

# DELIVERABLE 6.1

## ParCos Platform Requirements



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**"ParCos – Participatory Communication of Science"**  
**A HORIZON 2020 RESEARCH AND INNOVATION ACTION**

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<b>Overview</b>	<b>Details</b>
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## SUMMARY

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Within ParCos, there is a shared goal to develop training tools for foster participatory science making. These tools (Parcos platform, data explorer and data curator) aim to improve practices for curating, reusing, and communicating scientific data. This document outlines the human-centered approach to requirements elicitation for the ParCos tools and presents the key requirements that resulted from that process.

*Important note:* the primary purpose of this deliverable is to act as a requirements specification for the ParCos Platform that delivers access to all tools and methods associated with the ParCos approach. At the same time, requirements have been gathered as part of designing the data explorer and they are included. However, the final specification of the data explorer will be based on combining a prioritization of the requirements from other partners and stakeholders with novel research focus. The data explorer will be fully delivered as part of deliverable D6.2 (M22).

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# 1 INTRODUCTION

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This deliverable is part of work package 6, which aims to create a platform for delivering the outputs of the ParCos project, including a toolkit to support creating participatory science stories that embed data in different types of media. This work package in particular, focuses on identifying and formalizing the platform requirements. In order to achieve this, we have taken a participatory approach to requirements elicitation, organizing internal and external design workshops with project members and case study stakeholders. As a result, we have formalized the different needs into a set of requirements. These requirements have been prioritized according to their critical impact to functioning of version 1 of the platform prototype.

Following the project proposal, this platform requirements document outlines needs and opportunities for the creation of tools for curating, reusing, and communicating scientific data in a participatory way. These requirements are governed by responsible principles of technology use and data management. The tools described in this document are part of the ParCos Approach under development within this project. This approach seeks to develop methods, frameworks, and tools for the participatory and interactive communication of data (See Figure 1).

In this document, section 2 details the requirements elicitation process. Followed by Section 3, which presents an overview of the ParCos tools and their goals and the requirements elicitation results.

ParCos Deliverable 6.1 “Platform Requirements”

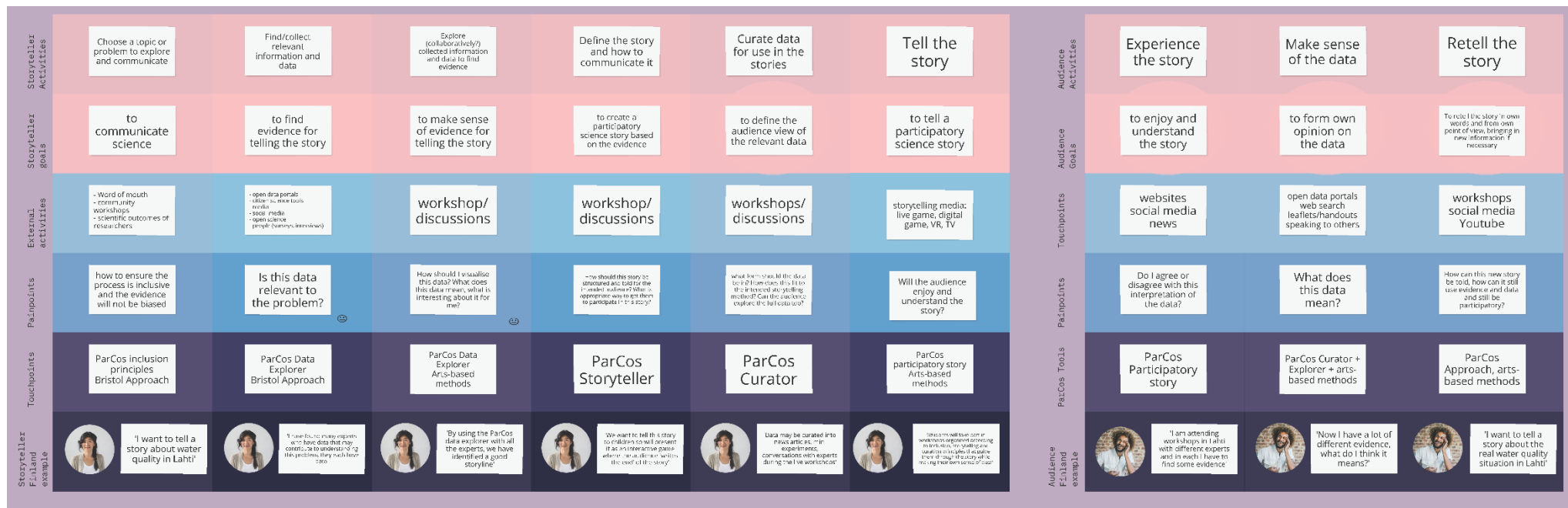


Figure 1: An overview of the ParCos Approach and the tools, frameworks and methods within this ecosystem<sup>1</sup>

<sup>1</sup> Larger version available in Appendix 1

## 2 PLATFORM REQUIREMENTS ELICITATION

The ParCos platform requirements elicitation process took place between August and December 2020. It involved 3 design workshops and several brainstorming sessions. In total 17 people were involved in the process. From which 10 were ParCos project members and 7 were community members linked with one of the ParCos case studies. This section details the human-centered approach taken during this process.

### 2.1 APPROACH

In line with the ParCos project spirit, the elicitation of requirements was completed through a combination of participatory activities and software engineering methods for requirements elicitation. The approach (see Figure 2) was built on the basis of the ParCos project proposal, design workshops with ParCos project members and community members linked to a ParCos case study in Finland, and a benchmarking of existing tools for data for curation, reuse, and communication. In the next subsection, details about the workshops are presented. The Section 3 synthesizes the results of this process.

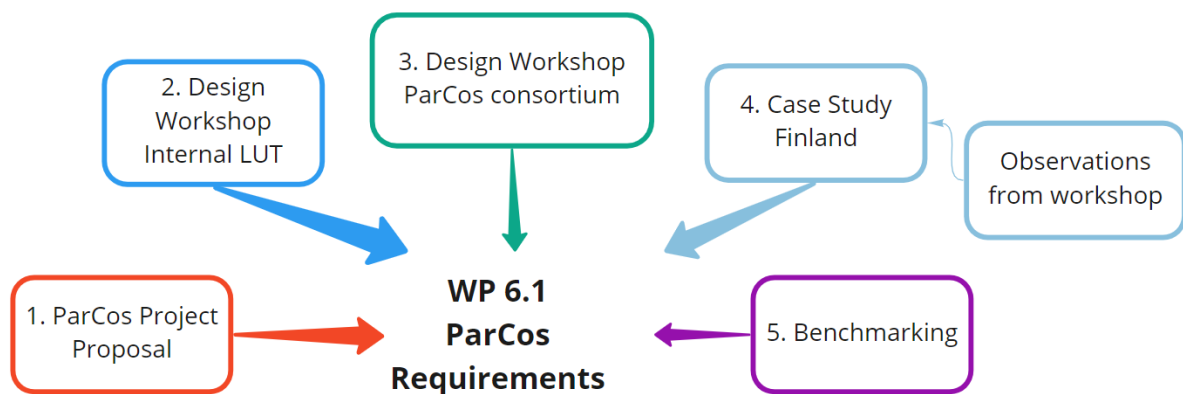


Figure 2: Requirements Elicitation Approach



### 2.1.1 Review of ParCos project proposal

The first source of information for this requirements elicitation process was the ParCos project proposal and its related documents such as the data management plan, the ethical agreements and instruments and the work-packages descriptions.

These documents were reviewed by the first author of this report, who extracted any reference to the ParCos tools and the needs they serve. In addition, these documents were also jointly reviewed during the first internal design workshop by LUT ParCos members. This included Antti Knutas, Annika Wolff, Anne Pässilä, and Natasha Tylosky.

### 2.1.2 Internal design workshop (LUT)

LUT is the partner responsible for developing the ParCos tools. Therefore, the first workshop in this process was organized internally among LUT ParCos members. This activity was a full-day workshop, and it took place online on 7.19. The focus of the event was the ParCos Data Explorer tool. A total of 4 ParCos members from LUT attended this workshop. These were Victoria Palacin, Antti Knutas, Natasha Tylosky and Annika Wolff. The activities during the workshop were the following:

- a) **Mapping requirements and needs from documentation:** In this activity each participant was responsible to read a ParCos project document (for example: work package descriptions, presentations from project planning stages and the data management plan), and to extract relevant needs, requirements, drawings, wishes that had been stated in those. The resulting mapped requirements were collected through post-it on a Miro board (See Figure 3).

ParCos Deliverable 6.1 “Platform Requirements”

