

# TRIAL AND EVALUATION DESIGN

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D22

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

The main aim of the IDEALVis project is to develop adaptive, human-centered data visualizations that facilitate the most efficient and effective exploration and analysis of complex and multidimensional data found in businesses for more effective decision making.

Operation and validation of the IDEALVis project will be performed in two companies RAI Consultants and KPMG located in Nicosia Cyprus. The said companies were chosen, since they are heavily driven by data analysis tasks for their day to day operations. RAI Consultants mainly provides its clients with consumer research services and KPMG offers a number of services spanning from audit, taxation and advisory services among many others. All the studies of the IDEALVis project will be performed on the premises of each company.

The main role of this deliverable is to provide the initial trials setup and design and examine issues like how the trial sites will be organized, what kind of training will be needed, how the evaluation data will be collected and define the user groups that will participate in the trials. Also, an inventory of the available resources and a specification of what needs to be added, extended or adapted for the support of the proposed pilots, is made. In addition, the overall evaluation approach (i.e., the quantifiable success indicators, the evaluation methodologies and evaluation questionnaires) that will be used both for the pre-trials' and the trials' evaluation, is defined in detail and mapped to the relevant objective indicators of the project.

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# 1 Introduction

## 1.1 Project Overview

The exponential growth of structured and unstructured data today creates new challenges in the business sector, especially in how to convert this data in a suitable format for use and understanding by each employee, regardless of his role. Traditionally, data models and their representations are characterized by considerable complexity that makes their analysis by non-experts often difficult or impossible. In IDEALVis, we argue that the complex nature of data visualizations requires the use of an integrated user model that includes cognitive characteristics, experience, understanding of objectives, and the characteristics of the data that can be processed. These factors can be used in data exploration and analysis and to support the development of sophisticated personalization and adaptation techniques that offer a more effective interaction. Therefore, the goal of IDEALVis is to develop adaptive, human-centered data visualizations that facilitate the most efficient and effective exploration and analysis of complex and multidimensional data found in businesses for more effective decision making. To this end, the research team will first investigate the effect of cognitive characteristics in relation to data visualizations and, therefore, formulate a multidimensional anthropocentric model that will be further enhanced by the integration of the user experience in data exploration. The model will also include the experience of experts in locating data best practices. The above model and mechanisms will make up the IDEALVis system that will dynamically adapt the structure and semantics of data visualizations based on the individual characteristics of users to increase their satisfaction and understanding.

## 1.2 Role of this deliverable

The main role of this deliverable is to provide a road map for the user studies and pilot evaluation. In particular, it provides important information about the trials setup and design and examines issues related with the organization of the trial sites, user training required, data collection. Furthermore, it analyses the user groups (i.e., analysts) from each organization that will participate in the trials. Finally, it outlines the evaluation methodology providing quantifiable success indicators and how these are linked to the objectives of the project.

## 1.3 Report Structure

The rest of the report will provide details about the sites that the user studies will run at, with details on what is needed in terms of infrastructure for the successful completion of all user studies and any considerations that the team needs to take into account for the smooth execution of all studies (Section 2). Moreover, the report will take a closer look at the required setup that needs to be in place and further discuss the several considerations that need to be handled like data protection matters and GDPR in general (Section 3). The user groups for the studies will also be shown, along with their details and the training that will be provided to them (Section 4). Moving on, the report will demonstrate the studies and the various tools that go with each study i.e. questionnaires and tasks that the participants will have to complete (Section 5). After the studies section, a

comprehensive evaluation design will be presented, aiming to evaluate the study and the data collection that comes with it (Section 6). Finally, further conclusions are discussed in Section 7.

## 2 Trial/Pilot Sites

This section will go through several considerations that relate to the setup of the sites for achieving the proper execution of the user studies. Moreover, the mandatory infrastructure per site is discussed with an indication of the various user groups that are participating.

### 2.1 RAI Consultants

RAI Consultants is a company based in Nicosia Cyprus that mainly offers consumer research services, helping their clients extend and enhance their marketing strategies, through the use of Quantitative and Qualitative Research techniques. Moreover, RAI Consultants offer trade research services such as (Market assessment studies, Forecasting, Imports/Exports analysis, Competitive assessment, Opportunity studies, Marketing planning and Logistics.

#### 2.1.1 Infrastructure

The user studies that will run for the portion of participants offered by RAI Consultants will be conducted at the premises of the company. The space needed for the user studies is a conference room with a proper WIFI connection that can accommodate up to 10 to 15 laptop computers at simultaneous operation. The site will be responsible for providing the space along with any appropriate equipment, such as desks, office chairs, laptop computers and peripherals i.e. computer mice. For the proper execution for some parts of the study i.e. psychometric tests in Study 1, it is essential that the participants will be equipped with a computer mouse for completing the tasks, since a laptop trackpad can diminish the overall performance of the participants.

#### 2.1.2 User Groups

Participants from RAI Consultants include: a) *internal analysts* from consumer research and syndicated sales data retail audits; and b) *external analysts* from collaborators and partner of the company. The latter includes key players of the Cyprus market such as Iakovos Photiades Foodstuff Suppliers LTD, BAT Cyprus, KEAN, Harco Trading LTD and Eureka LTD.

The business roles of the aforementioned analysts are detailed below:

- Data Processing Executives.
- Junior and Senior Data Analysts.
- Financial Analysts.
- Managers and Directors.
- Brand Managers.
- CEOs.



## 2.2 KPMG Cyprus

KPMG Cyprus is a company located in Nicosia Cyprus that offers a number of services spanning from audit, taxation and advisory services among many others. The company's goal is to offer professional services to its customers, helping them to mitigate risks and grasp opportunities for further development.

### 2.2.1 Infrastructure

The user studies that will run for the portion of participants offered by KPMG Cyprus will be conducted at the premises of the company. The space needed for the user studies is a conference room with a proper WIFI connection that can accommodate up to 15 to 20 laptop computers at simultaneous operation. The site will be responsible for providing the space along with any appropriate equipment, such as desks, office chairs, laptop computers and peripherals i.e. computer mice. For the proper execution for some parts of the study i.e. psychometric tests in Study 1, it is essential that the participants will be equipped with a computer mouse for completing the tasks, since a laptop trackpad can diminish the overall performance of the participants.

### 2.2.2 User Groups

Participants from KPMG Cyprus included internal analysts who handle a huge amount of external customers in the areas of data analysis, financial management/planning, accounting/auditing and senior executives.

The business roles of the aforementioned analysts are detailed below:

- Financial Advisors, Risk Analysts.
- Accountants / Auditors.
- Business Analysts.
- Managers.
- Systems Data Analysts.

## 2.3 Challenges/Considerations

The only challenges we can speculate at the moment are mainly network availability interruptions that can occur throughout the study sessions. This will be the responsibility of the IT staff that will be available on the premises during the study. Another issue that we have to mention is the case of the system experiencing any sort of problems that were not visible during previous testing phases. The mitigation of this risk will be ensured by the team members that will be present during the study sessions equipped with the appropriate hardware.

## 3 Infrastructure Setup

The infrastructure setup will be coordinated by the team that will be in communication with the participating companies. All the required hardware / software / network setups etc. will be setup by the participating companies after a discussion with the IDEALVis coordinator. Dedicated IT teams for both RAI and KPMG have been assigned to support the trials. More details regarding the infrastructure requirements are present in Section 2.

### 3.1 System Setup

The system setup will take place before the day of each study since the system is cloud-based. All the different tasks and questionnaires that the participants will have to complete for each study are virtual and offered inside the IDEALVis platform as a web application. On the day of each study, access to the system will be achieved through the use of laptop computers and updated web browsers, preferably Google Chrome. All participants will have to create user accounts using their emails in order to access the study tasks. To speed the process of the first study participants will be informed by their managers to register on the IDEALVis platform 7 days prior to the study. Moreover, the platform will allow participants to use their credentials to login and complete future studies as well, therefore less setup will be required.

### 3.2 Data Collection

All the data for all the studies will be collected online through the use of the IDEALVis platform. An example questionnaire of the platform is shown in Figure 1, likewise a psychometric test is shown in Figure 2. All participants will be able to register (see Figure 3) an account where their data will be kept isolated from other participants, accessible only by them and the research team (see data anonymity section below). The participants will also be able to view, edit and delete any of their responses. Moreover, the participants will be able to opt out of the study at any time with all their data being deleted or even downloaded for their personal use (see the data protection officer section below).

## Business Role Questionnaire

### ABOUT YOUR BUSINESS ROLE

\* 1) What is your current BUSINESS ROLE?

Business Role

\* 2) How LONG (months) have you been working in this role?

Months

\*3) What are your three (3) main RESPONSIBILITIES in this role?

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

First Responsibility

\* 4) How would you describe three (3) PAINPOINTS during data exploration (including interacting with data visualizations) for accomplishing your business tasks?

