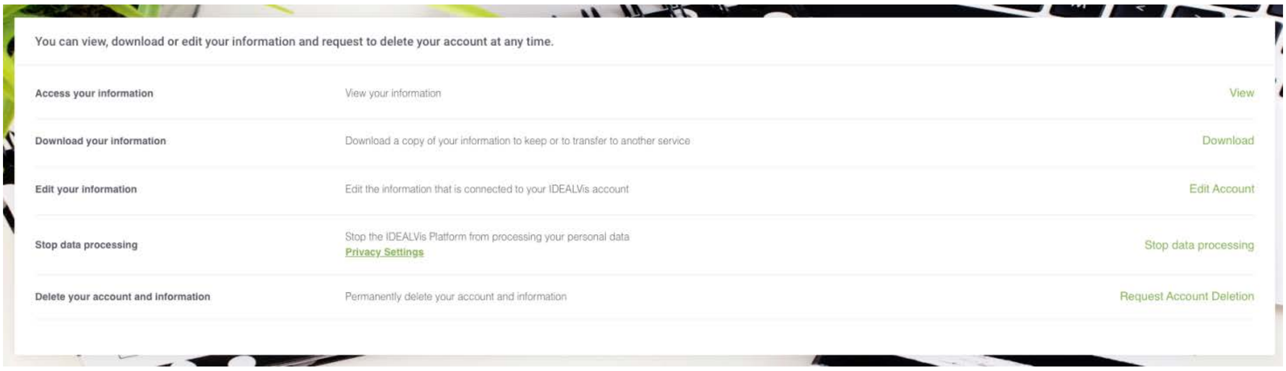


Figure 31: Web App Manage My Data Page

By selecting to access their information, users will be given their data in an XML format. For security purposes, by selecting to delete their account and information from the system, users will be receiving an automated email on the email address that they provided during their registration. This email will be containing an OTP (One Time Password) that users will have to enter to a dialogue modal that will be shown on their screen. An option to request an email with a new OTP will also be available on this modal (Figure 32).

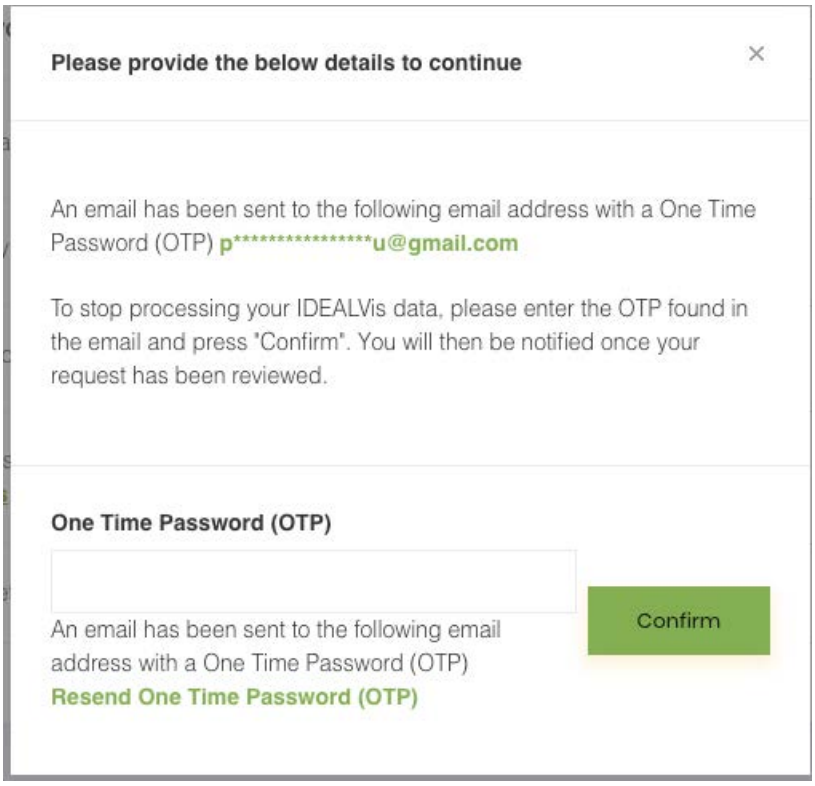


Figure 32: Account Deletion Dialogue Modal

At this point, it is also important to make clear that both, "Stop Data Processing" and "Account and Information Deletion" requests, will require an approval from the DPO actor before being processed by the system.

11.5 Support

As it was shown in Section 11.1, by clicking web app on their profile picture from the main header, users will be able to select the “Frequently Asked Questions” option or the “Support” option. The first option opens a page where the user can browse possible questions with their answers. If the user is not able to get an answer from there, then he/she can use the second option, “Support”, where he/she can directly contact the IDEALVis team by sending a message. After filling up the required text fields, the user will be able to submit the message through a "Send" button. In this case, support will be provided through email communications.

11.6 Notifications and Alerts

As explained in Section 11.1, users will be able to access their notifications through the main header or the Dashboard page of the platform. The notification icon will be flashing if there are unread notifications that the user did not engage with. The notification icon is presented in Figure 33.

Figure 33: Notifications Icon

By clicking on the notification icon, users will be able to view their notifications through a drop-down list. Greyed out notifications indicate the already viewed notifications, as illustrated in Figure 34.

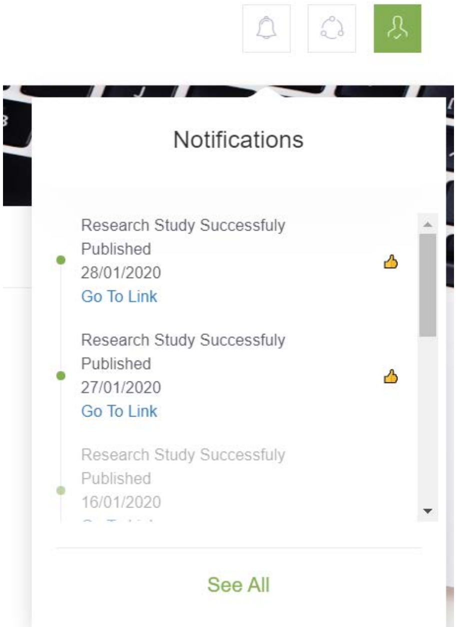


Figure 34: View Notifications

By clicking on an unread notification, the user will be moved to the page of the corresponding action, linked to that notification (if applicable). In addition, users will be able to select to "See All" their notifications. This will take them to a new page where they will be able to view all their notifications (new, old, read and unread). The Web App See All Notifications page is presented in Figure 35.

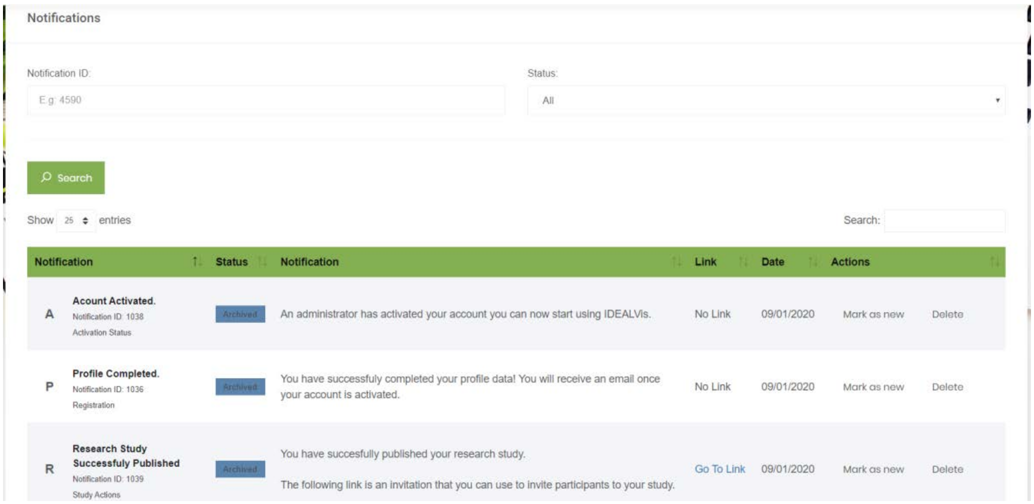


Figure 35: Web App See All Notifications Page

At this point, it is important to mention that on the Web App version of the platform, informative notifications that do not require an instant user action will also be presented as on-screen alerts. Figure 36 presents an example alert.

Figure 36: On-Screen Alert

On the Dashboard page a notification list with all notifications is showed (Figure 37).

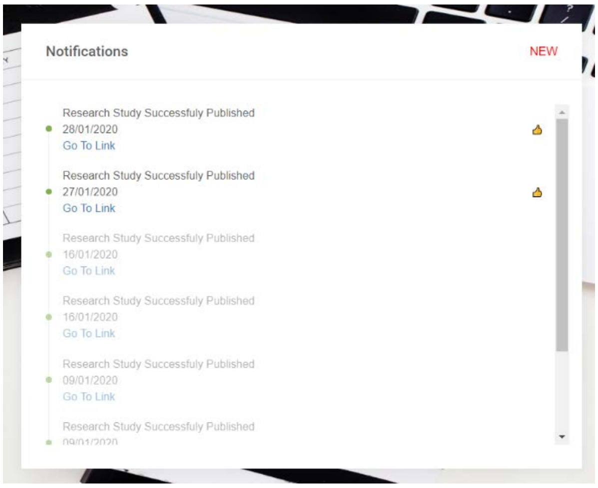


Figure 37: Notification List

11.7 Research Studies Management

Research Studies management is one of the most important functionalities of the IDEALVis Platform. As explained throughout the Use Cases presented in Section 2, the user group that will be able to manage research studies is Researchers.

Through the Web App's Research studies Management navigation link, a Researcher will be able to select from a drop-down list between "New Research Study" and "Research Studies".

The "New Research Study" option will redirect Researcher actors to the Create New Research Study page where they will be able to create and publish a new research study by filling in a form. The form fields will require Researcher actors to provide information about the study that they would like to create, including but not limited to, Research Study Name, Description, Publication date, Expiration data, Study availability (Open Study or Closed Study) and Research Tests. The UI implemented for this page is illustrated in Figure 38.