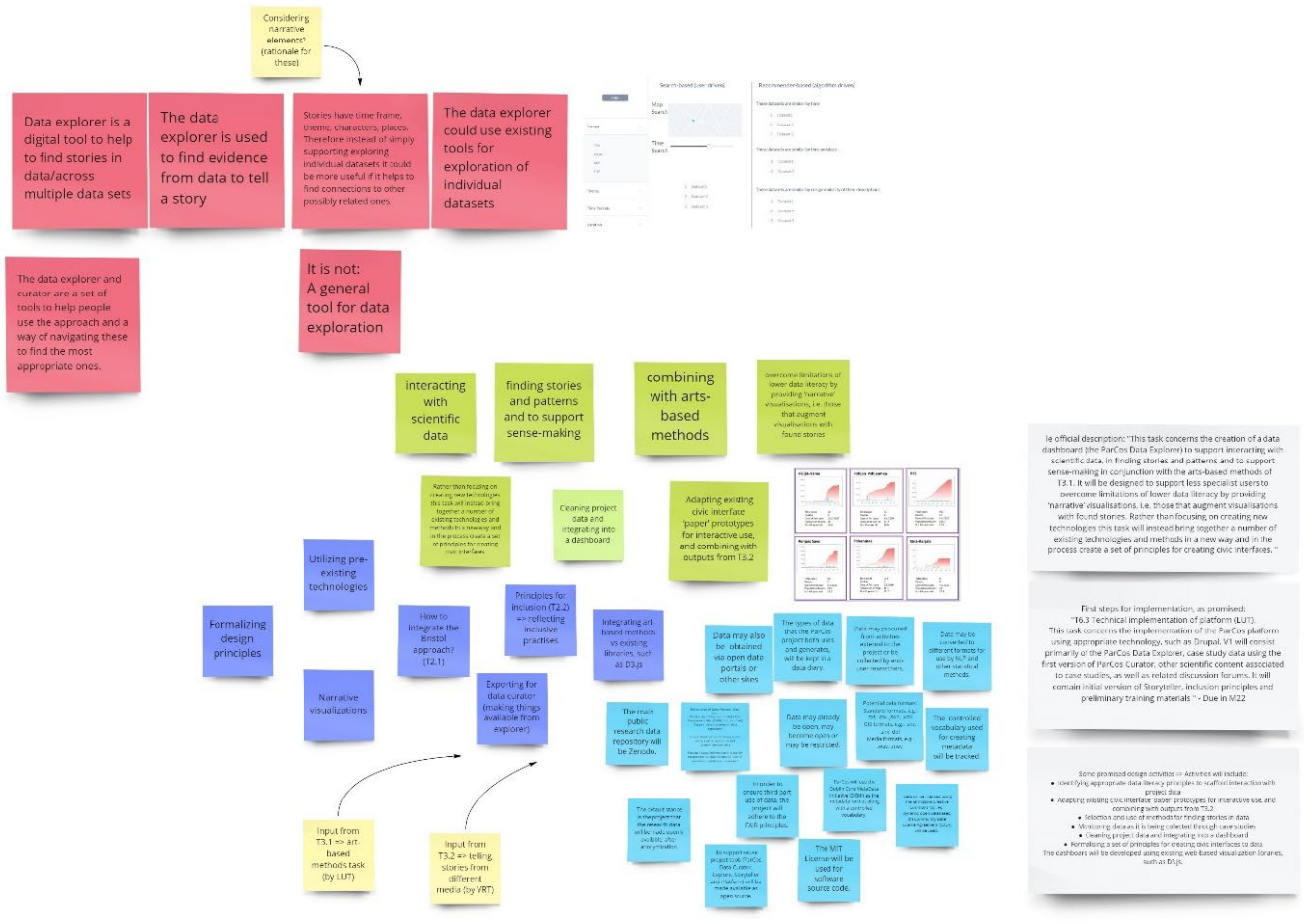


Figure 3: Mapped requirements from documentation

b) **Mapping concepts:** In this activity (see Figure 4), the participants brainstormed and discussed together four topics: the needs that the data explorer seeks to fulfill, what are the core functions of the data explorer, the roles of people within the digital system, and potential contexts in which data exploration could take place.

# 2: Map concept

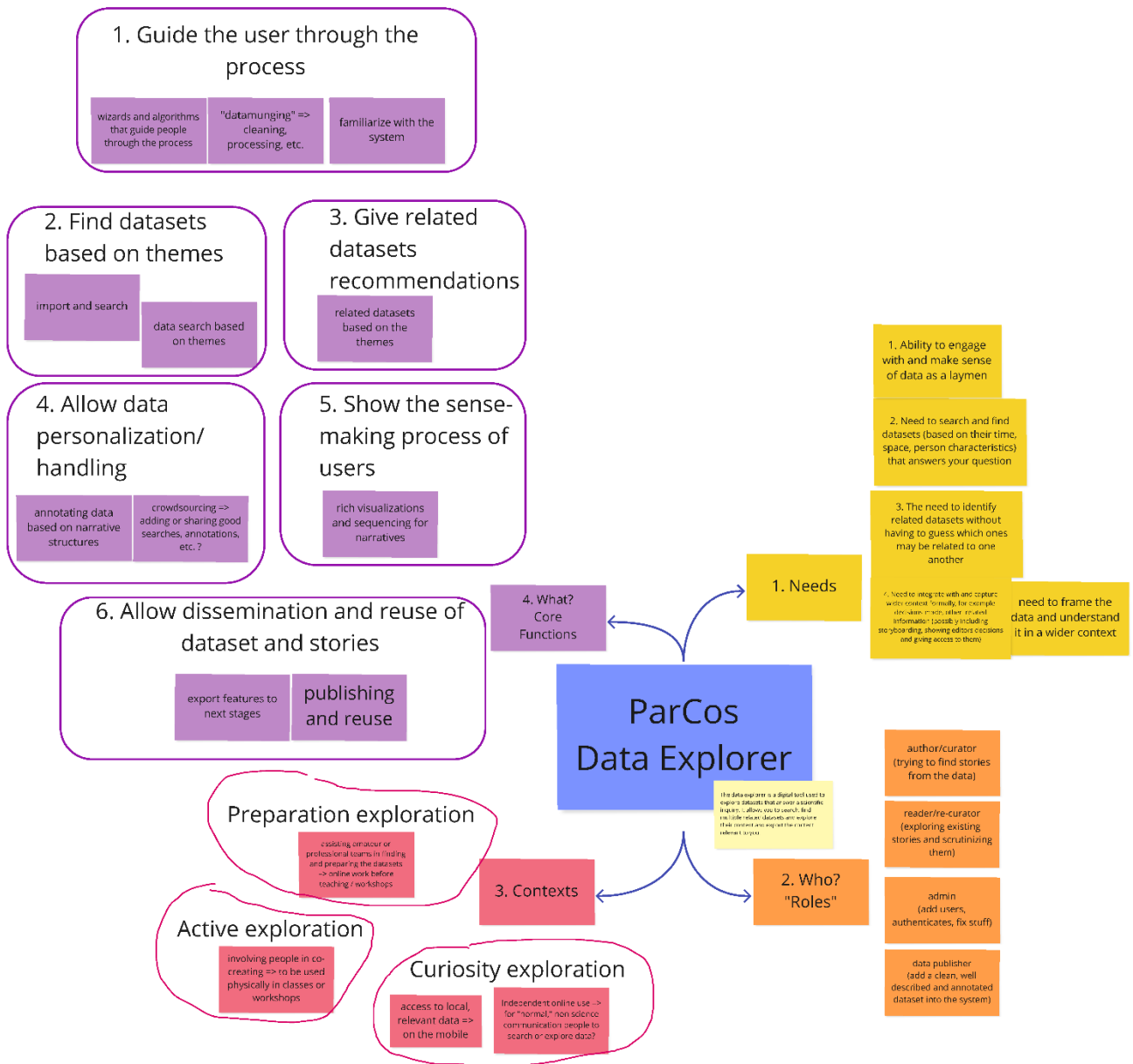


Figure 4: Data explorer, concept mapping

c) **Data explorer process modeling:** In this activity (see Figure 5), the participants were paired to create a process map for the core functionalities of the data explorer (which were defined in the previous activity). The goal of the process modeling was to describe in detail what is the desired course of action within a process. Hence, these models focus on what, why and who is involved in the process.

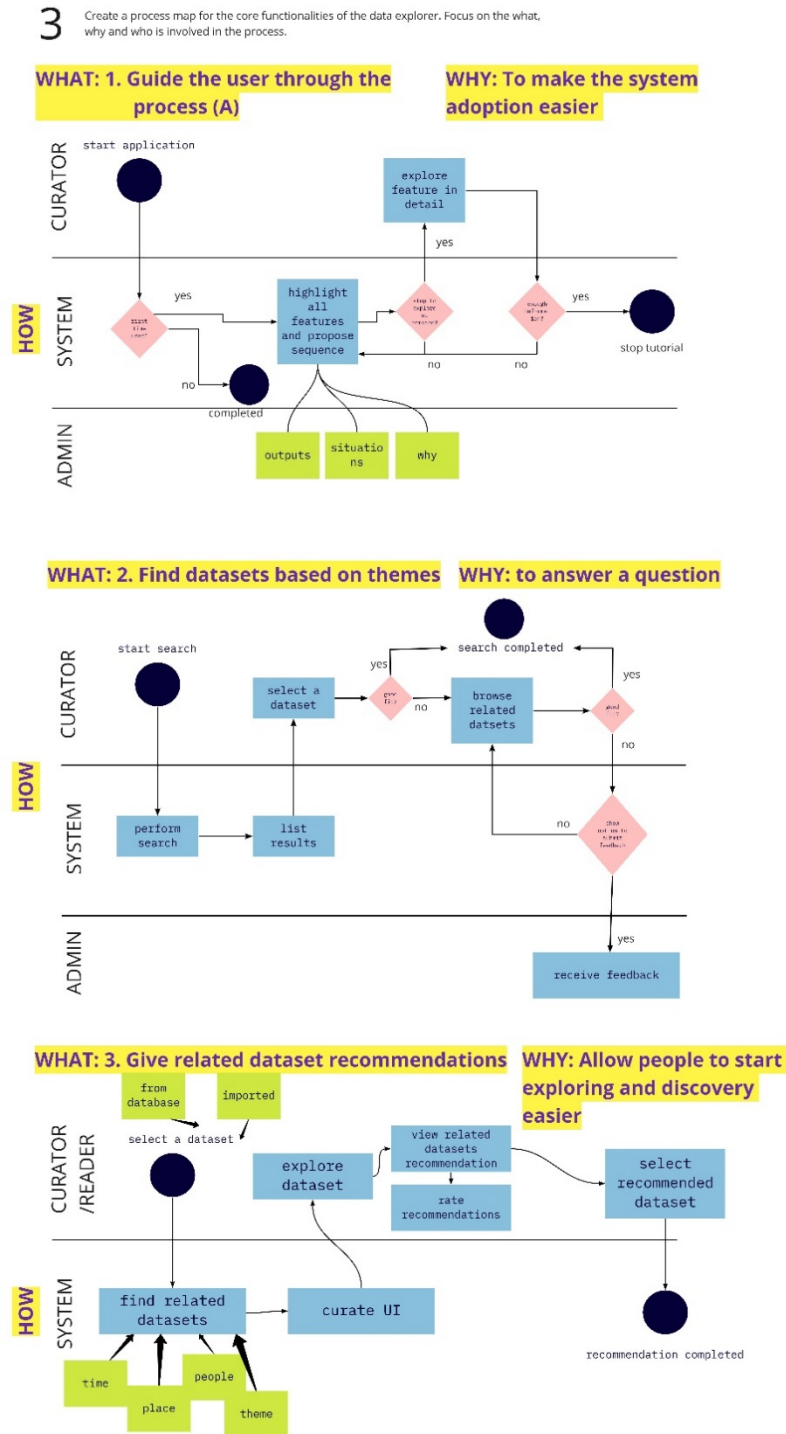


Figure 5: Data explorer, process modeling for three functionalities

- d) **Journey mapping:** In this activity, the participants were paired to create a journey map for the different user roles in the system (See Figure 6). In addition, participants brainstormed potential pain points within the user experiences when using the data explorer tool.

4

Create a journey map for the different user roles in the system. Add touchpoints, channels and personas. Brainstorm potential pain points.

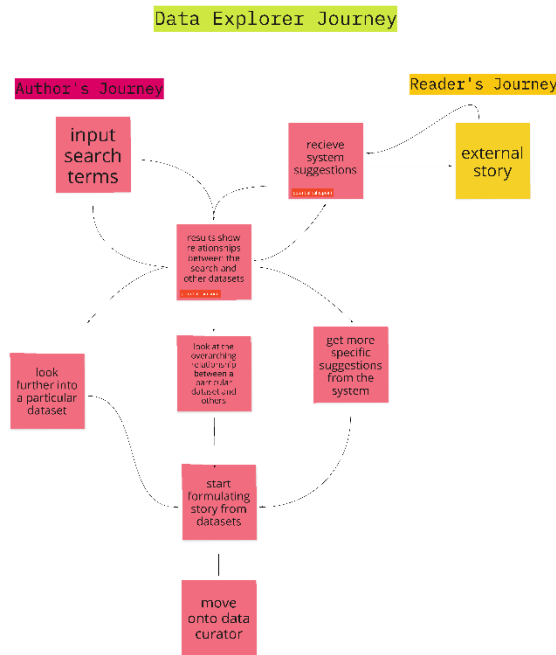


Figure 6: Journey map of an author and a reader in the data explorer

- e) **Ideating a prototype:** In this activity the participants synthesized all their previous discussions and brainstormed the components needed in the data explorer landing page (see Figure 7).