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

First Painpoint

Figure 1 - Business Role Questionnaire

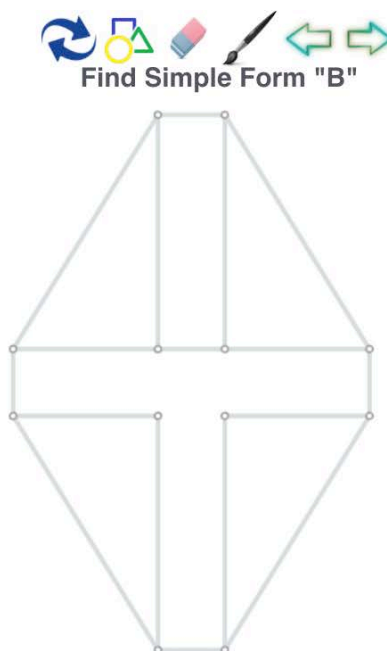
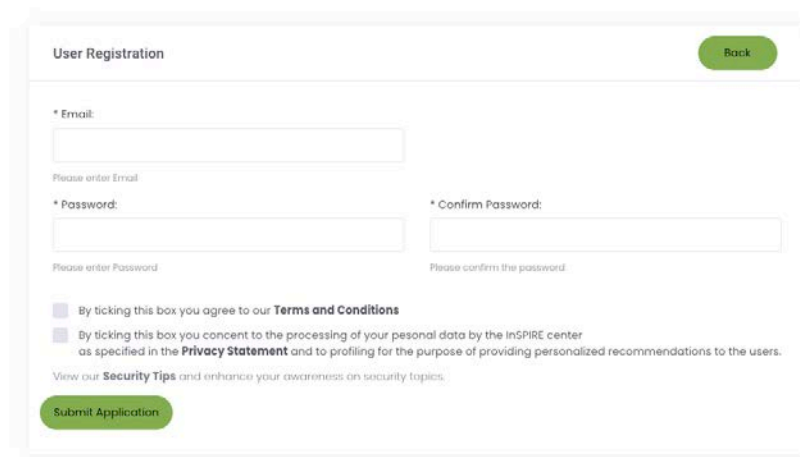


Figure 2 - Field Dependent Independent Psychometric Test



The image shows a 'User Registration' form. At the top right is a green 'Back' button. The form contains the following fields and elements:

- \* Email:** A text input field with a placeholder 'Please enter Email'.
- \* Password:** A text input field with a placeholder 'Please enter Password'.
- \* Confirm Password:** A text input field with a placeholder 'Please confirm the password'.
- Two checkboxes with associated text:
  - ☐ By ticking this box you agree to our **Terms and Conditions**
  - ☐ By ticking this box you consent to the processing of your personal data by the INSPIRE center as specified in the **Privacy Statement** and to profiling for the purpose of providing personalized recommendations to the users.
- A link: [View our Security Tips and enhance your awareness on security topics.](#)
- A green 'Submit Application' button at the bottom.



Figure 3 - Participant Registration Form

## 3.3 Compliance with GDPR

### 3.3.1 Data Storage and Deletion

The data that will be collected from the studies will be stored only for analysis purposes. All data will be stored on a computer with appropriate security mechanisms, and accessible only by the research team participating in the study. The research team, in collaboration with IT experts, will ensure that personal information is protected by appropriate controls at the operational and strategic levels. Appropriate risk protection mechanisms such as unauthorized access, destruction, use, modification, and disclosure or loss of data will be used throughout the project. Wherever a participant wishes their data to be deleted, it will be removed and deleted immediately from all databases, for more see the subsection below.

### 3.3.2 Data Protection Officer

A main priority of the IDEALVis platform is data protection and privacy, therefore the platform was built with functionality that can accommodate for such concerns. A vital part of the platform is the DPO (Data Protection Officer) user role, that is used by a legible team member for handling any data related requests by participants. A participant can send a request to a DPO through the platform for the erasure or the pause of processing of his or her data at any time. Participants can send such requests from an appropriate interface as seen in Figure 4.

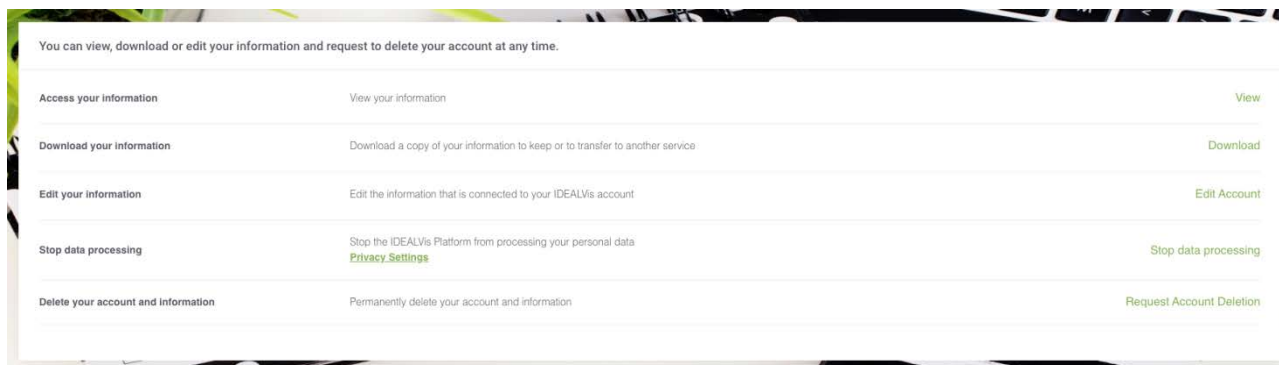


Figure 4 - Web App Manage My Data Page

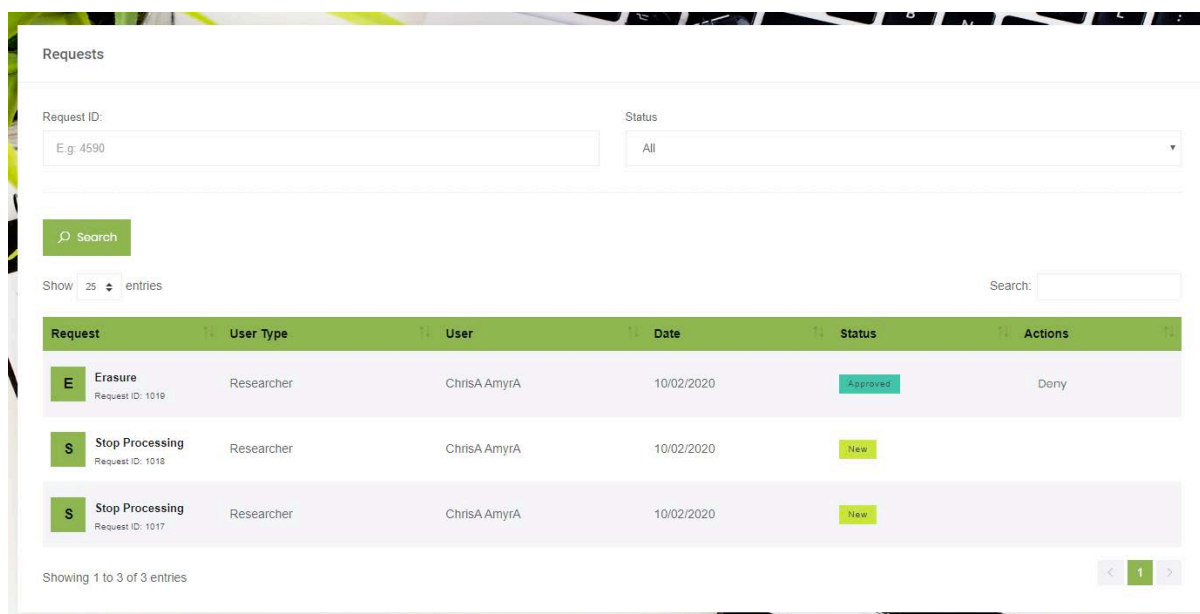


Figure 5 - Web App - Manage Account Requests

Moreover, the DPO can handle participant data requests from an appropriate interface that displays relevant request details, as shown in Figure 5.

### 3.3.3 Data Anonymity

No one, except the researchers of this project, will have access to the data collected. Additionally, according to the data minimization principle, researchers do not have access to personal information such as the name of the participant that is only used for managing the profile of each user. This also applies in the cases of a scientific publications.

During the study, appropriate policies and procedures will be used to safeguard the rights of participants, providing simple and easy ways to access, correct and delete personal data, as well as any other action dictated by the General Data Protection Regulation. The research team will also monitor possible changes to the GDPR and ensure that any new regulations and updates are incorporated into the developed research strategies.

## 4 User Groups

This chapter defines the user groups that will participate in the pilot trials and what kind of training will be provided to them.

