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**The platform for sharing, initiating and
learning citizen science in Europe**

D2.3: Platform Functionality Requirements & Specification Report



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Definitions and acronyms

API	application programming interface
CC	Creative Commons
CMS	Content Management System
CS	citizen science
CSA	Coordination and Support Action
CSS3	Cascading Style Sheets version 3
DG-Env	European Commission Directorate-General for Environment
DoA	Description of the Action
EC	European Commission
ECSA	European Citizen Science Association
EUPL	European Union Public License
GA	Grant Agreement
GDPR	General Data Protection Regulation
H2020	Horizon 2020
IA	information architecture
IP	Internet Protocol
LTI	Learning Tools Interoperability
LMS	Learning Management System
MTV	Model Template View
NGO	non-governmental organisation
OSI	Open Source Initiative
PPSR	Public Participation in Scientific Research
TGMS	Tools, guidelines, and other materials
the Platform	The EU-Citizen.Science platform
the Project	The EU-Citizen.Science project
RIA	Research and Innovation Action
RRI	Responsible Research and Innovation
SDG	Sustainable Development Goal
SEO	search engine optimisation
Stakeholders	Those who have a stake or interest in the success of the Platform and the outcomes of the Project
Target Audience	Those groups who we wish to actively seek out to use the Platform, and engage with in the community of Users
TMS	tag management system
UI	user interface
Users	Those who will use the Platform
UX	user experience



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W3C	World Wide Web Consortium
WCAG	Web Content Accessibility Guidelines
WP	Work Package

Executive summary

It is the ambition of the EU-Citizen.Science project to build on the growing impact of citizens participating in research across the full range of scientific enquiry, by developing a sustainable platform to act as a mutual learning space for citizen science, focusing on Europe but relevant globally. The EU-Citizen.Science platform will contain a mutual learning hub where resources will be shared: a projects & networks hub, training modules, high-quality resources, an events calendar, community forums and social media channels. The vision for the Platform is for it to become a central hub for knowledge sharing, coordination, and action at the European level.

The success of the EU-Citizen.Science platform will depend on five key factors:

1. The ease of finding & downloading the sought-for Citizen Science (CS) resources and training
2. The quality and applicability of those resources and training materials
3. The richness of community interactions
4. The ongoing contribution of the community to these resource bases
5. The usability and accessibility of the user interface.

The first half of this deliverable report describes the work undertaken in *WP2: Platform, Community and Network Building* to identify the needs and requirements of all stakeholders, to identify best practice for the development of content-rich knowledge-sharing platforms, and to research the availability of existing open source modules or platforms.

The second half of this deliverable report describes the EU-Citizen.Science platform structure, the functionality and features that will be developed, the release plan, and the development approach.

1 Introduction

1.1 The EU-Citizen.Science project

Citizen science (CS) actively involves the public in scientific research that generates new knowledge or understanding, and thus has the potential to bring together science, policy makers, and society as a whole in an impactful way. As a core dimension of Open Science, it opens up the opportunity for all members of society to take an active role in research, innovation and the development of evidence-based policy, at local, national and EU levels.

It is the ambition of the EU-Citizen.Science project ('the Project') to build on the growing impact of citizens participating in research across the full range of scientific enquiry, by developing a sustainable platform to act as a mutual learning space for citizen science, focusing on Europe but relevant globally. The overall vision for the EU-Citizen.Science platform ('the Platform') is to aid the mainstreaming of CS in Europe, such that it becomes an appreciated and widely established means for the democratisation¹ of science in Europe, as shown in Figure 1 below.



Figure 1: The vision, mission and objectives of the EU-Citizen.Science project

¹ Democratising science means “creating institutions and practices that fully incorporate principles of accessibility, transparency, and accountability. It means considering the societal outcomes of research at least as attentively as the scientific and technological outputs. It means insisting that in addition to being rigorous, science be popular, relevant, and participatory”. - Guston, David H. “Forget Politicizing Science. Let’s Democratize Science!” Issues in Science and Technology 21, no. 1 (Fall 2004) https://issues.org/p_guston-3/



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The building of the Platform is being pursued through three interconnected lines of activity:

1. Coordinating CS actions, and making use of existing resources in the presently fragmented CS landscape in Europe;
2. Engaging quadruple helix stakeholders at local, national and European levels;
3. Creating a mutual learning space and a set of comprehensive, co-designed training modules for different target audience.

In keeping with our mission, we aim to engage equally with CS participants, practitioners, researchers, policy makers and society as a whole throughout the course of the project. In order to do so effectively, it is necessary to have a clear understanding of who our target audience is, their needs and requirements, and how we can build a community of engaged users of the Platform.

1.2 The EU-Citizen.Science platform

The vision for the Platform is for it to become a central hub for knowledge sharing, coordination, and action at the European level. As shown in the diagram of work packages for the project in Figure 2 below, the Platform will include:

- a **mutual learning hub** where resources will be shared
- a **projects & networks hub** to help practitioners to find each other outside the platform
- **training modules** for capacity building
- a **CS events** calendar
- **community forums** for conversations and collaboration to take place amongst the community of practitioners on the Platform itself, and **social media**

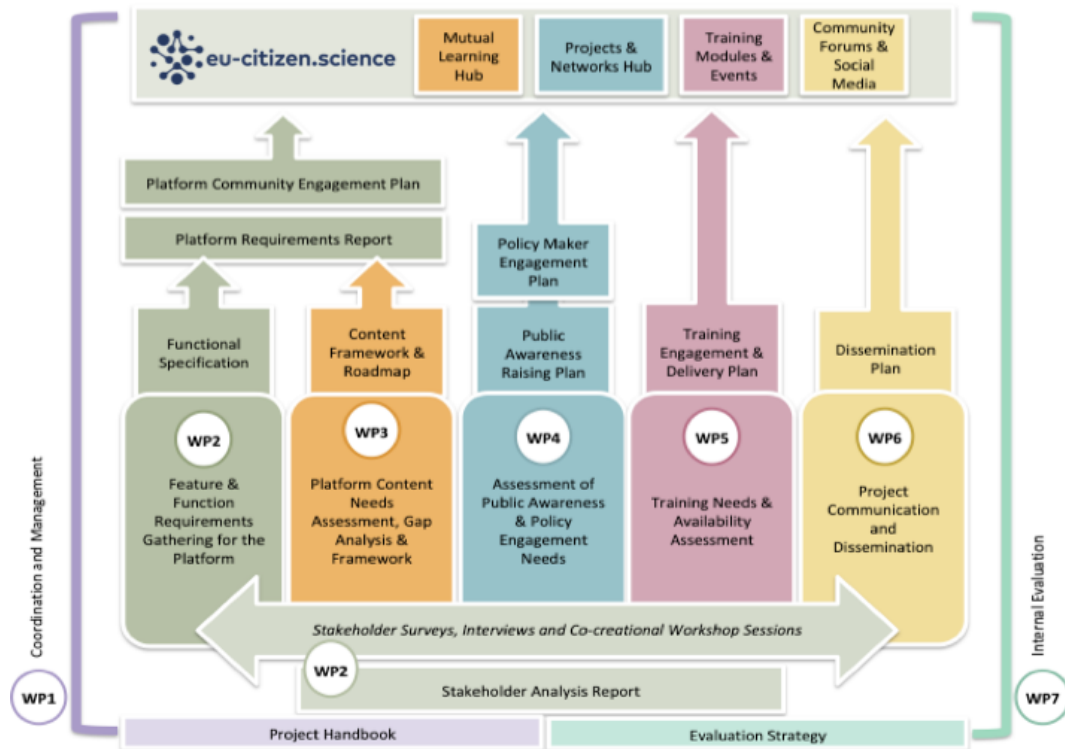


Figure 2: The EU-Citizen.Science diagram of work packages

The resources section of the Platform, which is the mutual learning space, will offer high quality materials for practitioners across all domains and experience levels. This section will enable community-driven content sharing, where CS project coordinators and participants can exchange experiences and successful strategies. Curation of these resources by the consortium partners will enable us to promote outstanding, state-of-the-art tools and materials that further the implementation of best practice.

The range of guidelines, tools and best practice examples will be available in different formats, and will address as wide a range of domains of practice as possible, from environmental sciences to the humanities.

Showcasing the wide range of projects that have been undertaken in Europe, particularly those that are still active, will enable practitioners to establish their own professional networks, as well as find regional and national network associations that will be relevant to their practice. This enables the Platform to serve as a European meeting point for relevant actors in CS, as well as for newcomers interested in discovering its potential.

The training modules featured on the Platform will enable the acquisition of skills and competencies to overcome difficulties or challenges in setting up citizen science initiatives, such as choosing the optimum methodology, reflecting on expected outcomes and impacts, data



quality assurance and validation, linking the various governance levels from local to global, ensuring balanced participation of citizens, the integrity of methods and data, recognising the work of citizens participating in CS initiatives, and managing large numbers of volunteers - to name but a few!

The community forum section will serve as the collaboration, dialogue and networking space to support coordination between new citizen science initiatives and established networks of CS practitioners, as well as between established practitioners.

1.3 The purpose of this deliverable

The work summarised in this deliverable '*Platform Functionality Requirements & Specifications Report*' (D2.3) took place in the context of WP2: *Platform, Community and Network Building*, which forms both the foundation and the heart of the Project. WP2 contains three crucial assessment phases - the first of which was to identify the key stakeholders of the EU.Citizen.Science platform and its stated objectives. This work was performed within Task 2.1 '*Mapping of stakeholders, key networks & platform-community members; multi-level engagement model for community and network building*', and culminated in the '*Stakeholders, Network & Community Mapping Report*'² (D2.1), and the '*Multi-level platform Engagement & Community Building Plan*'³ (D2.2).

The second assessment phase identified the needs and requirements of all stakeholders, and the third assessment phase researched the availability of existing open source modules or platforms. Both of these have been performed within Task 2.2 '*Co-design of platform requirements*', and are described in this report - in [Section 3](#), and [Section 5](#), respectively.

The purpose of this deliverable is to describe the needs-gathering activities which were undertaken, the platform features and functionality needs identified by key stakeholders, opportunities to integrate with other networks and platforms through application programming interfaces (APIs), and to draw as much as possible on the current state of the art.

In the Project description of activities, we identified seven factors which underlie the methodology for building the Platform, the third of which was 'Usability in terms of user interface (UI), design and speed'. The most common causes of low website usage rates that we identified were (a) an unattractive visual layout, (b) poor user interface design, and (c) slow page loading times, which can often be caused by the predominance of high-resolution images. In [Section 4](#) we describe state-of-the-art best practices for addressing these factors, and in [Section 7](#) we describe the specific ways in which they will be addressed in the development of the Platform.

² <https://zenodo.org/record/3465726>

³ <https://zenodo.org/record/3466417>

In the final sections of this report (from [Section 6](#) onwards) we describe our methodology and approach to developing and building the platform structure, the information architecture, and the required functionalities and features, which will commence in Task 2.3 of the project (*Building the EU-Citizen.Science Platform*), the roadmap for which is shown in Table 1.

Table 1: Platform development roadmap

Milestone Number	Milestone Title	Due Date	Means of verification
MS4	EU-Citizen.Science platform first release	15 (March 2020)	The EU-Citizen.Science platform is fully online
MS5	EU-Citizen.Science platform Alpha release	20 (August 2020)	Key stakeholders are engaged on the platform and content gathered in WP3 is available on the platform
MS6	EU-Citizen.Science platform Beta release	36 (December 2021)	The platform community is active, all relevant project outcomes are available, including training modules produced in WP5

1.4 The platform stakeholders

As outlined in D2.1, the key stakeholders for EU-Citizen.Science are ‘Any person, group, or entity with a common interest or stake in the outcomes of the Project and the success of the Platform’.

Since its start, the Project has engaged with key actors who are implementing CS initiatives at the European level (either as project coordinators, project partners, third parties or project supporters) as well as the national or regional level (mostly by engaging leaders of national or regional CS platforms in EU Member States), together with newcomers who can introduce and promote CS practices in their respective countries. The main stakeholder groups for EU-Citizen.Science can be summarized in seven groups, as shown in Figure 3. A detailed description of the composition of each stakeholder group is provided in D2.1.



Figure 3: The main stakeholder groups in EU-Citizen.Science

In order to focus more specifically on the actors who will be relevant for the success of the Platform, and how they will use it, we have made a distinction between ‘Stakeholders’, ‘Users’ and ‘Target Audiences’. There is a great deal of overlap between those who have a stake in the success and impact of the Platform (Stakeholders), those who will use the Platform (Users), and those groups who we wish to actively seek out and engage with, including those who are not yet involved in citizen science in any way and might not even be familiar with the term (Target Audiences).

1.5 The platform users & target audiences

As described in more detail in D2.1, the core user groups for the Platform can be divided into those who are ‘producers’ of CS (i.e. people who do CS) and those who are ‘consumers’ of CS (i.e. those who use the outcomes of CS). Both groups contain people who are acting in different contexts, as shown in Figure 4.

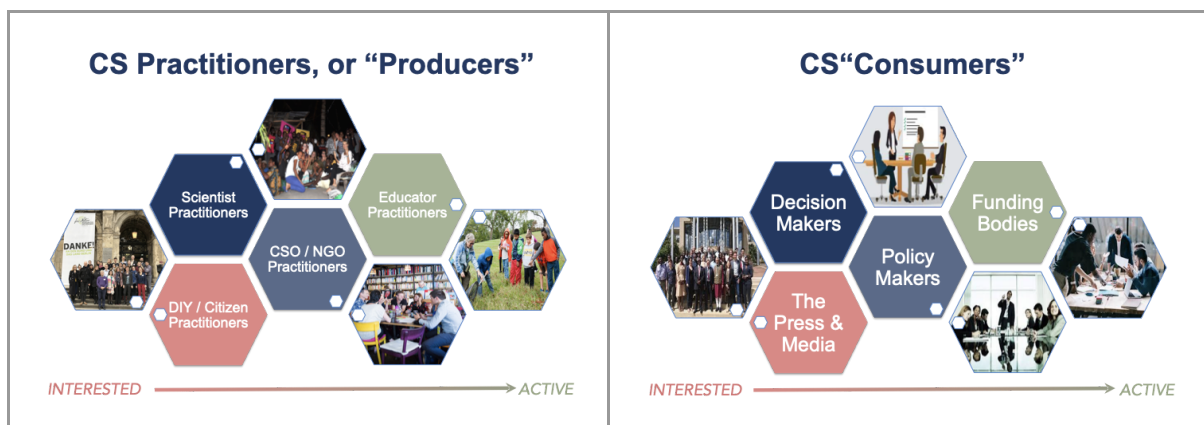


Figure 4: The two core user groups of the EU-Citizen.Science Platform



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Practitioners, or producers, include scientists and researchers, civil society organisations (CSOs) and non-governmental organisations (NGOs), educators using CS as an educational tool, and citizens starting their own bottom-up projects. Practitioners can also be found across a range of experience levels - from those who are new to CS ('Interested') to those who have active experience with CS ('Active').

The users of CS outcomes - the consumers -, include those making decisions based on the resulting data or knowledge production (such as policy makers and environmental managers), those making funding decisions, and those reporting on the outcomes of CS in formal or informal media.

It is the stated aim of the project to advance CS into the mainstream of public engagement, science communication and education' by actively promoting and raising awareness about CS amongst groups who are not traditionally reached, or not yet engaged with CS. These people thus form the core of our Target Audience, and may not find their way naturally to the Platform without intervention. This will be elaborated on further in D4.1 '*Guidelines and recommendations based on a range of best practices for achieving societal and policy-maker engagement*'.

2 Identification of needs & requirements

Following the first assessment phase described in the D2.1 and D2.2 reports, the second assessment phase that took place within Task 2.2 was to identify the needs and requirements of all stakeholders. In this section, we describe the needs-gathering exercise undertaken with a selection of key stakeholders in order to identify the full range of required platform features and functionality.

This task will be revisited at least every six months by launching consultations to new stakeholders and new citizen science initiatives, to allow for iteration cycles and continuous improvement of the Platform.

2.1 Methodology

Our approach for the Task 2.2 needs and requirements gathering activities has been to reach out to the concrete communities of practice who will actively engage with the Platform, as shown in Figure 4 above. The first user group that we have focused on are the professional CS researchers and practitioners in our immediate network - the Consortium project partners and third-party partners, the members of the Citizen Science COST Action, the members of the European Citizen Science Association (ECSA), and those undertaking similar initiatives to support CS in their home countries.

We have identified this group as our primary target audience, and the most critical to our aims of gathering and sharing good quality tools, guidelines and materials. The needs and requirements gathering process is however an iterative one, which will continue to take place over the course of the project, to reach out more widely across all user groups.

Our methodology has been to conduct in-person interviews, and to run interactive workshops with the primary user group.

2.2 In-person interviews

As described in *Deliverable 2.2, Section 4*, we have addressed this core community by selecting a group of around 30 individuals to compose a gender balanced cluster, representative of professional CS practitioners. Out of the 30 individuals we have reached out to, 24 were available for a semi-structured interview conducted by ECSA team members. Most of these interviews took place by phone, during the months of August and September 2019. Almost all EU-Citizen.Science partners and third parties have been interviewed as part of the sample. The same set of questions was asked to all participants:

1. What are your expectations towards the EU-Citizen.Science platform, what would motivate you to use it, what would you like to find there (needs)?
2. Is there any particular inspiring resources that you would suggest?



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3. What would you like to contribute to the platform, in terms of expertise or resources?

These questions allowed us to collect useful information for the preparation of this deliverable, as well as *Deliverable 2.2*, where we analyze the key needs and expectations that emerged in depth. A summary of the key interview outcomes, in terms of requirements and usability factors underlined by our primary community of practice, is contained in [Section 3](#) below. Write-ups of interviews conversations, in an anonymized and summarized form, are available in [Appendix 1](#) (only answers to Question n.1 are provided here, as relevant to this Deliverable).

2.3 Consortium workshops

The first periodic meeting of the EU-Citizen.Science consortium took place in Vilnius in September 2019, providing an excellent opportunity to engage a representative group of CS practitioners in a series of workshops to develop user personas, value propositions and customer journeys for the Platform.