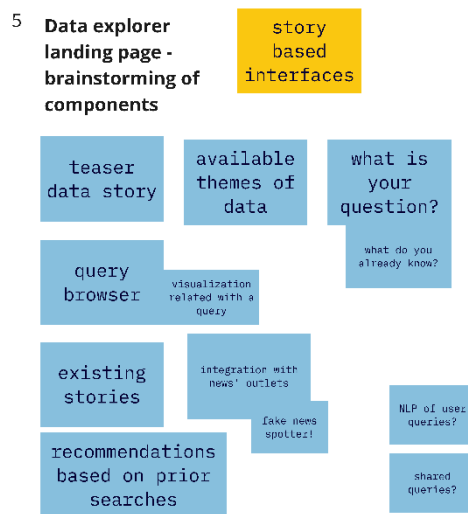


Figure 7: Brainstorming of components needed in the Data Explorer landing page

### 2.1.3 Internal design workshop (ParCos Consortium)

On October 14<sup>th</sup> 2020, a two-hour online workshop focused on the ParCos platform requirements was held within the virtual consortium meeting. The focus of the event was to understand the expectations and needs regarding digital tools for data processing within the ParCos project and its cases. The activities during the workshop were the following:

- a) **Mapping mental models and needs:** In this activity the participants mapped their favorite and least favorite digital services and examined what functionalities, in particular, made those services outstanding. This was followed by a presentation about the ParCos tools, in order to remind everyone of the project goals and commitments. Then the participants brainstormed together, what types of functionalities they wished these tools would have (See Figure 8). Within this task, they had to discuss and classify those functionalities into “wish” and “needs” categories.

# 2



Figure 8: Brainstorming of wishes and needs for the ParCos tools

b) **User stories:** The workshop continued with an introduction of user roles (gathered from the previous workshop). Then participants worked with their ParCos case study teams and discussed these user roles within their cases. They used story boarding techniques to map the needs of those users within their specific case study context (See Figure 9).

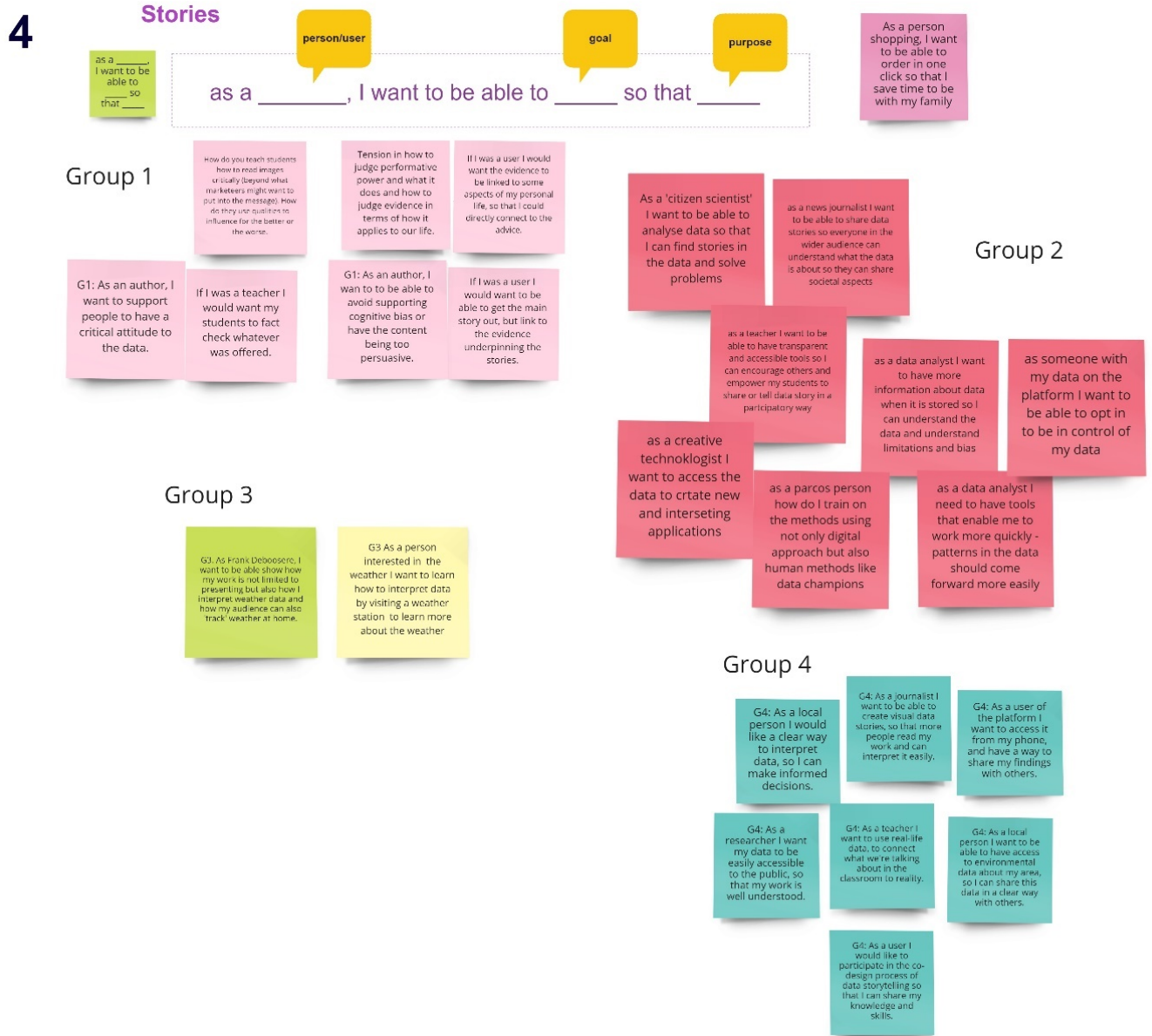


Figure 9: Stories of users from case studies and ParCos tools

- c) **Open discussion on digital inclusivity and equitability:** In this activity, participants were asked to brainstorm about the potential gaps and inclusivity issues ParCos could create in society. ParCos seeks to create tools with a meaningful positive impact for communities, hence placing inclusivity and equitability concerns at the core of the requirements elicitation was a prioritized. Figure 10 summarizes the results of this brainstorming.

## 5 Open Discussion



Figure 10: Equitability and inclusivity concerns for the ParCos tools



- d) **Prioritization of functionalities:** For the last activity, the facilitators classified the wishes and needs brainstormed in activity a: mapping mental models and needs. Then they presented this to everyone and opened a discussion about it and proceeded to edit the priorities according to these conversations.

# 6

## Expected outcomes

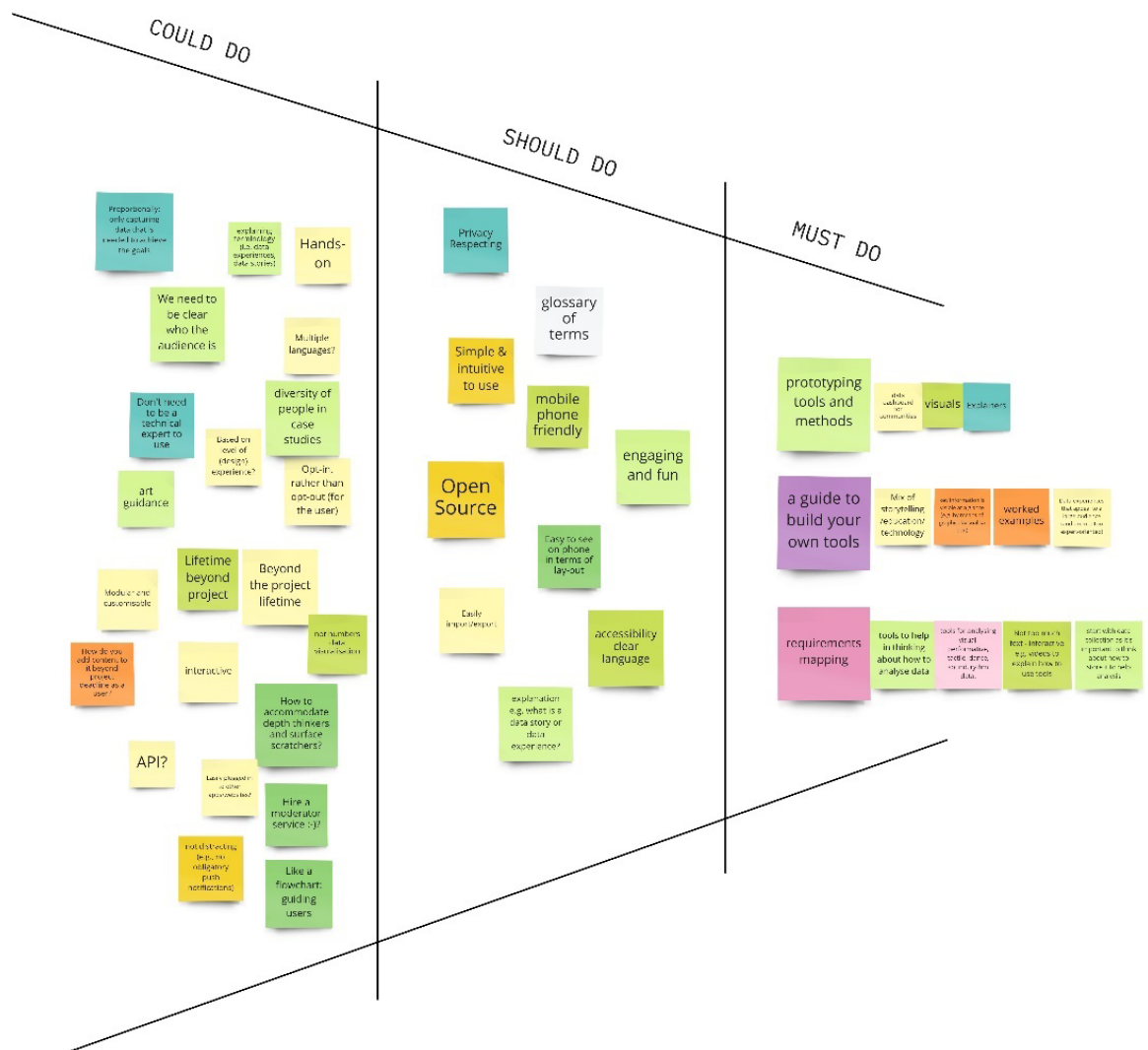
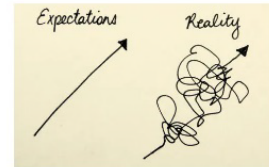


Figure 11: Prioritization of needs and wishes for the ParCos tools

#### 2.1.4 External design workshop (Case Study Participants)

The ParCos case study in Finland is focused on participatory science education for children. Along this case, a *participatory game* is being designed for high schoolers in Lahti, Finland. The game seeks to popularize scientific research methods among 100 children from 5 schools. For this purpose, 8 scientists from different disciplines (psychology, leadership and knowledge management, chemistry, biology, art, crisis response) will host a series of science workshops on each topic, where children will make sense of information and carry out laboratory experiments.