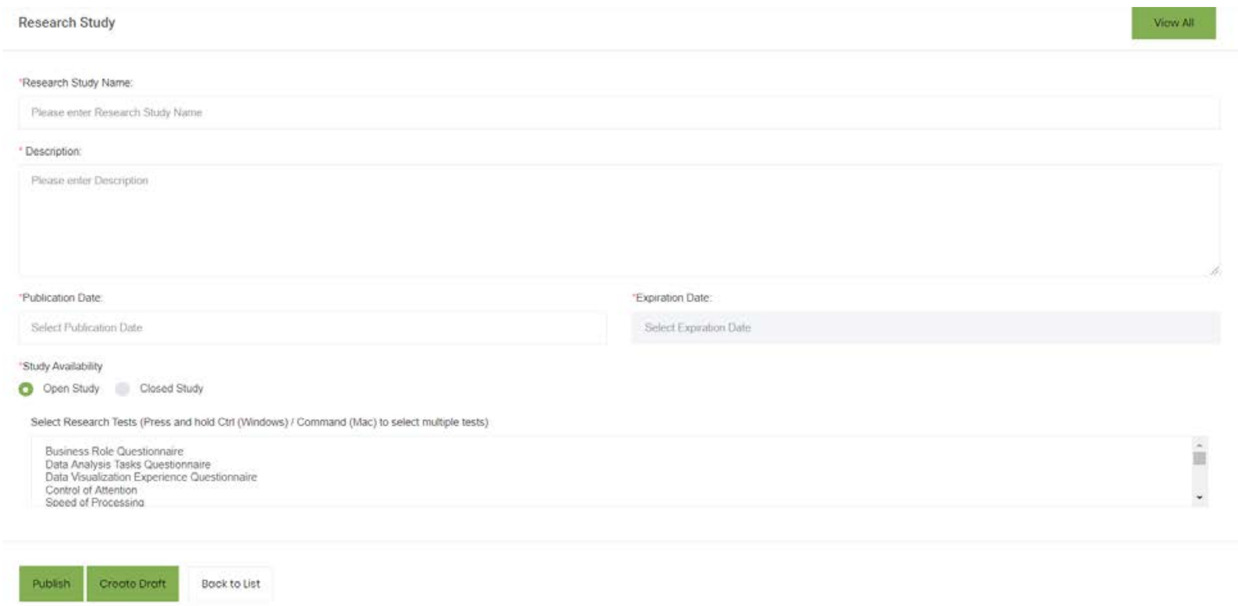


Figure 38: Create New Research Study

After successfully completing this form, Researcher actors will have to click on either the "Publish" button, or the “Create Draft” button, or the “Back to List” button. The relevant buttons are illustrated in Figure 39.

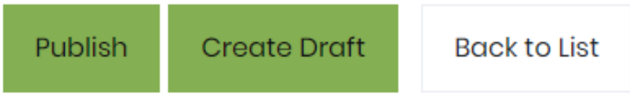


Figure 39: Research Study Mode Buttons

Within the Create Research Study page, the Researcher actor can select the tests for the study and also order them using a drag and drop mechanism by placing one above the other. The order describes how the tests will be involved in the new study. Figure 40 illustrates the relevant mechanism.

Figure 40: Research Tests Mechanism

The second drop down item that Researcher actors will be able to select from the Research Study Management navigation item is the "Research Studies". This item will be opening a dynamic page where the Researcher will be able to edit, delete or view their Published and Draft Research Studies. Also, in this page, the Researcher can invite Participants to the study by copying an invitation link. Figure 41 presents the UI created for the "Research Studies" page for Researcher.

Research Study Id	Study Name	Description	Status	Accessibility	Actions
1116	PilotStudy	PilotStudy for Testing	Ready To Publish	Open	
1117	PilotStudy	PilotStudy for Testing	Ready To Publish	Open	

Figure 41: Manage and View Research Studies

In case a Researcher actor chooses to delete a draft or a published study, a dialogue modal will be asking them to confirm this action. The Study Deletion confirmation modal is presented in Figure 42.

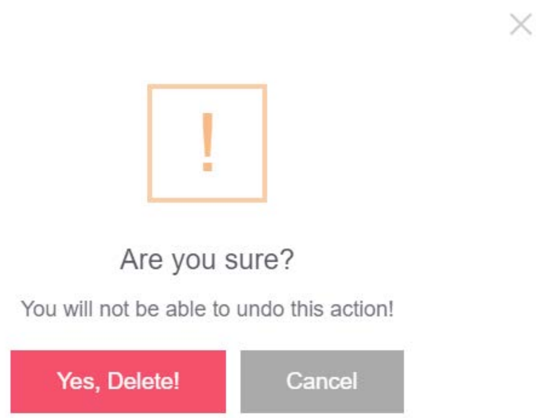


Figure 42: Web App Draft Study Deletion Confirmation Modal

11.8 Activate Researchers Management

Activate Researcher Management is one of the most necessary functionalities of the IDEALVis Platform. As explained throughout the Use Cases presented in Section 2, the user group that will be able to manage Researchers is Admin.

Through the Web App's navigation bar, an Admin will be able to select from a drop-down list "Activate Researchers".

The "Activate Researchers" option redirects Admin actors to a page for managing all existing Researchers. The Admin here is able to activate or deactivate Researchers as shown in Figure 43. The Admin is responsible to decide whether to activate Researchers or not.

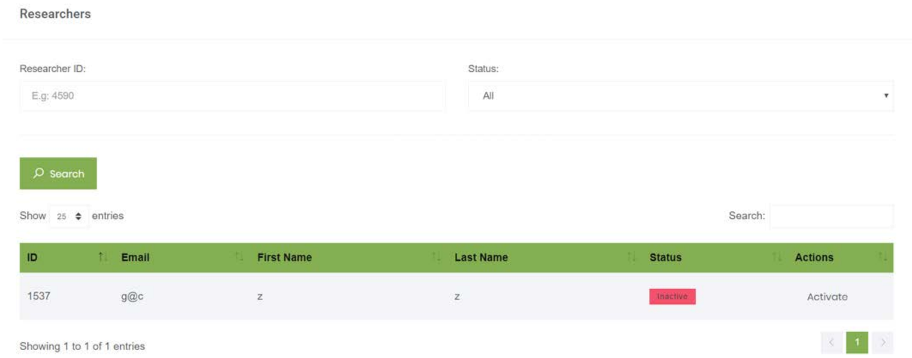


Figure 43: Activate Researchers

11.9 Notification Management

As explained throughout the Use Cases presented in Section 2, the user group that will be able to manage the notification types is Admin.

Through the Web App's navigation bar, the Admin will be able to select from a drop-down list the "Notification Types".

The "Notification Types" option redirects Admin actors in a page where they can create, view and edit Notification Types. Figure 44 presents the interface designed for the "Notification Types" page, while Figure 45 presents the interface designed for creating new “Notification Types".

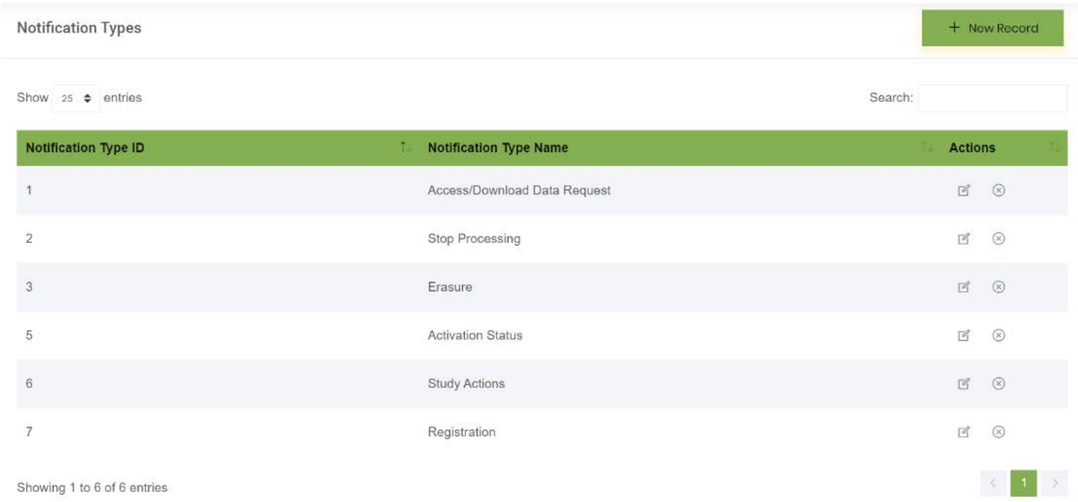


Figure 44: Notification Types

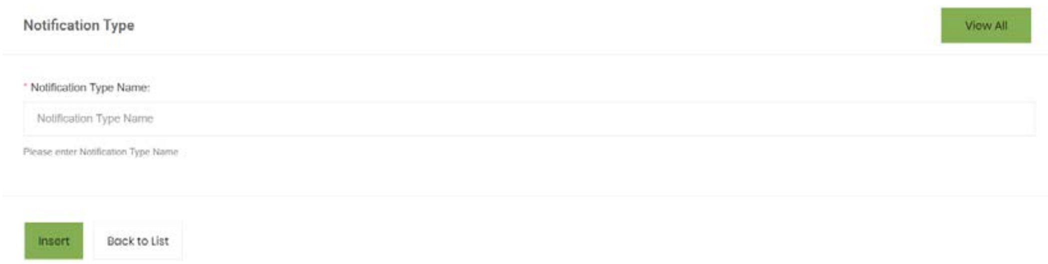


Figure 45: Create new Notification Type

In case Admin actors choose to delete a notification type, a dialogue modal will be asking them to confirm this action. The notification Deletion confirmation modal is presented in Figure 46.

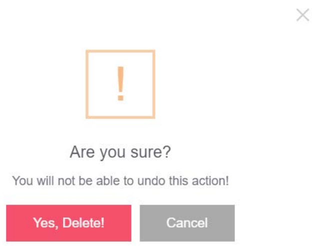


Figure 46: Web App Draft Notification Deletion Confirmation Modal

11.10 Studies for Participants - Examples of Cogntive Tests

This section presents specific cognitive test examples which have been successfully applied to studies.

Working Memory Span

Working memory span is a Psychometric test and has been defined as the system which actively holds information in the mind to do verbal and nonverbal tasks, such as reasoning and comprehension, and to make it available for further information processing. Primarily, the working memory system is composed of two slave systems (under the central executive): the phonological loop that stores phonological information and continuously articulates its contents for refreshing the information and prevent decay, and the visuo-spatial sketchpad that stores visual and spatial information (e.g., constructing and manipulating visual images (e.g., shape, color, etc.)), and representing mental maps (e.g., location). The working memory span has an impact on the complexity of Web-based interactive environments and the quantity or clarity of information delivered each time for making decisions, and therefore, it is directly related with interaction scenarios that entail data exploration and visualization.

We are mainly interested in the notion of the working memory span, since it can be measured and the implications on information processing are rather clear. Each working memory span instance (i.e., Low/Medium/High), indicating the working memory capacity of a person, has implications on the navigation, quantity of content and aesthetics of an interactive environment. Due to the visual form of presentation, primarily of data visualizations, we have mainly focused on the measurement of visual working memory in terms of psychometrics and partially on the verbal working memory (may be used for cross-validation and completion purposes).