### 4.1 Target User Groups

The target group of IDEALVis, is a group of people that work in industries that requires them to use data analysis and visualizations for performing their daily tasks. All the participants in the studies will be recruited voluntarily based on the following inclusion criteria:

- Expression of interest in the project.
- Is an employee or a partner of either KPMG Cyprus or RAI Consultants.
- Has some experience in performing data analysis related tasks.
- Is able to process and understand basic data visualizations.
- Signed appropriate consent forms in the platform before participating.

### 4.2 User Training

It is essential for every participant to have a prior experience in using a computer to access the internet and use a web application, something that all participants are expected to know beforehand since their working roles entail the use of a computer for far more complicated tasks. Regarding the training for each individual study, the platform takes the participants through trial sessions that provide them with the appropriate knowledge before any task is initiated and the valid responses are recorded.

Firstly, prior to each study, a series of presentations will be performed both at RAI Consultants and KPMG Cyprus in order to introduce the IDEALVis platform, explain how the study will unfold and what are the primary research goals; ensuring that all the participants will be able to attend.

Moreover, during the studies, researchers will:

- Answer any questions related to the completion of a task or questionnaire.
- Answer any data related questions.
- Provide guidance or technical support if there is something wrong with the platform.

## 5 Studies

For the completion of the IDEALVIS platform, four (4) studies with real users will be carried out as described below:

- **Study 1**  
Collection of information for the platform design, user identification interviews and user activities
- **Study 2**  
Study of the effect of user characteristics in relation to the type of visualizations
- **Study 3**  
Study of the effect of user characteristics in relation to visualization elements
- **Study 4**  
Pilot Study and evaluation of the acceptance and satisfaction of the final system

The following sections provide more information about these studies.

### 5.1 Study 1: Collection of information for the design of the IDEALVIS platform, user identification interviews and user activities

For the purposes of designing the IDEALVIS platform, the system requirements will be collected and analyzed by different types of end users of the three organizations (e.g., analysts and decision makers). One of the primary goals of collecting and analyzing information from users is to create a user profile. Scenarios will also be developed to model user interaction with the IDEALVIS platform. The above will be based on data (information and comments) that will be collected by users.

The results of this study will help to better understand the expectations of end users and will be the basis for defining the various features of the platform to be developed.

The following will be used to collect data on system requirements:

- Interviews
  - Interviews with participants will aim to gather information on the requirements of the IDEALVIS platform. Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions.
  - More specifically, the interview questions will aim to gather information about participants' daily work activities so that researchers can better understand the requirements for developing the IDEALVIS platform. The interviews will be semi-structured and will be more in the form of an informal discussion (rather than

questions and answers). The interviewer will guide the discussion and encourage participants to share their thoughts on the functionality that the IDEALVIS platform should have in order to make their work more efficient and productive.

- The preliminary questionnaire is located in Annexes A, B, C, D, E, F, G, H and I.
- The results will be saved anonymously.
- Online Questionnaire - Cognitive Characteristics
  - The questionnaire will be completed by the users who will take part in all the studies. Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions.
  - The questionnaire will consist of questions that will evaluate the following: Working Memory Span, Speed of Processing, Control of Processing, FDI, Digit Memory Span.
  - The preliminary questionnaire is located in Annexes J, K, L, M, and N.
  - The results will be saved anonymously.
- Focus groups
  - The participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analytical positions. The participant selection process will take into account the profile we are addressing (e.g. role in the organization, expertise, technological skills, etc.). Participation in the above activities will be voluntary. Potential participants will be informed about the research and study as well as about all relevant procedures (e.g. withdrawal from the study, handling of personal data, etc.). After the briefing, potential participants will have the opportunity to ask any questions they may have about the study. They will then be given a consent form and those who would like to participate in the study will be asked to provide their consent. All information collected will be anonymous (aliases will be used).
  - Like interviews, focus groups will aim to gather information about the requirements of the IDEALVIS platform and an understanding of users' roles and activities. Focus groups will be complementary to the interviews, as group interaction can bring additional data and information about participants' day-to-day work tasks.
  - Focus group participants will have open discussions on topics similar to those discussed during the interviews, as well as additional topics that will emerge from the interviews. Such issues will aim at identifying possible operational problems that may be encountered during the performance of their daily work tasks, as well as possible recommendations on how to deal with such problems by the IDEALVIS platform. The discussions will also focus on specific operational activities that can be integrated into the IDEALVis platform to make their work more efficient and effective.
  - The focus group facilitator will lead the discussion and will be responsible for ensuring that the discussion goes smoothly, and that not a single person will dominate the discussion.
  - The results will be saved anonymously.



## 5.2 Study 2: Effect of user characteristics in relation to the type of visualizations

This study aims to recognize the effect of user characteristics in relation to the type of data visualizations in terms of performance and decision-making efficiency. More specifically, users will be asked to find information on specific job questions (identified in Study 1) but the way the data to be used to make the decision will be changed.

Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions.

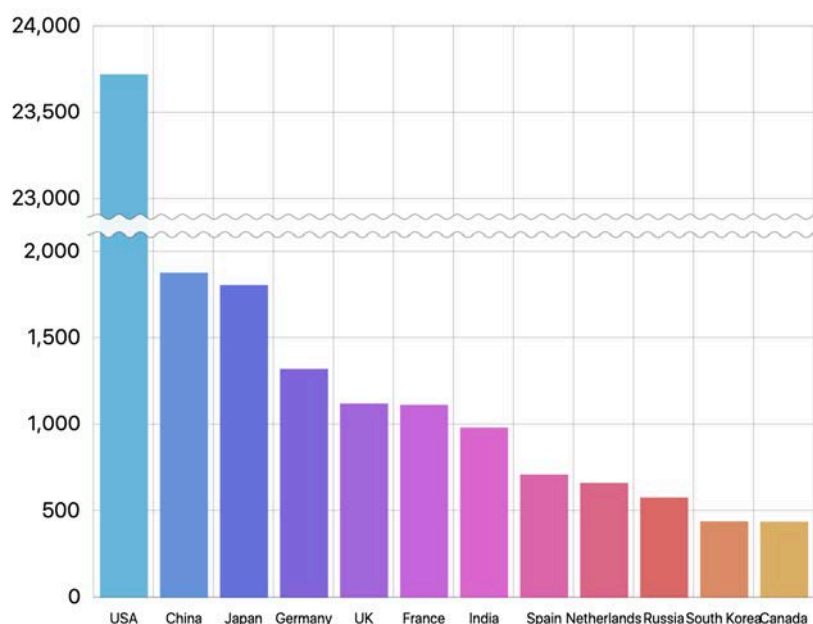
The following will be used to collect the study data:

- Online Questionnaire

- The questionnaire will be completed by the users who will take part in all the studies. Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions.
- The questionnaire will be dynamic and will consist of questions that will be created in relation to existing data. An example of the questions that will be generated dynamically is given below.

"For brand X, in which country are sales low but very close to 1,000M?"

Next, a data visualization like the one below will be shown and the answers for the user to choose will be presented.



- The system will record the user's answer and response time.

- The results will be saved anonymously.

### 5.3 Study 3: Effect of user characteristics in relation to the elements of visualizations

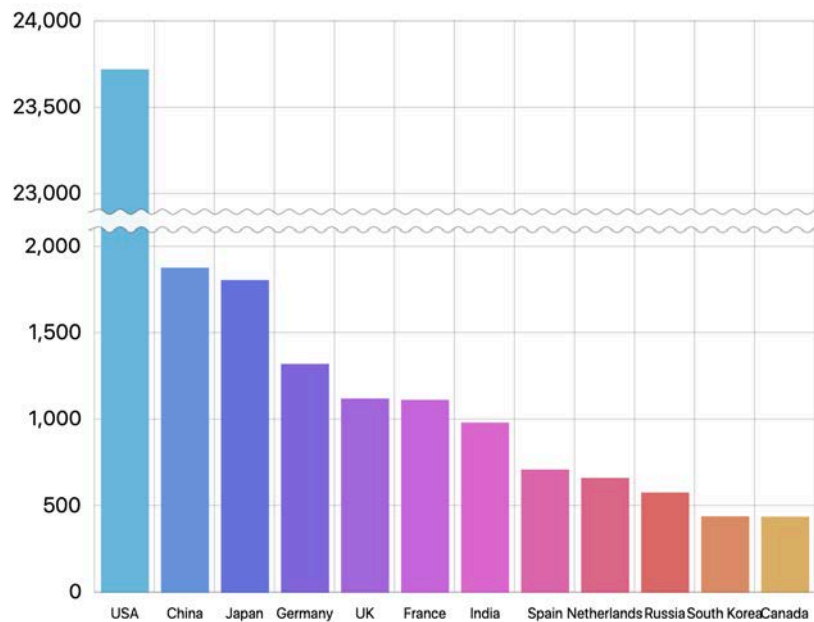
This study aims to recognize the effect of user characteristics in relation to data visualizations in terms of performance and decision-making efficiency. More specifically, users will be asked to find information on specific job questions (identified in Study 1) but the way the data to be used to make the decision will be changed. More specifically, once it has been identified as the most efficient type (or most efficient types) of visualizations for each user, the study will investigate the elements of visualizations and how they affect the performance and efficiency of decision making.

Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions.

The following will be used to collect the study data:

- Online Questionnaire
  - The questionnaire will be completed by the users who will take part in all the studies. Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions.
  - The questionnaire will be dynamic and will consist of questions that will be created in relation to existing data. An example of the questions that will be generated dynamically is given below.  
"For brand X, in which country are sales low but very close to 1,000M?"

Next, a graphical representation like the one below will be presented and the answers for the user to choose will be presented.



- The preliminary list of elements to be studied is the following:

56789

56789 color

56789 size

56789 orientation

56789 texture

- The system will record the user's answer and response time.
- The results will be saved anonymously.

## 5.4 Study 4: Evaluation of acceptance and satisfaction of end users for the final form of the IDEALVIS platform

For the purposes of evaluating the IDEALVIS platform, data will be collected and analyzed by actual end users. This data will relate to the acceptance of the platform by users, user satisfaction with their interaction with the platform, user engagement with the platform, and the impact of the platform on the effectiveness and efficiency of analysts and the organization in general.

The results of this study will provide an overview of the impact and functionality of the IDEALVIS platform in a real business environment.

The following will be used to collect data to assess the acceptance and satisfaction of the end system by real users, as well as the efficiency of the same system:

- Focus Groups
  - The focus groups will aim to gather information on the evaluation of the system (IDEALVIS platform).
  - Focus group participants will have open discussions on issues related to their satisfaction with the use of the final system, as well as topics aimed at identifying potential system problems they may have encountered during the use of the system for carrying out their daily work tasks, and possible recommendations for improving the IDEALVIS platform.
  - The focus group facilitator will lead the discussion and will be responsible for ensuring that the discussion goes smoothly and that not a single person will dominate the discussion.
  - The results will be saved anonymously.
- Shading techniques - Shadowing
  - Work shadowing will take place during the normal working hours of the participants and in their work environment. The purpose of this activity is to collect information about the evaluation of the IDEALVIS platform, by monitoring the interaction of end users with the system.
  - A researcher will monitor participants during their interaction with the IDEALVIS platform. This will give the researcher the opportunity to observe and study how end users interact with the system and to identify potential problems and / or future improvements for the system.
  - The results will be saved anonymously.
- Automatic user monitoring - User profiling
  - When using the proposed system, the system will automatically collect information regarding the user's work functions (methodology, performance etc.).
  - The information will be stored anonymously.
- Online questionnaires
  - During the pilot operation of the system, at regular intervals, the system will provide the opportunity to participate in electronic questionnaires, aimed at the qualitative analysis of various functions of the system.
  - The electronic questionnaires will include questions about the experience of the participants during the use of the system, such as the efficiency of the system, its ease of use, its functionality, etc.
  - Questionnaires will include Likert scale questions as well as open-ended questions.
  - At present, the questionnaires that will be used cannot be shown as they are not ready, as specified in the research proposal, the questionnaire preparation process is an important part of WP8 activities (Tasks 8.1, 8.2). The exact content of the questionnaires will depend on the system requirements to be collected (WP3-Task 3.3) and the final design of the platform (WP7).
  - The results will be saved anonymously.

Participants in this study (users) will be selected from the workforce of the partners in the project, InSPIRE, RAI Consultants Ltd and KPMG Cyprus Ltd and companies, external partners of RAI Consultants Ltd and KPMG Cyprus Ltd who will assign users who are in decision-making or analysis positions. The participant selection process will take into account the profile we are addressing (e.g. role in the organization, expertise, technological skills, etc.). Participation in the above activities will be voluntary. Potential participants will be informed about the research and study as well as about all relevant procedures (e.g. withdrawal from the study, handling of personal data, etc.). After the briefing, potential participants will have the opportunity to ask any questions they may have about

the study. Those who would like to participate in the study will be asked to provide their consent in the platform virtually. All information collected will be anonymous (aliases will be used).

## 6 Evaluation Design

This chapter defines the overall evaluation approach that will be used both for user studies and the pilot evaluation. More specifically, the main project objectives which will be achieved during the lifetime of the project, as well as the quantifiable success indicators and the evaluation approach that will be used for defining and measuring the progress towards the success of these objectives, are defined.

The main project objectives are described in Section 6.1. All objectives relate to the indicators defined in Section 4.4. The evaluation methodology that will be used to define and measure the progress towards the success of these objectives is described in Section 6.1. Furthermore, Section 4.2 provides a detail description of the pre-trials and trial evaluation setup.

### 6.1 IDEALVis Objectives

The overall aim of the IDEALVis project is to design, develop and evaluate adaptive, human-centered data visualizations that facilitate the most efficient and effective exploration and analysis of complex and multidimensional data found in businesses for more effective decision making. To this end, the research team will first investigate the effect of cognitive characteristics in relation to data visualizations and, therefore, formulate a multidimensional anthropocentric model that will be further enhanced by the integration of the user experience in data exploration. The model will also include the experience of experts in locating data best practices. The above model and mechanisms will make up the IDEALVis system that will dynamically adapt the structure and semantics of data visualizations based on the individual characteristics of users to increase their satisfaction and understanding.

Below the four main objectives of the IDEALVis, which will be achieved during the lifetime of the project, are stated:

**Objective 1: Identify which are the most efficient and effective visualization types for each user type based on their multi-dimensional model.**

We argue that different users, i.e., users with different models (traditional characteristics, cognitive characteristics, expertise and experience) perceive and understand data visualization types (e.g., bars, lines) differently.

This objective will be investigated through User Study 1 and 2 and will contribute to D11: The Impact of Cognitive Factors on Data Visualizations.

**Objective 2: Identify which are the most efficient and effective elements of data visualizations for each user type based on their multi-dimensional model.**

We argue that different users also perceive and understand elements of data visualizations, such as colors, font sizes, backgrounds, differently.

This objective will be investigated through User Study 1, 2 and 3 and will contribute to D11: The Impact of Cognitive Factors on Data Visualizations.

**Objective 3: Identify if reflection practices on the analytical workflow can improve user efficiency.**

We argue that users, given the opportunity to reflect on their practices, will be able to understand where they over/under perform. In turn, organizations can pinpoint inefficiencies in their setup workflows and apply appropriate interventions (e.g., user training, invest in new tools) to eliminate or minimize them.

This objective will be investigated through User Study 4 by incorporating the work of WP5.

**Objective 4: Investigate if identification and sharing of best practices on the analytical workflow can improve user efficiency.**

We believe that some users have the ability to optimize analytical workflows based on their experience. We argue that sharing these workflows has the potential to improve individual user performance, and in turn improve organizational efficiency.

This objective will be investigated through User Study 4 by incorporating the work of WP5.

## 6.2 Quantifiable Success Indicators

The mapping between the tests, the objectives and the indicators of the project is described below:

Objective	Data Collected	Indicator
Objective 1	Business Role Questionnaire Data Analysis Tasks Questionnaire Data Visualization Experience Questionnaire Emotion Regulation Questionnaire Eysenck Personality Questionnaire Decision Making Questionnaire Problem Solving Style Questionnaire Executive Skills Questionnaire Working Memory Speed of Processing Control of Attention FDI Digit Memory Span	User model formulation: Cluster fitness for user grouping  Accuracy: Precision/Recall on correct responses (positive vs. Negative)  Efficiency: Time Performance (ms)
Objective 2	User Model from Study 1 Business Role Questionnaire Data Analysis Tasks Questionnaire Data Visualization Experience Questionnaire Emotion Regulation Questionnaire Eysenck Personality Questionnaire Decision Making Questionnaire Problem Solving Style Questionnaire Executive Skills Questionnaire Working Memory Speed of Processing Control of Attention FDI	User model formulation: Cluster fitness for user grouping  Accuracy: Precision/Recall on correct responses (positive vs. Negative)  Efficiency:

	Digit Memory Span	Time Performance (ms)
Objective 3	Complete User Model Pilot Evaluation	Accuracy: Precision/Recall on correct responses (positive vs. Negative)  Efficiency: Time Performance (ms)
Objective 4	Complete User Model Pilot Evaluation	Accuracy: Precision/Recall on correct responses (positive vs. Negative)  Efficiency: Time Performance (ms)

## 6.3 Controlled Evaluation Setting

The user studies will be performed on a controlled setting using the identified user groups in each organization. A controlled setting is essential as a number of tests record real-time performance and are prone to lack of focus and external distractions. However, questionnaires assessing the current perceived expertise of the user will be assessed in a 7-day period where users can login and complete them on their own time.