The ParCos tools will ultimately support this type of activities. Where for example, educators have to create a learning event where scientific facts and information have to be disseminated in a participatory way. The ParCos tools are going to serve people who want to tell stories using data as its basis. On December 2<sup>nd</sup> 2020 a workshop was organized amongst the game designers, ParCos LUT project members (Victoria Palacin, Natasha Tylosky and Annika Wolff) and science workshop leaders to understand how scientists are currently curating data into information and the way they plan to share it with children. Also, this workshop was intended to support the current efforts of the people designing this game (Veden Armoilla). The workshop lasted for 2 hours and a half. A total of 10 people participated in this workshop (1 game designer, 6 scientists and 3 ParCos project members). The event was guided by the following questions:

- What does data mean for different scientists?
- What are the motivations of scientists to run participatory workshops with children?
- What are the key questions each participatory workshop within the upcoming game would seek to answer?
- What are the core activities of the proposed participatory workshops with children?

The workshop had a pre-survey to gather information about the scientists and the participatory workshops they intend to run as part of the game event. The ParCos members from LUT processed the responses from that survey and presented it back to scientists as: a data game, an infographic, and data physicalizing examples (See Figure 12). This was an activity that sought to encourage creative ways of representing data. The activities that followed, centered around the planning of each individual workshop. In table 1, an overview of the results of this planning activity is presented.

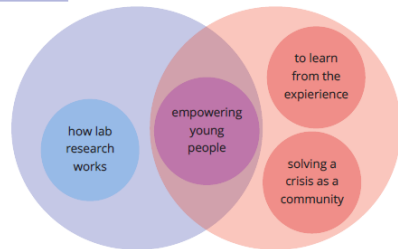
**Have you Ever**

1. Have you ever worked with **high school students**?
2. Have you ever worked with **data**?
3. Have you ever worked with **local communities**?
4. Have you ever **analyzed water with a microscope**?
5. Have you ever **conducted research**?

**Why did you join the workshop personally?**

What inspires or motivates you to run a workshop within this game?

What inspires or motivates you to run a workshop within this game?



# VEDEN ARMOILLA

## WORKSHOPS

≈ 100 school children

AUDIENCE

How was the water polluted?

What are the biological hazards threatening drinking water?

How to communicate during a crisis?

### KEY TAKEAWAYS

- Crisis Communication
- Bacteria/Bacterium
- Crisis Management
- Laboratory
- Experiment
- DNA

## SCIENCE IS FUN

- PSYCHOLOGY
- COMMUNIC.
- KNOWLEDGE
- CHEMISTRY
- ART
- MICROBIOLOGY

Figure 12a: Creative data visualizations from pre-survey responses, pt. 1 <sup>2</sup>

<sup>2</sup> Larger version available in Appendix 1

What does data mean to you?

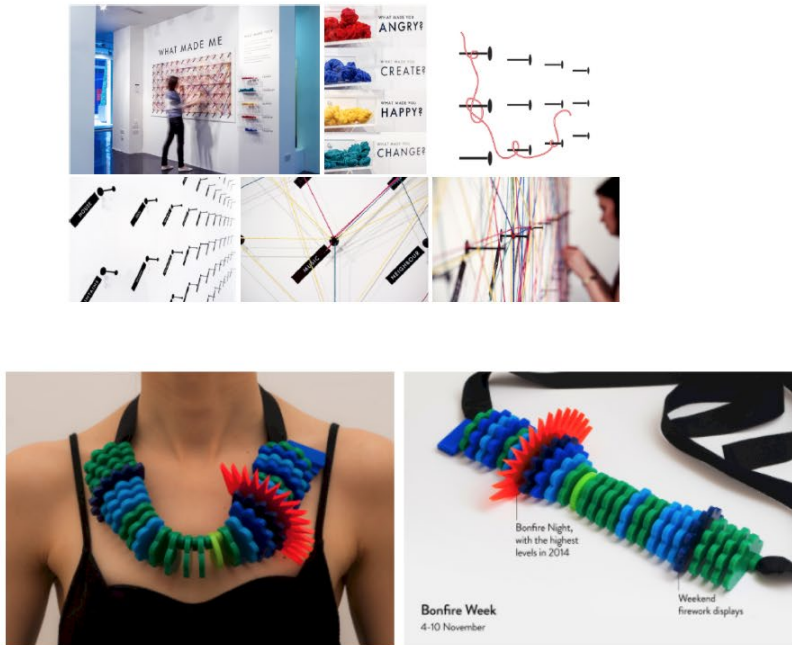


Figure 12b: Creative data visualizations from pre-survey responses, pt. 2

**Table 1:** Participatory workshops within case study and data sources

Theme	Workshop	Data sources
<b>Laboratory research (3 scientists)</b>	Microbial contamination analysis	Microbe sample
	DNA-fingerprinting	DNA sample
	Cleaning water chemically	UV treatments Chemical compounds in water
<b>Decision making (3 scientists)</b>	Cross-sectorial collaboration and decision making in the midst of crisis	Inter-organizational trust literature
	Psychological support when solving a crisis	Mental issues in teamwork Types of human emotions Strategies to handle negative human emotions
	How to communicate the solutions in order to make people listen, follow and act?	The problem (water pollution)
<b>Society (1 artist)</b>	Reflection and imagination in the midst of crisis	Results from other workshops

### 2.1.5 Benchmarking

The last source of information for this requirements elicitation process was a benchmarking of existing digital data curation services. These services were mapped from two sources: know-how from ParCos consortium members (during our second workshop) and from there a snowball technique was used to find related digital services.

### 3 PARCOS’ TOOLS REQUIREMENTS

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#### 3.1 PARCOS TOOLS OVERVIEW

Within the h2020 ParCos Project (<https://parcos-project.eu/>), there is a shared goal to develop training tools to foster participatory science making. These tools (Parcos platform, data explorer and data curator) aim to improve practices for curating, reusing, and communicating scientific data. Figure 13 illustrates an overview of these tools, below a brief introduction to each of them:

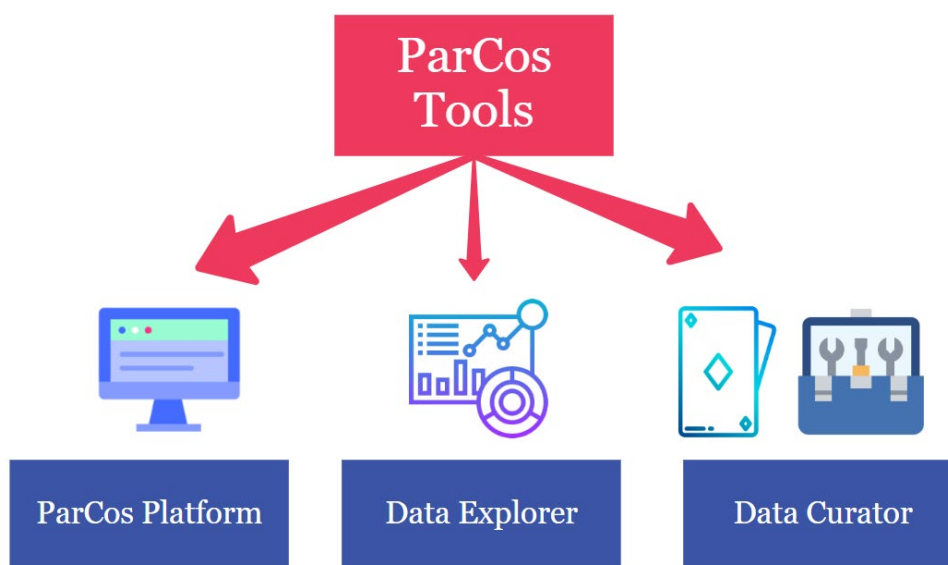


Figure 13. ParCos Tools Overview

- **The ParCos platform** is a web-based service that facilitates the communication and re-use of the ParCos project outputs. This platform is aimed to support people who want to re-use the ParCos approach
- **The Data Explorer** is a digital tool used to explore datasets that answer a scientific inquiry. It allows you to search, find multiple related datasets and explore their content and export the content relevant to you. This tool supports interactions with scientific data, with the goal of supporting the people who use it in finding stories and patterns.
- **The Data Curator** is a set of digital materials and templates that can be used to select and present data as part of data storytelling activities.

### 3.2 AUDIENCES AND USER ROLES

Within ParCos, there are several intended users, including 1) professional and non-professional producers of media content, 2) community members who are trying to communicate outcomes from citizen science experimentation, 3) professional scientists and/or educators who are preparing educational materials for school-children, 4) school-children and youth who are conducting science and are learning new ways of interpreting and telling science stories either a) formally, e.g. in schools b) semi-formally, e.g. during school visits to science museums and c) informally, e.g. in their free time such as when watching or reading about science or taking part in other hobbies 5) ParCos project researchers who are developing methods, templates, and frameworks to deliver knowledge.

These audiences have been classified into four key groups, based on their usage goals, contributor, explorer, spect-actor, and administrator. Each of those usage roles as described below. Further, Table 2, describes in detail these specific user roles per case study.

1. **Contributor:** A person who publishes a dataset. Publishing a dataset involves adding a clean, well-described, open, and annotated dataset into the system.

*Example of a contributor in the ParCos platform: The LUT ParCos researchers have designed a set of cards that can help teachers design data exploration activities. They have digitized these materials in accessible colors and publish them through the ParCos platform so that everyone can use them.*

*Example of a contributor in the Data Explorer: The LUT ParCos researchers have access to data about water quality. They clean this dataset and add annotations in Finnish and English and publish it on the platform so that teachers can use this dataset in their classes.*

2. **Explorer:** A person who authors or curates stories from a dataset.

*Example of an explorer in the ParCos platform: Maria, a schoolteacher, wants to discuss with her students the issues related with water quality in their local lake. She uses the ParCos platform to find stories about this issue. She finds a visualization showing the relationship of dog poop into the lake. She uses this visualization in class as a prompt to talk about the topic and raise awareness.*

*Example of an explorer in the Data Explorer: Matti, a community member, is researching water quality through the data explorer. He wonders if low-income areas have poorer water quality. Through the data explorer, he finds some correlations, writes them down as a story linked to the datasets he found and publishes it for open use.*

3. **Spect-actor:** A spect-actor may read stories and explore their corresponding data sets -- put together by explorers. They then could build their own story and become an author themselves. They could be a knowledgeable person who creates a data

experience using the datasets and information drawn from the data explorer and other sources.