WMS	Description	Web Implications
Low	Low working memory capacity	Needs more guidance in hypermedia content, navigation support tools, less content, emphasize content
Medium	Medium working memory capacity	Prefers navigation support tools, emphasize content
High	High working memory capacity	More complex structure and enriched quantity of content

Users' Visual Working Memory Capacity Task: This test illustrates a geometric figure on the screen and the user is required to memorize the figure. Thereafter, the figure disappears, and 5 similar figures are illustrated on the screen, numbered from 1 to 5 (Figure 47).

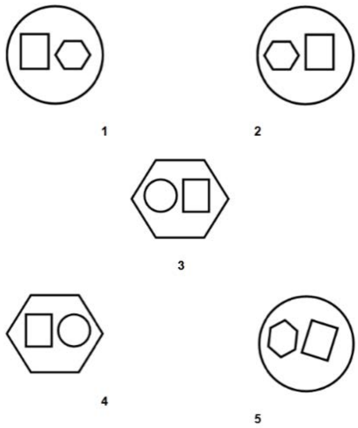


Figure 47: Visual working memory task

The user is required to provide the number (using the keyboard) of the corresponding figure that is the same as the figure that was shown initially. The test consists of 21 figures (seven levels of three trials each; 1-2 = Low, 3-5 = Intermediate, 6-7 = High). As the user correctly identifies the figures of each trial, the test provides more complex figures as the levels increase indicating an enhanced visual working memory capacity.

Control of Processing and Speed of Processing

Other popular psychometric test are the Control of Processing and Speed of Processing. From the perspective of individual differences in human cognition, various theories exist that aim to describe and explain how and why individuals differ in attention. Researchers attempted to understand attention and the functioning of the human mind in terms of more basic processes, such as control of processing and speed of processing. Control of processing refers to cognitive processes that can identify and concentrate on goal-relevant information and inhibit attention to irrelevant stimuli. Control of processing is also closely related to the individual's speed of cognitive processing, which refers to the maximum speed at which a given mental act may be efficiently executed. Speed of cognitive processing and control of processing are directly related to a person's age, as well as to the continuous exercise and experience, with the former to be the primary indicator.

Two Stroop-like tasks are devised to measure reaction time to address speed of processing and control of processing. For measuring speed of processing, users are required to read a number of words denoting a color written in the same or different ink color (e.g., the word “Red” illustrated in green ink color). For measuring control of processing, similarly, a Stroop-like task is devised, but instead of denoting the written word itself, users are required to recognize the ink color of words denoting a color different than the ink (e.g., the word "Red" illustrated in green ink as illustrated in Figure 48). In each test, a total of 18 words are shown to the users including the words "Red", "Green" or "Blue", either written in red, green or blue ink color. The users are required to press the R keyboard key for "Red", the G for "Green" and the B for "Blue".

Red

Figure 48: Control of Attention

11.11 Examples of Questionnaires

This section presents specific questionnaire examples, which have been successfully applied to studies.

Business Role Expertise Questionnaire

The Business Role Expertise Questionnaire focuses on understanding participant’s profile, tasks, challenges and desires. The participant’s answers are provided so as to extract personas and organize the responders into groups (e.g., managers, senior and junior analysts), in order to understand better how each group comprehends and processes information and visualizations more efficiently. All answers will be kept strictly confidential.

Data Visualization Experience Questionnaire

The Data Visualization Experience Questionnaire focuses on understanding the participant’s interaction with data visualizations. The participant’s answers are provided so as to understand how the participant uses data visualizations in his/her everyday operations and what his/her experience is with different types of visualizations.

Emotion Regulation Questionnaire

The Emotion Regulation Questionnaire attempts to understand important aspects on how people behave in their emotional life, and in particular, how they control, regulate and manage their emotions. For each question, the participant will answer using a scale from 1 (Strongly disagree) to 5 (Strongly agree).

11.12 IDEALVis Study Methods

To achieve the identified goals, we suggest specific instruments. Based on the goal, we implement a combination of questionnaires and Psychometric Tests:

Researcher

- Researchers will create a new researcher study:
    - Researchers will decide on the availability of the study. At first availability, called Open Study, participants are invited through a link. On the other hand, in the second availability, called Closed Study, participants are invited by email.
    - Researchers will select the Questionnaires and Tests that will be included a new research study.

Participants

- Participants will select a research study after first accepting the invitation to participate.
- Participants will complete all Questionnaires and Tests in the selected research study.
- Participants will view their results:
    - For the Questionnaires, they will observe their answers.
    - For the Tests, they will notice their total correct answers and their overall score.

11.13 Cognitive Test Pages for Participants

Participants will select a research study from their Dashboard page. Each research study contains psychometric tests and questionnaires. Each test consists of introduction, the test itself and the test results. Figure 49 shows an example page designed for the test introduction.

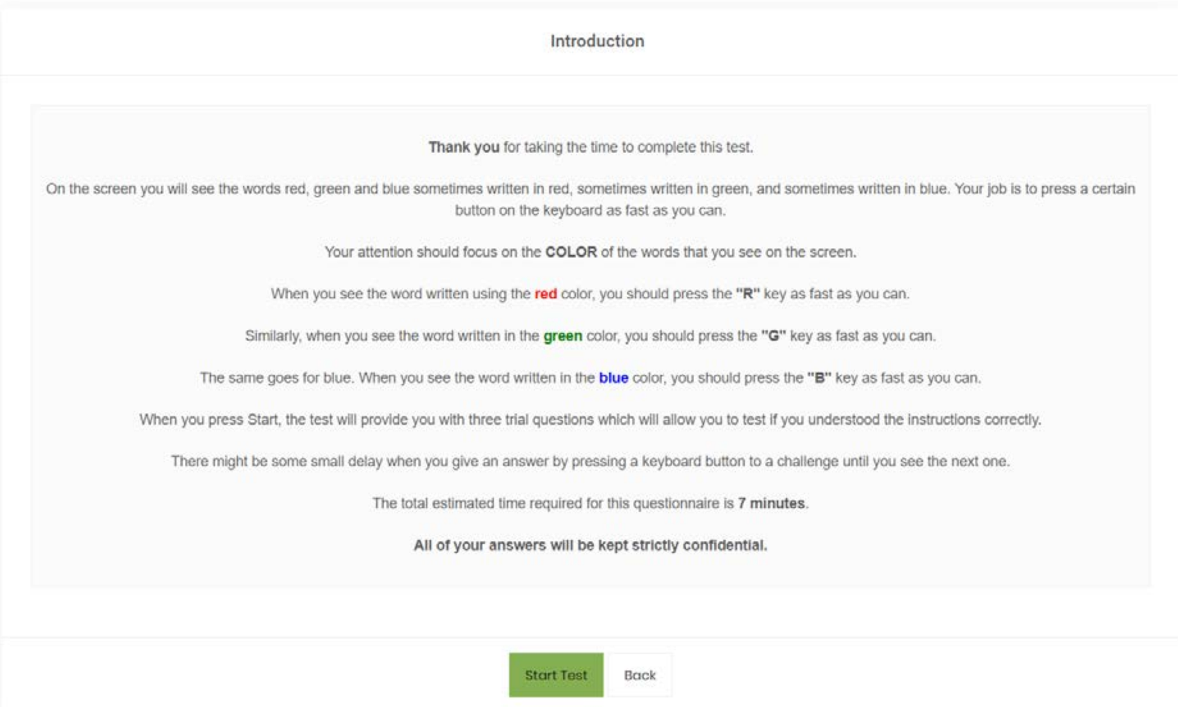


Figure 49: Example of Test Introduction Page

Each test begins with three demonstration questions that help the participant become familiar with the test (trial session). Figure 50 shows an example of the page designed for the test.

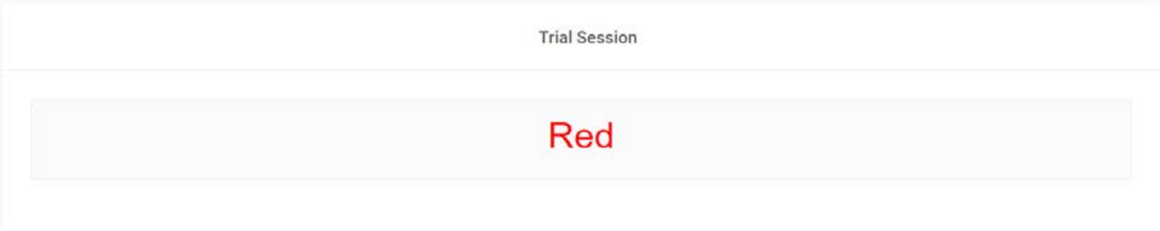


Figure 50: Example of Test Page

When the test is completed, the finish page displays key numbers about the participant's answers (total answers, incorrect answers, average response time, study average response time, rank), percentage of correct and incorrect answers and statistics for every question (Figure 51).

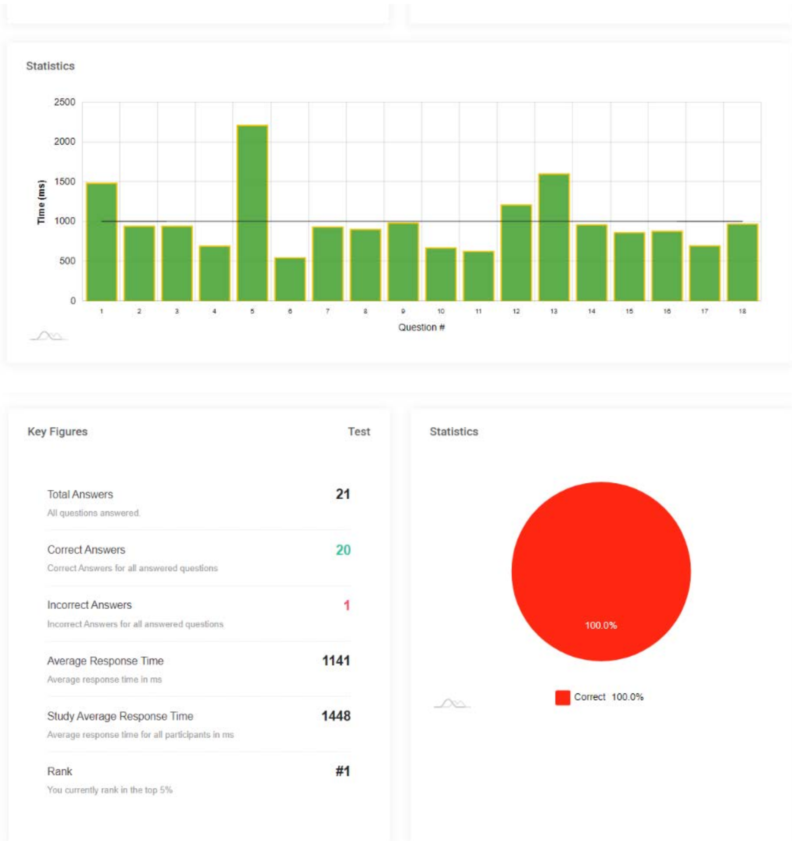


Figure 51: Example Finish Page

11.14 Questionnaires for Participants

In each questionnaire, participants will read the introduction page and then complete the questionnaire. It should be noted that all participants answers will be kept strictly confidential. Figure 52 presents the introduction of the Business Role Questionnaire, which is an example of the questionnaires, and Figure 53 presents the questionnaire itself.