## 7 Conclusions

In this report we mentioned the considerations that relate to the setup of the sites for achieving the proper execution of the user studies. Moreover, the mandatory infrastructure per site was discussed with an indication of the various user groups that are participating from each company. Further on, we mentioned all the required hardware / software / network setups that are needed along with the appropriate personnel i.e. IT staff. The system setup was also described along with the procedures that will enable the participants to provide their results to the research team. Compliance with GDPR procedures was demonstrated throughout the report and through the platform's flexibility with data protection matters i.e. DPO. The report also gave a brief explanation of the different user groups that the studies are aimed for, with an overview on what training the users will need to go through – along with other criteria that an individual must fulfil in order to participate. Further on, a discussion about all four studies took place where each study was thoroughly explained with clear steps. Finally, we presented the evaluation approach to be used for the studies along with emphasis on the quantifiable success indicators that will be used both for the pre-trials' and the trials' evaluation.

## Annex A – User Traditional Information

Name	Description
GENDER	Participant's Gender
AGE	Participant's Age
HAS_BACHELOR	Participant's Educational Level
HAS_MASTERS	
HAS_PHD	
ORGANIZATION_NAME	Participant's Organization Name
NATIONALITY	Participant's Nationality

# Annex B – Business Role Questionnaire

## Business Role Questionnaire

### ABOUT YOUR BUSINESS ROLE

\* 1) What is your current BUSINESS ROLE?

Business Role

\* 2) How LONG (months) have you been working in this role?

Months

\* 3) What are your three (3) main RESPONSIBILITIES in this role?

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

First Responsibility

\* 4) How would you describe three (3) PAINPOINTS during data exploration (including interacting with data visualizations) for accomplishing your business tasks?

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

First Painpoint

\* 5) Which would be three (3) WISHES for improving your daily operations that involve interaction with data visualizations?

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

First Wish

## PERCEIVED EXPERTISE

## Part A - Expertise Questions

\* 6) Indicate how much each statement applies to you.

	Never	Rarely	Sometimes	Often	Always
I strictly adhere to taught rules, theories or principles for analyzing my data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I trust my judgement for evaluating the current data analysis situation (upon receiving a request and prior starting my task), over the taught practices and models for data analysis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I perceive current data analysis situations as familiar and I use previous relevant cases to tackle them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As an initial reaction during preparation phase, I treat new data analysis requests as separate cases, instead of classifying them in predetermined categories based on my experience.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Before I start data analysis, I have an understanding of the intermediate steps (specific methodology/ strategy in mind) that will lead me to my goal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the capability to deal with more than one requests at the same time (multiple activities/ requests) during data analysis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a holistic understanding, based on my experience, of the data analysis that is required for a specific request.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I adapt models or data exploration methods to my current data analysis situation, e.g. indicating deviations from normal patterns (that may apply to repeated data analysis requests).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I take the risk of creating alternative exploration paths for analyzing data based on my perception of what is possible and more effective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I trust my intuition during data analysis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Part B - Expertise Meta-Questions

\* My level of expertise for the current business role is:

☐ Novice ☐ Advanced Beginner ☐ Competent ☐ Proficient ☐ Expert

Important: If you believe that your expertise lies within two categories, please indicate below the category. Please take into consideration the categories (Novice, Advanced Beginner, Competent, Proficient, Expert).

Your Answer

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I can adequately handle demanding tasks because I can control stressful and/or unexpected events.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am confronted with a problem, I can usually find a solution if I invest the necessary effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can remain calm when facing difficulties because I can rely on my coping abilities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

# Annex C – Data Analysis Tasks

## Questionnaire

### Data Analysis Tasks Questionnaire

#### ABOUT YOUR TASKS

\* 1) What are the three (3) most typical BUSINESS TASKS when you are exploring data using visualizations (both graphical and tabular)?

An example task is to search for missing values or outliers during data preparation.

Please respond as concisely as possible (max 10 words).

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

First Business Task

\* 2) How OFTEN do you use data visualizations for executing your business tasks?

☐ One day/week ☐ Two days/week ☐ Three days/week ☐ Four days/week ☐ Five days/week

\* 3) How many HOURS do you spend interacting with data visualizations on average each time?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more

\* 4) How many REQUESTS for data analysis are you handling every week on average?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 or more

\* 5) Which are the MOST FREQUENT QUESTIONS/ REQUESTS you need to answer when you are exploring data visualizations?

An example request would be to identify relationships amongst data elements.

Please respond as concisely as possible (max 10 words).

Please provide at least one answer. If the second and third response are not available, please enter "N/A" in the answer placeholder.

Short Description

6) Please indicate the tools that you use more frequently to analyze your data:

☐ R ☐ Python ☐ SAS ☐ STATA ☐ Tableau ☐ PowerBI ☐ Excel

7) Other

Other Tools

## FREQUENT ACTIONS

\* 8) Indicate the ACTIONS that you perform when you are executing your business tasks:

	Never used	Rarely used	Frequently used
Data Preparation (e.g., sampling, cleaning, transformations)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exploration (e.g., distribution of values, comparisons)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clustering (e.g., grouping, dimensionality reduction)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anomaly detection (e.g., outliers, unusual/missing values)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Correlation (e.g., regression, p-test, frequent patterns)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time-series analysis (e.g., trends, forecasting)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classification (e.g., two class, multi-class)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prediction (e.g., linear regression, decision forests, neural networks)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data Communication (e.g., preparing Dashboards, presentations or reports)	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

9) If you have selected other above, provide a short description of the action(s) you perform:

Short Description

## Frequent Questions

Indicate the most frequent requests that correspond to the following actions during data (visualizations) exploration. Where the answer is not available, please enter "N/A" in the answer placeholder.

\* 10) Dataset preparation:

Short Description

\* 11) Data Exploration (distributions, contributions, correlations):

Short Description

\* 12) Relationship:

Short Description

\* 13) Classification:

Short Description

\* 14) Anomaly Detection:

Short Description

\* 15) Prediction:

Short Description

\* 16) Composition:

Short Description

\* 17) Geographical Analysis (e.g., region and location):

Short Description

# Annex D - Data Visualization Experience

## Questionnaire

### Data Visualizations Questionnaire

#### DATA VISUALIZATION TYPES

\* 1) Which type of visualisations do you use more often:

- ☐ Graphs (any type of graph, e.g., lines, bars pies)
- ☐ Tables (any type of tabular format, including pivot tables)
- ☐ I use both graphs and tables equally

2) Indicate at most three (3) data visualization TYPES that you prefer for each action, based on a related data exploration request (use the scroll-bar at the bottom for more actions):

	Alternating Rows Table	Bar Chart	Bubble Chart	Circular Area Chart	Column Chart	Column Histogram	Column Line Chart	Groupings Table	Line Chart	Line Histogram	Pie Chart	Pie Ch with Highliq
Comparison	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correlation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Deviation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cycles (time-series)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Composition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Relationship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3) Specify below any other combination of data visualization type - action:

Short Description



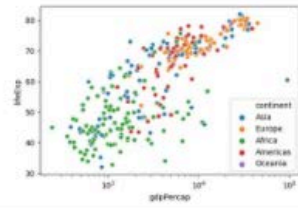


## Data Visualization Elements

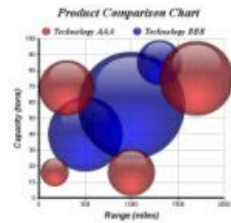
\* 4) How COMPLEX would you consider the following data visualizations:

[illegible]

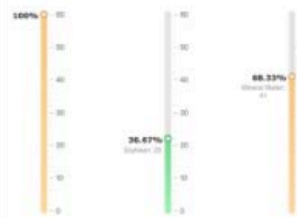
Scatter Plot



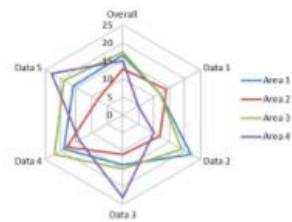
Bubble Chart



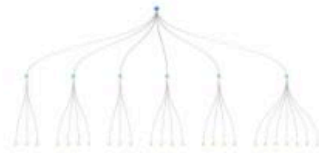
Gauge



Radar Chart



Frame Diagram





\* 5) Which data visualizations you would consider as COMPLEX (based on e.g. data dimensions, data points or volume of data, variation in colours, complementing info like labels, callouts, etc.)?

Short Description

\* 6) Which data visualizations you would consider as SIMPLE (based on e.g. data dimensions, data points or volume of data, variation in colours, complementing info like labels, callouts, etc.)?

Short Description

## VISUAL LITERACY

\* 7) Answer the questions below regarding your visual perception.

	Not good	Good	Neutral	Very Good	Extremely Good
How good are you at working with bar charts?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How good are you at working with line plots?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How good are you at working with pies?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How good are you at inferring the size of a bar in a bar chart?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How good are you at determining the difference between 2 bars in a bar chart?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How good are you at projecting a future trend from a line chart?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To what extent do you believe in the saying "a picture is worth one thousand words"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When reading books or newspapers, how helpful do you find the graphs that are part of a story?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* Are graphs easier to understand than numbers?