*Example of a spect-actor in the ParCos platform: Nick, a community member wants to paint some murals in his neighborhood over summer. He deeply cares about environmental conservation and would like this to be the guiding theme of the murals. He finds the ParCos guidebook on art-based methods and uses it as a guide to create his murals. He also uses the ParCos Data Explorer to find stories about the environment in his area.*

*Example of a spect-actor in the Data Explorer: Suvi found this story about water quality in low income areas. She is familiar with the neighborhood and knows the air quality is also bad. She starts using the data explorer to find stories about air quality, but finds none. Then she decides to create her own story about air quality in the low-income areas and links it to the story about water quality.*

4. **Admin:** A person with administrator privileges. This means, this person can add users, create content, moderate content, add announcements, see usage statistics.

*Example of an admin in the ParCos platform: Lorie, a ParCos project researcher wishes to create a podcast about community experiences with data. She uses the platform to create a category for this media material and can upload the audios in here.*

*Example of an admin in the Data Explorer: Anna, a ParCos project researcher has found some data without annotations, she flags this dataset, which makes it non-public and a notification is sent to the explorer to complete the data documentation.*



**Table 2.** ParCos tools and usage roles across the case studies

Tool	Roles	Case Study 1 Belgium	Case Study 2 Finland	Case Study 3 UK
<b>ParCos Platform</b>	Contributor	VRT ParCos Researchers	LUT ParCos Researchers	KMWC ParCos Researchers
	Explorer	Professional and non-professional producers of media content  Community members	Veden Armoilla Science Experts  Community members	Community members
	Spect-actor	Community members	School-children	Community members
	Admin	VRT ParCos Researchers	LUT ParCos Researchers	KMWC ParCos Researchers
<b>Data Explorer</b>	Contributor	VRT ParCos Researchers	LUT ParCos Researchers	KMWC ParCos Researchers
	Explorer	Professional and non-professional producers of media content	Veden Armoilla Science Experts	Community members
	Spect-actor	Community members	School-children	Community members
	Admin	VRT ParCos Researchers	LUT ParCos Researchers	KMWC ParCos Researchers
<b>Data Curator</b>	Spect-actor	Journalists educators, school children	Researchers, school children	Researchers, community members

### 3.3 REQUIREMENTS

The core requirements of each tool are detailed in this section. These are described in detail with use cases in sub-sections 3.5, 3.6 and 3.7.

The requirements presented in the document are preliminary requirements. Platform, Data Explorer, and the Data Curator will be developed as a prototype according to a prioritization of requirements and research goals.

#### 3.3.1 Requirements for the ParCos platform

This is a web-based service that facilitates the communication and re-use of the ParCos project outputs. This platform is aimed to support people who want to re-use the ParCos approach. This platform should support people in the following ways:

1. Guide people through the tools according to what they want to do (using the Bristol approach language and appropriate phases to guide this, adapt the process to ParCos)
2. Provide a list of the ParCos tools for data exploration and curation (e.g. storyteller)
3. Provide a list of science communication instruments and training materials (e.g. the ParCos Training Package and the Guidebook on the use of arts-based methods)
4. Access to lists of curated scientific data with annotations
5. Information about ParCos case studies and content associated with them
6. Integration with social media channels

#### 3.3.2 Requirements for the ParCos data explorer

This is a web-based data dashboard for sense-making in conjunction with the arts-based methods. This tool supports interactions with scientific data, with the goal of supporting the people who use it in finding stories and patterns. The data explorer should:

1. Guide people through its key functionalities and the meaning of datasets
2. Show civic data-centric dashboards with stories in clear, accessible, and friendly visualizations
3. List datasets within themes
4. Allow the browsing of datasets
5. Recommend related datasets
6. Allow data handling and personalization
7. Show the progress within the data analysis
8. Allow dissemination and reuse of datasets and stories
9. Integrate content from other sources (e.g. news outlets)
10. Integrate with the data curator materials

### 3.3.3 Requirements for the ParCos data curator

This is a set of digital and/or analogue materials and templates that can be used to select and present data as part of storytelling activities. The data curator is detailed in depth in the upcoming deliverable D2.3 M16. The data curator should:

1. Show principles for designing data-centric activities (i.e. a catalogue)
2. Provide examples and templates to follow when using data as part of science stories
3. Integrate with the data explorer by proposing starting points and strategies to support data exploration within specific story contexts.
4. Integrate with the ParCos storyteller by providing principles for curating data for using within different types of ParCos participatory story.

### 3.3.4 Requirements for privacy and inclusivity

In addition to the above, all ParCos tools should ensure the following requirements are met:

5. The handling of personal data will be done in accordance with the GDPR directive, with the caveat that partners must also check correspondence with their own national guidelines.
6. All ParCos tools should, to the greatest extent possible, be created in line with existing appropriate accessibility standards in order to remove barriers against use, such as due to visual, hearing or other impairment or disability. This applies to interfaces, content, functionalities, and reuse capabilities.
7. The ParCos platform and the data explorer should be optimized for printing its contents to the greatest extent possible so that important information can be used offline
8. Data on any of the ParCos tools, must be licensed using the permissive Creative Commons 4.0. for dynamic, open databases, the Community Data License Agreement (CDLA) will be used.

## 3.4 DEVICES SUPPORT

The ParCos tools are mainly developed for desktop use and also have a responsive design to adapt to mobile devices such as smartphones and tablets.

### 3.5 PARCOS PLATFORM FEATURES AND FUNCTIONALITY

#### 3.5.1 Features and functionalities

- **Navigate** between the ParCos tools, materials, case studies content, datasets, without prior registration or login.
- **Interact** with content by reading and printing it from various formats (DOCX, PDF, EXCEL, CSV), without prior registration and login.
- **Download** content from various formats (DOCX, PDF, EXCEL, CSV), without prior registration or login.
- **Upload** content from various formats (DOCX, PDF, EXCEL, CSV), with prior registration or login.
- **Share** pages via social media (Facebook, Whatsapp) or by copying its link, without prior registration or login.

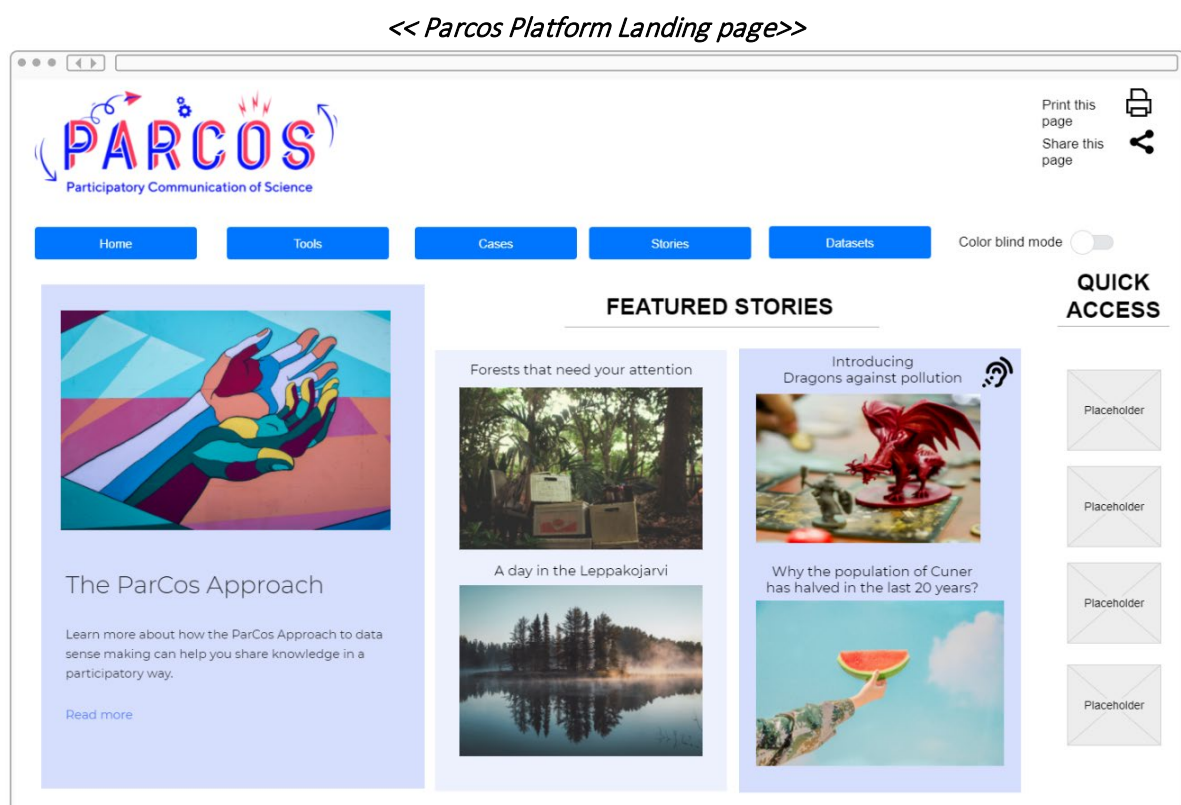
#### 3.5.2 Usage scenario examples

User type	Scenario interactions
<p><b>Contributor</b> A person who publishes a dataset. Publishing a dataset involves adding a clean, well-described, open, and annotated dataset into the system.</p>	<ol style="list-style-type: none"> <li>1. Maria is part of the ParCos consortium and wants to publish the data they used in a workshop</li> <li>2. She goes to the ParCos platform website</li> <li>3. She sees a front page with stories based on datasets</li> <li>4. She then logs in</li> <li>5. She has a panel where she can create/update different types of content (Case studies, ParCos materials, Data Stories, Datasets)</li> <li>6. She selects the ‘Create Dataset option</li> <li>7. She uploads her dataset and marks the content with tags (‘material’, ‘dataset’, ‘content of dataset’).</li> <li>8. She can link her dataset to the existing types of content (for example: Case Study Finland)</li> <li>9. She then saves her changes</li> <li>10. She gets a confirmation that her dataset has been uploaded</li> <li>11. She can voluntarily submit a feedback/comment/question about the process</li> <li>12. The dataset that she uploaded is listed under the Datasets page, but also it is listed as a linked content to the ‘Case Study Finland’.</li> </ol>
<p><b>Explorer</b> A person who authors or curates stories from a dataset.</p>	<ol style="list-style-type: none"> <li>1. Matt searches through the internet for ‘water quality in the Dyle river’</li> <li>2. Matt gets to the ParCos platform that has a story on the topic</li> <li>3. Matt read the story</li> <li>4. He decides to download the PDF version of the story for printing</li> <li>5. At this point he can voluntarily submit a feedback/comment/question about the process</li> <li>6. Next day, Matt takes this story to his classroom (he is a teacher) and asks his students to discuss about the water quality in the river and brainstorm potential causes for this</li> </ol>
<p><b>Spect-actor</b> A spect-actor may read stories and explore their</p>	<ol style="list-style-type: none"> <li>1. Nick, a community member wants to paint some murals in his neighborhood over summer. He deeply cares about environmental conservation and would like this to be the guiding theme of the murals.</li> </ol>