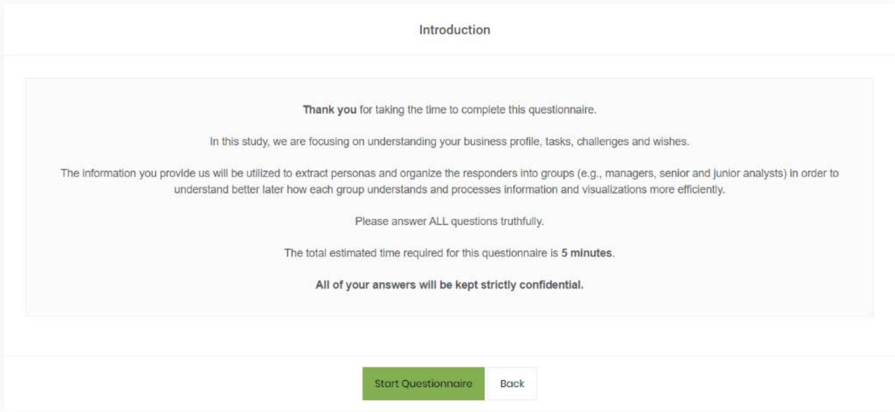


Figure 52: Example of Questionnaire Introduction

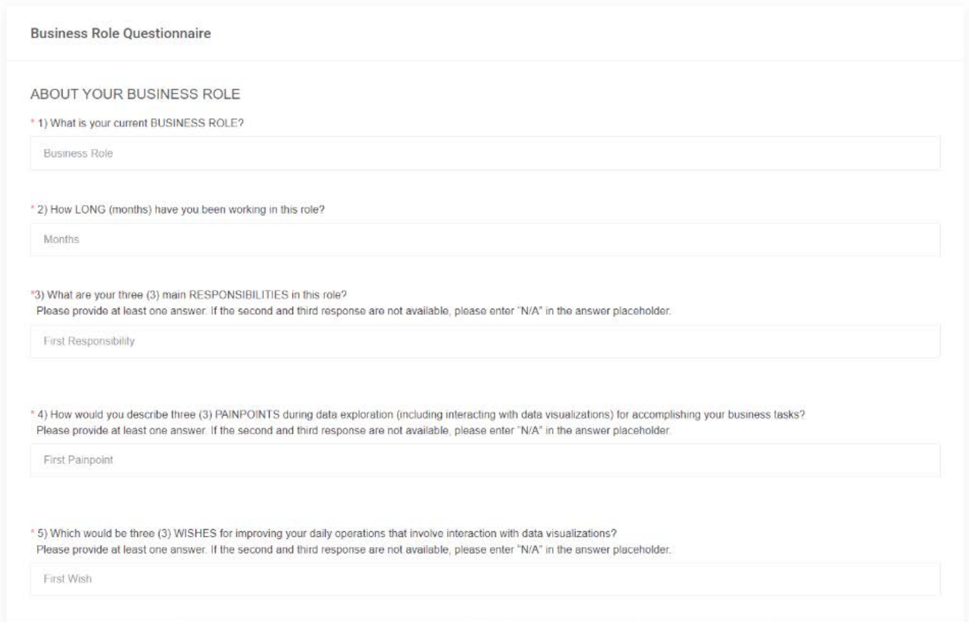


Figure 53: Example of Questionnaire

11.15 Manage Account Requests DPO

As explained in Section 10 of this report, through the Platform, DPO actors will only be able to manage requests related to Privacy and Data (Account Deletion Requests and Stop Data Processing Requests). Through a page similar to "See all Notifications" page, the DPO actor will be able to view all the requests that other user actors posted, with indications next to each request on whether the request in Pending, Approved, or Rejected. Figure 54 presents the "Manage Account Requests" page that will only be available to DPO actors.

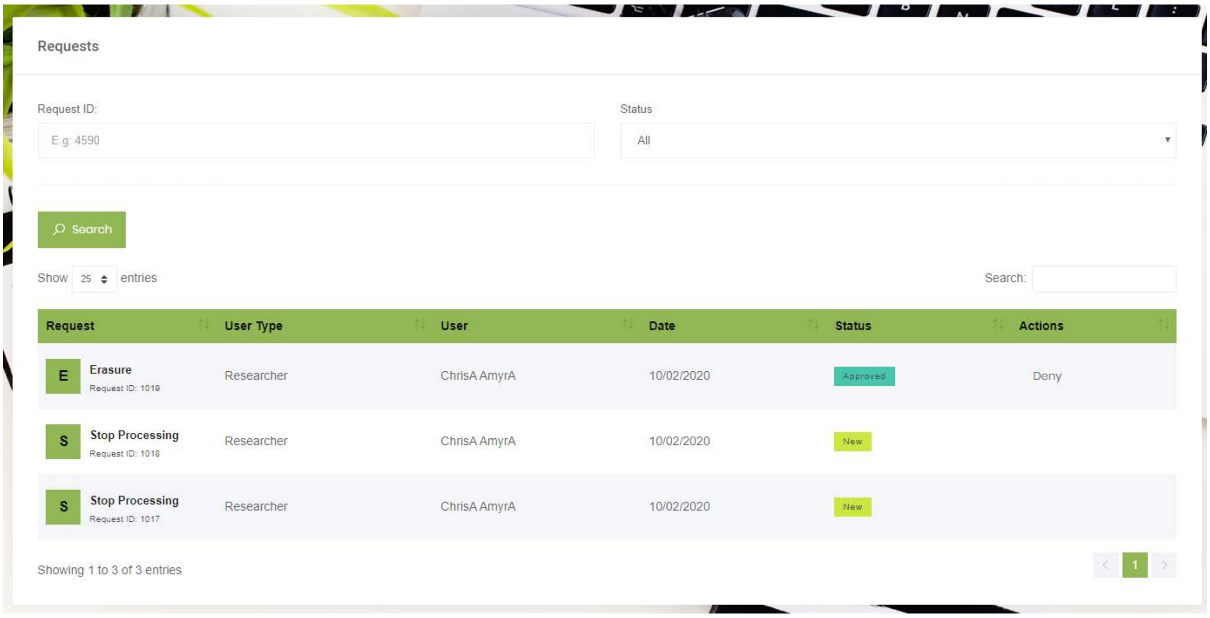


Figure 54: Web App - Manage Account Requests

An activity flow that illustrates the functionality of the "Account and Data Privacy Request" of the platform is presented in Section 12 of this report (Activity Flows).

12 Activity Flows

This section provides the Activity Flows illustrating the functionalities of the platform based on specific Use Cases.