2.3.1 User Personas workshop

Personas are a tool used in user experience design, marketing, and product & service design to create reliable and realistic representations of the key target audience groups by describing a fictional individual to represent each unique group. These representations are ideally based on qualitative user research and web analytics, summarised into 1-2 page persona descriptions that include “behavioral patterns, goals, skills, attitudes, with a few fictional personal details to make the persona a realistic character”.⁴

Thinking about the needs of a fictional persona helps designers and developers to better anticipate what a real person might need or expect, and helps the whole team to have a shared understanding of the real users in terms of their goals, capabilities, and contexts. The goal of personas is not to represent all audiences and address all needs for the Platform, but instead to focus on the major needs of the most important user groups. Personas also provide a means to measure the effectiveness of the Platform, and can thus contribute to the evaluation procedures described in the D7.1 *‘Evaluation and Impact Framework’*.⁵

The European Commission’s Joint Research Centre (JRC) has put a lot of thought into the concept of a Citizen Science Platform in the style of the EU Science Hub⁶, and for this they also developed a set of user personas, (as shown in Figure 5) that form a very useful input to our process.

⁴ [https://en.wikipedia.org/wiki/Persona_\(user_experience\)](https://en.wikipedia.org/wiki/Persona_(user_experience))

⁵ <https://zenodo.org/record/3529269>

⁶ <https://ec.europa.eu/jrc/en>

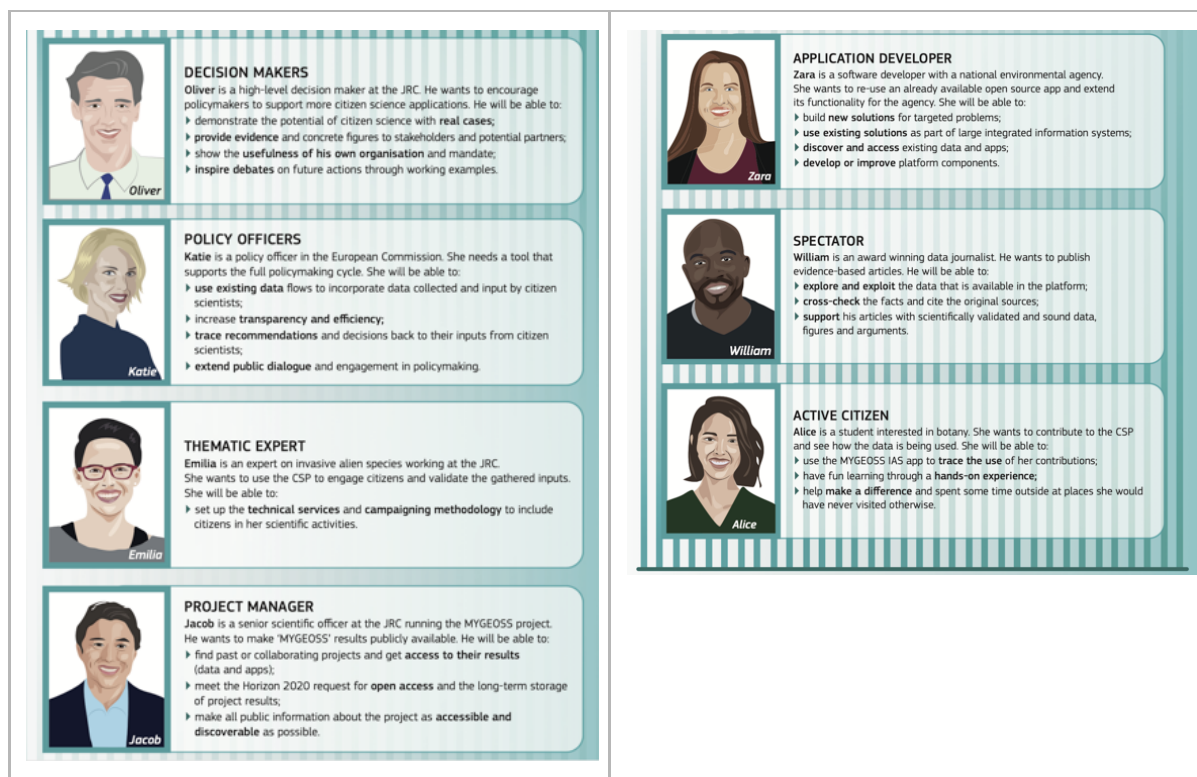


Figure 5: User personas developed by the JRC for a conceptualised Citizen Science Platform

At the Vilnius consortium workshop, participants were asked to split out into groups, and together fill out the persona details of a fictional person to represent:

1. an Academic /Research CS Practitioner,
2. an Educator CS Practitioner,
3. a Citizen Scientist / DIY Practitioner,
4. a Decision Maker, and
5. a member of the Press / Media.

Alongside a range of descriptive details, participants also indicated whether their persona was new to the field of CS, or had a degree of experience already. The outcomes of this exercise are shared in [Appendix 2](#).

2.3.2 Value Proposition Canvas workshop

The Value Proposition Canvas⁷ is a tool within the wider Business Model Canvas⁸ framework for lean start-up⁹ thinking that focuses the development of a product or service on the values and needs of the user of that product or service. The main purpose of the canvas is to ensure that there is a good fit between those needs and what is being built or offered.

Starting with a user profile based on the persona work performed in the first workshop, we first asked the workshop participants to indicate on the canvas (shown in Figure 6 below) what the job to be done is from the point of view of that persona, such as the functional tasks they are trying to perform, the problems they are trying to solve or the needs they wish to satisfy when they come to the Platform (the ‘Jobs’). We then asked what benefits that persona needs and expects from the Platform, especially in terms of what would ‘delight’ them and encourage them to use the Platform (the ‘Gains’). Finally we asked what negative experiences, emotions and risks that persona experiences in the process of getting or trying to get the job done (the ‘Pains’).

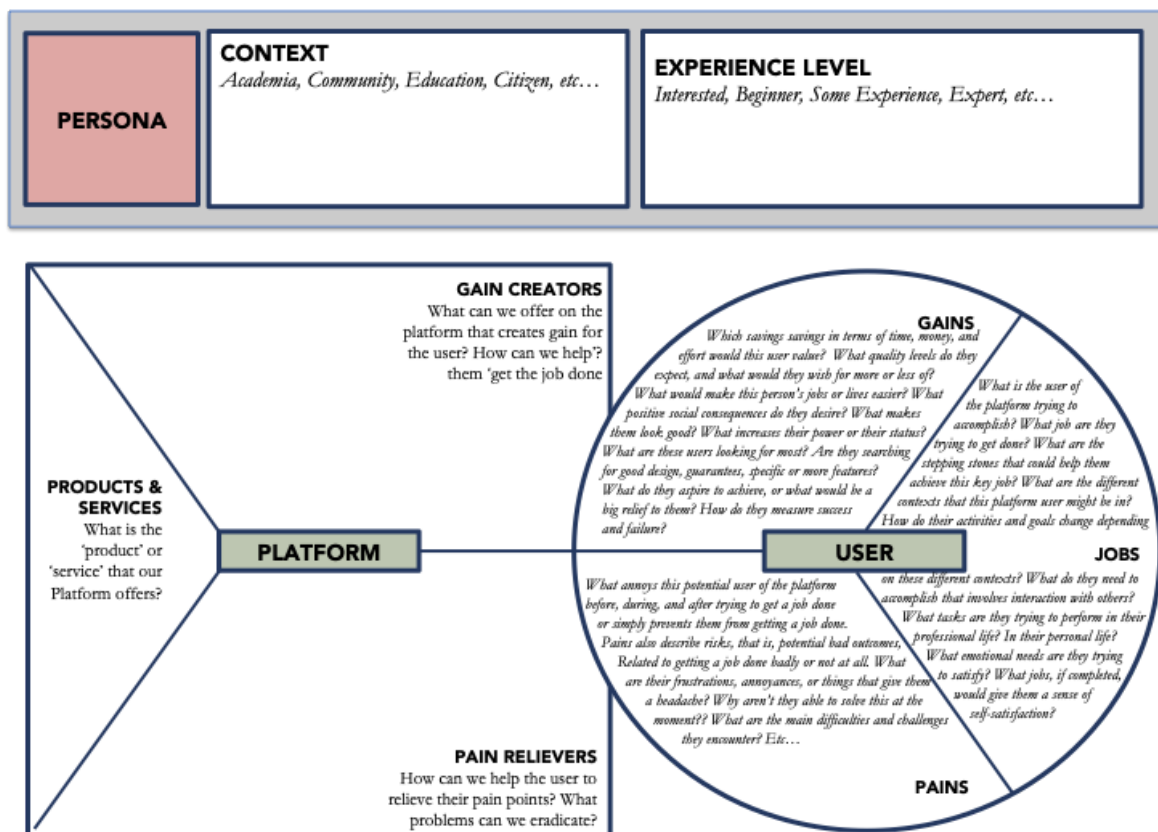


Figure 6: The Value Proposition Canvas for the EU-Citizen.Science platform

⁷ <https://www.strategyzer.com/canvas/value-proposition-canvas>

⁸ <https://www.strategyzer.com/canvas/business-model-canvas>

⁹ <http://theleanstartup.com/>

For the Platform Value section of the canvas we asked the workshop participants to consider how the Platform could address these needs by first describing how the Platform can specifically benefit that Persona (the ‘Gain Creators’), how the Platform can alleviate the issues being faced by that Persona (the ‘Pain Relievers’), and then asked them to summarise what the added-value product or service is that the Platform can offer that Persona (the ‘Product & Services’) in light of their Pains and Gains. The outcomes of this exercise are shared in [Appendix 2](#).

2.3.3 User Journey Mapping workshop

A customer journey map is a visual representation of the steps and stages of the user experience on the Platform, that identifies interaction points and takes into account the mental models and emotions of the user as they try to accomplish their ‘job to be done’. Customer journey mapping helps us to step into the shoes of our users to experience the Platform from their perspective. Even more importantly, it helps us to identify any barriers that may prevent them from using the Platform effectively or making their own contributions of content by going through the whole experience from first click to final outcome.

A typical template for customer journey mapping can be quite complex (as shown in Figure 7) and should ideally be developed over a number of days or weeks, so for our purposes we used a simplified version of the map (as can be found in [Appendix 2](#)).

CUSTOMER JOURNEY MAP

Example of an online grocery store

STAGE	AWARENESS	CONSIDERATION	DECISION	DELIVERY & USE	LOYALTY & ADVOCACY				
CUSTOMER ACTIVITIES	Hear from friends, see offline or online ad, read from newspapers	Compare & evaluate alternatives	Add groceries to shopping cart	Make an order	Receive or pick up on order	Contact customer service	Enjoy groceries	Order again and/or order more	Share experience
CUSTOMER GOALS	No goals at this point	Find the best solution to buy food	Find and select products easily, get inspired	Order effortlessly	Receive or pick up an order effortlessly and when needed	Get help if problems appear, request for refund	Have the right and good quality ingredients	Repeat good customer experience	Share feelings, give feedback
TOUCHPOINTS	Word of mouth, traditional media, social media	Word of mouth, website, brick & mortar store, social media	Website, app, order confirmation email	Delivery service, packing, messages (email, SMS, phone call)	Phone, email, chat	Food products, packages, other materials	Word of mouth, social media		
EXPERIENCE	Interested, curious	Requires effort but excited	Excited	"Payment is painful"	Requires effort, happy when received	Frustrated	Satisfied	"This is easy"	"Have to share this"
BUSINESS GOAL	Increase awareness and interest	Increase number of website visitors	Increase shopping cart value & conversion rate	Increase online sales and conversion rate	Deliver on time and minimise the delivery window	Increase customer service satisfaction, minimise waiting time	Make products to match expectations	Increase retention rate and order value and/or frequency	Turn customers into advocates, turn negative experiences into positive
KPIs	Number of people reached	New website visitors	Shopping cart value, conversion rate	Online sales, conversion rate	On time delivery rate, average delivery window	Customer service success rate, waiting time	Product reviews	Retention rate, order value and frequency	Customer satisfaction
ORGANISATIONAL ACTIVITIES	Create marketing campaigns and content both offline and online, PR	Create marketing campaigns and content both offline and online	Optimise grocery shopping experience	Optimise online purchase funnel, order handling	Picking & delivery	Organise customer service	Develop products & product range	Target marketing, make re-ordering easy, upselling and/or cross-selling	Manage feedback and social media, develop sharing / inviting possibilities
RESPONSIBLE	Marketing & Communications	Marketing & Communications	Customer service	Online development, warehouse, logistics	Warehouse, logistics	Customer service	Product development, purchasing	Marketing, online development	Customer service, online development
TECHNOLOGY SYSTEMS	CRM, analytics, programme, buying platform, social media	CRM, analytics, CMS, marketing automation	CRM, analytics, CMS, ecommerce platform, PIM	CRM, analytics, CMS, ecommerce platform, PIM, inventory system, marketing automation	CRM, analytics, order & delivery system, marketing automation	CRM, analytics, help desk, ticketing system, chat	CRM, analytics, vendor management system, PIM	CRM, analytics, marketing automation, ecommerce platform	CRM, analytics, marketing automation, ecommerce platform, social media analytics

Figure 7: Example Customer Journey Map¹⁰

The participants in the workshop were asked to work further with the persona they had developed, and the ‘job to be done’, to first map the steps in that user’s journey from awareness of the platform through varying levels of engagement for that job, such as their first action on the Platform, interactions with the Platform community, and what deeper engagement actions might look like (such as contributing resources). With that journey established, we then asked them to describe what the touchpoints¹¹ are with EU-Citizen.Science (such as via social media, specific pages on the Platform, conversations with Consortium partners, etc), what the goal of the user is at that step, and what their emotional state might be during that step (such as frustrated, curious, etc). The outcomes of this exercise are shared in [Appendix 2](#).

2.4 COST Action Working Group 2 workshop

The workshop entitled ‘Building a community network for educators, teachers, Citizen Science practitioners and researchers on synergies between Citizen Science and Education¹²’ was organised and

¹⁰ <https://www.columbiaroad.com/blog/why-and-how-to-create-a-customer-journey-map-download-free-template>

¹¹ <https://www.surveymonkey.com/mp/identify-customer-touchpoints/>

¹² <https://cs-eu.net/news/workshop-report-wg-2-building-community-network-educators-teachers-citizen-science>



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run by members of the Citizen Science COST Action CA15212 Working Group (WG) 2 ‘*Develop synergies with education*’¹³, in collaboration with ECSA and other project partners.

The main goal of the workshop was to effectively and sustainably connect the diverse stakeholders in the field of CS and Education by contributing to the development of:

- a) a platform that enables us to easily share existing resources and to collaborate openly on creating new ones, and
- b) a communication strategy that is tailored to the stakeholders’ needs.

Participants at the workshop came from nine different countries and represented teachers, educators, scientists, citizen science researchers, national hubs, the Citizen Science COST Action, ECSA, and EU-Citizen.Science.

In preparation for the workshop, participants were asked to think about the following questions:

- What is the purpose of this community?
- What resources are needed?
- Which channels does this community use to communicate?
- What content is shared?
- What do people within these communities gain from participating/contributing?

In the first workshop session the participants shared, clustered and discussed their ideas about these questions, to form a more coherent vision of how a platform could be used by the community at the intersection of CS and Education.

Also in preparation for the workshop, participants were asked to use the Mozilla Foundation’s ‘Personas and Pathways’¹⁴ tool to create a persona drawing on their own experience and based on their own viewpoint, expertise in one of the following categories:

- Teachers
- Science educator / Scientist,
- CS participant
- Informal educator

¹³ <https://cs-eu.net/wgs/wg2>

¹⁴ <https://mozilla.github.io/open-leadership-training-series/articles/building-communities-of-contributors/bring-on-contributors-using-personas-and-pathways/>

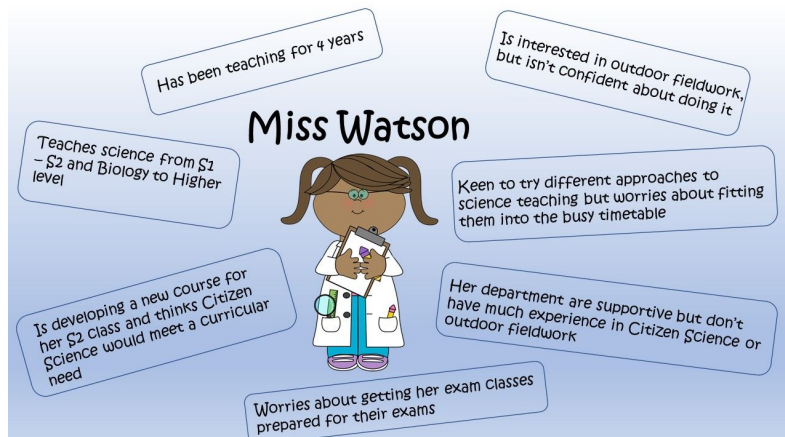


Figure 8: Example persona developed during the COST Action WG2 workshop¹⁵

In the second workshop session, the group then discussed the characteristics of each identified persona, the expected pathway into the network, some of the key barriers to engagement, and possible solutions. One of the key conclusions from this session was that;

“the wide range of competing priorities represented in the groups above highlights the need for the proposed community network to have simple and clear navigation routes to ensure that the widest range of audiences can be effectively reached and engaged in citizen science activities that are of value to themselves and the communities/organisations that they represent.”

A longer description of the workshop is contained in [Appendix 3](#) below, and the full report¹⁶ of the outcomes of the workshop can be found in the COST Action WG reports on the COST Action website¹⁷

2.5. Joint Workshop with COST Action Working Group 4

The workshop entitled ‘Co-creating the European citizen science platform of the future’¹⁸ was organised by ECSA in co-operation with the Museum für Naturkunde (MfN) and the members of the Citizen Science COST Action WG 4 ‘Enhance the role of CS for civil society’¹⁹. It had the dual aim of actively contributing to the collaborative development of the Platform, and identifying potential collaborations between the ongoing COST Action and the Platform, throughout its development.

¹⁵ <https://cs-eu.net/news/workshop-report-wg-2-building-community-network-educators-teachers-citizen-science>

¹⁶ https://drive.google.com/file/d/1Vm8HUMpTWM_Y6EzjPa3usrQYh1mfiKz1/view

¹⁷ <https://cs-eu.net/news/workshop-report-wg-2-building-community-network-educators-teachers-citizen-science>

¹⁸ <https://cs-eu.net/events/internal/workshop-wg-4-and-eu-citizen-science-co-creating-european-citizen-science-platform>

¹⁹ <https://cs-eu.net/wgs/wg4>



The 18 participants from 11 countries in attendance were invited to share their expectations for the platform, and to contribute their expertise by identifying potential features and functionalities.