☐ Not at All ☐ Not Much Easier ☐ Neutral ☐ Easier ☐ Much Easier

\* How often do you find graphical information to be useful?

☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Very often

# Annex E - Emotion Regulation Questionnaire

## Emotion Regulation Questionnaire

**Instructions:** The following statements describe how people behave in their emotional life, in particular, how they control, regulate and manage their emotions. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale from 1 (Strongly disagree) to 5 (Strongly agree).

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) I can easily recognize the changes in my current emotional state.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) I recognize my emotions and I interpret them with accuracy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) I know how to explain my feelings to someone.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) My feelings help me to understand what has happened.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) I can easily adapt emotionally according to the circumstance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) I can manage my emotions with efficiency.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) I often find myself regretting about my behaviour in specific occurrences.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) When I am emotionally aroused I cannot perform properly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9) I remain focused on my goals even if I am under pressure.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10) I find it difficult to perform unpleasant duties.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11) I reorganize myself immediately after a failure.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12) I can meet the requirements of whatever I may take over, because I can control or at least I am not affected by any stressors and/or negative influences in the environment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13) I am feeling an inner completeness that makes me feel confident in what I do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14) When I am facing a difficult situation I remain calm because I can rely on my abilities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15) When I try to learn something new, I quit easily if I cannot perform well immediately.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16) I feel that I can deal with anything that will happen to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17) When I am experiencing an emotion I have the tendency to magnify it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18) My emotional reactions usually have a long duration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19) I realize that when my emotions are intense, they have an impact on my system.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20) My reasoning is greatly influenced by my emotions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21) My emotional reactions usually surprise me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22) When I am emotionally aroused I react intensely and excessively.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23) I have the tendency to be influenced by my emotions and react impulsively.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24) When my emotions are clouded I feel unable to take decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25) Despite the intensity of the moment, I can control my behaviour.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26) When I cannot react how I want, I feel an inner tension.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27) When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28) I keep my emotions to myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29) When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30) When I am feeling positive emotions, I am careful not to express them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31) When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32) I control my emotions by not expressing them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33) When I want to feel more positive emotion, I change the way I'm thinking about the situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34) I control my emotions by changing the way I think about the situation I'm in.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35) When I am feeling negative emotions, I make sure not to express them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36) When I want to feel less negative emotion, I change the way I'm thinking about the situation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

# Annex F - Eysenck Personality Questionnaire

## Eysenck Personality Questionnaire

**Instructions:** Personality is defined as the characteristic sets of behaviors, cognitions, and emotional patterns that evolve from biological and environmental factors. This questionnaire investigates personality traits. Please answer the following questions with yes or no. There is no right or wrong answer and also no time limitation. Answering these questions accurately requires honest reflection on how you really think, feel, and act. Some of the questions on this questionnaire measure personality traits differently than you might guess or think it would be ideal, so just focus on being honest if you want the most accurate results.

	Yes	No
1) Does your mood often go up and down?	<input type="radio"/>	<input type="radio"/>
2) Do you take much notice of what people think?	<input type="radio"/>	<input type="radio"/>
3) Are you a talkative person?	<input type="radio"/>	<input type="radio"/>
4) If you say you will do something, do you always keep your promise no matter how inconvenient it might be?	<input type="radio"/>	<input type="radio"/>
5) Do you ever feel 'just miserable' for no reason?	<input type="radio"/>	<input type="radio"/>
6) Would being in debt worry you?	<input type="radio"/>	<input type="radio"/>
7) Are you rather lively?	<input type="radio"/>	<input type="radio"/>
8) Were you ever greedy by helping yourself to more than your share of anything?	<input type="radio"/>	<input type="radio"/>
9) Are you an irritable person?	<input type="radio"/>	<input type="radio"/>
10) Would you take drugs which may have strange or dangerous effects?	<input type="radio"/>	<input type="radio"/>
11) Do you enjoy meeting new people?	<input type="radio"/>	<input type="radio"/>
12) Have you every blamed someone for doing something you knew was really your fault?	<input type="radio"/>	<input type="radio"/>
13) Are your feelings easily hurt?	<input type="radio"/>	<input type="radio"/>
14) Do you prefer to go your own way rather than act by the rules?	<input type="radio"/>	<input type="radio"/>
15) Can you usually let yourself go and enjoy yourself at a lively party?	<input type="radio"/>	<input type="radio"/>
16) Are all your habits good and desirable ones?	<input type="radio"/>	<input type="radio"/>



17) Do you often feel 'fed-up'?	<input type="radio"/>	<input type="radio"/>
18) Do good manners and cleanliness matter much to you?	<input type="radio"/>	<input type="radio"/>
19) Do you usually take the initiative in making new friends?	<input type="radio"/>	<input type="radio"/>
20) Have you ever taken anything (even a pin or button) that belonged to someone else?	<input type="radio"/>	<input type="radio"/>
21) Would you call yourself a nervous person?	<input type="radio"/>	<input type="radio"/>
22) Do you think marriage is old-fashioned and should be done away with?	<input type="radio"/>	<input type="radio"/>
23) Can you easily get some life into a rather dull party?	<input type="radio"/>	<input type="radio"/>
24) Have you ever broken or lost something belonging to someone else?	<input type="radio"/>	<input type="radio"/>
25) Are you a worrier?	<input type="radio"/>	<input type="radio"/>
26) Do you enjoy co-operating with others?	<input type="radio"/>	<input type="radio"/>
27) Do you tend to keep in the background on social occasions?	<input type="radio"/>	<input type="radio"/>
28) Does it worry you if you know there are mistakes in your work?	<input type="radio"/>	<input type="radio"/>
29) Have you ever said anything bad or nasty about anyone?	<input type="radio"/>	<input type="radio"/>
30) Would you call yourself tense or 'highly strung'?	<input type="radio"/>	<input type="radio"/>
31) Do you think people spend too much time safeguarding their future with savings and insurance?	<input type="radio"/>	<input type="radio"/>
32) Do you like mixing with people?	<input type="radio"/>	<input type="radio"/>
33) As a child were you every cheeky to your parents?	<input type="radio"/>	<input type="radio"/>
34) Do you worry too long after an embarrassing experience?	<input type="radio"/>	<input type="radio"/>
35) Do you try not to be rude to people?	<input type="radio"/>	<input type="radio"/>
36) Do you like plenty of bustle and excitement around you?	<input type="radio"/>	<input type="radio"/>

37) Have you ever cheated at a game?	<input type="radio"/>	<input type="radio"/>
38) Do you suffer from 'nerves'?	<input type="radio"/>	<input type="radio"/>
39) Would you like other people to be afraid of you?	<input type="radio"/>	<input type="radio"/>
40) Have you ever taken advantage of someone?	<input type="radio"/>	<input type="radio"/>
41) Are you mostly quiet when you are with other people?	<input type="radio"/>	<input type="radio"/>
42) Do you often feel lonely?	<input type="radio"/>	<input type="radio"/>
43) Is it better to follow society's rules than go your own way?	<input type="radio"/>	<input type="radio"/>
44) Do other people think of you as being very lively?	<input type="radio"/>	<input type="radio"/>
45) Do you always practice what you preach?	<input type="radio"/>	<input type="radio"/>
46) Are you often troubled about feelings of guilt?	<input type="radio"/>	<input type="radio"/>
47) Do you sometimes put off until tomorrow what you ought to do today?	<input type="radio"/>	<input type="radio"/>
48) Can you get a party going?	<input type="radio"/>	<input type="radio"/>

# Annex G - Decision Making Style Inventory

## Questionnaire

### Decision Making Style Inventory Questionnaire

**Instructions:** Decision-making is the process of identifying and choosing alternatives based on the values, preferences and beliefs of the decision-maker. This questionnaire identifies how we process data and information in order to reach to a decision. Please indicate whether you agree or disagree with each statement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) I double-check my information sources to be sure I have the right facts before making a decision.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) When making a decision, I rely upon my instincts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) I often need the assistance of other people when making important decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) I avoid making important decisions until the pressure is on.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) I generally make snap decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) I make decisions in a logical and systematic way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) When I make decisions, I tend to rely on my intuition.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) I rarely make important decisions without consulting other people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9) I postpone decision making whenever possible.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10) I often make decisions on the spur of the moment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11) My decision making requires careful thought.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12) I generally make decisions that feel right to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13) If I have the support of others, it is easier for me to make important decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14) I often procrastinate when it comes to making important decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15) I make quick decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16) When making a decision, I consider various options in terms of a specific goal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17) When I make a decision, it is more important for me to feel the decision is right than to have a rational reason for it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18) I use the advice of other people in making my important decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19) I generally make important decisions at the last minute.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20) I often make impulsive decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21) I explore all of my options before making a decision.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22) When I make a decision, I trust my inner feelings and reactions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23) I like to have someone to steer me in the right direction when I am faced with important decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24) I put off making many decisions because thinking about them makes me uneasy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25) When making decisions, I do what seems natural at the moment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