12.1 Creation of Research Study Activity Flow

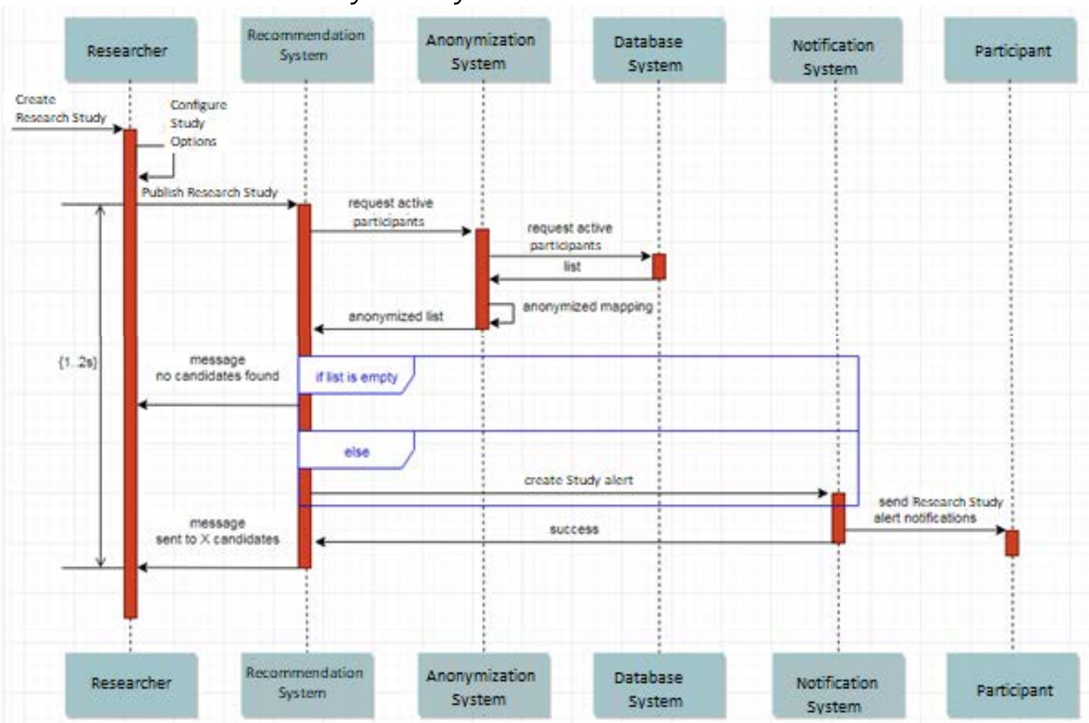


Figure 55: Creation of Research Study Activity Flow

12.2 Account and Data Privacy Request Activity Flow

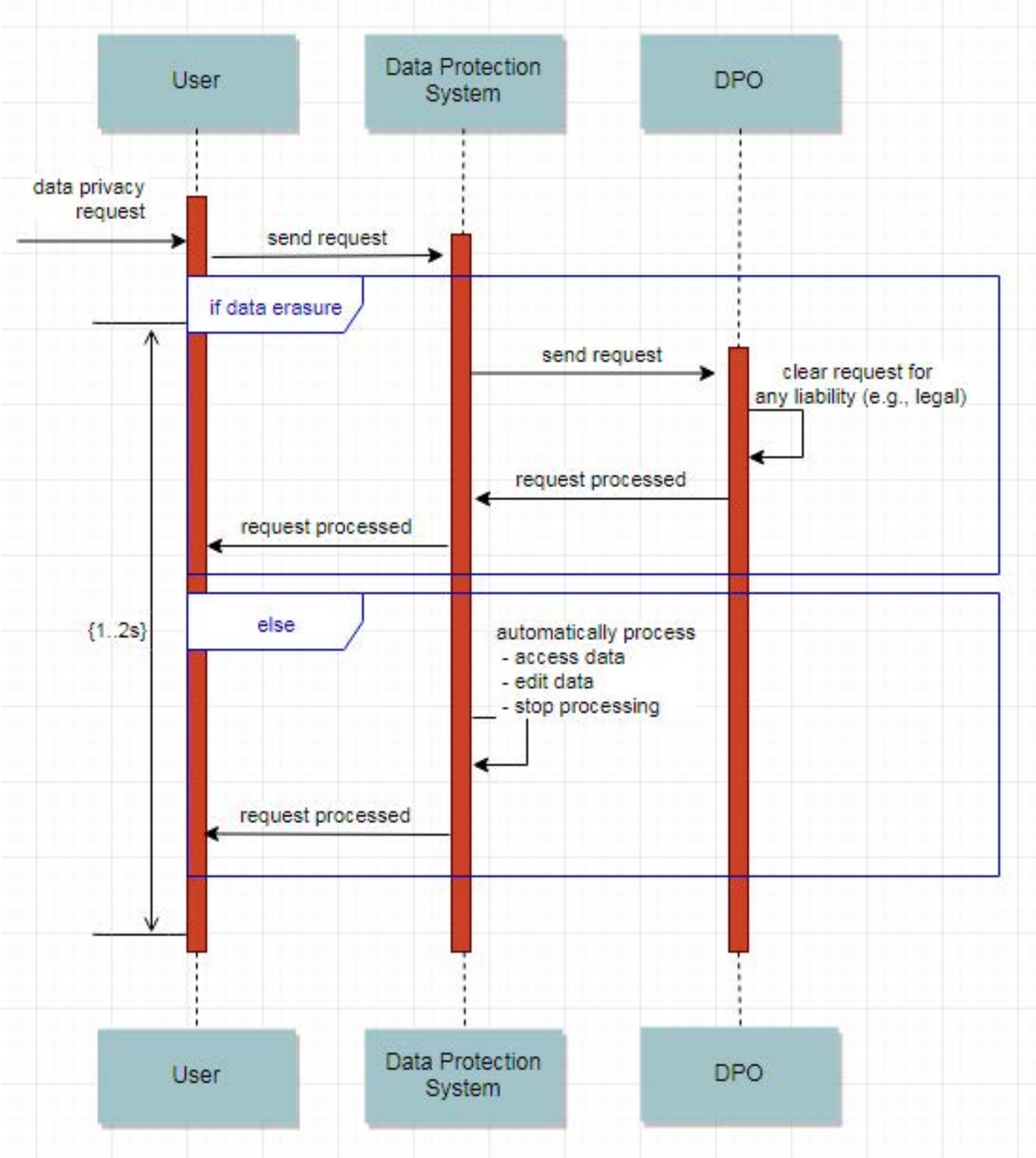


Figure 56: Account and Data Privacy Request Activity Flow

12.3 Login Activity Flow

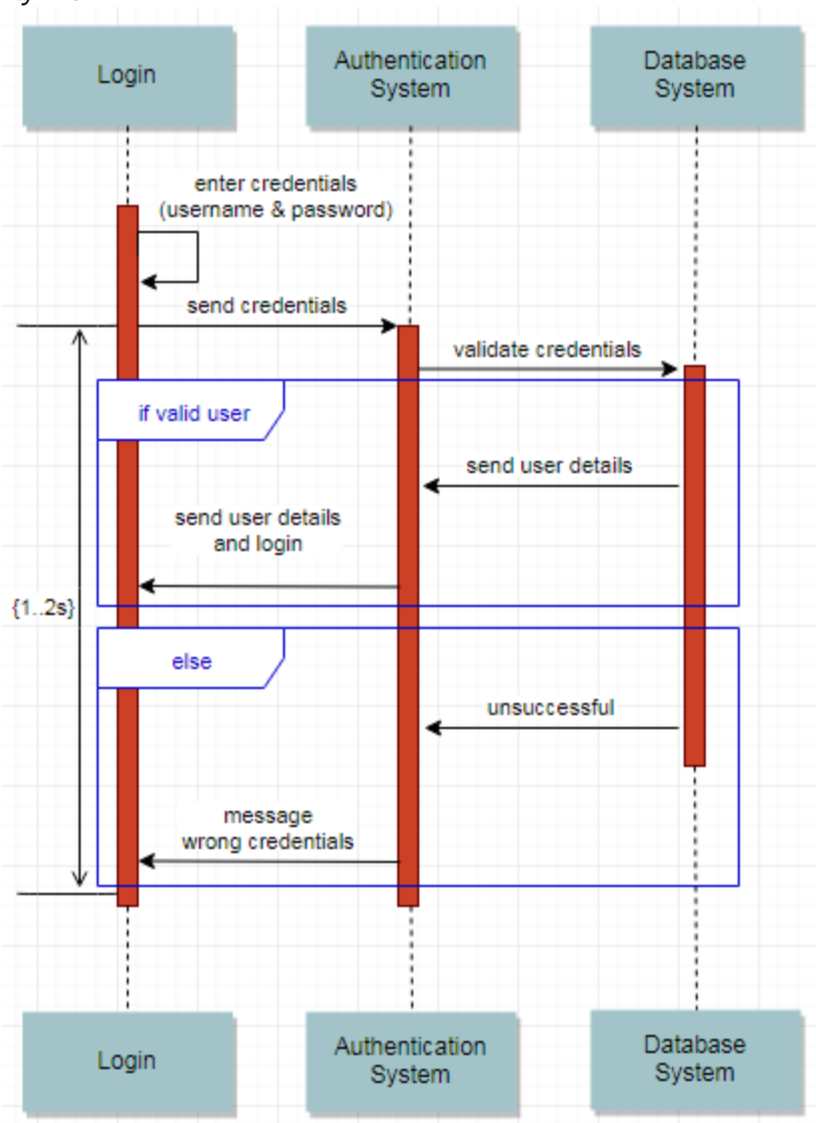


Figure 57: Login Activity Flow

12.4 Registration Activity Flow

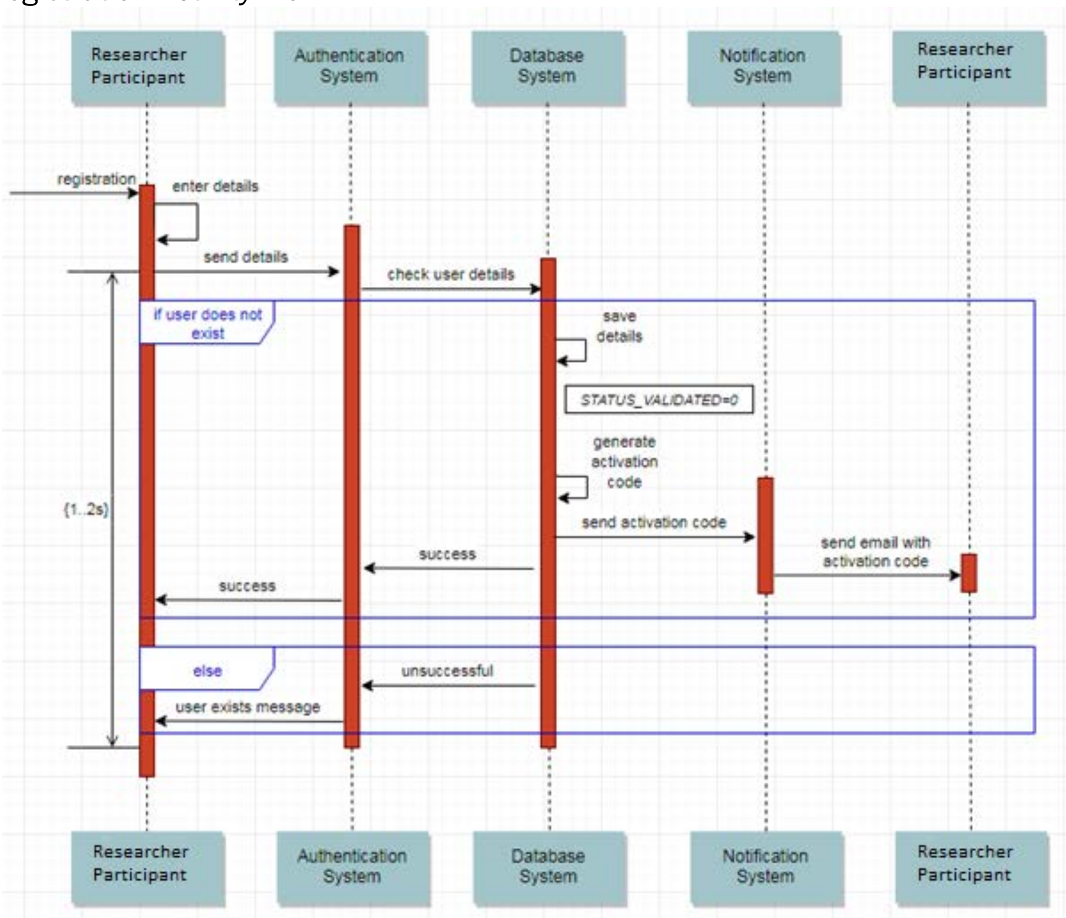


Figure 58: Registration Activity Flow

12.5 Reset Password Activity Flow

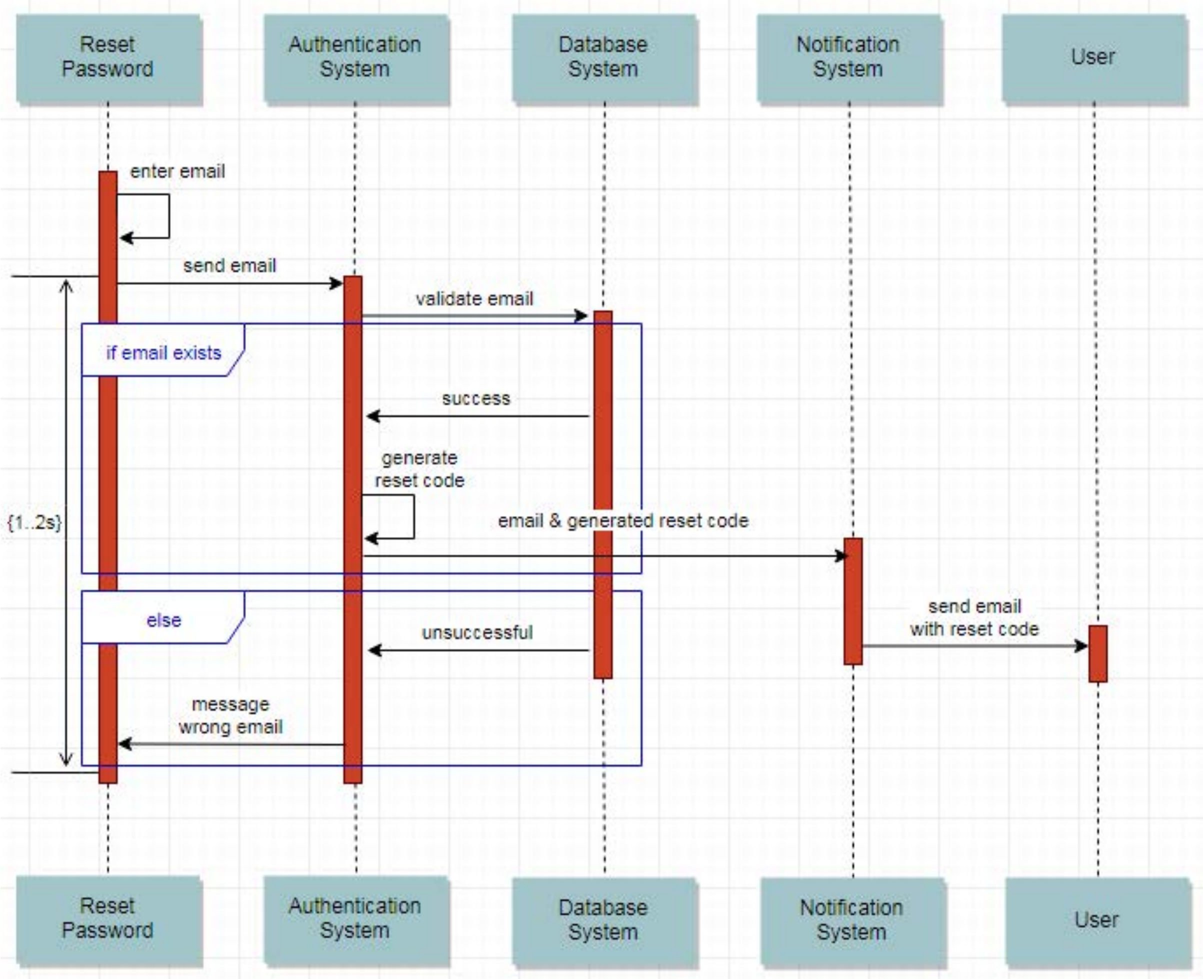


Figure 59: Reset Password Activity Flow

12.6 User Activation Activity Flow