During one of the collaborative activities during the two-day workshop, participants were invited to think about possible users of the EU-Citizen.Science platform. Each group of four created a profile for an imaginary platform user, as shown in Figure 9 below, describing their motivations and any potential barriers to engaging with the Platform.

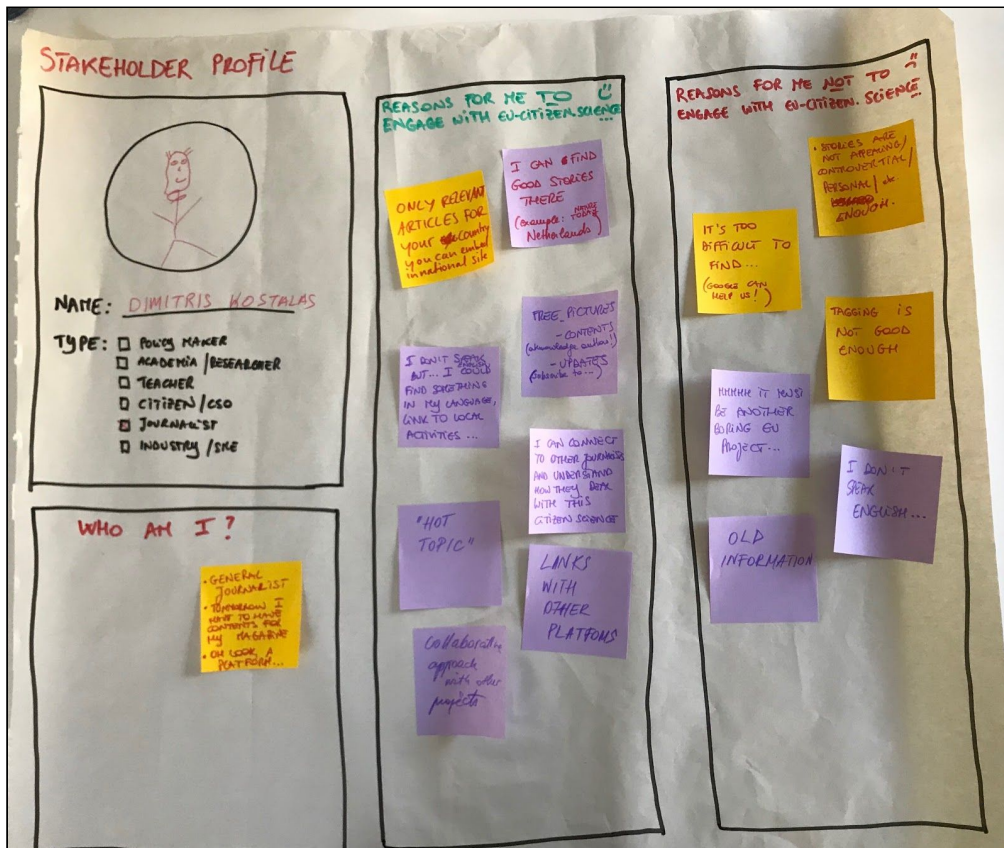


Figure 9: Stakeholder persona profile

A longer description of the workshop is contained in [Appendix 4](#) below, and the full report²⁰ of the outcomes of the workshop can be found in the COST Action WG reports on the COST Action website.²¹

²⁰ https://cs-eu.net/sites/default/files/CA15212_WorkshopReport_WG4andEUCSPlatform.pdf

²¹ <https://cs-eu.net/wgs/wg4>

3. Outcomes of the requirements gathering activities

As previously mentioned, there are a few key expectations towards the EU-Citizen.Science platform, as they have emerged from the semi-structured interviews (summarized and anonymized write-ups of all interviews can be found in [Appendix 1](#)) and workshops (summarized in [Appendix 2](#), [Appendix 3](#) and [Appendix 4](#)). In the following paragraphs we will analyze and classify them. [Section 6](#) will use the outcome of this section to create the backlog of items which will be developed during the first release of the Platform.

The following table shows a summary of the requirements collected from interviews and workshops, classified based on their nature. For the sake of clarity it is also included the *Module* which will provide the desired functionality. All *Modules* are explained in detail in [sections 6](#) and [7](#) of this deliverable. All collected requirements have been classified around four categories:

- **Platform functionalities (human-oriented and machine-oriented):** they include a list of the “most wanted” key functionalities, and how they translate into platform core *Modules*.
- **Usability and accessibility requirements:** These requirements are not directly translatable into platform functionalities as such, but they do represent key aspects to be considered in order to attract users to the platform, make sure that navigating through the platform is an enjoyable experience, and be as inclusive as possible.
- **Content requirements:** A key focus of the requirements expressed by the core group of our future users refers to the availability of resources on the platform, as well as specific characteristics of those resources. Although this set of requirements also does not translate into specific functionalities of the platform, and another workpackage within the project is focusing on making sure that the right resources are uploaded on the platform ([as explained in section 3.6.1 “Resource selection criteria”](#)), it is our responsibility as platform developers to make sure that we provide the necessary technical infrastructure to host and classify the required resources.
- **Other suggestions:** In this category we provide a list of tips and suggestions emerged from workshops and interviews, that do not fit within any of the other categories, but we consider that are still relevant for the platform. In [section 3.5](#) of this chapter we will explain how we will address at least some of these suggestions (eventually in future releases of the platform), as well as why we have decided not to address some of them.

Table 2: List of suggested requirements and related functionalities, by category.

Type	Description	Module (*)
Human oriented platform functionalities	- MatchMaking - Mentorship - Networking - Forum - Communication tool - Communities of interest - Catalogue of institutions, individuals, contact details	Social network
	- Mapping of CS projects - Showcasing projects - Statistics at EU level for CS	Graph engine
	- A very good search tool (including an advanced search tool)	Search engine
	- News, stories and updates on CS	Content manager
	- Calendar of events	Event manager
Machine oriented platform functionalities	- Interoperability	Filter Engine Crawler API
Type	Description	
Usability and accessibility requirements	- Easy to use - Dynamic (promote active use) - Simple - Attractive	
Content Requirements	- Quality: a curated list of best resources (with ranking, “top-five”, etc.) - Link with already existing resources, take over what good already exists. - Getting the feeling of what is important for CS both for experienced practitioners but also for users outside academia. - Starter guides - Best practices - Guidelines	



	<ul style="list-style-type: none"> - Toolkits - Funding calls
Other suggestions	<ul style="list-style-type: none"> - Impacts of CS: CS projects should be searchable by impacts they generated (not only by discipline). I.e. projects in water monitoring that had an impact in terms of public policy. - Language: Having everything in English could be a barrier to participation. - Policy support: Support the creation of national platforms. - Bottom-up approach: the platform should be the place where citizens can express their concerns, and CS community helps to provide answers, and where scientists express their research questions and citizens help to answer. - Co-creation: Support the possibility to co-create “things” within the platform, such as for example training modules, new resources, etc. - Personalized user-journeys: Foresee separate entry points for: professional (with experience in CS), amateur (little or no experience in CS) and citizen scientist (looking for answers on CS). - A dedicated facilitator: uploading new content, stimulating conversations, keeping new / events / resources up-to-date. How does this link with long-term sustainability issues for the platform? - Data collection and Data Quality: the platform should collect datasets from CS projects and guarantee quality. - Modularity: while building the platform

3.1 Human oriented platform functionalities

Social Network

“Networking”, “Matchmaking”, “Communication” and “Forum” are amongst the most commonly used words in conversations that occurred during the interviews. When talking about key features of the Platform, one of the key expectations is that it should support opportunities to network, collaborate, get in touch with peers, etc. Interaction seems to be one of the key needs of the CS community, as it has emerged in most of the interviews, under different wording. Foreseen benefits of interactions supported by the platform are multiple, ranging from support



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to finding adequate project partners when building a consortium for a EU-funded call, up to quickly finding answers to questions that arise when working on a CS project.

Building a strong network through regular interactions with peers is something that most of the interviewees perform on a regular basis, but mostly in an unstructured way. For example, when asked to provide examples of valuable resources they use in their work on CS, several participants answered that reaching out to colleagues for questions or suggestions was quite often more useful to them than any other resources such as websites, guidelines, etc. This clearly shows that there is a strong “Science of Citizen Science” community of practice, which could benefit from a Platform that supports their interactions, and mentors newcomers to CS.

This need will be addressed by implementing social network functionalities within the platform (*social network module*), as explained in section 6.

Graph Engine

One of the most shared elements between all interviewees is the expectation of finding inspiring CS projects on the platform, for a number of reasons: best practices, lessons learned, avoiding repetition, or even some simple inspiration. The showcased projects should be searchable by various criteria, such as country, thematic interests, stakeholder categorization, silos, etc. but also impacts they have achieved. It is interesting to notice that this expectation was not shared by all participants. According to a few of them, EU-Citizen.Science does not need to list projects (as there are already other platforms dedicated to this). This view has been supported mostly by representatives based in countries that already have strong support for CS via national networks, national or regional funding, etc. Most of the participants from countries where CS is still struggling to get institutional recognition and a structured network advocate for EU-Citizen.Science to be a tool where it is possible to find “good, inspiring projects, in a clear and harmonious way.” Sometimes, even in countries that already have national platforms of CS projects available, interviewees mentioned that they would still find it useful to have projects showcased on our platform, in case it provides added values such as a ranking system, a “top-five” function, or the possibility to download statistics on CS in Europe. Several interviewees referred to these services as something that would make them “save time” and would make the platform something widely used by the community. According to interviewees, such services would represent a big added value not only when compared to national platforms, but also in comparison to existing databases of CS projects, such as for example [SciStarter](#), where according to some of them there is a lot of information available, but not easy to navigate, nor to find out what is of good quality or not. As the EU-Citizen.Science is meant to be a strategic tool to support the spreading of CS in all of Europe, we have decided to include the showcasing of CS projects on the platform, as a way to support access to information in particular to the many Member States that still do not have national CS platforms.



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While the “quality” component of CS projects showcased in the platform will be addressed in sections 3.4 and 3.5 of this chapter, the platform will address this need by implementing a graph engine module that will allow to easily search through CS projects. An ontology of CS projects as well as specific metadata will be used in order to upload projects on the platform in a meaningful way, as explained in chapters 6 and 7.

Search engine

According to several interviewees, the platform should provide a good search functionality that allows to quickly find what you are looking for. This will be of particular importance considering the large amount of resources and training modules that will be uploaded on it, as well as the vast users community

This need will be addressed by implementing advanced search functionalities within the platform (*search engine module*), as explained in section 6.

Content manager and Event manager

According to several participants, one of the main aims of the platform should be to make it easy for its users to find out what is going on in CS, what are the latest developments, key events, etc. According to collected suggestions, it could do so by regularly publishing news and updates on CS, but also by providing a calendar of events. Besides this, the platform should also provide ways to give citizen scientists and citizen science projects more visibility, more voice (and therefore recognition). It could do so by for example publishing success stories of citizen scientists, or significant impacts achieved through CS.

This need will be addressed by implementing a *content manager* and an *event manager module* within the platform, to be used by platform managers as well as by the community at large to upload contents (news, stories, events) on the platform, as explained in section 6.

3.2 Machine oriented platform functionalities

Interoperability

The need of supporting interoperability has been underlined by several interviewees. The concept of interoperability has taken multiple shapes within interviews conversations, such as for example in technical terms, through references to making use of already existing API, metadata, ontologies, etc. This expectation has been underlined in particular by professionals working within institutions such as the JRC, or engaged in activities within the Citizen Science Cost Action CA15212. The reason for this is that in the last couple of years, big repositories of CS initiatives have been created (such as the [JRC's inventory of CS activities](#) for environmental policies or the Country Fact Sheets for the development of recommendations for the development of (national) Citizen Science Strategies, of [WG3 of the CS Cost Action](#) - to be published soon), as well as shared ontologies have been adopted (such as the one developed by



[Working Group 5 - Improve data standardization and interoperability](#) - of the COST Action). But interoperability has also been mentioned when referring to “not reinventing the wheel”, making use of what already exist, linking to already available resources and seeing the platform as a repository for other projects' outcomes. Overall, EU-Citizen.Science is making a big effort in making sure that interoperability

While we will address the need to link with ongoing and already existing resources in section 3.5 of this chapter, we will address the overall need for interoperability by implementing Filter Engine, Crawler and API, as explained in sections 6 and 7.

3.3 Usability and accessibility requirements

Throughout interviews, several participants referred to the importance of the “look and feel” of the platform. In particular, several of them mentioned that the platform should be “easy to use”, “dynamic” (in the sense of promoting active use), but also “simple” and it should look “attractive”. As platform developer we are well aware of the importance of all these aspects that we have categorized under the broad umbrella of “Usability and accessibility requirements”. In [Chapter 4](#) of this deliverable we describe at length the state of the art know-how in website design usability, particularly in terms of [accessibility and inclusion](#) and [user interface & user experience design](#). Best practices described there are critical to the success of the EU-Citizen.Science platform and they are a great source of inspiration for the work we are developing. In [Chapter 8](#) we also underline how one of the core factors for the success of the platform is the “[Factor 3: Usability in terms of UI, design and speed](#)”. Usability and accessibility have been one of the key components we have been focusing on since the very first conceptualization of the platform that we performed when writing the proposal.

We will address these needs by making sure that the platform has an appealing design, it is easy to use, accessible and inclusive. Active use of the platform is also at the very core not only of the platform development, but also of it's long-term sustainability plan. The platform will only be successful if its vast community of users becomes actively engaged in uploading content, making sure they are of good quality, but also using the platform as a tool for interaction, networking and community building.

3.4 Content requirements

Most of the selected interviewees mentioned that not only do they expect to see a lot of contents on the platform, of various types, but also that quality is the key element that would not only make them interested in the contents available, but would also represent the biggest added value when compared to what is already available online in terms of CS resources. Most of the participants have underlined how the platform should provide some kind of ranking,



prioritization or identification of those which can be considered as exemplary projects to follow, get inspired from, replicate (for several aspects, such as volunteers engagement, data quality, societal impacts, etc.). As framed by one participant, knowing that what is on the platform is of high quality, and being able to easily and quickly relate to it (by for example having a ranking system, or a list of “top-five” selected projects / resources on the homepage) would represent a turning point when compared to searching for CS resources on Google (or any other search engine), or on existing platforms such as SciStarter. Some interviewees referred to this same concept as a key service that the platform should provide, as “getting the feeling of what is important for CS both for experienced practitioners but also for users outside academia”. In their view, having the EU-Citizen.Science platform as “the” reference portal for “good quality” citizen science would make them save time (compared to performing long searches or having to contact colleagues when looking for reliable resources) as well as it would support them in their role of advocators for CS (for example, when talking scientists into CS, it would be of help for them to be able to refer them to one portal where they can be sure that only good quality things are showcased).

When talking about contents, participants have been referring to a large variety of resources that they would like to find in the platform. Several of them underlined the need for “starter guides”, a collection of “best practices”, “guidelines” addressed to all levels of experience, “toolkits”, but also support on how to find funding calls, a list of reliable CS apps, and scientific literature. Finally, some participants reminded us how important it will be for the platform not to “reinvent the wheel” but to link with already existing resources, and take over what good already exists.

We are addressing these content needs through multiple actions:

- One of the main questions which arises from the identification of this need for quality, is how do participants define what they consider to be “good” and credible examples (of CS initiatives and resources). This is the core issue that is being addressed within WP3, through the definition of selection criteria that will determine what is “good enough” to be uploaded on the platform. A summary of ongoing WP3 activities is provided in [Section 3.6.1 Resource selection criteria](#) of this Chapter. In the upcoming month, concerned project partners will be testing the selection criteria that have been defined so far, with the aim of being able to start uploading resources on the platform as soon as possible. The platform will already contain good quality resources as of its first release. The first set of resources available will be curated by the project consortium, based on the defined selection criteria. Following this, and as soon as the platform users community will start growing, citizen science practitioners and initiatives will be invited to share resources online, making sure that they fulfill the defined selection criteria.



- Following workshops, interviews and interactions with EC representatives we have come to the conclusion that the platform should not provide a strict definition of CS. Nonetheless, the platform should support the community by addressing the need for a better understanding of what CS is, how it happens and what characterises it. Several interviewees mentioned that the [10 Principles of Citizen Science](#), developed by ECSA a few years ago, are a great starting point but also difficult to use in practical terms. In the past few months ECSA, as leading partner of the platform development, has therefore been carrying out a process of defining Citizen Science characteristics that involves not only the project consortium, but also the entire CS community at large. Led by Prof. Muki Haklay (UCL and ECSA Vice-chair), the process has been developing through the identification of a framework, key factors and a vignette study that has recently resulted in [a survey](#) that led to the collection of 392 responses. Survey outcomes are being analyzed and a very first draft of the Citizen Science characteristics will be available at the end of January 2020. Along with other project partners, ECSA is already focusing on how to translate the outcomes of this process into a way to provide useful information on CS projects showcased in the platform.
- MfN and ECSA are leading the project networking activities, establishing links with ongoing (or recently ended) projects, as to make sure that useful resources they have developed are uploaded on the platform repository. In the past few months we have been collecting suggestions for valuable resources to be uploaded on the platform through workshops, interviews, but also through direct contacts with projects such as [DITOs](#), [WeObserve](#), [GROW](#), etc. These networking activities will increase in 2020: we will not only be regularly in contact with all ongoing CS projects, but we will also start uploading all existing resources that have been produced (under the condition that fulfill the selection criteria developed in WP3).

3.5 Other suggestions

1. Impacts of CS

A key issue that has emerged in several conversations with interviews participants relates to the impacts of CS activities. In particular, providing the opportunity to search through CS projects by impacts they generated (and not only by discipline) is perceived as a very important added value in terms of services provided by the platform.

Although we will not be able to address this need within the first release of the platform, we are discussing along with Consortium members about how to fulfill this key expectation. More information about ongoing discussions as well as collaborations with key projects focusing on impacts of CS are provided in [Section 3.6.2 Ontology to describe CS impacts](#) of this Chapter.

Concretely, we are considering the possibility of adding a field to our metadata to capture this information where it is known and can be self-reported.

2. Language

Several participants have underlined how providing contents on the platform exclusively in English could be a barrier to participation. In some cases, participants also mentioned that having the possibility to use local languages, in particular for interaction with users, would be of great support to those countries that do not have national CS platforms.