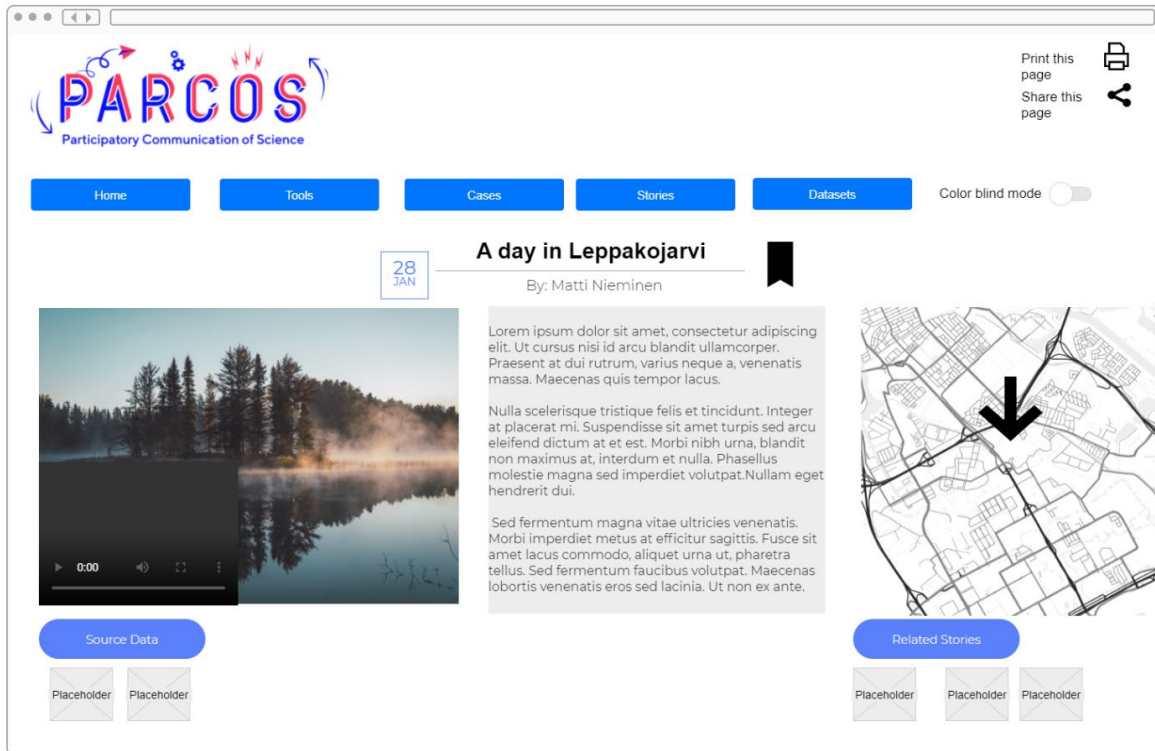
<p>corresponding data sets -- put together by explorers. They then could build their own story and become an author themselves.</p>	<ol style="list-style-type: none"> <li>2. He searches the internet for ‘art methods + climate change + mural’</li> <li>3. Matt gets to the ParCos platform that has a guidebook on art-based methods</li> <li>4. He downloads the ParCos guidebook on art-based methods and uses it as a guide to design his murals.</li> <li>5. At this point he can voluntarily submit a feedback/comment/question about the process</li> <li>6. He also checks the the ParCos Data Explorer which is linked in the ParCos platform and tries to find stories about the environment in his area. Unfortunately, he does not find any reports about his city at this time but advice on how to find data from open data portals is available.</li> <li>7. At this point he can voluntarily submit a feedback/comment/question about the process</li> </ol>
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### 3.5.3 Wireframes

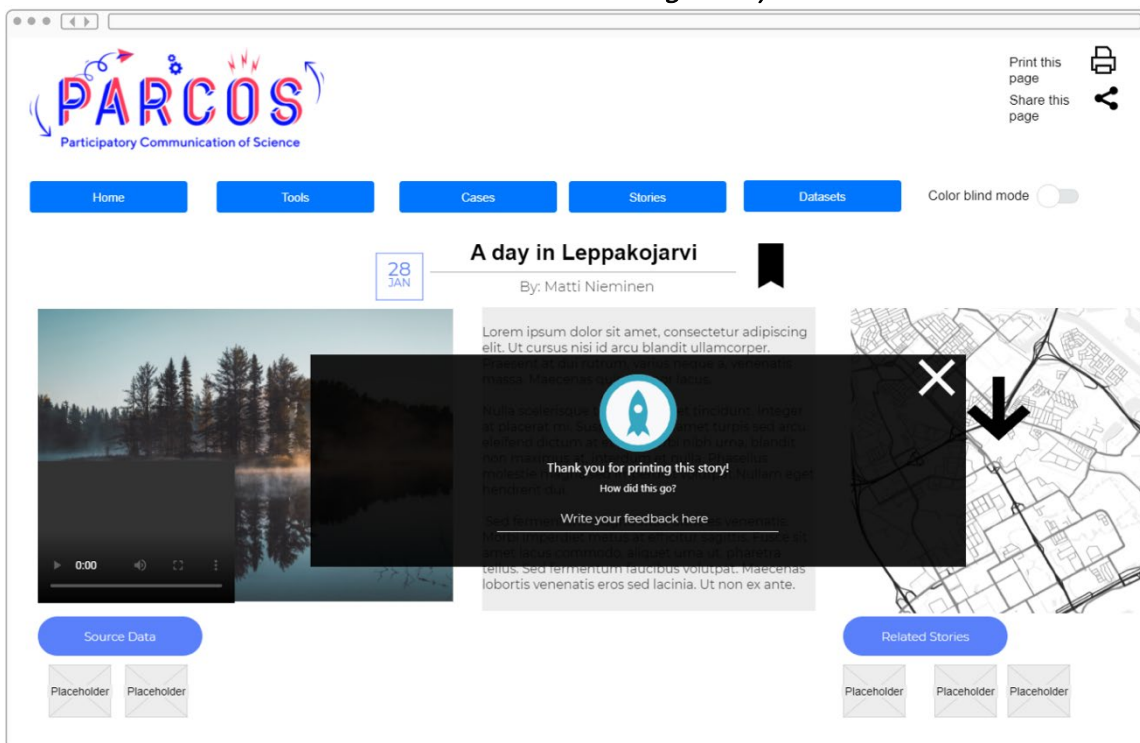
Example of ParCos platform design and user scenario of printing a story.



<< Parcos Platform Reading a Story >>



<< Parcos Platform Printing a Story >>



### 3.5.4 Benchmarking

The following presents a list of existing methods, tools and services to support exploring and telling stories with data. As detailed in the ParCos workplan, the project will consider the potential for re-using - rather than replacing or remaking - existing tools that fulfill important needs of ParCos, thereby allowing resources to be focused on new and novel aspects of participatory storytelling.

Digital Service	Website	Brief description
Public Sphere Project	<a href="https://www.publicsphereproject.org/patterns/LV">https://www.publicsphereproject.org/patterns/LV</a>	A set of patterns for 'positive social change' with background information
Public Sphere Project Catalogue	<a href="https://publicsphereproject.org/sites/default/files/001-136_small.pdf">https://publicsphereproject.org/sites/default/files/001-136_small.pdf</a>	All patterns as an easy to browse card set
Data Culture Project	<a href="https://databasic.io/en/culture">https://databasic.io/en/culture</a>	A self-learning website with activities to facilitate fun interactions with datasets.
Dear Data Project	<a href="http://www.dear-data.com/theproject">http://www.dear-data.com/theproject</a>	A collection of hand drawings about data.
The Data Literacy Project	<a href="https://thedataliteracyproject.org/">https://thedataliteracyproject.org/</a>	A network that discusses and develops tools to enhance data literacy in society.
Data Education in Schools	<a href="https://dataschools.education/about-us/about-our-project">https://dataschools.education/about-us/about-our-project</a>	It is a project that seeks to teach data literacy and data citizenship skills to young learners. The core activities of the project are: 1) Creation of the NPA Data Science, 2) Development of Data Education Resources 3) Delivery of a range of professional learning events
Data to the People	<a href="https://www.datatothepeople.org/">https://www.datatothepeople.org/</a>	An industry initiative that provides tools to assess and enhance data literacy in organizations.
Data Literacy LLD	<a href="https://dataliteracy.com/">https://dataliteracy.com/</a>	A company that provides assessments and training to improve data literacy for individuals and organizations.
FlowingData	<a href="https://flowingdata.com/">https://flowingdata.com/</a>	A blog that highlights data visualization projects, guides, and resources.
D3.JS	<a href="https://d3js.org/">https://d3js.org/</a>	A JavaScript library for producing dynamic, interactive data visualizations in web browsers

### 3.6 DATA EXPLORER FEATURES AND FUNCTIONALITY

1. The data exploration process involves a number of steps (see Figure 14) from: Identifying a question that can (at least partly) be answered by data.
2. Collecting data and/or finding data from existing sources.
3. Determining which data that is available is relevant to the query.
4. Visualizing data (including data cleaning if necessary).
5. Exploring data to fulfill the user’s goal.

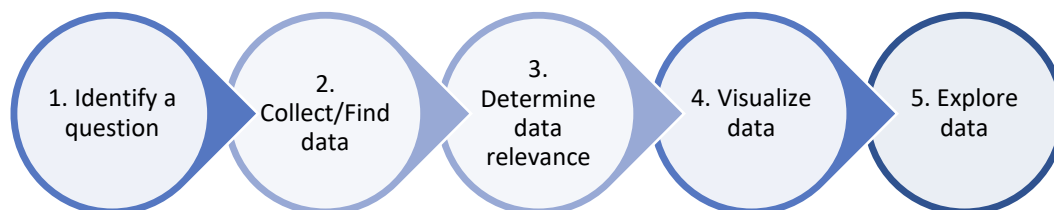


Figure 14. ParCos Data Exploration Steps

#### 3.6.1 Features and functionalities

The implemented version of the Data explorer will a prototype aimed at fulfilling research goals. Therefore, not every potential functionality and feature will be included in the final prototype.