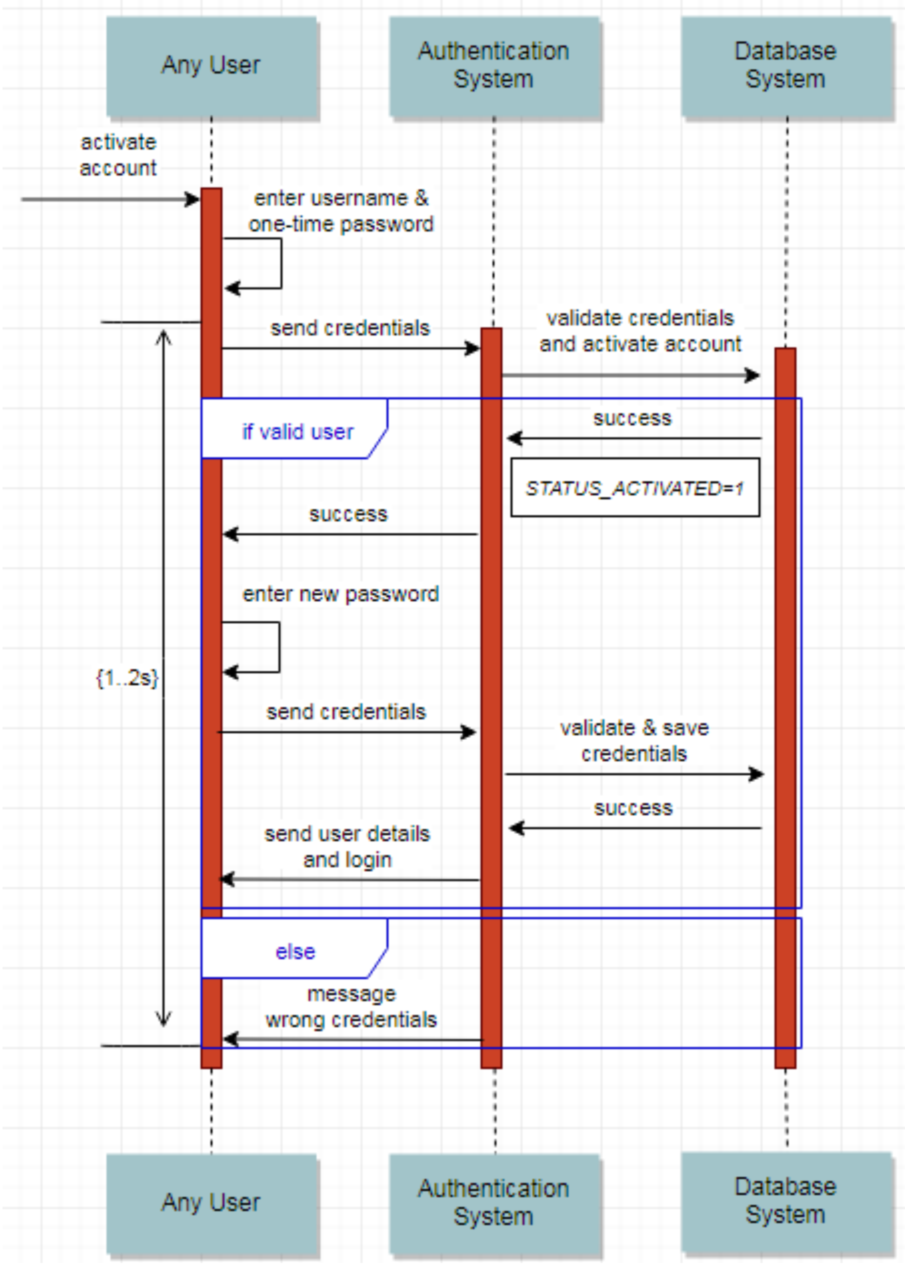


Figure 60: User Activation Activity Flow

12.7 Create Researcher/Participant Activity Flow

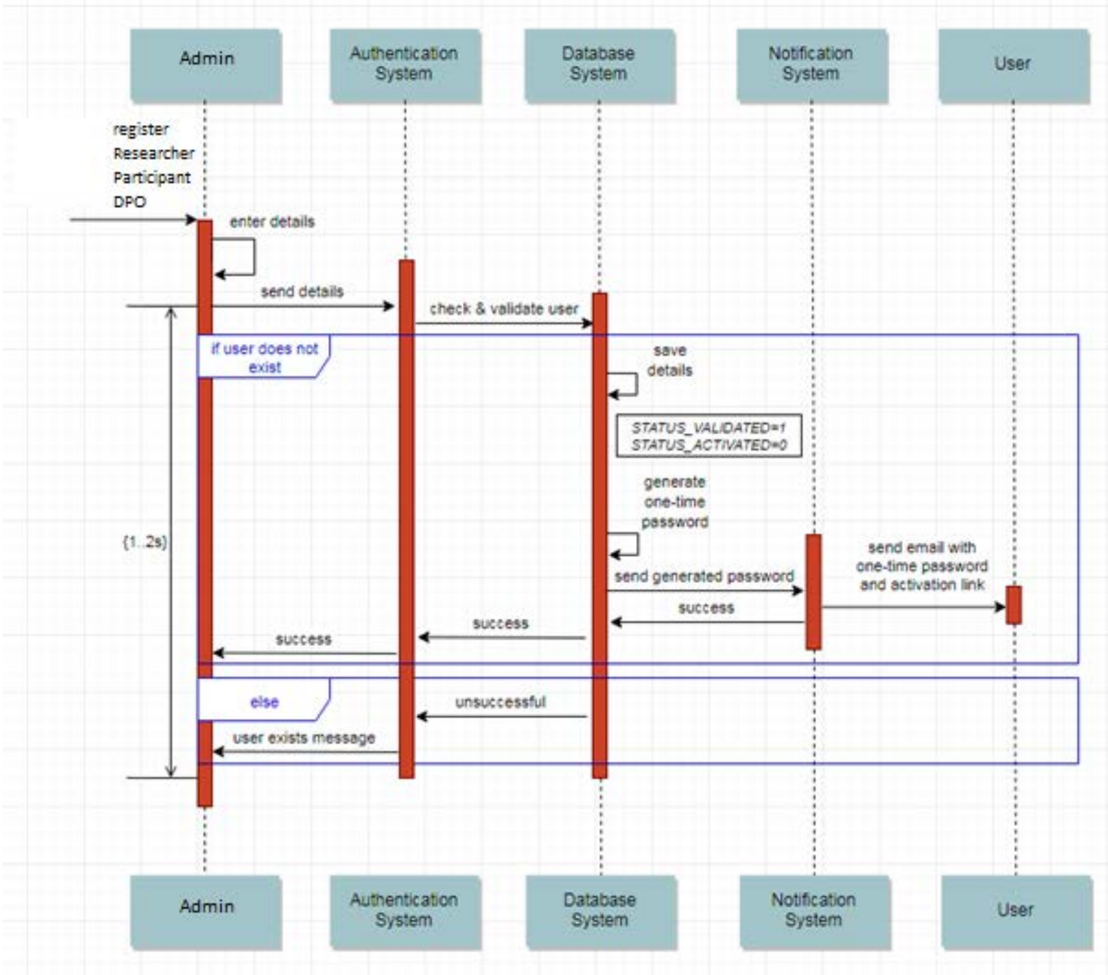


Figure 61: Create Researcher/ Participant Activity Flow

12.8 Validation of Researchers and Participants Activity Flow

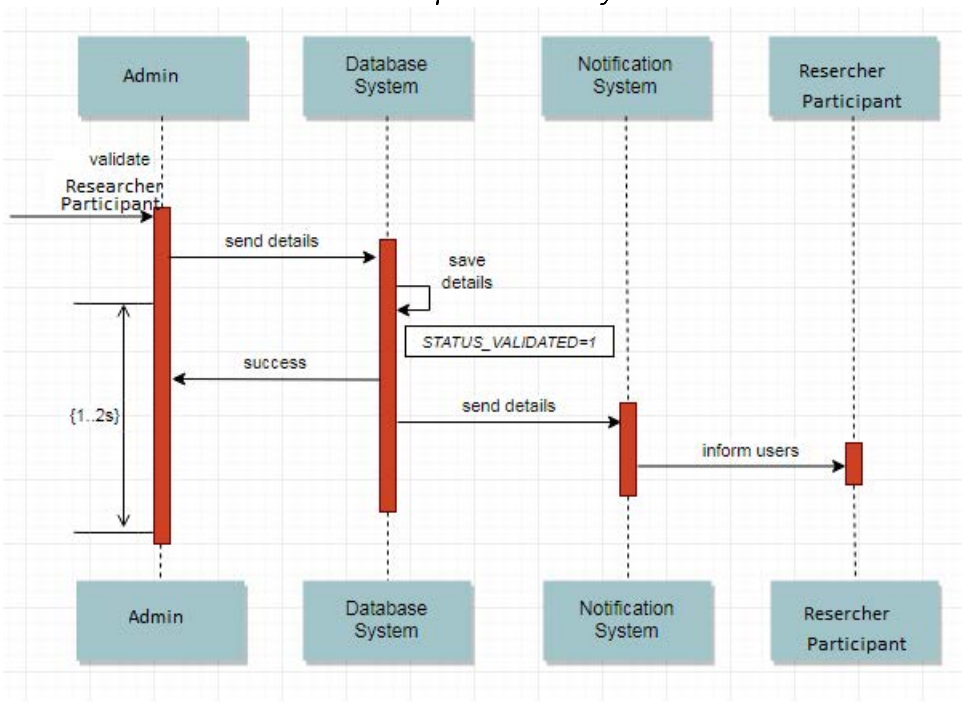


Figure 62: Validation of Researchers and Participants Activity Flow

Appendix 1 – Stakeholder Information

The main stakeholders of the project are three, (1) InSPIRE, (2) RAI Consultants and KPMG Cyprus. The expertise of the Consortium members and all the information collected from the companies below forms the complete set of the project requirements.