Although it will be impossible for us to provide all platform contents in multiple languages, the platform will indeed support multilingual interactions, as explained in [Section 7.6.1 Multi-language support](#) of this Deliverable. The platform will provide internationalization and localization since the first release and the translation of the platform will be done through message files. We are also exploring possible collaborations with the Citizen Science Translation Hub developed as one of the valuable outcomes of the DITOs project but UCL's team. The Hub is still under development and it will be launched in January 2020; it will support downloading of plain text documents of citizen science literature and translation into any language, as well as submitting material for translation. More information on how this collaboration evolves will be provided in the second platform release.

3. Policy support

According to some participants, the platform should provide support both directly to policy makers interested in supporting CS initiatives, as well as to professionals engaged in advocating for better public support of CS within their countries.

This need does not translate into specific platform functionalities but it will be addressed through several foreseen actions within the project, such as:

- High quality resources and training modules specifically addressing policy makers and policy impact.
- WP4 colleagues are finalizing the preparation of *Deliverable 4.1 "Guidelines and recommendations based on a range of best practices for achieving societal and policymaker engagement"*, focused on providing useful suggestions on how to engage policy makers in CS initiatives.
- The Spanish Ministry of Science, Innovation and Universities (MINECO) is an active partner within the EU-Citizen.Science consortium and is providing guidance and inspiration (mentorship) to partners who are struggling to get public support to CS initiatives in their home countries.

4. Bottom-up approach



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One of the valuable suggestions collected through interviews is that the platform should be a place for bilateral interactions between citizens and scientists. For example, through the platform citizens could be invited to express their concerns, so that the CS community could help to translate them into research questions and provide answers, but also where scientists express their research questions and citizens help to answer.

Also in this case, this need will not translate into a specific platform functionality, but it will be nonetheless addressed through one of the already foreseen core modules, the *social network* one. Interactivity will be at the core of the platform functionalities, therefore there will be already a system in place that supports any type of exchanges between all types of users. The real challenge will lay in attracting the general public to the platform: this issue has partially been addressed in D2.2 “Multi-level platform Engagement & Community Building Plan” and it will also be addressed through the ongoing co-creation process (consultations, etc.) carried out in WP2.

5. Co-creation

According to some interviewees, the platform should support the possibility for users to co-create “things” along with project partners, such as for example training modules, new resources, etc. This co-creation component would also be useful when there is a need for adaptation processes, i.e. one specific resource needs to be slightly modified to be adapted to a local context.

We find this suggestion very useful and we plan to address it in one of the future platform releases, although it will not be part of the core set of functionalities implemented in the first release.

6. Personalized user-journeys

Some participants have suggested the idea of providing specific entry points for each type of stakeholders who will be using the platform, such as for example: professionals (with experience in CS), amateurs (little or no experience in CS) and citizen scientists (looking for answers on CS).

Although we find this an interesting suggestion, after several reflections as well as exchange of lessons learnt with existing platforms, we have decided not to implement this option in the first release of the platform. Providing “personalized experiences” to users is definitely important, but as one of the interviewees has suggested, it is also as important to make sure that we avoid breaking contents into multiple categories which end up having similar characteristics. One example of this is the [RRI Tools Toolkit](#). When surfing through it, it is possible to select between multiple options according to the type of stakeholder (such as for example Policy Makers, Research Community, Education Community, etc.). Despite this level of personalization, when selecting one stakeholder group or the other, similar resources are suggested each time, generating some frustration in users who expect to see highly personalized



contents. This is due to the fact that most of the resources can be useful to several types of stakeholders. Learning from the RRI Tools experience, we will avoid providing specific entry points at first, but we will also make sure that it is easy for platform users to understand what are the resources and training modules available, and to whom they are addressed.

7. A dedicated facilitator

In some interviews, it has been suggested that the platform should have a dedicated facilitator, who takes care of uploading new content, stimulating conversations, keeping news, events and resources up-to-date, etc.

Throughout the duration of the project, the platform will have a dedicated Community Manager in charge of some of these tasks, while the uploading of new resources, training modules etc. will be a shared effort with partners. Nonetheless, when looking at **long-term sustainability issues** for the platform, it is important that the platform becomes as self-sustaining as possible through community generated contents and review processes. This will be a key challenge of the upcoming two years of platform development and community building.

8. Data collection and Data Quality

In two interviews, it has been suggested that the platform should collect datasets from CS projects and guarantee that they are of quality.

Following discussions between Consortium members, it has been decided that this is not in line with the platform core aims, and it will therefore not host datasets. Several websites and platforms dedicated to this already exist (such as for example the [GBIF network](#), [iNaturalist](#), etc.) and the platform will provide resources and training modules on how to address issues of Data Quality and Data Management within CS projects.

9. Modularity

One of the advantages about using modularity in the development is that each set of functions is *isolated* in a way if a module fails, other modules might continue working. Modularity will allow us to work together with other similar platform sharing the same kernel (see [sections 6](#) and [7](#)) and build new modules on top of it.

3.6 Upcoming inputs

Within this deliverable report we capture the inputs that have been gathered up until the time of filing the report in M12 of the Project, but a range of anticipated inputs after this date will also be incorporated into the development of the Platform in time for the first release.

3.6.1 Resource selection criteria

The work being undertaken in WP3 ‘*Content - Framework, Quality Assurance and Curation*’ will develop a content framework to identify and facilitate the collection and sharing of suitable high-quality tools, guidelines, and other materials stemming from best practices in citizen science following an inclusive, community centered approach. These resources will form the main content of the Platform.

The two main objectives of WP3 are to:

1. Deliver organising criteria and a quality roadmap that enable citizen science practitioners and initiatives to share resources from best practices online.
2. Curate state-of-the art resources that are useful to actors inexperienced in organizing and supporting citizen science initiative,s as well as to career scientists, policy makers and other stakeholders to engage with, or start citizen science activities. Outputs from WP3 will link closely with WP2 (needs analysis and platform design), WP5 (training) as well as WP1 in establishing close ties with other SwafS and RIA projects on citizen science.

The work performed in Task 3.1 ‘*Criteria definition for collecting and sharing best practices in citizen science*’ will culminate in the D3.1 ‘*Framework Report - describing criteria and rationale for sharing and selecting state of the art Citizen Science resources*’. This report will have implications for how new resources can be submitted by the community to the Platform, what criteria they must meet, and how the moderation process must therefore function. It will therefore be an important input for the development of the Platform, and will further inform the design of its functionalities and features, to be incorporated within the first release.

The work performed in Task 3.2 ‘*Collating state of the art in citizen science: tools, guidelines and materials*’ will follow the criteria established in Task 3.1 to curate a collection of state of the art CS resources, to be shared in the first release of the platform. This will be done in collaboration with consortium partners, third party partners, members of the other SwafS RIAs, and the wider community of CS practitioners. The first release of the Platform will contain this content.

3.6.2 Ontology to describe CS impacts

One of the recurring requests made by the stakeholders who were interviewed regarding their needs and requirements (as described in [Section 2.2](#) and summarized in [Section 3](#)) was the ability to search for projects or resources by their impact, e.g. on public policy. Although it will be beyond our scope to assess projects or resources according to their impact, we can add a field to our metadata to capture this information where it is known and can be self-reported.



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Work currently being conducted in the WeObserve Community of Practice (CoP) on ‘*Impact and value of citizen observatories for governance*’²² (in which ECSA, IIASA, and NHM are active members) will be of great value in developing such an impact-field ontology.

The stated objectives of the WeObserve Impact CoP are to (1) provide an inventory of ‘tried and tested’ methods for capturing the impacts of citizen observatories (COs) on governance, (2) capture CO impact stories/examples of best practice from citizens, public sector and policy perspectives, and (3) to provide guidance on CO impact assessment for the CoP2 members and beyond.²³ Outcomes from this work, which are anticipated to be made public in Q1 2020, will contribute directly to the creation of this metadata field to describe impact.

Similar work is currently being conducted in the Measuring Impact of Citizen Science (MICS) project, in which Earthwatch is the coordinating partner, with a focus on developing methods for measuring citizen science impact. So far, the IHE Delft team leading this effort has focused on scoping this effort, creating the methodology for developing the impact assessment framework and planning the testing of the impact assessment framework by the MICS case studies and beyond. Overall, MICS is suggesting a three-pronged approach to capturing the impacts of Citizen Science: 1) by means of Impact Stories (in close collaboration with the work of the WeObserve Community of Practice on value and impact of CS for governance; 2) the MICS Impact Assessment Framework which will be available in due time on the MICS online platform; and 3) in-depth case studies.²⁴

²² <https://www.weobserve.eu/weobserve-cop2-impact-and-value-of-citizen-observatories-for-governance/>

²³ <https://www.weobserve.eu/wp-content/uploads/2018/11/Inception-report-CoP2-Impact-and-value-of-citizen-observatories-for-governance.pdf>

²⁴ <https://mics.tools/component/k2/7-romania-plenary>

4 State of the art in website design for usability

It is clear from the feedback from our core target user group described in [Section 2](#), and the stated ambitions of the Project described in [Section 1](#), that the success of the Platform will depend on five key factors:

1. The ease of finding & downloading the sought-for CS resources and training
2. The quality and applicability of those resources and training materials
3. The richness of community interactions
4. The ongoing contribution of the community to these resource bases.
5. The usability and accessibility of the user interface.

In this section we describe the best practices that will be of particular importance to meeting these success criteria and the stated needs of our target audience, which inform the effective design and structure of the Platform.

Please note that the factors that relate to the curation of good quality resources will be addressed in D3.1, the *Resources Framework Report* that describes the criteria and rationale for sharing and selecting state-of-the-art CS resources, and the D3.2 *Resources Analysis Report* on the resource gaps and opportunities. The factors relating to good interactions with the community have been addressed in D2.2.

4.1 Best practice in accessibility & inclusion

Accessibility is “the inclusive practice of ensuring there are no barriers that prevent interaction with, or access to, websites on the World Wide Web by people with physical disabilities, situational disabilities, and socio-economic restrictions on bandwidth and speed”²⁵. Other factors include the responsiveness of a platform to the device being used to access it (i.e. computer, tablet or mobile phone), the removal of any visual impairment barriers, and the provision of multi-language support.

Inclusion is closely related to accessibility, but is primarily about diversity, and “ensuring involvement of everyone to the greatest extent possible. In some regions this is also referred to as universal design and design for all.”²⁶

There are guidelines, standards and techniques for web accessibility, such as the Web Content Accessibility Guidelines (WCAG²⁷), which is the international standard ISO/IEC 40500, but the human interaction aspect is just as important. This requires user testing with as broad a group as possible. Similarly, the World Wide Web Consortium (W3C) has defined Accessibility

²⁵ https://en.wikipedia.org/wiki/Web_accessibility

²⁶ <https://www.w3.org/WAI/fundamentals/accessibility-usability-inclusion/>

²⁷ <https://www.w3.org/WAI/standards-guidelines/wcag/>



Principles²⁸, which provide web designers with good guidance during the design phase, which should then subsequently be tested with real people. The four central principles are that information on the web must be:

1. **“Perceivable** - Information and user interface components must be presentable to users in ways they can perceive. This means that users must be able to perceive the information being presented (it can't be invisible to all of their senses)
2. **Operable** - User interface components and navigation must be operable. This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform)
3. **Understandable** - Information and the operation of user interface must be understandable. This means that users must be able to understand the information as well as the operation of the user interface (the content or operation cannot be beyond their understanding)
4. **Robust** - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. This means that users must be able to access the content as technologies advance (as technologies and user agents evolve, the content should remain accessible)”²⁹

4.1.1 Visual impairment considerations

Accessibility should never be sacrificed for design. Users with poor eyesight will struggle to read text that does not have a sufficiently strong contrast between the background colour and the colour of the text, or that is not large enough to be easily legible. To ensure that the text can be read by people with visual impairments, the W3C's WCAG has the following contrast-ratio recommendations:

- Small text should have a contrast ratio of at least 4.5:1 against its background. A ratio of 7:1 is preferable.
- Large text (at 14-point bold and 18-point regular and up) should have a contrast ratio of at least 3:1 against its background.

The WebAIM Color Contrast Checker³⁰ tool can be used to quickly check whether a design is within the optimal range.

Similarly, users who are colour blind (as much as 4.5% of all people³¹) will not be able to understand interface directions that are being conveyed by colour, such as indicating text entry

²⁸ <https://www.w3.org/WAI/fundamentals/accessibility-principles/>

²⁹ <https://www.w3.org/TR/UNDERSTANDING-WCAG20/intro.html>

³⁰ <http://webaim.org/resources/contrastchecker/>

³¹ <http://www.colourblindawareness.org/colour-blindness/>



errors in red. As the W3C states, color should not be used “as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.”³²

For blind people using assistive technologies to read the website out loud, it is important to attribute descriptive text to all images used on the platform to convey meaning (as opposed to those used for decoration), so that this information can still be conveyed.

4.1.2 Physical impairment considerations

Some people with motor impairments use their keyboard to navigate websites, rather than using a mouse. Interactive and navigation elements can be made accessible to this group of users by designing interactive elements so that they can also be used with the Tab key and Enter key, and by displaying a keyboard-focus indicator that outlines the element that can be selected, illustrated in Figure 11.

Figure 11: Example of a keyboard-focus indicator highlighting the selected interface item³³



More examples of best practice design for keyboard interaction can be found in the “Design Patterns and Widgets” section of the W3C’s “WAI-ARIA Authoring Practices” document³⁴.

4.1.3 Auditory impairment considerations

According to the World Health Organization 466 million people were living with disabling hearing impairment in 2018, and this estimate is projected to rise to 630 million by 2030 and to over 900 million by 2050³⁵. As noted by the W3C, people with auditory disabilities often rely on:

³² <https://www.w3.org/TR/UNDERSTANDING-WCAG20/visual-audio-contrast-without-color.html>

³³ <https://a11yproject.com/practical-accessibility-improvements/>

³⁴ https://www.w3.org/TR/wai-aria-practices/#aria_ex

³⁵ Addressing the rising prevalence of hearing loss. Geneva: World Health Organization; 2018. Available from: <http://www.who.int/pbd/deafness/estimates/en/> [cited 2019 Apr 1].



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- Transcript and captions of audio content, including audio-only content and audio tracks in multimedia.
- Media players that display captions and provide options to adjust the text size and colors of captions.
- Options to stop, pause, and adjust the volume of audio content (independently of the system volume).
- High-quality foreground audio that is clearly distinguishable from any background noise.

We need to have in mind that for some people with auditory disabilities, sign language is the primary language, and they may not read the written language as fluently. However, it is important to remember that not all people with auditory disabilities know sign language.

4.1.4 Cognitive, learning and neurological disabilities

It is worth to point out that the Web provides many opportunities for people with cognitive, learning, and neurological disabilities to interact with content and to process information in ways that are more usable to them (e.g. using different navigation strategies or changing the content according to their individual needs or preferences). As noted by the W3C, depending on the individual needs, people with cognitive, learning and neurological disabilities often rely on:

- Clearly structured content that facilitates overview and orientation.
- Considering labeling of forms, buttons and other content parts.
- Predictable links targets, functionality, and overall interaction.
- Different ways of navigating websites, such as hierarchical menu and search.
- Options to suppress blinking, flickering, flashing, and otherwise distracting content.
- Simpler text that is supplemented by images, graphs, and other illustrations.

4.2 Best practice in user interface & user experience design

The state of the art in website design, beyond the latest visual design trends, boils down to achieving a clear structure, easy navigation, effective search tools and smooth functioning (such as quick image loading times) for the core tasks at hand. This requires good front-end design and information architecture (IA).

There are a vast range of resources when it comes to good website design, from individual blogs of User Experience (UX) and User Interface (UI) designers such as <https://justuxdesign.com/> and <https://www.lukew.com/>, large specialist consultancies such as the Nielsen Norman Group (<https://www.nngroup.com/articles/>), and UI/UX community resource websites such as <https://www.usability.gov/>, <https://uxplanet.org/> and <https://www.uxmatters.com/>.



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In this section we highlight a small number of best practices that will be particularly critical to the success of the EU-Citizen.Science platform.

4.2.1. Information architecture & navigation

IA is “the structural design of shared information environments; the art and science of organizing and labelling websites, intranets, online communities and software to support usability and findability”³⁶. Good IA helps users to navigate through the website via a clearly structured menu and site hierarchy, and to navigate through sections of the platform with more complex sets of information, such as the resources and training modules.

Hierarchy

The hierarchy for information and content on the website should be clear and logical, and align with users’ expectations of where to find the information they seek. The best way to achieve this is through proper user research and testing, including user interviews in which users are asked about their expectations and how they would categorise a variety of information groups.

Variation of fonts to establish hierarchy

One ‘quick win’ for establishing content hierarchy is to provide adequate variation between fonts, to establish a visual hierarchy on the platform, such that the boldest and largest fonts are the most important. This visual significance helps users to identify important structural elements, content headings and frequently used functions.

Card sorting & tree testing

‘Card sorting’ is an effective mechanism for creating a menu structure based on the results of user interviews, to test whether it satisfies the user’s mental model³⁷. UX researchers also use a technique called ‘tree testing’ to prove that the IA will work, which happens before designing the actual interface. It is crucial that navigation across the site is simple, clear and consistent.

Visual cues

One of the best-practice rules of thumb when designing the navigation structure for a platform is to make sure that the navigation cues meet the expectations of the user group. As an example, compare the ‘hamburger menu’ icons on the mobile web, which are a very common design element when space is limited (see Figure 12a) to the prioritisation of the most important tasks in the mobile menu (see Figure 12b), which allow users to find the most commonly sought tasks or web sections quickly.