# Annex H - Problem Solving Style Questionnaire

## Problem Solving Style Questionnaire

**Instructions:** Problem solving is the procedure of finding solutions in difficult and complex matters. It is considered a natural part of our daily lives. Below you will find statements relevant to the problem-solving procedure. Please rate how much you personally agree or disagree with these statements – how much they reflect how you feel or think.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) Most people think that I am objective and logical.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2) Most people would say that I am emotional and rather motivating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3) Most people believe that I know the details of my job and do it very accurately.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4) Most people agree that I am a complex and intellectual person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5) I tend to focus on immediate problems and let others worry about the distant future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6) I try to please others and need occasional praise myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7) When I face a problem, I try to analyze all the facts and put them in systematic order.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8) I'm more interested in long-range implications and am often bored with minor here and now details.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9) I'm usually more people oriented than task oriented.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10) Before I put energy into a project, I want to know what's in it for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11) I normally solve problems quickly without wasting a lot of time on details.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12) When I have a job to do, I do it, even if others' feelings might get hurt in the process.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13) I get bored with routine and prefer to deal with new and complicated challenges.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14) I'm a pretty good judge as to how others feel about problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15) I don't let problems upset me, no matter how difficult they are.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16) I like to do things that I do well, but I'm not comfortable trying to learn new skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17) I prefer harmony in a work group—otherwise efficiency suffers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18) I really enjoy solving new problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19) I am a quick learner, but I don't like theoretical, futuristic concepts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20) When necessary, I have no trouble making tough, hard-nosed decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Annex I - Executive Skills Questionnaire

## Executive Skills Questionnaire




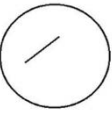

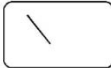

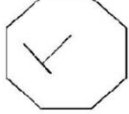
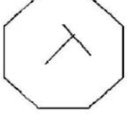
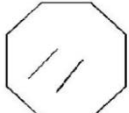
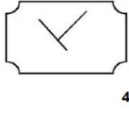
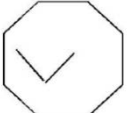

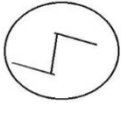
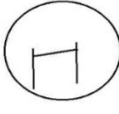

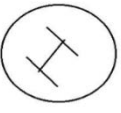
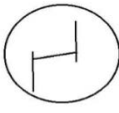
**Instructions:** Executive skills is a term scientists use to describe core, brain-based habits of mind that all of us employ to prioritize and execute daily tasks, including getting organized, staying focused, and controlling our emotions. Please read each item and then rate that item based on the extent to which you agree or disagree with how well it describes you.

[illegible]

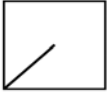
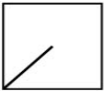





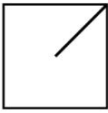
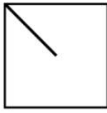

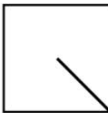
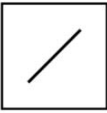

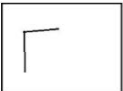
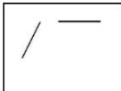

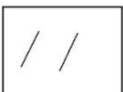









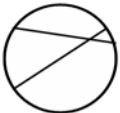
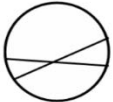
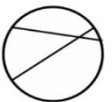



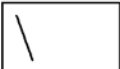

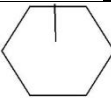


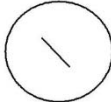
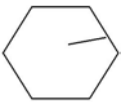



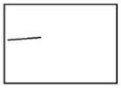
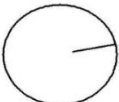
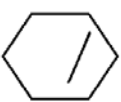

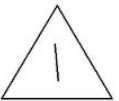
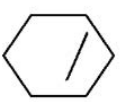


## Annex J - Working Memory Questionnaire (Working Memory Span)


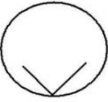
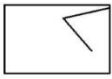
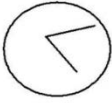

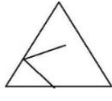

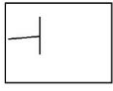
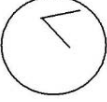















Image recognition presented for a limited time.

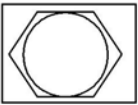
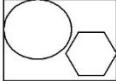
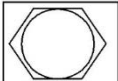


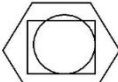
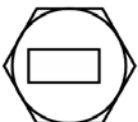

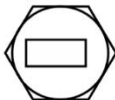




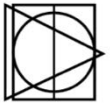



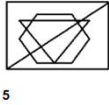




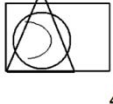

-3	 <b>Answer:1</b>	 1  2  3  4  5
-1	 <b>Answer:1</b>	 1  2  3  4  5
0	 <b>Answer:5</b>	 1  2  3  4  5


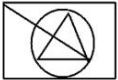




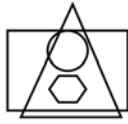

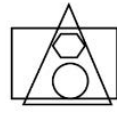

















2	 Answer:1	 1  2  3  4  5
3	 Answer:3	 1  2  3  4  5
4	 Answer:3	 1  2  3  4  5
5	 Answer:5	 1  2  3  4  5

6	 Answer:2	 1  2  3  4  5
7	 Answer:1	 1  2  3  4  5
8	 Answer:1	 1  2  3  4  5
9	 Answer:3	 1  2  3  4  5

10	 Answer:1	 1  2  3  4  5
11	 Answer:4	 1  2  3  4  5
12	 Answer:5	 1  2  3  4  5
13	 Answer:5	 1  2  3  4  5

14	 Answer:2	<div>   </div> <div>    </div>
15	 Answer:2	<div>   </div> <div>    </div>
16	 Answer:4	<div>   </div> <div>    </div>
17	 Answer:2	<div>   </div> <div>    </div>

18	 Answer:4	<div>   </div> <div>  </div> <div>   </div>
19	 Answer:3	<div>   </div> <div>  </div> <div>   </div>
20	 Answer:4	<div>   </div> <div>  </div> <div>   </div>
21	 Answer:2	<div>   </div> <div>  </div> <div>   </div>

## Annex K - Questionnaire Processing Speed (Speed of Processing)

Identify the color behind the word.

-2	<b>Red</b>	Answer: r
-1	<b>Green</b>	Answer: b
0	<b>Blue</b>	Answer: g
1	<b>Blue</b>	Answer: r
2	<b>Red</b>	Answer: b
3	<b>Red</b>	Answer: r
4	<b>Green</b>	Answer: b
5	<b>Red</b>	Answer: g
6	<b>Green</b>	Answer: g
7	<b>Green</b>	Answer: b
8	<b>Green</b>	Answer: g
9	<b>Red</b>	Answer: g
10	<b>Green</b>	Answer: g
11	<b>Red</b>	Answer: r
12	<b>Blue</b>	Answer: b
13	<b>Green</b>	Answer: r
14	<b>Blue</b>	Answer: b
15	<b>Blue</b>	Answer: g
16	<b>Red</b>	Answer: r
17	<b>Blue</b>	Answer: b
18	<b>Blue</b>	Answer: r

## Annex L - Processing Control Questionnaire (Control of Processing)

Recognize the color that the word of the word writes.

-2	<b>Red</b>	<b>Answer: r</b>
-1	<b>Green</b>	Answer: g
0	<b>Blue</b>	Answer: b
1	<b>Green</b>	Answer: g
2	<b>Red</b>	Answer: r
3	<b>Green</b>	Answer: g
4	<b>Green</b>	Answer: g
5	<b>Green</b>	Answer: g
6	<b>Red</b>	Answer: r
7	<b>Blue</b>	Answer: b
8	<b>Red</b>	Answer: r
9	<b>Green</b>	Answer: g
10	<b>Blue</b>	Answer: b
11	<b>Red</b>	Answer: r
12	<b>Red</b>	Answer: r
13	<b>Blue</b>	Answer: b
14	<b>Blue</b>	Answer: b
15	<b>Red</b>	Answer: r
16	<b>Green</b>	Answer: g
17	<b>Blue</b>	Answer: b
18	<b>Blue</b>	Answer: b

## Annex M - Digit Memory Span

For each of the below tasks, the available numbers of each task (produced randomly from 0 - 9) are shown one by one to the participant. Once all the available numbers are shown the participant has to enter them in the system using the correct sequence that the numbers appeared.