KPMG Cyprus and RAI Consultants had a significant role as they contributed to the collection of requirements.

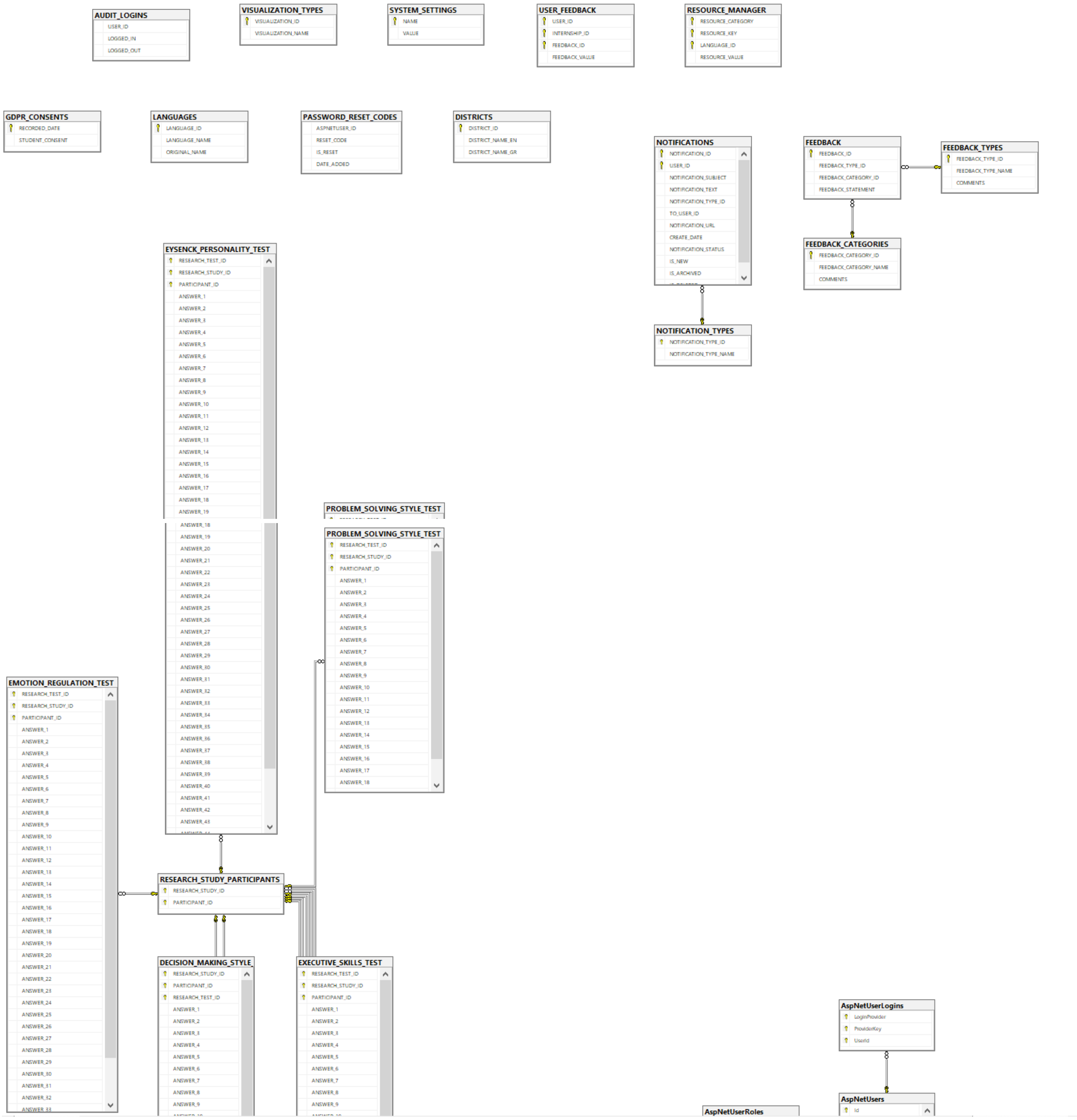
KPMG Cyprus enrolled users from the Data Analytics and Regulatory department for drawing requirements from multiple roles, providing expertise across multiple domains.

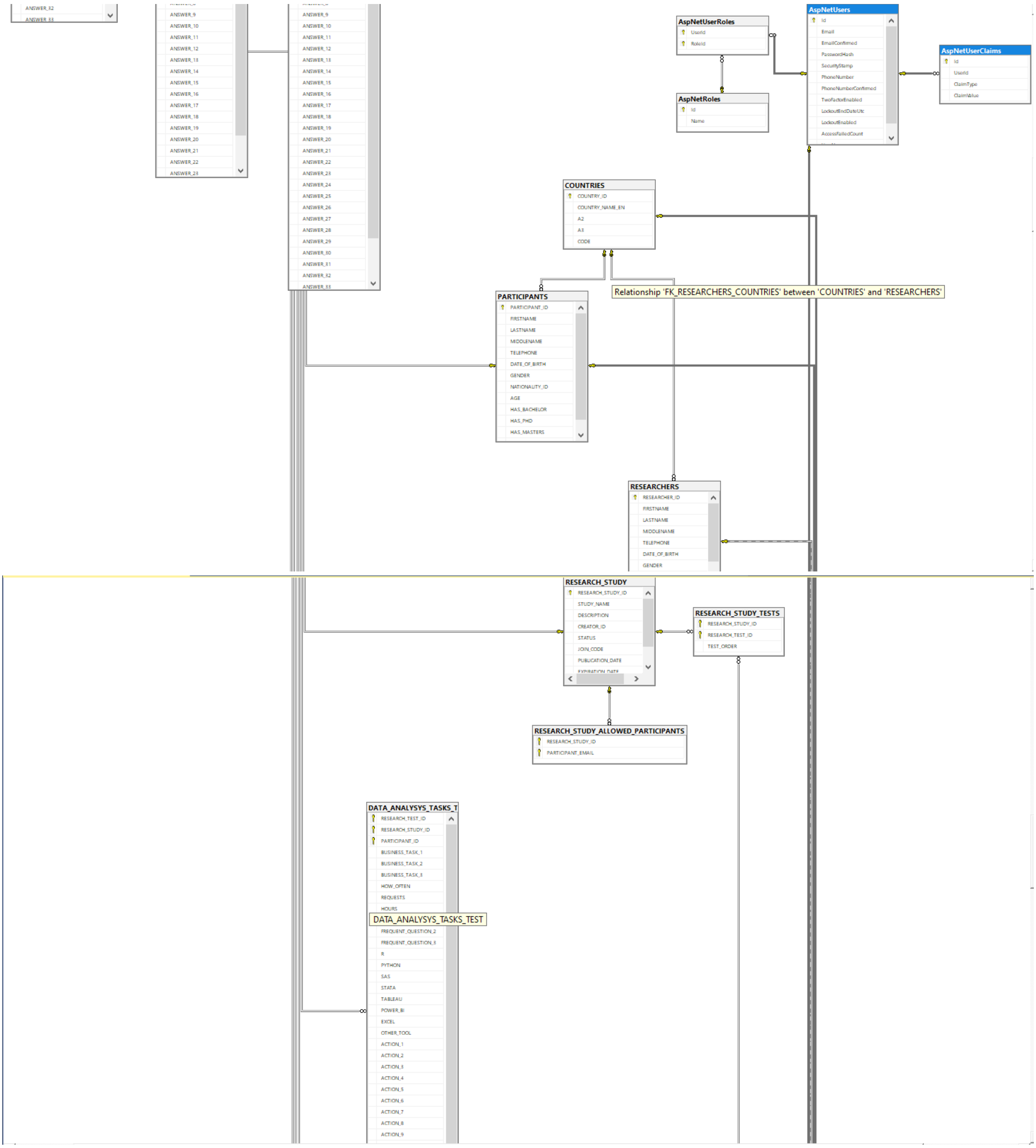
RAI Consultants enrolled users from the Retail Audit Analysis department for drawing requirements from multiple roles, providing expertise from domains related to retail sales. The company also enrolled marketing managers from major retailer companies in Cyprus.