³⁶ https://en.wikipedia.org/wiki/Information_architecture

³⁷ <https://www.smashingmagazine.com/2017/11/comprehensive-guide-web-design/>

Figure 12a: The 'hamburger menu' feature used in responsive web design³⁸

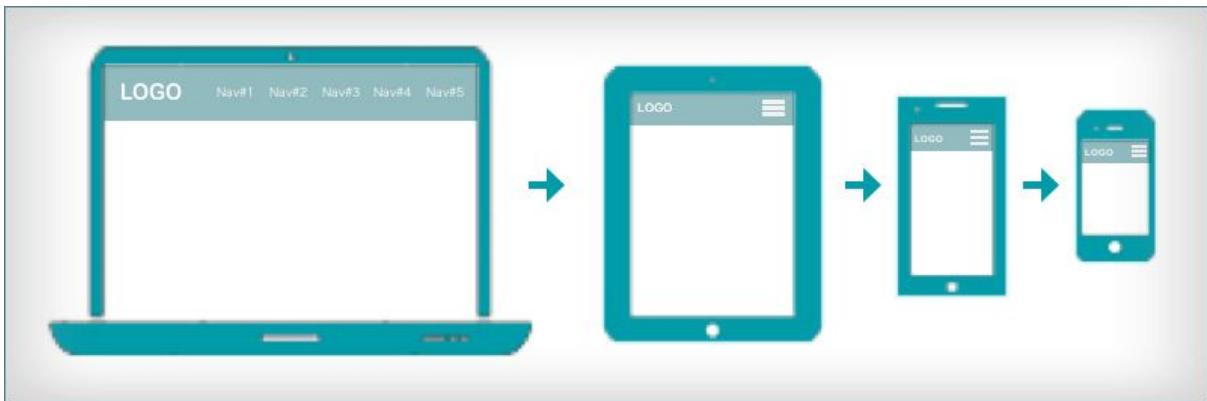
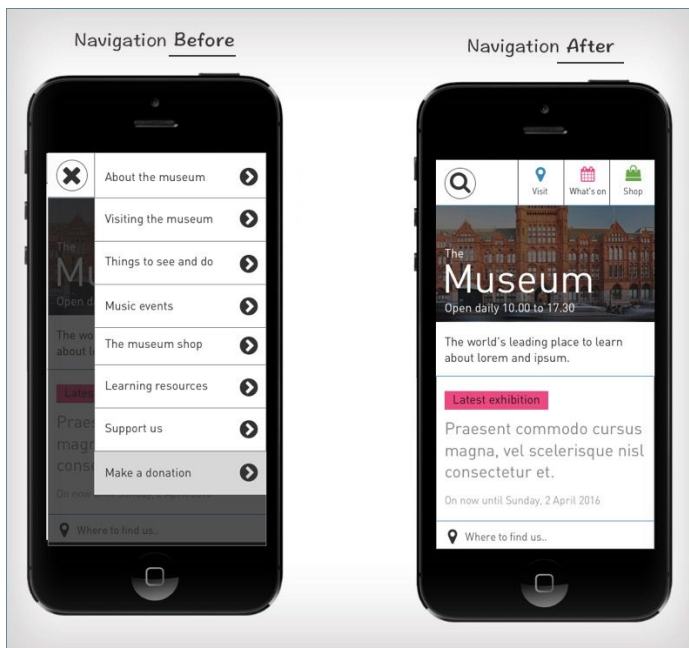


Figure 12b: Prioritising the most important tasks in the mobile menu³⁹



Another rule of thumb, from Nielsen's heuristics⁴⁰ for web design, is to minimise the user's memory load by making all important navigation options permanently visible. The most important navigation options should be available at all times, not just when a designer anticipates that the user will need them⁴¹.

Breadcrumbs

³⁸ <https://justuxdesign.com/blog/my-beef-with-the-hamburger-menu>

³⁹ <https://justuxdesign.com/blog/streamlining-a-website-s-navigation-a-practical-example>

⁴⁰ <https://www.nngroup.com/articles/ten-usability-heuristics/>

⁴¹ <https://www.nngroup.com/articles/ten-usability-heuristics/>



Finally, users of a platform should know where they are in its IA at all times. This can most simply be achieved by using ‘breadcrumbs’, as shown in Figure 13. Using a ‘more than’ sign (>) or right-pointing arrow (→) is better than a slash, as they infer forward motion and are less easily confused with text elements that might include a slash (such as UI/UX).



Figure 13: Location-based breadcrumb navigation to show website hierarchy⁴²

4.2.2 Site search design

The IA will play a key role in giving users of the Platform a clear indication of the types of content contained there, but browsing through the hierarchy can be tiresome or even a barrier to use when a specific resource is required. Given the richness of information to be contained or showcased on the Platform, a good search function will be critical for users.

Search box display

The best-practice guidance for content-heavy websites is to:

- put the search box where users expect to find it (either the top right-hand corner of the website or centered prominently)
- display the search box prominently
- provide enough space in the text entry field for extensive search terms (the Nielsen Norman Group recommends a 27-character input field⁴³)
- make the search function universally accessible on every page of the site⁴⁴.

Given the complexity of the range of resources on the Platform, additional cues such as text affordances (subtle cues that help users to interact with an interface) within the search box and popular content tags can guide the user towards more successful search results, as illustrated in the example in Figure 14.

⁴² <https://www.smashingmagazine.com/2009/03/breadcrumbs-in-web-design-examples-and-best-practices/>

⁴³ <https://www.nngroup.com/articles/top-ten-guidelines-for-homepage-usability/>

⁴⁴ <https://www.smashingmagazine.com/2017/11/comprehensive-guide-web-design/>

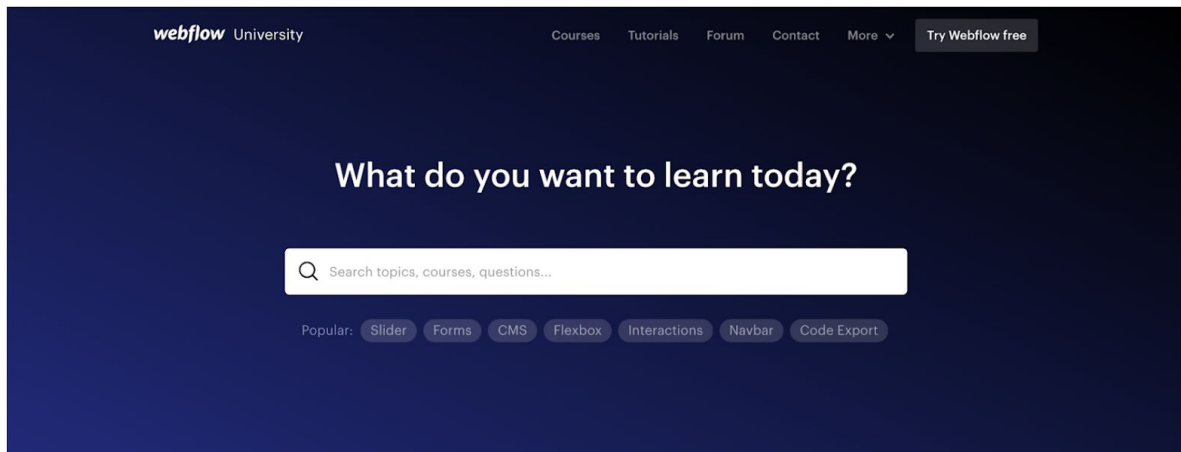


Figure 14: Central search box placement with content cues and most popular tags⁴⁵

Empty state page

Enabling users to type text into a search box and submit their search query should take them straight to what they are looking for when related content is available, and to a prompt to inform the Platform community manager of the gap in resources when it is not. A well-designed 'empty state' page (where you land if there are no search results) should propose alternative actions that keep users moving forward, instead of getting stuck. Offering users a range of suggestions for search queries that do return results, or the most common search queries, are both powerful ways to help users further⁴⁶.

Content tagging

Similarly, on search result pages showing content found, the content tags should be displayed in order to aid finding more similar content, and the link to the content should display the slug (the full content url that reveals IA hierarchy in a similar fashion to breadcrumbs) to help users better understand the overall site structure.

Content tagging is a great way to navigate websites - tags are one or two words that describe a resource in terms of its content, such as the subject matter, domain of application, stage of the CS project lifecycle, and so on. These tags not only make it easy to find more related content, they also improve search engine optimisation (SEO). While website menu categories function like a table of contents for the platform, the tags function like an index or taxonomy that describes the content in much more detail, and provide an additional layer of IA for the content⁴⁷. Given the content complexity of the Platform, it will be wise to have a tag management

⁴⁵ <https://webflow.com/blog/best-practices-for-site-search-design>

⁴⁶ <https://www.nngroup.com/articles/search-no-results-serp/>

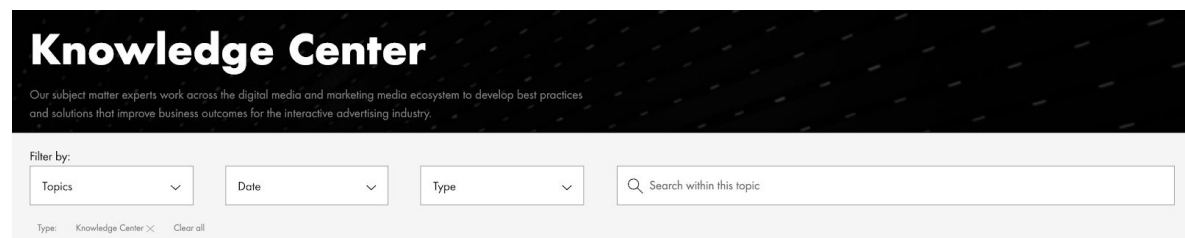
⁴⁷ <https://www.paceco.com/insights/design-development/digital-editors-guide-to-content-tagging/>

system (TMS) in place, using clear and concise naming conventions, alongside a data layer throughout the whole site.

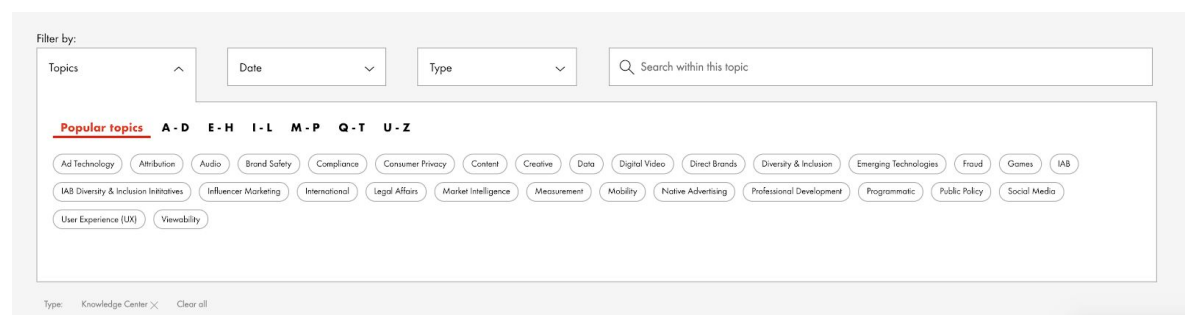
Category filters

An even more powerful mechanism to aid the search experience for the user on a content-rich website is to provide filter categories, for example by resource type (document, video, training, project, etc) or by domain (such as air quality, biodiversity, humanities, etc). These allow users to get straight to the type of content they are looking for more quickly, and once again have the added benefit of helping users to appreciate the range of content available. Filters work by selecting options from within one or more drop-down menus, and then entering the search query in the search field, as shown in Figure 15 below.

Filtered search interface:



Topics filter drop-down menu:



Type filter drop-down menu:

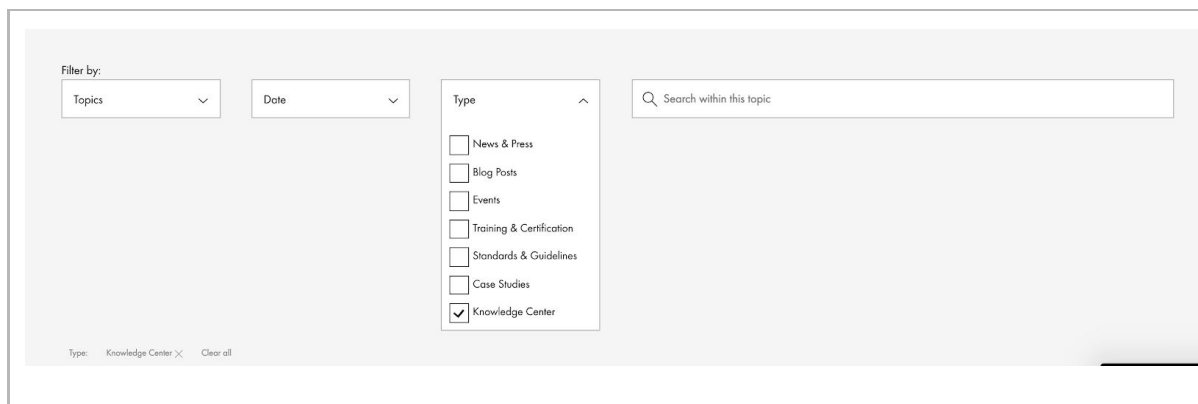


Figure 15: Example of filtered search for content-rich websites⁴⁸

Grouping the Platform content into categories that can be used as filter categories has the additional advantage of helping to prevent information overload, by providing more clarity on the IA hierarchy and tagging system throughout, and getting users to the content they seek faster and more effectively. To achieve this, it is important that no more than four filter categories are used, and that overlaps between drop-down options are minimised (for example, a type of CS resource is either a document or a project, but cannot be both).

4.3 Best practice in metadata and ontologies

Metadata is “data that provides information about other data”⁴⁹, and crucial to aiding the discovery and identification of content on the Platform. Descriptive metadata is information about a resource, such as its title, author, and keywords to describe the content. These keywords serve the same purpose as the content tags described in Section 2.1.2 above, and should thus align directly with the IA and data layer for the Platform. In the sections below, we describe two Metadata standards that have direct relevance to the Platform.

Similarly, an ontology provides the “formal naming and definition of the categories, properties and relations between the concepts, data and entities” that are the subject of the metadata, i.e. the CS resources and platforms to be shared on the Platform. The goal of having ontologies is to reduce complexity and organize information into a system of categories according to terminology that have been agreed upon within that field, so that data and knowledge are more easily shared.

⁴⁸ <https://www.iab.com/insights/>

⁴⁹ <https://en.wikipedia.org/wiki/Metadata>



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In this way, the ontologies applied by the Project will inform the content of the metadata, the keywords & tags, and the information hierarchy of the Platform. The main ontology components relevant to the Platform are class ontologies (the types of resources) and attribute ontologies (the aspects, properties, features, and characteristics of the CS resources shared and the CS projects profiled).

An excellent source of vocabulary for such ontologies can be found on Schema.org (<http://schema.org/>), which is a collaborative community that creates, maintains, and promotes schemas for structured data on the Internet. Schema.org vocabularies are developed by an open community process, using the public-schemaorg@w3.org mailing list and through GitHub.

4.3.1 Metadata for describing CS resources

As there is no metadata standard for describing CS resources, we will use the ontology proposed by Schema.org on Digital Document (and a small variation for courses). As one can read on main [Schema.org homepage](#), Schema.org is a collaborative, community activity with a mission to create, maintain, and promote schemas for structured data on the Internet, on web pages, email messages, and beyond.

Schema.org vocabulary can be used with many different encodings, including RDFa, Microdata and JSON-LD. These vocabularies cover entities, relationships between entities and actions, and can easily be extended through a well-documented extension model. Over 10 million sites use Schema.org to markup their web pages and email messages. Many applications from Google, Microsoft, Pinterest, Yandex and others already use these vocabularies to power rich, extensible experiences.

Founded by Google, Microsoft, Yahoo and Yandex, Schema.org vocabularies are developed by an open [community](#) process, using the public-schemaorg@w3.org mailing list and through [GitHub](#).

Using this schema within the IA of the Platform will enhance the interoperability of the Platform with other such platforms and resources, and any future potential linked data cloud or Semantic Web implementations. These standards are maintained by Schema.org initiative-

Within these, the Resource Description Framework (RDF) is a specification developed and maintained under the auspices of the W3C, and is maintained at <http://www.w3.org/TR/rdf-schema/>. The RDF schema provides mechanisms for describing groups of related resources and the relationships between these resources.

A complete description of the vocabulary used for resources is provided in [Section 7](#).



4.3.2 JSON for Linked Data and mapping to RDF

JavaScript Object Notation (JSON) is an open standard format that allows data to be easily transferred across the web⁵⁰ by providing representation of those data objects when transmitting them across the Internet. Because JSON is native to JavaScript, it is a popular and widespread standard. The most common use for JSON is pulling data from web servers on demand.

JavaScript Object Notation for Linked Data (JSON-LD) is a method of encoding Linked Data using JSON. Linked Data is structured data which is interlinked with other data so it becomes more useful through semantic queries, extending information in a way that can automatically be read by computers⁵¹.

JSON-LD is designed around the concept of a "context" to provide additional mappings from JSON to an RDF model, as described in the section above within Dublin Core. A JSON-LD document is therefore both an RDF document and a JSON document, allowing resources to be part of a network of standards-based, machine-readable data across Web sites, and enabling the following of embedded links to other pieces of Linked Data that are hosted on different sites across the Web.⁵²

4.3.3 PPSR_Core metadata for describing CS projects

Three working groups (WGs) of CS practitioners have been working closely on the development of a core conceptual model and metadata standard for describing CS projects - namely the U.S. Citizen Science Association (CSA) 'Data and Metadata' WG, ECSA's 'Projects, Data, Tools, and Technology' WG, and the EU COST Action "Citizen Science to promote creativity, scientific literacy, and innovation throughout Europe" (<https://www.cs-eu.net/>) WG to 'Improve data standardization and interoperability'.

In 2013 the Wilson Center⁵³ coordinated an agreement between a range of organizations supporting CS in the United States to share basic information across databases that catalog projects. This led to the development of the PPSR_CORE Program Data Model Metadata Standard / data sharing protocol, where PPSR stands for 'public participation in scientific research'.

These metadata were developed further at the 'Citizen Science & Crowdsourcing Metadata' Workshop hosted by the Wilson Center's Commons Lab in 2015, in coordination with the U.S. Environmental Protection Agency and the Federal Community of Practice on Crowdsourcing

⁵⁰ <https://en.wikipedia.org/wiki/JSON>

⁵¹ https://en.wikipedia.org/wiki/Linked_data

⁵² <https://json-ld.org/>

⁵³ <https://www.wilsoncenter.org/article/ppsr-core-metadata-standards>

and Citizen Science. The results of this workshop expanded the number of fields on which there was consensus from 7 to 30, and identified areas for further collaboration.⁵⁴

In November 2015, members of CSA, ECSA, and the Australian Citizen Science Association (ACSA) jointly proposed a CSA Data and Metadata WG with these goals in mind, and the first task force meeting was held at the 2017 CSA Citizen Science Conference to define ongoing work on the PPSR Core common data model, shown in Figure 16 below.