- **Navigate** between the data stories, data teasers, datasets, key concepts of data literacy, and ParCos project information, without prior registration or login.
- **Search and filter** stories by their time frame, theme, characters, places, without prior registration or login.
- **Read** the details of stories and meta data of datasets, without prior registration or login.
- **Recommend** related datasets and stories when reading a data story or a dataset metadata, without prior registration or login.
- **Download** content from various formats (DOCX, PDF, EXCEL, CSV), without prior registration or login.
- **Export and Print** content from various formats (DOCX, PDF, EXCEL, CSV), without prior registration or login.
- **Create dataset** record by adding a name, description, and relevant tags, with prior registration or login.
- **Upload a dataset** to a dataset record from various numeric formats (EXCEL, CSV),
- **Create story** record by adding a title, description, and media. Also, optionally, select the related content (datasets or other stories) in the platform.
- **Upload story media** to a story record from various numeric formats (videos, images, links to videos on Youtube or other video platforms, social media posts, websites, blog links).



- **View** the profiles of story authors by clicking their name through their stories
- **Share** pages via social media (Facebook, Whatsapp) or by copying its link, without prior registration or login.

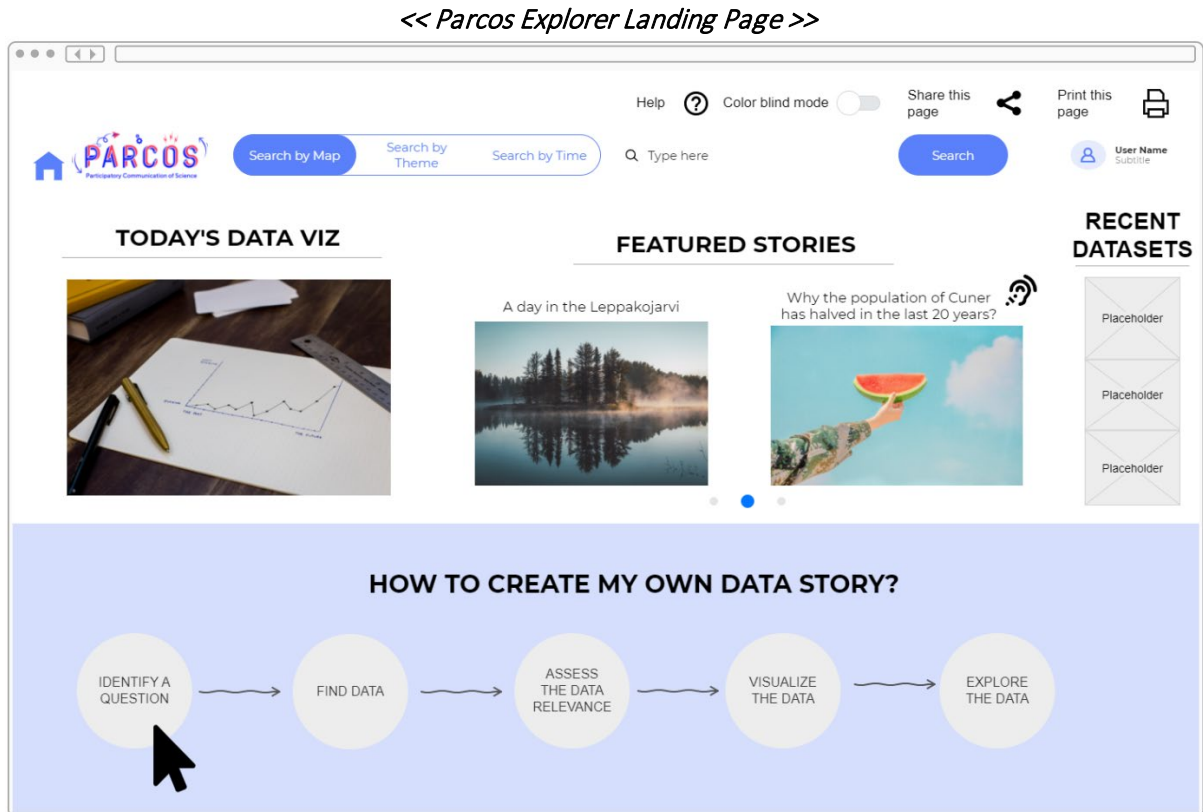
### 3.6.2 Usage scenarios

User type	Scenario interactions
<p><b>Contributor</b> A person who publishes a dataset. Publishing a dataset involves adding a clean, well-described, open, and annotated dataset into the system.</p>	<ol style="list-style-type: none"> <li>1. The LUT ParCos researchers have access to data about water quality.</li> <li>2. They go to the ParCos Explorer to upload it               <ol style="list-style-type: none"> <li>a. They have cleaned the dataset before uploading it to the platform (make sure it has clear headers, separators, content)</li> </ol> </li> <li>3. First, they create a dataset record with basic information about the data (name, location, time when it was collected, author, copyright)</li> <li>4. They click on ‘upload dataset’ and select their data</li> <li>5. They can select ‘Related content’, then a pop-up opens with a (checkbox) list of the existing stories and datasets in the ParCos Explorer. This way they can link related content.</li> <li>6. They click on ‘Save’</li> <li>7. Once saved two options appear ‘Publish’ and ‘Preview’</li> <li>8. The ‘Preview’ button opens a new tab or pop-up and shows how the data set would look like once published</li> <li>9. The ‘Publish’ option makes the dataset record public</li> <li>10. The ParCos Explorer confirms that the dataset has been published</li> </ol>
<p><b>Explorer</b> A person who authors or curates stories from a dataset.</p>	<ol style="list-style-type: none"> <li>1. Matti, a community member, is researching water quality and through the data explorer. He wonders if low-income areas have poorer water quality.</li> <li>2. He decides to search data in his area using the ‘Search by Map’ functionality in the Data Explorer</li> <li>3. He writes down his address and finds few relevant datasets</li> <li>4. He clicks on the first dataset which is about ‘Lake algae records 2015-2019’ and reads through it</li> <li>5. He clicks on ‘Save dataset to’ and then clicks on ‘Create new story’ and adds a name to it</li> <li>6. He continues searching and adds one more dataset to his story</li> <li>7. He now clicks on ‘My Data Stories’ and finds his story, he can then start writing his observations in there. Also, he can add data visualizations from the datasets he had added.</li> <li>8. He saves his story and when he is ready, he publishes it for open use.</li> </ol>
<p><b>Spect-actor</b> A spect-actor may read stories and explore their corresponding data sets -- put together by explorers. They then could build their own story and become an author themselves.</p>	<ol style="list-style-type: none"> <li>1. Suvi found this story about water quality in low income areas. She is familiar with the neighborhood and knows the air quality is also bad.</li> <li>2. She starts using the data explorer to find stories about air quality (using the ‘Search by Theme’ functionality) but finds none.</li> <li>3. She clicks on ‘Add a Related Story’ when reading the story about water quality. She calls her story ‘Air quality in (name of town)’</li> <li>4. She browses datasets by theme in the data explorer</li> <li>5. She finds 3 important datasets and adds them to her story</li> <li>6. She then clicks on ‘My Data Stories’ and finds her story, she can then start writing observations in there. Also, she can add data visualizations from the datasets she had linked, and from the data story about water quality she read.</li> </ol>

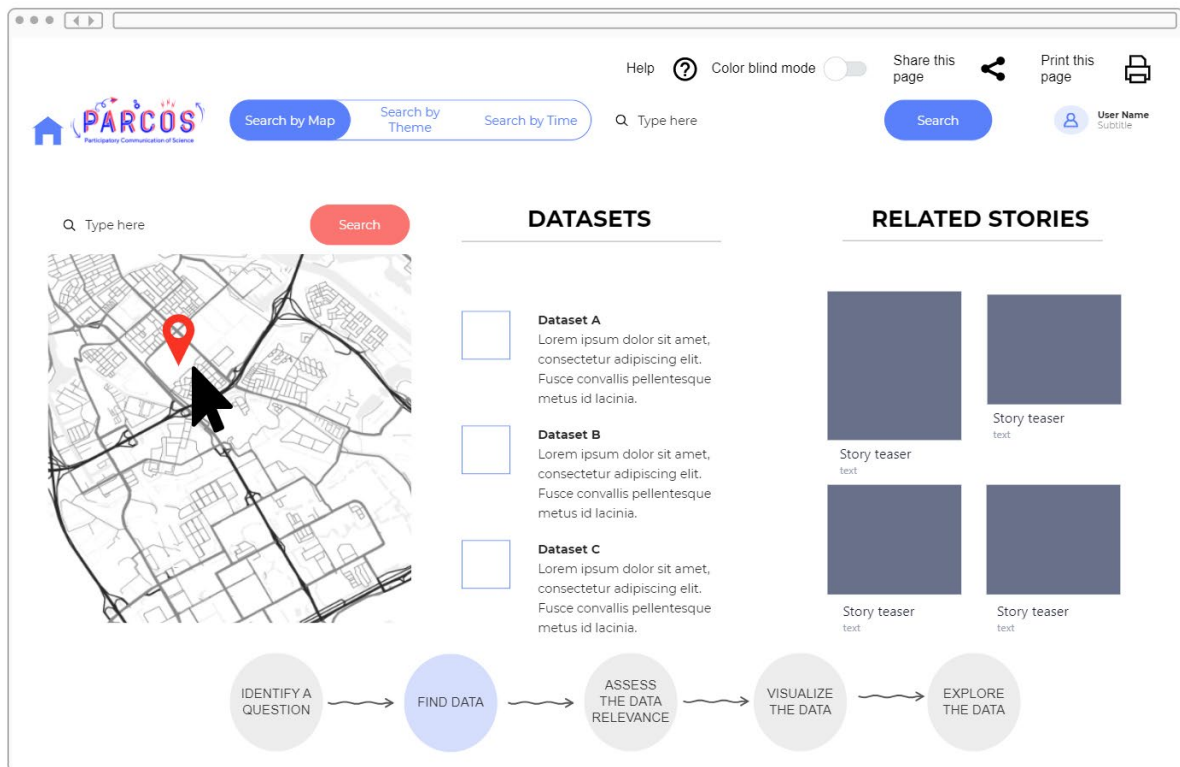
7. She saves her story and when she is ready, she publishes it for open use.