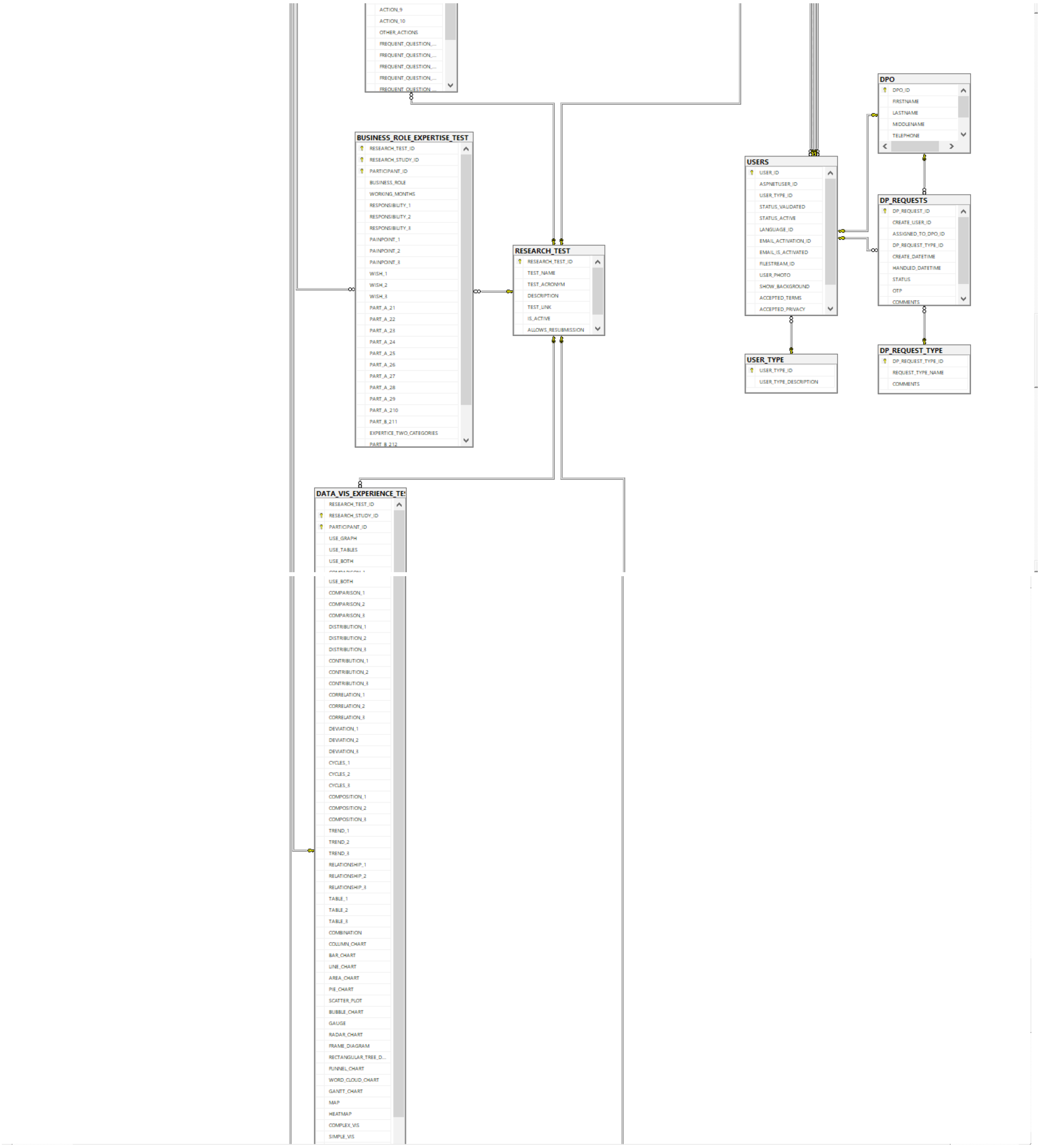
Information collected from stakeholders for completing the set of requirements included the following:

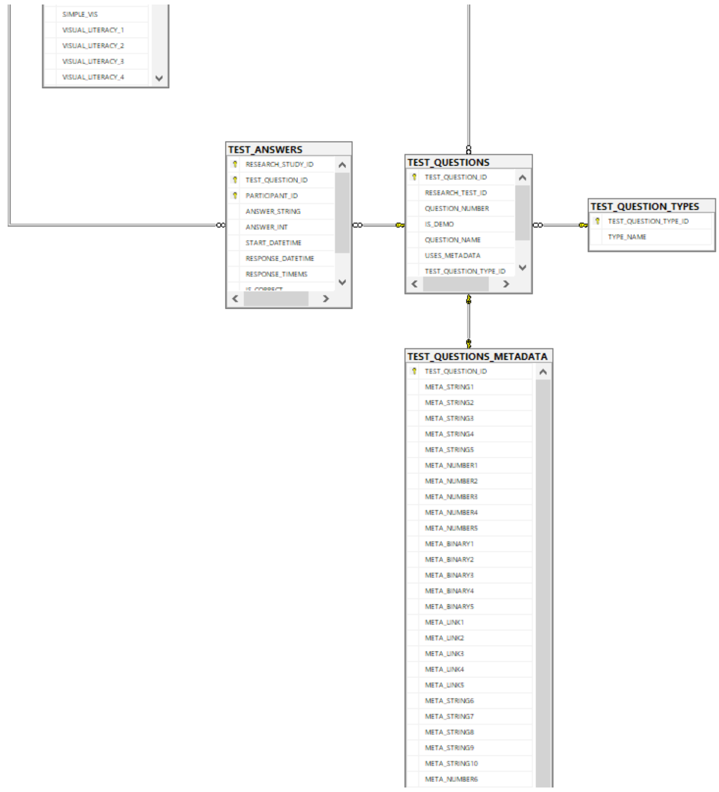
- Information about their business role, what responsibilities they have and how much time they have been in the current role.
- Qualitative experience of work.
- Expertise they have in their role.
- Tasks they take regarding their daily data analysis procedures.
- How much requests and how much time they spend on data analysis tasks.
- How much they use visualizations in data analysis tasks.
- The data analysis tools they are using.
- Frequent actions that they perform when executing data analysis tasks.
- Frequent requests that correspond to data analysis tasks.
- The types of visualizations they use mostly.
- The visualization types they perceive as complex. And how complex.
- Their abilities to work with certain visualizations.

Appendix 2 – Entity Relationship Diagram




AspNetUserRoles
AspNetUsers
AspNetUserClaims
AspNetRoles
COUNTRIES
PARTICIPANTS
Relationship 'FK_RESEARCHERS_COUNTRIES' between 'COUNTRIES' and 'RESEARCHERS'
RESEARCHERS
RESEARCH_STUDY
RESEARCH_STUDY_TESTS
RESEARCH_STUDY_ALLOWED_PARTICIPANTS
DATA_ANALYSYS_TASKS_T
DATA_ANALYSYS_TASKS_TEST


ACTION_9
ACTION_10
OTHER_ACTIONS
FREQUENT_QUESTION_...
FREQUENT_QUESTION_...
FREQUENT_QUESTION_...
FREQUENT_QUESTION_...
BUSINESS_ROLE_EXPERTISE_TEST
RESEARCH_TEST_ID
RESEARCH_STUDY_ID
PARTICIPANT_ID
BUSINESS_ROLE
WORKING_MONTHS
RESPONSIBILITY_1
RESPONSIBILITY_2
RESPONSIBILITY_3
PAINPOINT_1
PAINPOINT_2
PAINPOINT_3
WISH_1
WISH_2
WISH_3
PART_A_21
PART_A_22
PART_A_23
PART_A_24
PART_A_25
PART_A_26
PART_A_27
PART_A_28
PART_A_29
PART_A_210
PART_B_211
EXPERTICE_TWO_CATEGORIES
RESEARCH_TEST
RESEARCH_TEST_ID
TEST_NAME
TEST_ACRONYM
DESCRIPTION
TEST_LINK
IS_ACTIVE
ALLOWS_RESUBMISSION
USERS
USER_ID
ASPNETUSER_ID
USER_TYPE_ID
STATUS_VALIDATED
STATUS_ACTIVE
LANGUAGE_ID
EMAIL_ACTIVATION_ID
EMAIL_IS_ACTIVATED
FILESTREAM_ID
USER_PHOTO
SHOW_BACKGROUND
ACCEPTED_TERMS
ACCEPTED_PRIVACY
USER_TYPE
USER_TYPE_ID
USER_TYPE_DESCRIPTION
DPO
DPO_ID
FIRSTNAME
LASTNAME
MIDDLENAME
TELEPHONE
DP_REQUESTS
DP_REQUEST_ID
CREATE_USER_ID
ASSIGNED_TO_DPO_ID
DP_REQUEST_TYPE_ID
CREATE_DATETIME
HANDLED_DATETIME
STATUS
OTP
COMMENTS
DP_REQUEST_TYPE
DP_REQUEST_TYPE_ID
REQUEST_TYPE_NAME
COMMENTS
RESEARCH_TEST_ID
RESEARCH_STUDY_ID
PARTICIPANT_ID
USE_GRAPH
USE_TABLES
USE_BOTH
USE_BOTH
COMPARISON_1
COMPARISON_2
COMPARISON_3
DISTRIBUTION_1
DISTRIBUTION_2
DISTRIBUTION_3
CONTRIBUTION_1
CONTRIBUTION_2
CONTRIBUTION_3
CORRELATION_1
CORRELATION_2
CORRELATION_3
DEVIATION_1
DEVIATION_2
DEVIATION_3
CYCLES_1
CYCLES_2
CYCLES_3
COMPOSITION_1
COMPOSITION_2
COMPOSITION_3
TREND_1
TREND_2
TREND_3
RELATIONSHIP_1
RELATIONSHIP_2
RELATIONSHIP_3
TABLE_1
TABLE_2
TABLE_3
COMBINATION
COLUMN_CHART
BAR_CHART
LINE_CHART
AREA_CHART
PIE_CHART
SCATTER_PLOT
BUBBLE_CHART
GAUGE
RADAR_CHART
FRAME_DIAGRAM
RECTANGULAR_TREE_D...
FUNNEL_CHART
WORD_CLOUD_CHART
GANTT_CHART
MAP
HEATMAP
COMPLEX_VIS
SIMPLE_VIS


SIMPLE_VIS
VISUAL_LITERACY_1
VISUAL_LITERACY_2
VISUAL_LITERACY_3
VISUAL_LITERACY_4
TEST_ANSWERS
RESEARCH_STUDY_ID
TEST_QUESTION_ID
PARTICIPANT_ID
ANSWER_STRING
ANSWER_INT
START_DATETIME
RESPONSE_DATETIME
RESPONSE_TIMEMS
TEST_QUESTIONS
TEST_QUESTION_ID
RESEARCH_TEST_ID
QUESTION_NUMBER
IS_DEMO
QUESTION_NAME
USES_METADATA
TEST_QUESTION_TYPE_ID
TEST_QUESTION_TYPES
TEST_QUESTION_TYPE_ID
TYPE_NAME
TEST_QUESTIONS_METADATA
TEST_QUESTION_ID
META_STRING1
META_STRING2
META_STRING3
META_STRING4
META_STRING5
META_NUMBER1
META_NUMBER2
META_NUMBER3
META_NUMBER4
META_NUMBER5
META_BINARY1
META_BINARY2
META_BINARY3
META_BINARY4
META_BINARY5
META_LINK1
META_LINK2
META_LINK3
META_LINK4
META_LINK5
META_STRING6
META_STRING7
META_STRING8
META_STRING9
META_STRING10
META_NUMBER6