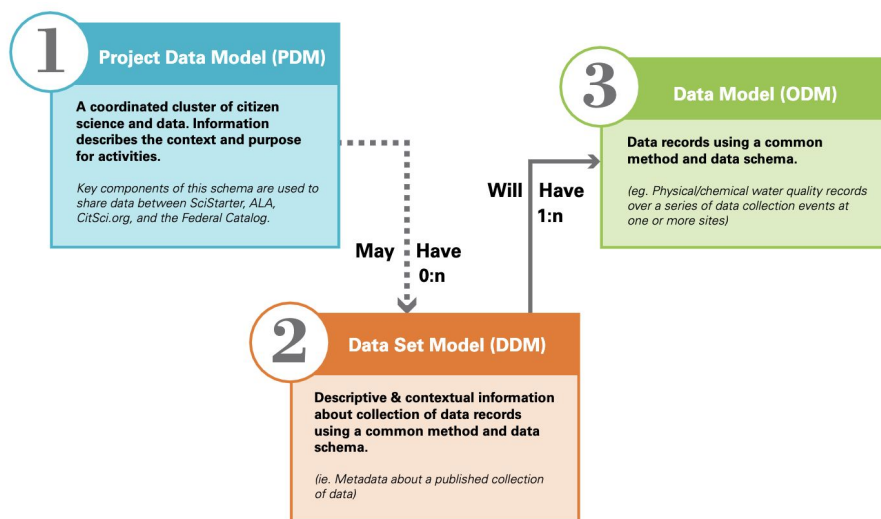


Figure 16: The PPSR Core common data model, with three main schemas⁵⁵

An international workshop hosted by the European Commission Joint Research Centre (JRC) in January 2016⁵⁶ developed this work further, by discussing the relationships between existing databases, identifying major requirements for interoperability between CS project databases, and drafting a reference model for analyzing and sharing CS tools and data⁵⁷. At this workshop, the Atlas of Living Australia presented an overview of how the metadata align across a range of key standards for CS, including PPSR_Core, as shown in Figure 17.

⁵⁴ https://www.wilsoncenter.org/sites/default/files/2015_CL_EPA_metadataWS_summaryFINAL.pdf

⁵⁵ https://www.wilsoncenter.org/sites/default/files/wilson_171204_meta_data_f2.pdf

⁵⁶ <https://ec.europa.eu/jrc/en/event/workshop/citizen-science-workshop?search>

⁵⁷ https://ec.europa.eu/jrc/sites/jrcsh/files/Citizen_science_27022016_next_steps.pdf

Description	ALA - BioCollect	PPSR-CORE (CitSci.org)	SciStarter	SHaRED (RIF-CS)	DublinCore	POD v1.1	CKAN API	DCAT	Schema.org
GUID for the project. System generated.	projectId	ProjectGUID	id	SHD.projectIdentifier	Identifier	identifier	id	dct:identifier	n/a
Short text name or title of the project.	name	ProjectName	title	SHD.projectName	title	title	title	dct:title	name
Key words (comma separated) which are indexed and aid in searching for and finding projects.	keywords	ProjectKeywords	search_terms	SHD.keyWords	subject	subject			
List of tags to assist with searching and filtering.	keywords	ProjectTags (or ProjectKeywords)	tags	SHD.keyWords	subject	keyword	tags	dcat:keyword	keywords
Free text description of the aim or objectives of the project. Short description of what the project should accomplish.	aim		goal	SHD.datasetObjective					
Short description of what needs to be done by the participant	task		task						
The date and time that the project was created in the database	dateCreated		date		created	issued	n/a	dct:issued	datePublished
The date and time that project metadata was last updated	lastUpdated	ProjectDateLastUpdated	updated	SHD.latestUpdate	modified	modified	n/a	dct:modified	dateModified
The activity status of the project. This automatically updates based on serverDate relative to project start/end dates.	status	ProjectStatus	expired	SHD.projectStatus					
First and last name of primary project coordinator		ProjectCoordinator	project_owner_name	SHD.authorGivenName + SHD.authorSurname	contributor	contactPoint ? fn	maintainer	dcat:contactPoint ? vcard:fn	provider ? Person:name
Email address of the primary contact for the project.	managerEmail	ProjectContactEmail	project_owner_email	SHD.datasetContactEmail		contactPoint ? hasEmail	maintainer_email	dcat:contactPoint ? vcard:hasEmail	provider ? Person:email
Short text name or title of the organisation responsible for, supporting or sponsoring the project.	organisationName	ProjectOrganization	presenter	SHD.datasetContactOrganisation	creator	publisher ? name	organization ? title	dct:publisher ? foaf:name	publisher ? Organization:name
Short text name or title of the Institution supporting the project.	organisationName	ProjectInstitutionName							
Name of data provider / source / initial first registry	organisationName	ProjectDataProvider							
List of project partners	organisationName	ProjectPartners							
List of scientific collaborators; i.e. scientists or academic departments using the data collected		ProjectScientificPartners							
Web location where project data are/will be published			data_publication_url			accessURL	resources ? url	dcat:accessURL	contentUrl
Free text description of the project.	description	ProjectDescription	description	SHD.projectAbstract	abstract	description	notes	dct:description	description
Free text description of how people can get involved in the project. Textual instructions for joining the project.	getInvolved		how_to_join						
HTTP URL to an external web site for the project.	urlWeb	ProjectURL	url		InteractiveResource				
Web address of the project's blog			blog_url			landingPage	n/a	dcat:landingPage	url
Image to represent the project	urlImage		image	SHD.imageFile					
Credit for the image	logoCredit		image_credit						

Figure 17: Metadata alignment⁵⁸

The latest changes and extensions to the PPSR Core model (Version 1) were presented as the outcome of the COST Action WG5 workshop held in Geneva in June 2018⁵⁹, in ‘the Geneva Declaration on Citizen Science Data and Metadata Standards’⁶⁰. In this declaration, the PPSR-Common Conceptual Model has been renamed into three main schemas: Project Metadata Model (PMM), Dataset Metadata Model (DMM) and Observation Data Model (ODM).

4.4 Best practice in software development

4.4.1 The Agile development method

The essence of the Agile Method for software development, which includes websites and web platforms, is that teams are able to respond flexibly to new inputs or insights that can optimise value, by structuring work in incremental, iterative sequences (known as sprints), and measuring and evaluating progress throughout. This makes it possible to continuously align the platform

⁵⁸ https://ec.europa.eu/jrc/sites/jrcsh/files/03_Ceccaroni%20.pdf

⁵⁹ <https://cs-eu.net/sites/default/files/media/2018/06/COST-WG5-GenevaDeclaration-Report-2018.pdf>

⁶⁰ <https://docs.google.com/document/d/1peRcL-UDoZzDSIDloTFR23p83sBioAZoTeNaNHjfv-o/edit>

being developed with the needs of the users. The mechanisms for this are shown in Figure 18 below.

The Manifesto for Agile Software Development⁶¹ states that developers should value:

- **Individuals and Interactions** over processes and tools
- **Working Software** over comprehensive documentation
- **Customer Collaboration** over contract negotiation
- **Responding to Change** over following a plan

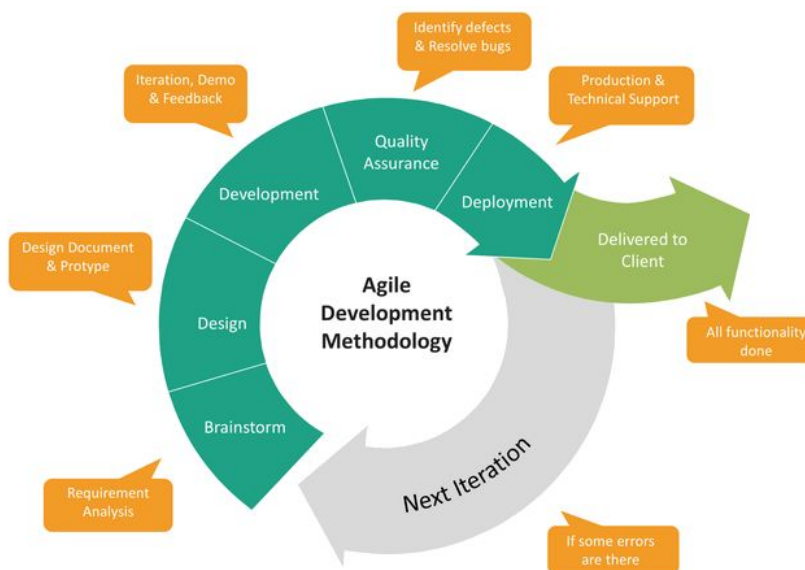


Figure 18: The Agile Methodology

4.4.2 The Scrum development method

The Scrum process framework defines a set of good practices for working collaboratively as a team within the methodology, to obtain the best possible result of a project, with a focus on delivering value to the user. Sprints are at the heart of the Scrum process. Scrum is particularly suitable for projects in complex environments that need quick results, the requirements are changing or poorly defined, or in which innovation, competitiveness, flexibility and productivity are essential. The key aspects of the Scrum process are shown in Figure 19.

⁶¹ <http://agilemanifesto.org/>

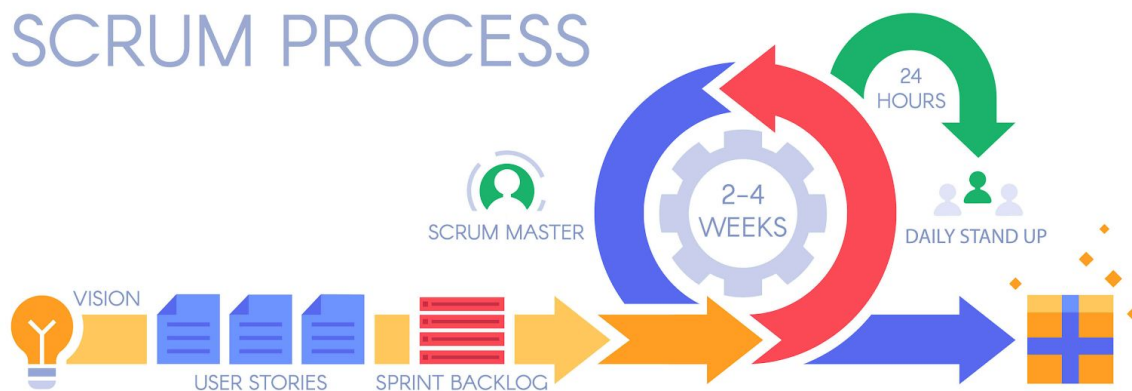


Figure 19: The Scrum Process

The Scrum Process uses the following concepts:

- **Product Owner:** Role in Scrum, accountable for maximizing the value of a product, primarily by incrementally managing and expressing business and functional expectations for a product to the Development Team(s).
- **Team:** A self-organizing team consisting of a Product Owner, Development Team and Scrum Master.
- **Scrum Master:** The role within a Scrum Team accountable for guiding, coaching, teaching and assisting a Scrum Team and its environments in a proper understanding and use of Scrum.
- **Product Backlog:** An ordered list of the work to be done in order to create, maintain and sustain a product. Managed by the Product Owner.
- **Sprint Planning Meeting:** Time-boxed event of 8 hours, or less, to start a Sprint. It serves for the Scrum Team to inspect the work from the Product Backlog that's most valuable to be done next and design that work into Sprint backlog.
- **Sprint Backlog:** An overview of the development work to realize a Sprint's goal, typically a forecast of functionality and the work needed to deliver that functionality. Managed by the Development Team.
- **Sprint:** Time-boxed event of one month or less, that serves as a container for the other Scrum events and activities. Sprints are done consecutively, without intermediate gaps.
- **Daily Scrum:** Daily time-boxed event of 15 minutes for the Development Team to re-plan the next day of development work during a Sprint. Updates are reflected in the Sprint Backlog.
- **Sprint Review and Sprint Retrospective:** Sprint Review serves for the Scrum Team and the stakeholders to inspect the Increment of product resulting from the Sprint, assess the impact of the work performed on overall progress and update the Product backlog in



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order to maximize the value of the next period. And Sprint Retrospective serves for the Scrum Team to inspect the past Sprint and plan for improvements to be enacted during the next Sprint.

5 Identification of open source modules

The third assessment phase, which took place in Task 2.2 ‘*Co-design of platform requirements*’, was to research the availability of existing open source modules or platforms, identify opportunities to integrate with other networks and platforms through APIs, and to cross-publicise the Platform in order to drive traffic and encourage engagement. We have surveyed existing knowledge-sharing platforms and online community environments to identify the current state of the art, and have also evaluated existing web solutions for potential fit.

This task will be revisited at least every six months by launching consultations with new stakeholders and new CS initiatives. This will allow for iteration cycles and continuous improvement of the Platform.

5.1 Open Source Tools and Platforms

5.1.1 Moodle

Moodle is a free and open-source Learning Management System (LMS) written in PHP and distributed under the GNU General Public License. Moodle is compatible with the following e-learning standards:

- Sharable Content Object Reference Model (SCORM)
- The AICC HACP standard
- IMP Common Cartridge packages
- Learning Tools Interoperability (LTI)

As explained later, we will use Moodle as a LMS for Courses provided by WP5.

5.1.2 Wordpress

Wordpress is a free and open-source Content Management System (CMS) written in PHP and distributed under GPL License. The Spanish National Platform on CS (created by Ibercivis) is built on top of WordPress. Wordpress was one of the initial tools pre-selected in order to build the EU-CITIZEN.SCIENCE platform. However, this option was discarded due to the little flexibility offered when designing a new website from scratch. Security - as it is widely used, new vulnerabilities are discovered every year - and backwards compatibility - nothing guaranteed that new versions of WordPress would be compatible with our code - were also two compelling reasons to discard this choice.

Knowing the great popularity that the platform has among citizen science projects (many projects use this technology to create their own web, due to the ease of use), we have created two



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Plugins for WordPress allowing compatibility and interoperability with our platform regarding projects and resources.

5.1.3 Drupal

Drupal is also a free and open-source CMS written in PHP and distributed under the GNU General Public License. As one can see in the next table, some national CS platforms are built on top of Drupal. As well as WordPress, Drupal was one of the initial tools pre-selected in order to build the EU-CITIZEN.SCIENCE platform. However, this option was discarded due to the little flexibility offered when designing a new website from scratch. Security - as it is widely used, new vulnerabilities are discovered every year - and backwards compatibility - nothing guaranteed that new versions of WordPress would be compatible with our code - were also two compelling reasons to discard this choice.

5.1.4 Django

Django is a free and open-source web framework, which follows the model-template-view (MTV) architectural pattern. It is licensed under the 3-clause BSD License. This framework emphasizes reusability and *pluggability* of components, less code, low coupling, rapid development, and the principle of *don't repeat yourself*. Django makes working from scratch compatible with reusing code or third-party work. It is just in the middle of a CMS-based solution with working completely from scratch. For this reason (among others) Django was the selected option for platform development.

5.2 OpenAire and Zenodo

Zenodo is an open-access repository created in 2013 to let researchers in any subject area to comply with any open science deposit requirement absent an institutional repository. Zenodo was developed under the European OpenAIRE program. Zenodo uploads get Digital Object Identifiers (DOI) to make them easily and uniquely citable.

The Open Access Infrastructure for Research in Europe (OpenAire) is a project funded by the European Commission's Seventh Framework Programme, which ended in December 2012 and supports open access policy implementation in Europe. Over its three-year duration, OpenAire had the following three objectives:

- To build research support structures for the repository of FP7 research publication through the collaboration of 27 National Open Access Liaison Offices.
- To establish an electronic infrastructure (web portal) for access to scientific information



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- Promote the deposit in Open Access of all scientific production generated in the framework of project funded by the European Commission.

Zenodo provides a REST API which currently support:

- Deposit: Upload and publishing of research outputs
- Records: search published records
- Files: download/upload files
- Communities: search communities
- Funders: search for funders
- Grants: search for grants
- Licenses: search for licenses

The EU-CITIZEN.SCIENCE platform will establish needed protocols in order to be compatible with Zenodo repository. If needed, the EU-CITIZEN.SCIENCE platform will use Zenodo as default repository to upload documents.

5.3 Other CS platforms

There are similar platforms within the scope of citizen science; these are collected in Table 3. For each, we briefly explain what it is for, the technology used and if there is an API to allow its use in other software platforms, and the ontology used. Not all the websites and/or platforms listed in this table can be considered open-source, but we are including them here to maximize the overview of existing platform on CS.