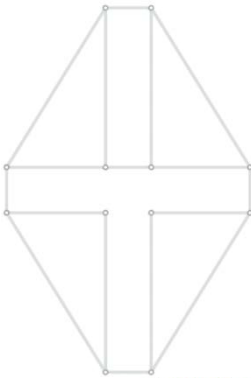
	Available Numbers	Correct Answer
-3	<b>1</b>	1
-2	<b>1 - 2</b>	12
-1	<b>2 - 3 - 4</b>	234
1	<b>2</b>	2
2	<b>2 - 7</b>	27
3	<b>9 - 2 - 3</b>	923
4	<b>9 - 7 - 2 - 3</b>	9723
5	<b>2 - 2 - 4 - 7 - 5</b>	22475
6	<b>8 - 4 - 7 - 4 - 6 - 5</b>	847465
7	<b>1 - 4 - 2 - 6 - 6 - 5 - 2</b>	1426652
8	<b>9 - 9 - 9 - 8 - 4 - 7 - 5 - 2</b>	99984752
9	<b>1 - 3 - 4 - 5 - 7 - 8 - 4 - 6 - 2</b>	134578462



# Annex N – Cognitive Test Dependence / Independence of Field (Field Dependent / Independent)

Shape recognition.

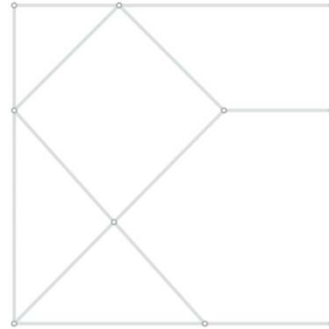
Find Simple Form "B"



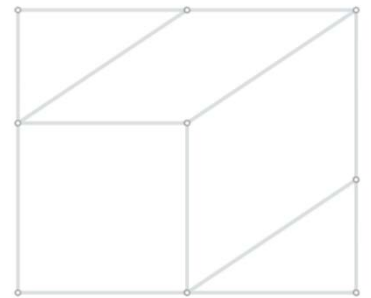
Find Simple Form "G"



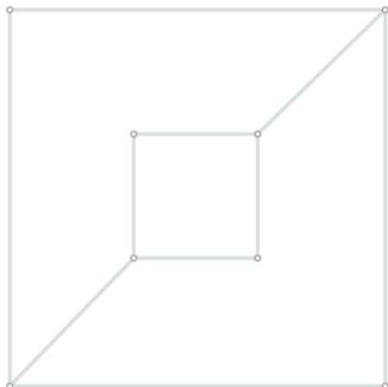
Find Simple Form "D"



Find Simple Form "E"



Find Simple Form "C"



Find Simple Form "F"



Find Simple Form "A"



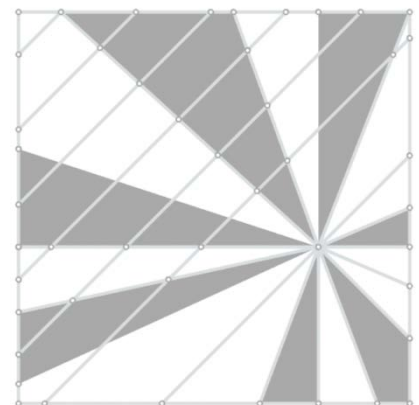
Find Simple Form "G"



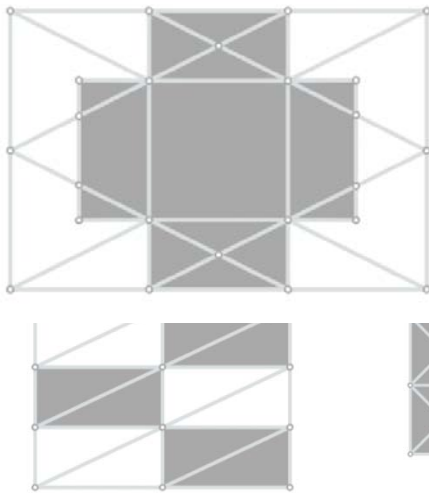
Find Simple Form "A"



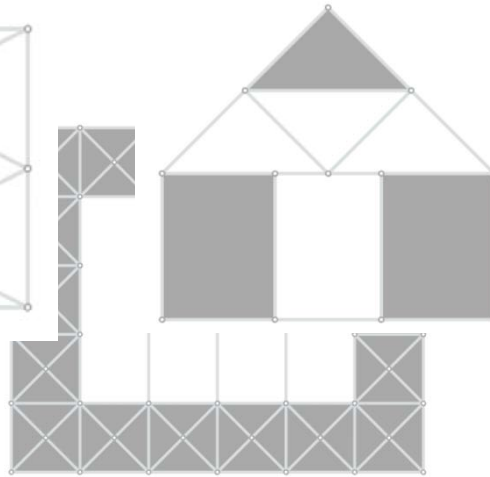
Find Simple Form "G"



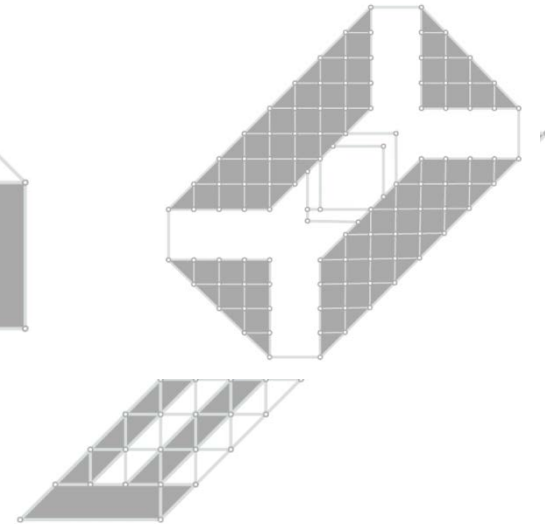
Find Simple Form "E"



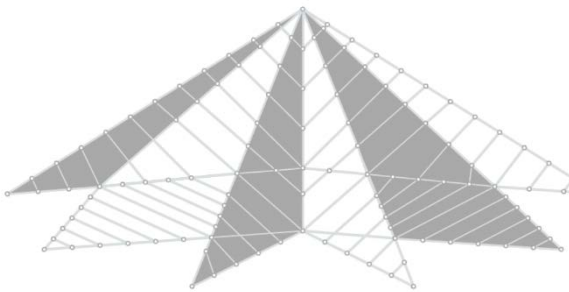
Find Simple Form "D"



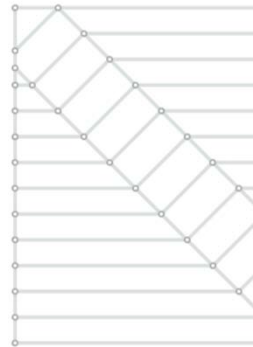
Find Simple Form "H"



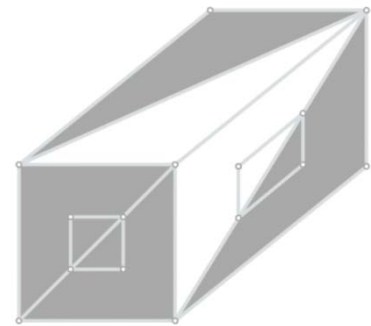
Find Simple Form "F"



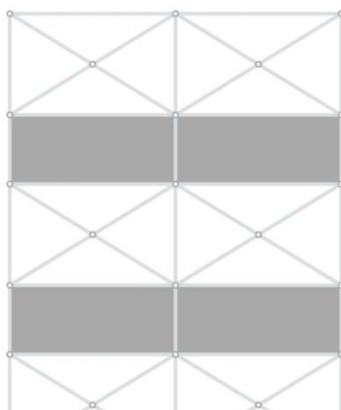
Find Simple Form "G"



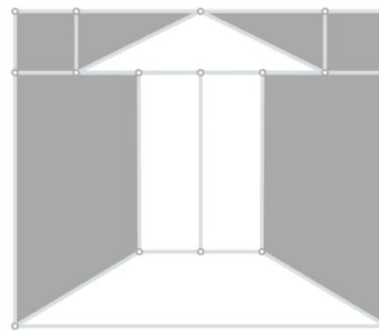
Find Simple Form "C"



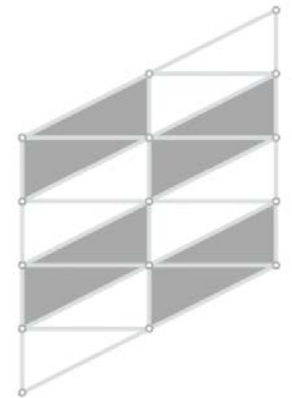
Find Simple Form "E"



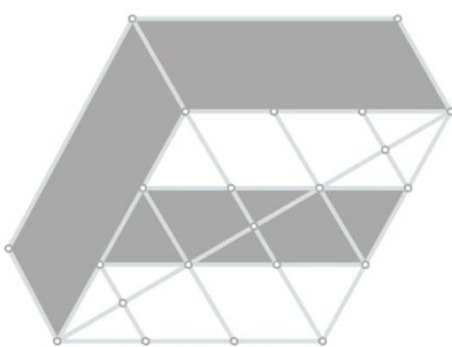
Find Simple Form "B"



Find Simple Form "E"



Find Simple Form "A"



Find Simple Form "C"