### 3.6.3 Wireframes

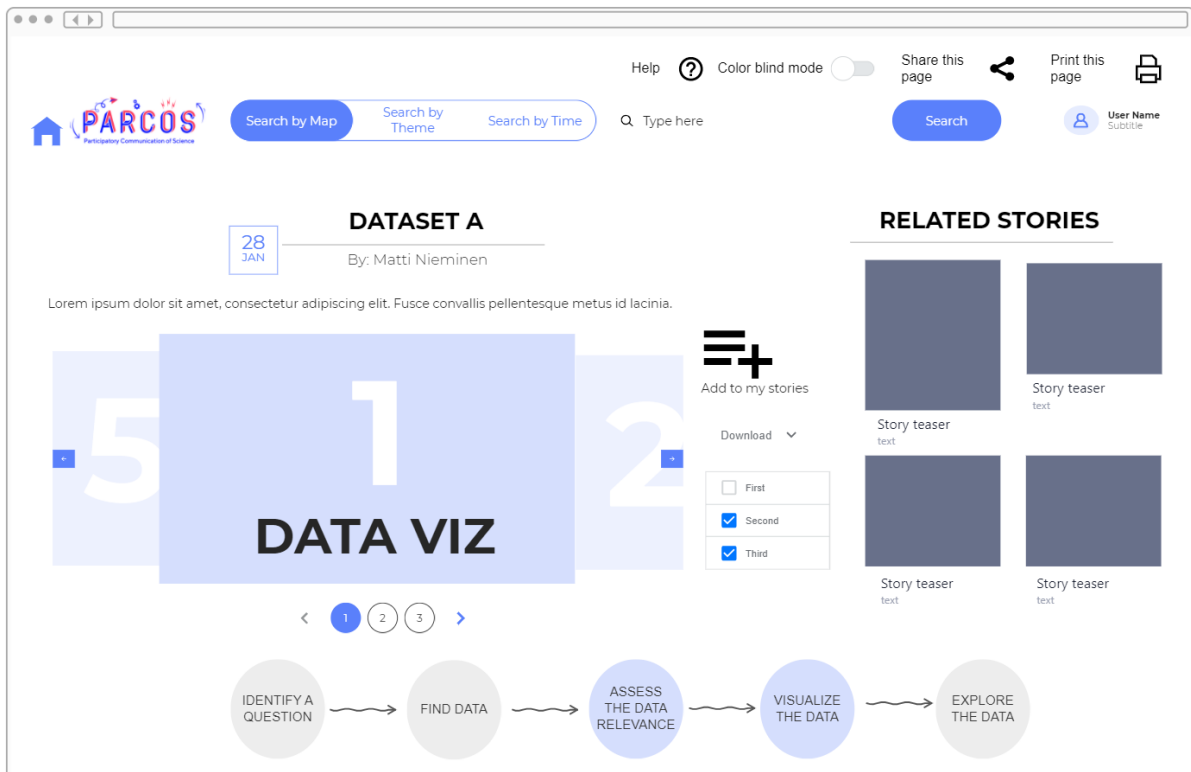
Example of ParCos Explorer design and user scenario of searching a dataset and creating a story.



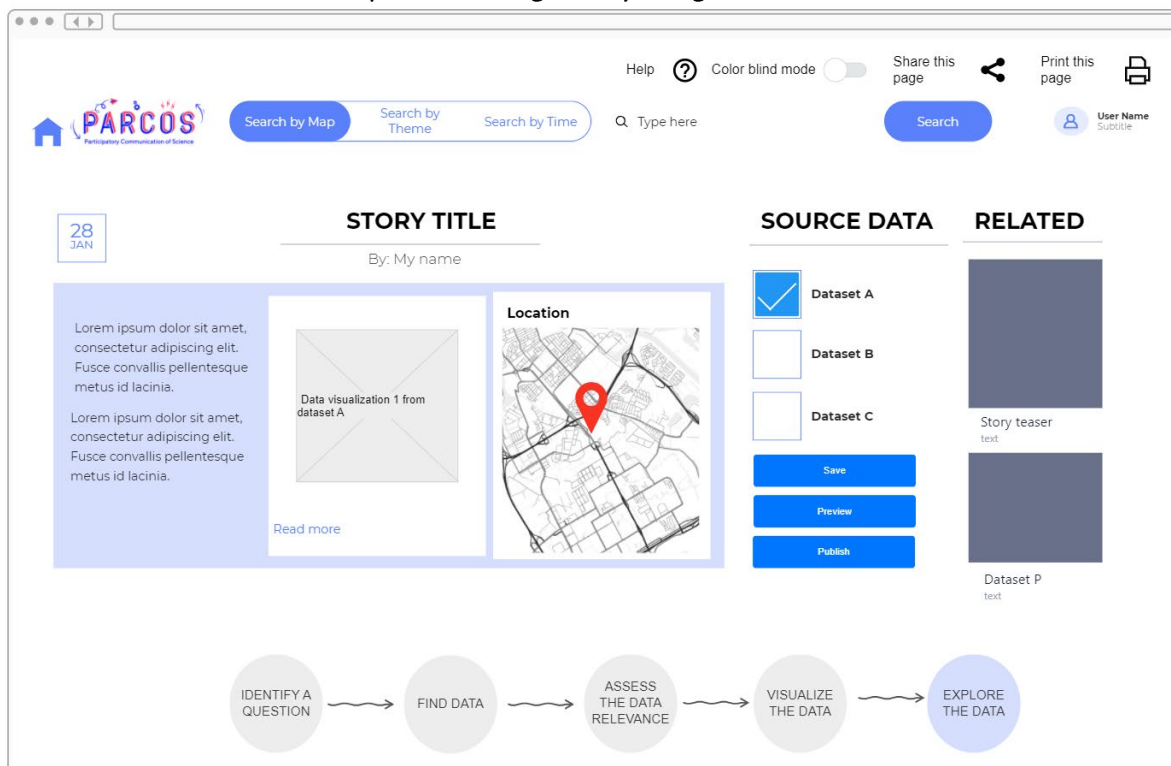
<< Parcos Explorer Searching a Dataset by Map >>



<< Parcos Explorer Reading Existing Dataset >>



<< Parcos Explorer Creating a Story Using Data Visualizations >>



### 3.6.4 Benchmarking

The following presents a list of existing data visualization tools that will serve as a reference point for further development of the ParCos Data Explorer. ParCos will consider providing links to tools that may support aspects of the ParCos data exploration goals.

Category	Digital Service	Website	Brief description
Catalogues	Dataviz Catalogue	<a href="https://datavizcatalogue.com/">https://datavizcatalogue.com/</a>	A library of different information visualisation types.
	Data Viz Project	<a href="https://datavizproject.com/">https://datavizproject.com/</a>	A project by a design firm that seeks to educate people on how to transform their data and information into captivating visuals.
Basic Data Literacy Tools And Content	Data Basic	<a href="https://databasic.io/en/">https://databasic.io/en/</a>	A suite of easy-to-use web tools for beginners that introduce concepts of working with data. These simple tools make it easy to work with data in fun ways, so that the people can learn how to find great stories to tell.
	From Data to Viz	<a href="https://www.data-to-viz.com/">https://www.data-to-viz.com/</a>	From Data to Viz is a classification of chart types based on input data format. It comes in the form of a decision tree leading to a set of potentially appropriate visualizations to represent the dataset.

	Data Physicalization Hub	<a href="http://dataphys.org/">http://dataphys.org/</a> and <a href="http://dataphys.org/list/">http://dataphys.org/list/</a>	A resource hub for data physicalization, it contains key terminology, examples, tools, workshops, and spaces for collaboration.
	Datatrotters	<a href="https://www.datatrotters.com/game">https://www.datatrotters.com/game</a>	A game based on data visualization and analysis.
	Datopolis	<a href="https://missiondrive.io/datopolis">https://missiondrive.io/datopolis</a>	Datopolis is a tactile and engaging game that brings this dynamic new world to life by simulating how you build things with data - services, websites, devices, apps, research - using closed, shared, and open data.
	The Data Literates	<a href="https://dataliterates.com/">https://dataliterates.com/</a>	The first ever podcast specifically dedicated to Data Literacy and the rising effort to improve Data Literacy in the world.
Dashboards Generators	Grafana	<a href="https://grafana.com/">https://grafana.com/</a>	It is a multi-platform open source analytics and interactive visualization web application; it allows the creation of dashboards.
	Dashbuilder	<a href="http://dashbuilder.org/">http://dashbuilder.org/</a>	An open source platform for building business dashboards and reports visually.
	Freeboard	<a href="https://freeboard.io/">https://freeboard.io/</a>	A product that allows the creation of real-time, interactive dashboards using drag and drop interfaces.
Data Analysis Tools for Developers	BioVinci	<a href="https://vinci.bioturing.com/">https://vinci.bioturing.com/</a>	A data analysis and visualization software for life scientists.
	Google Charts	<a href="https://developers.google.com/chart">https://developers.google.com/chart</a>	A gallery of interactive charts and data tools for developers
	Google Data Studio	<a href="https://datastudio.google.com/">https://datastudio.google.com/</a>	A tool to create interactive dashboards and reports.
	Kibana	<a href="https://www.elastic.co/kibana">https://www.elastic.co/kibana</a>	Kibana is an open source data visualization dashboard (limitation: it only works with elasticsearch data)
	D3.JS	<a href="https://d3js.org/">https://d3js.org/</a>	A JavaScript library for producing dynamic, interactive data visualizations in web browsers

### 3.7 QUALITY OBJECTIVES

A Quality Objective is a quality result that you intend to achieve. The Quality Objectives for the ParCos project are to assure that the project deliverables meet their stated requirements.

In the ParCos project the overall quality objectives are:

- **Reusability:** The ParCos platform and the data explorer should be optimized for printing its contents, so that they could be used offline.

- **Legal compliance:**
  - The handling of personal data will be done in accordance with the GDPR directive.
  - Data on any of the ParCos tools, must be licensed using the permissive Creative Commons 4.0 . For dynamic, open databases, the Community Data License Agreement (CDLA) will be used.
- **Usability:** The experiences of users will be recorded through feedback, prompted along with the functionalities. The team will choose an appropriate usability instrument to gather this feedback.
- **Accessibility:** All ParCos tools should be created in line with accessibility standards (Such as the W3C Accesibility Standards for Websites: <https://www.w3.org/WAI/standards-guidelines>).
  - This applies to interfaces, content, functionalities, and reuse capabilities.

## APPENDIX 1. LARGER, A3 SIZE VERSIONS OF SPECIFIC FIGURES



Figure 1: An overview of the ParCos Approach and the tools, frameworks and methods within this ecosystem

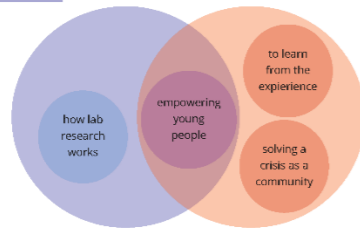
**Have you Ever**

1. Have you ever worked with **high school students**?
2. Have you ever worked with **data**?
3. Have you ever worked with **local communities**?
4. Have you ever **analyzed water with a microscope**?
5. Have you ever **conducted research**?

**Why did you join the workshop personally?**

What inspires or motivates you to run a workshop within this game?

What inspires or motivates you to run a workshop within this game?



**VEDEN ARMOILLA WORKSHOPS**

PSYCHOLOGY COMMUNIC KNOWLEDGE CHEMISTRY ART MICROBIOLOGY

≈ 100 school children

**AUDIENCE**

What are the biological hazards threatening drinking water?

How was the water polluted?

How to communicate during a crisis?

**KEY TAKEAWAYS**

Crisis Communication Bacteria/Bacterium Crisis Management Laboratory Experiment DNA

**SCIENCE IS FUN**



What does data mean to you?



Figure 12: Creative data visualizations from pre-survey responses