Table 3: Citizen Science Platforms

Platform and country	Short description and main technology	API	Ontology
Scistarter United States, global	Platform for sharing CS projects and recruiting participants, that also trains, and equips people for citizen science research projects in need of their help. SciStarter is a collection of smart web tools and an event-based organization that connects people to more than 1,200 registered and vetted citizen science projects, events, and tools ⁶² . Built using Django ⁶³	YES	PPSR
CitizenScience.org United States, global	Home of the Citizen Science Association Built using WordPress	NO	NO
The Wilson Center -	Website run by the Commons Lab to provide	NO	NO

⁶² <https://en.wikipedia.org/wiki/SciStarter>

⁶³ See pag. 59 and <https://docs.djangoproject.com/>



Commons Lab United States, global	independent and rigorous analysis of emerging technologies, networks, and methods that mobilize public participation in science, technology, and policy ⁶⁴ . Built using PHP		
CitSci.org United States, global	Platform to support CS research by providing tools and resources that allow practitioners to customize their scientific procedure ⁶⁵ . Built using HTML and Javascript	YES	PPSR
Citizenscience.gov United States	Official U.S. government website designed to accelerate the use of crowdsourcing and citizen science across the U.S. government. Built using HTML and Javascript	NO	NO
Ciencia-Ciudadana.es Spain	Spanish Observatory on Citizen Science Built using Wordpress	NO	NO
Citizen-Science.at Austria	Platform sharing and profiling CS projects in Austria. Built using PHP	NO	NO
Zentrumfuercitizenscience Austria	Website of the Austrian Center for Citizen Science. Built using PHP	NO	NO
Buergerschaffenwissen Germany	Platform sharing and profiling CS projects in Germany, and supporting the network of german-speaking practitioners. Built using Drupal	NO	NO
Schweiz-forscht Switzerland	Platform sharing and profiling CS projects in Switzerland. Built using PHP	NO	NO
http://www.naturefrance.fr/sciences-participatives France	Website sharing information about participatory science systems in France. Built Using Drupal	NO	NO
Iedereen Wetenschapper Belgium	Platform to profile and share CS projects and practitioners in Belgium and the Netherlands. Built using Drupal	NO	NO
Natural History Museum	Webpage showcasing CS projects related to the	NO	NO

⁶⁴ <https://www.wilsoncenter.org/publication-series/commons-lab>

⁶⁵ <https://www.citsci.org/CWIS438/Websites/CitSci/About.php?WebSiteID=7>



London ‘Take Part’ United Kingdom, global	Museum, including wildlife observations, sample collecting, and transcribing handwritten collection labels. Built using HTML and Javascript		
UK Centre for Ecology & Hydrology United Kingdom	Webpage with a collection of CS resources such as apps, best practices and projects. Built using Drupal	NO	NO
JRC Citizen Science Platform Europe, global	Customizable tool to facilitate data collection, particularly supporting citizens’ contributions. Built using Drupal	NO	NO
Zooniverse United Kingdom / United States, global	Portal that allows users to participate in scientific research with real data, via marking, tagging, transcribing, and data analysis tasks Built using HTML and Javascript	NO	NO
PyBossa global	It enables users to create and run projects that utilise online assistance in performing tasks that require human cognition such as image classification, transcription, geocoding and more. Built using Python	YES	NO
GBIF Global	International network and research infrastructure sharing open access species and observation data about all types of life on Earth. Built using Express	YES	NO
Inaturalist United States, global	Web platform for sharing nature observation data for biodiversity science, that is collected via mobile app. Built using RubyOnRails	NO	NO
European Net of Living labs (ENOLL) Europe, global	Website of the European federation of Living Labs, which shares and profiles Living Lab projects worldwide. Built using PHP and Javascript	NO	NO
UN Environment Global	Webpage featuring and sharing a range of CS projects that address the Environment. Built using HTML and Javascript	NO	NO
Spotteron Global	SPOTTERON is a fully customizable and affordable solution for Citizen Science, environment protection and volunteer monitoring projects.	YES	NO



As one can see, there are very few platforms compatible with the PPSR ontology and only five of them provide API. Although according to the interviews with experts interoperability is a must, we are aware of the great effort this entails and not only in the technical part. Interoperability means that at least two platforms are understood according to a common language. A great work must be done to promote the adoption of these standards by the CS community.

6 Platform functionalities and features

6.1 Methodology

We have followed a five-step methodology which covers all phases of development from requirement gathering up to a release of the platform. This methodology will be repeated three times during the project lifetime, releasing three versions of the platform on v1 on M15, v2 on M20 and v3 on M36, an intermediate release of the platform v2.5 will be provided on M28.

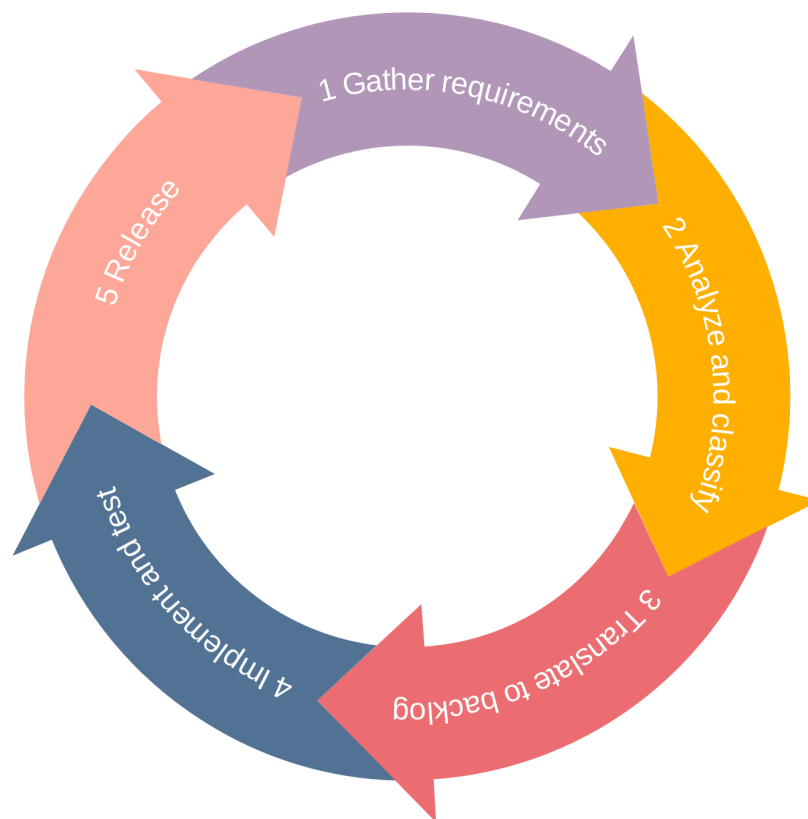


Figure 20. Overall Methodology

The first step, gather requirements, has been explained in [Section 2](#). Outcomes of interviews and workshops are provided in [Appendix 1, 2, 3](#) and [4](#). [Section 3](#) explains how requirements gathered are classified based on their nature (e.g. functionalities, usability factors, etc.). This section explains how we translate classified requirements into backlog items. These items will be implemented and tested as explained in [Sections 8](#). In [Section 7](#) we explain how we will arrange the different items to be implemented in a coherent structure. [Section 9](#) deals with license and ethical aspects.

Having gathered input and feedback regarding features and functionalities, we are now moving into planning development of the website. In doing so we will be using the Agile development methodology following scrum guidelines for the development process, both of which have been described in [Section 4.4](#) above.

6.2 Selecting the core functionality set

Moving from the requirements gathering phase into the Platform design phase is the crucial point at which ambitious visions for the Platform’s potential must be translated into a tangible set of functionalities and requirements to be prioritised for development.

The inherent risk in trying to meet the needs of all of the key users and stakeholders of the Platform, is that in trying to be all things to all people, the Platform will become unwieldy and unusable. Any software or website development project is vulnerable to scope creep, where ‘just one more thing’ requests start bloating the development process beyond the original core idea.

The concept of ‘Minimum Viable Product⁶⁶’ (MVP) is useful in countering this risk. The MVP is the most basic version of the Platform, with just enough features to satisfy the needs of early users, test the usability of the Platform, and gather feedback for future product development. By focusing on the MVP version of the Platform, we can protect ourselves against scope creep by ensuring that the most important elements of the Platform are built in the first release, and additions and improvements are planned for in future releases.

The phenomena of scope creep, and the very differing experiences of stakeholders looking at the Platform on the surface from that of Platform users trying to find useful resources or connect with each other are illustrated in the cartoons shown in Figure 21.

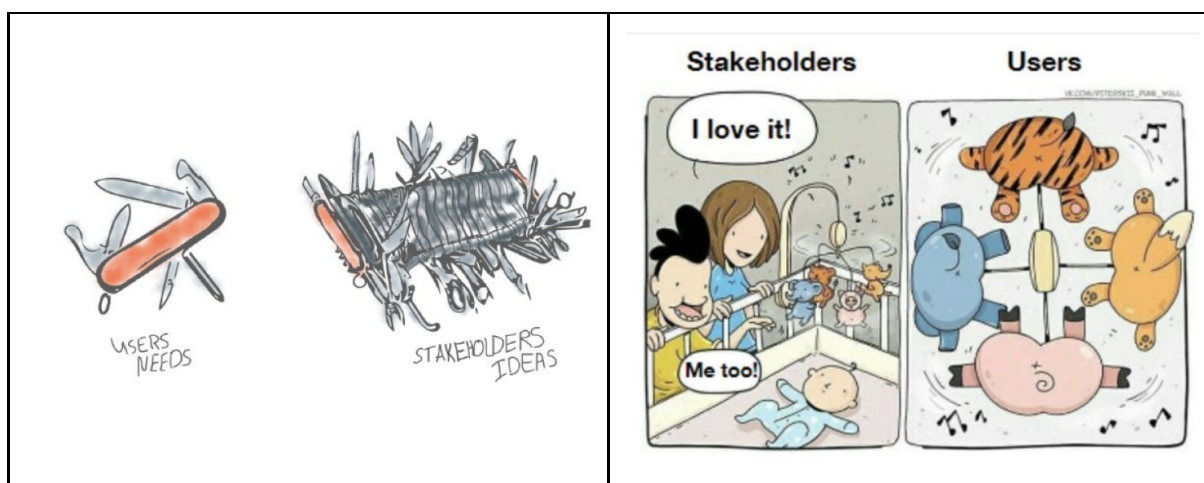


Figure 21: The difference between stakeholder & user needs, and stakeholder & user experience.

⁶⁶ <http://www.startuplessonslearned.com/2009/08/minimum-viable-product-guide.html>



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With this in mind, and having organised the needs and requirements into relevant categories (table 2 in [Section 3](#)) we are describing here each of the modules that will be part of the platform. It must be taken into account that, since there will be new phases of requirements collection, new functionalities may be included in the already existing modules or new modules may be created.

In the Backlog section below, we list the tasks required to meet our larger strategic aims for the Platform (first release) according to their priority for our Platform users. The structure of the Backlog consists of 'Epics', which are a larger chunk of work with one common objective such as a feature or function. More detail for each of these Epics is captured in the User Stories, which describe what the users want, and why - from their perspective.

An epic usually takes more than one sprint to complete, and so also time-box the list of tasks such that prints can be done consecutively, without intermediate gaps. The product backlogs in subsequent sprints will come to contain change requests and bug fixes as well, as we develop the Platform iteratively over the course of the Project.

6.3 Platform overview

As repeatedly said, we do not want the platform to be a list of resources or projects, at least not only. We want the Platform to be a community of CS actors (considering actors in a broad way). Having this in mind, as desired by feedback from workshops and interviews, the design of the platform will be focused on user interaction. Although any user will be able to access all the resources on the Platform, signup will be necessary in order to add new resources and/or project, or to participate in the forum (information about GDPR compliance is provided in [Section 9](#) "[License and ethical aspects](#)").

Here are presented the *modules* to be implemented in each release of the platform (that have been briefly introduced in [Section 3](#)). Each module provides one service with a common set of functionalities. As one can see, dark orange modules in the picture provide human oriented services, light orange modules provide machine oriented services. It can be seen that some of the *modules* correspond to desired services from interviews, some others are being designed to fulfill other requirements identified by WP2 and the rest of the consortium.

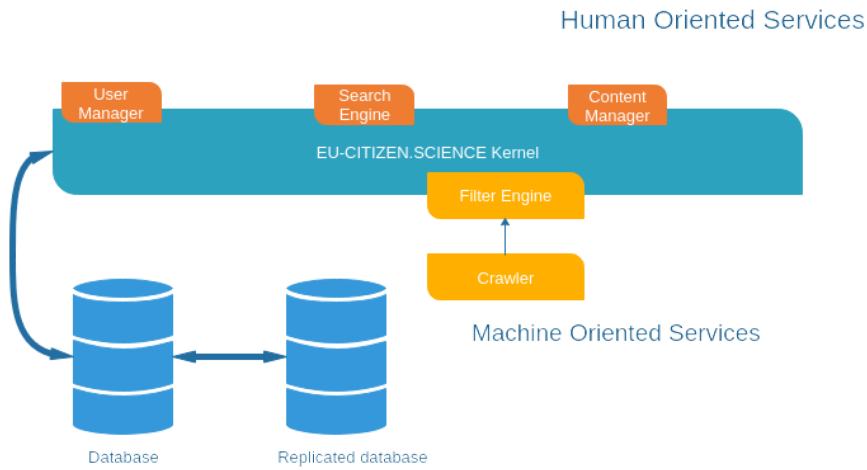


Figure 22: Modules to be up and running in the first release of the Platform (M15)

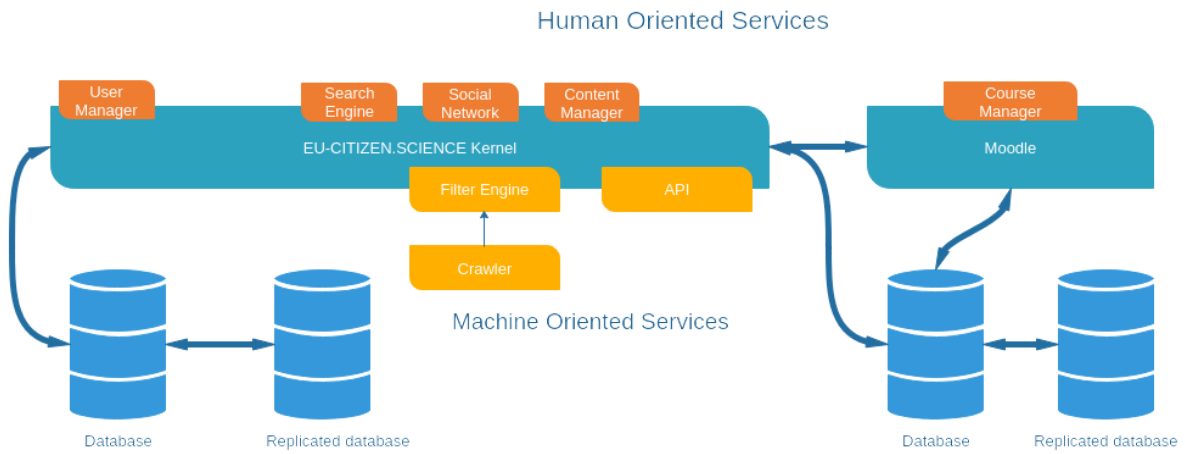


Figure 23: Modules to be up and running in the second release of the Platform (M20)

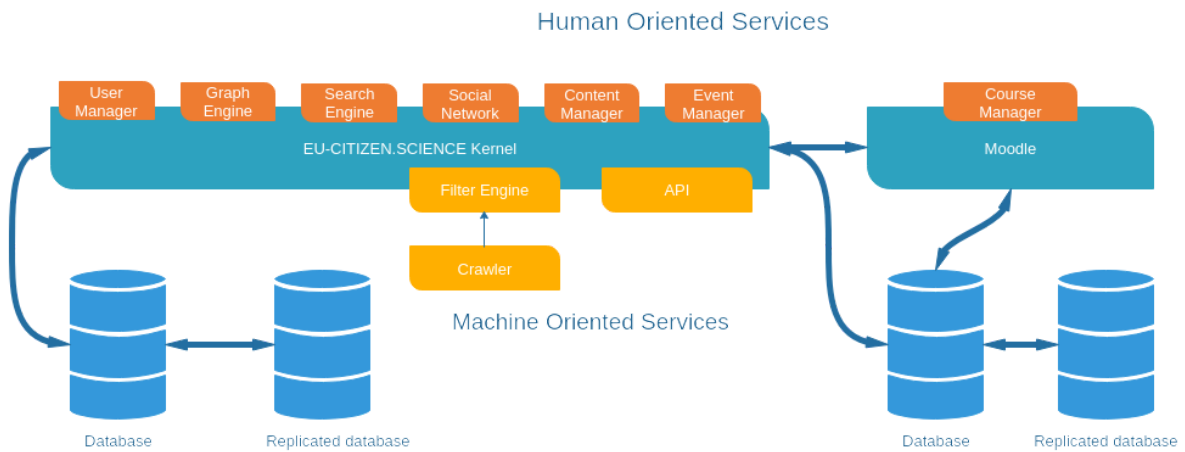


Figure 24: Modules to be up and running in the 2.5 (M28) and third release of the Platform (M36)

6.3.1 Description of the first release of the Platform

We provide below a detailed description of modules to be implemented in the first release of the platform:

- **User Manager:** User registration will be needed in order to access some of the features of the platform. Therefore, the user manager module must be developed. This module will also provide the following services:
 - User sign-in/sign-out
 - User login/logout
 - Password recovery
 - User management by *admin user*
 - Role change
- **Search Engine:** As one can see in the interviews, the search engine is one of the most wanted tools to be provided by the Platform. We will create an easily usable tool that allows to search through any of the fields (metadata) associated with each type of item (project, resource or course). We will provide API commands to use the Search Engine in the third release of the platform. The quality of the search engine will be improved in future releases based on feedback provided by platform users. This module will provide the following services:
 - Basic search for projects and resources
 - Search based on metadata
 - *Autocomplete* search
- **Content Manager:** A content manager will be developed in order to *upload* resources and projects to the Platform. The content manager will also be in charge of showing results provided by the Search Engine. Whenever possible we will not physically upload the resources to the platform, but we will link to the existing location where they are already available, by including the necessary information needed to access them (URL, title, authors, etc.). We will provide API command to use the Content Manager in the third release of the platform. This module will provide the following services:
 - Manage (upload, add metadata, etc.) projects and resources
 - Show projects and resources
- **Crawler and Filter Engine:** Both modules will be in charge of gathering and filtering information from interoperable platforms which provide compatible information using JSON-LD language.

The kernel of the Platform will support all the services and connect these modules with the replicated database. Building the platform in this way will allow us to provide modularity to the development (In fact, it is expected the modules to communicate with the kernel through API).



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Although these modules will be fully functional after the first release of the Platform, improvements on them will be made based on feedback and consortium experience.

6.3.2 Description of the second release of the Platform

The second release of the Platform is mainly oriented to providing all the necessary infrastructure to support Courses developed within WP5, therefore the Moodle infrastructure will be connected with Platform Kernel. Both (Platform and Moodle) will share user table. We will deliver a very first version of the Social Network module. Some improvements in previous modules will be also implemented.

- **Social Network:** Some of the requests collected during the interviews had to do with connecting citizens to scientists, or citizens to citizens when they participate in the same project. Overall, several interviewees underlined the importance of providing the possibility to interact with peers through the platform. All this suggests the need to create a social networking tool, which provides all these functionalities.

6.3.3 Description of the third release of the Platform

The third release of the platform (M36) will be oriented in the development of the Graph Engine, and Event Manager and the release of the API. These three modules will support user community, encouraging active participation. As there is a long time between the second (M20) and the third (M36) releases of the Platform, an intermediate one (M28) will be launched with a first implementation of these three modules. This intermediate release will be helpful to test and improve these modules. Here is a description of them.

- **Graph Engine:** We will provide interactive visualization of the data available in the Platform. These visualizations will be user customizable and will allow, at a glance, to understand the selected aspect of CS in Europe (such as the number of projects addressing a certain type of impact by country)
- **Event Manager:** The Event Manager module will be developed in order to support a calendar of CS events in Europe.
- **API:** The Application Program Interface (API) will be published in the third release of the platform.

We are not providing a complete description of the functionalities of second and third platform version modules as we will work on them and complete them in further revisions.

6.3.4 WordPress client

The bulk of the development Platform work focuses on the creation of the Platform as such. WordPress modules will be developed so that, in a simple way, any citizen science page built on WordPress can be compatible with the Platform.

The philosophy behind this architecture is that any changes in the web of a CS project (e.g. changing the geographical scope of a project, adding a new guideline to the web, etc.) is transferred automatically and without human intervention to the Platform.

The plugin installed in WordPress in the client project will transform the required information to schema.org (for digital document) or PPSR-CORE (for projects) standards. The format chosen to display the metadata within the code is JSON-LD.

```
{
  "@context": {
    "name": "http://xmlns.com/foaf/0.1/name",
    "homepage": {
      "@id": "http://xmlns.com/foaf/0.1/workplaceHomepage",
      "@type": "@id"
    },
    "Person": "http://xmlns.com/foaf/0.1/Person"
  },
  "@id": "http://me.example.com",
  "@type": "Person",
  "name": "John Smith",
  "homepage": "http://www.example.com/"
}
```

Figure 26: JSON-LD language

We will consider the possibility of developing similar plugins for other platforms in future deliveries. However, you can always embed the JSON-LD source code to be compatible with the Platform.

Once the plugin is installed, or the JSON-LD code is embedded, the client platform must be announced manually using a simple form at the Platform, which will periodically consult the client page looking for possible changes and/or novelties by adding them to the database.

We know that the great challenge of this architecture is to make third parties compatible with this Project, and for this a communication campaign will be created once the technology is

stable enough. However, ciencia-ciudadana.es (Spanish citizen science portal, which depends on Ibercivis) will be eu-citizen.science compatible from the first release.

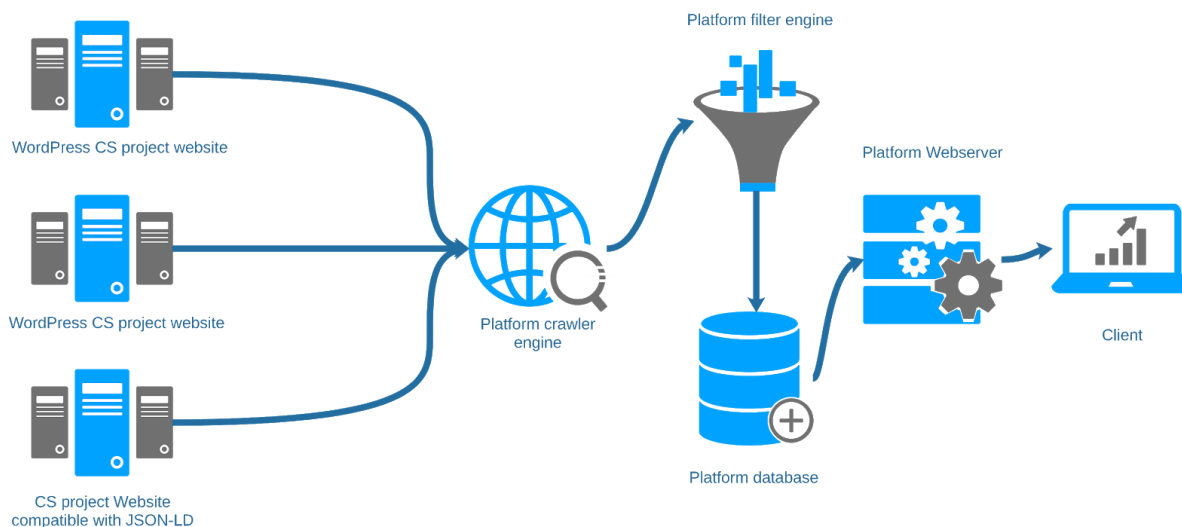
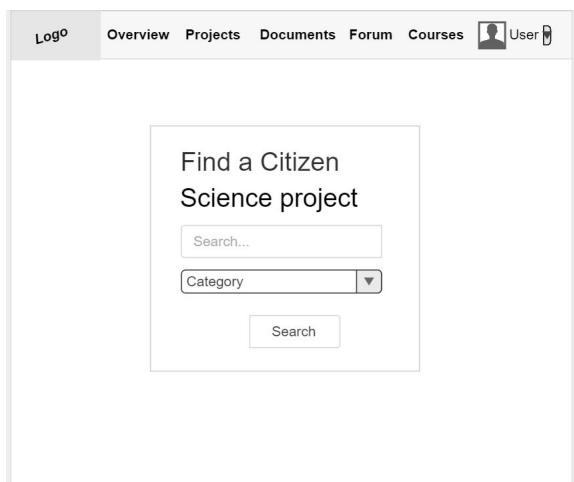


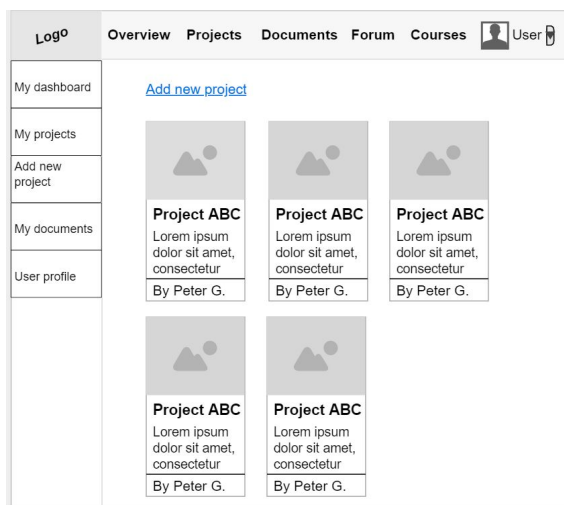
Figure 27: Projects and resource gathering from interoperable platforms, including WordPress

6.4 Mockups

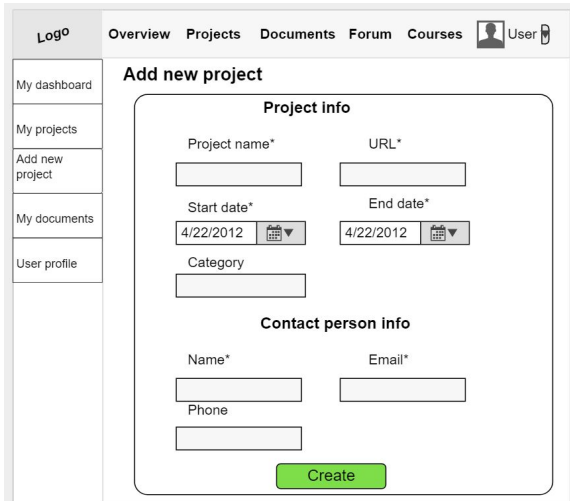
Here are present simple mockups of main pages to be implemented in the first release of the platform.



Main page. Search engine front-end

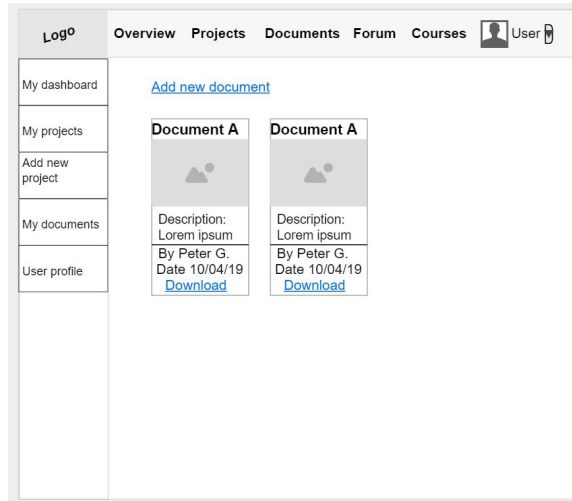


Projects view. Registered users will see a left sidebar in order to manage own projects.



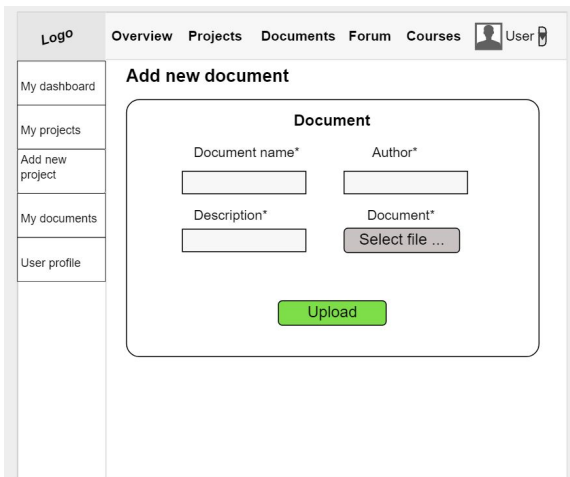
The screenshot shows the 'Add new project' form. It includes a sidebar with navigation options: My dashboard, My projects, Add new project, My documents, and User profile. The main content area is titled 'Add new project' and contains two sections: 'Project info' and 'Contact person info'. The 'Project info' section has fields for Project name*, URL*, Start date* (with a calendar icon), End date* (with a calendar icon), and Category. The 'Contact person info' section has fields for Name*, Email*, and Phone. A green 'Create' button is at the bottom.

Registered users will be able to add new projects



The screenshot shows the 'Add new document' form. It includes a sidebar with navigation options: My dashboard, My projects, Add new project, My documents, and User profile. The main content area is titled 'Add new document' and contains a link 'Add new document'. Below the link are two document cards, each titled 'Document A'. Each card has a description 'Description: Lorem ipsum', the author 'By Peter G.', the date 'Date 10/04/19', and a 'Download' link.

Resources view. Registered users will see a left sidebar in order to manage own resources.



The screenshot shows the 'Add new document' form. It includes a sidebar with navigation options: My dashboard, My projects, Add new project, My documents, and User profile. The main content area is titled 'Add new document' and contains a form titled 'Document'. The form has fields for Document name*, Author*, Description*, and Document*. There is a 'Select file ...' button next to the Document* field. A green 'Upload' button is at the bottom.

Registered users will be able to upload new resources.

6.5 Backlog

Here is presented how we built the backlog for the first release of the Platform. Based on the vision, and following gathered requirements in workshops and interviews we created user histories. The user histories were *translated* to items to be implemented. The backlog of the first release is, therefore, the set of item we will implement until M15. We are not presenting here the backlog for future release. Next backlogs will be created after first release based on proposed implementation (see [section 6.3](#)), requirements gathered in new interviews and feedback received after first release.

As one can see in the following tables, not only administrators will be able to upload projects and resources, but also registered users with needed privileges. We will use also interoperability between platforms - not described here - to upload projects and resources to the Platform.

Here are brief instructions in order to read the following tables. The Epic line describes the action, as a user, you want to perform (for example, in the first Epic, the user will search for a document, select one of the results, read and share). In the Story section it is described how the user can perform, but you don't have to read it in a linear way, from left to right (for example, one user can browse by knowledge area, see the results, read it online and share by twitter). In the sprint section are shown the needed items to be implemented to support user histories. As one can imagine, each item will belong to one of the modules described above.

EPIC 1: As a CS practitioner, I want to look for and read a CS resource document

Epic 1	Search for a document	Select	Read	Share
Story	Free text search	Show results and allow to select one of them	Read online / Download	By Facebook
	Browse by knowledge area, license, impact and other metadata		Download related resources/projects	By Twitter
				By instagram
Sprint	Provide powerful search engine (free text) with autocomplete	Show results of a search, along with available metadata about the resources.	Create template for resource view	Show links for each social media linked with the document



		and allow to click (hyperlink)		
	Create a section of website dedicated to CS Resources	Show results when browsing by category, Knowledge area, language	Show links with related resources and projects	
	Create and implement ontology to describe the resources			
	Create a 'filter by' functionality (language, impact, license, etc.)			
	Create a section dedicated to CS resources			
	Create a FAQ entry item to describe all functions			

EPIC 2: As a CS practitioner, I want to upload a CS resource document to the Platform

EPIC 2	Login/First Step	Fill the form	Check	Confirm	Share
Story	Login as 'contributor' with needed privileges and click on 'Add document'	Fill the form in the platform (metadata*) and upload the document	Show preview	Confirm	By Facebook
	Add resource	Link to 'related project'		Cancel	By Twitter
		Save draft			By instagram
Sprint	Create a user signup and registration function to access certain features of the platform	Create a resource description form template that includes mandatory and requested metadata	Create template to show preview	Create button to confirm in the preview	Show links to share



		fields, and upload function(metadata*)			
	Create a hierarchy of user permissions, to include <i>Community Member</i> , <i>Consortium Member</i> and <i>Admin</i>	Create function to save form draft		Create a moderator alert function, that assigns a platform moderator with the task of manually approving the publication of the uploaded resource to the platform	
	Administrator promote 'user' to 'contributor'	Create function to show preview	Create button and function to go back	Create function and button to cancel/remove	
	Create 'Add resource' button and functionality	Create function to link resource with other resources/projects of the website			
	Create a series of FAQ entry items to describe these functions	Check if the document is already added (md5)			

EPIC 3: As the owner of a Resource, I want to edit it, update it, or delete it from the Platform

Epic 3	Login and first steps	Fill the form	Check	Confirm	Share
Story	Login as 'contributor' with needed privileges. Click on 'my documents'	Show the form with (meta)data of selected document (metadata*)	Show preview	Show button to confirm	By Facebook



	Click on Edit	Show buttons Save/Preview/Delete			By Twitter
	Click on Delete				By instagram
Sprint	Provide user login/logout	Create a 'Resubmit' button and a 'Cancel' button for the form, and give the upload function the prompt 'Replace current resource with new version'	Template showing preview	Button to confirm in the preview, if confirmed, create an automated notice on the resource display that show 'This resource was updated on dd-mm-yyyy'	Show links to share through social networks
	Create a 'My Profile' function that allows registered and logged in users of the platform to see a list of resources that they have uploaded to the platform, that are hyperlinked.	Create the functionality to save the form once edited	Create the button and functionality to go back	Button to confirm the preview template	
	Clicking on the link of a resource opens up the original metadata form, with the field data as originally entered and submitted, that can be edited directly.	Create the functionality to show the preview once edited		When deleting, button 'are you sure?'	
	Show edit/delete buttons for my documents	Create delete functionality with associated button			

	Create a series of FAQ entries to describe these functions				
--	--	--	--	--	--

EPIC 4: As a CS practitioner, I want to find other CS projects so that I can learn about them and from them

Epic 4	Search for a project	Show and Select	Read	Share
Story	Free text search	Show results and allow to select one of them	Read online	By Facebook
	Browse by knowledge area, country, impact and other metadata		Show related resources/projects	By Twitter
				By instagram
Sprint	Provide powerful search engine (free text) and autocomplete,	Create template for project results	Create template for project view	Show links in each template
	Create a section of website dedicated to CS projects	Show results of a text search and allow to click	Show links with related resources and projects	
	Create a series of FAQ describing these functions	Show results when browsing by category/Knowledge area, etc.		
	Create and implement an ontology to describe projects	Create leaflet map that shows CS projects (with hover functionality)		
		Sidebar presenting a range of filter options		

EPIC 5: As a CS practitioner, I want to upload information about my own CS projects, to share with other practitioners

Epic 5	Login/First Step	Fill the form	Check	Confirm	Share
Story	Login as 'contributor' with needed privileges	Fill the form in the platform (metadata*)	Show preview	Confirm	By Facebook
	Add project	Save draft		Cancel	By Twitter
					By instagram
Sprint	Provide user signup and registration function to access certain features of the platform	Create a project description form template that includes mandatory and requested metadata fields	Create template to show preview	Button to confirm in the preview template	Show links to share
	Administrator promote 'user' to 'contributor'	Mechanism to save draft	Create button and function to go back	Create function and button to cancel	
	Create 'Add project' button and functionality	Mechanism to show preview		Create a moderator alert function, that assigns a platform moderator with the task of manually approving the publication of the project to the platform	
	Create a series of FAQ entry items to describe these functions	Create functions to check if the project is already added			

EPIC 6: As the owner of Project, I want to be able to edit or delete CS projects that I have created

Epic	Login and first steps	Fill the form	Check	Confirm	Share
Story	Login as 'contributor' with needed privileges. Click on 'my projects'	Show the form with data of selected project (metadata*)	Show preview	Show button to confirm	By Facebook
	Click on Edit	Save draft			By Twitter
	Click on Delete				By instagram
Sprint	Provide user login/logout	Form to fill project, with metadata of selected project	Create template showing preview	Button to confirm the preview template	Show links to share
	Update the 'My profile' function to allow registered and logged in users of the platform to see a list of projects that they have submitted to the platform, that are hyperlinked	Create button and functionality to save draft	Create the button and functionality to go back	When deleting, button 'are you sure?'	
	Clicking on the link of a project opens up the original metadata form with the field data as originally entered and submitted that can be edited directly	Create button and functionality to show previews	Create the button and functionality to cancel changes	Create and automated notice on the project display 'This project was updated on dd-mm-yyyy'	



	Show edit/delete buttons, with associated functionalities				
	Create a series of FAQ entries to describe these functionalities				

EPIC 7: As an administrator, I want to be able to change the role or personal data of another user

Epics	Login	Browse users	Change roles	Confirm
Story	Log as 'administrator'	Browse users by role, name, country, etc.	Change roles of a user	Confirm changes
		User search by text (email, name...)	Change password of a user	
			Change other personal data of a user	
			Look for projects of selected user	
Sprint	Create function to login	Define roles,	Create template for user view and edit	Create button and functionalities to confirm changes
	Create function to logout	Provide mechanism to browse by role/name/country	show link to projects of selected user	Button to delete user (with confirmation)
	Provide remember password	Free text user search		
		Template to show user search results		
		Provide in each result, button to edit/delete		

EPIC 8: As a user, I want to change my personal data and/or leave the platform

Epic	Login	Go to my Data	Edit User	Confirm
Story	Log as 'user'/contributor/'moderator'/administrator'	Button to 'go to my personal data'	Change roles of a user	confirm changes
		Button to 'go to my projects'	Change password of a user	left the platform
			Change other personal data of a user	
Sprint	Provide user login/logout (template and functions)	Create template with 'my personal data'	Create template for user view and edit	Button to confirm changes
	Provide template and functions to remember password	Create list of 'my projects' and 'my documents' (can be sorted)		Button to sign out (with confirmation).

7. Platform structure

7.1 Information architecture

Information Architecture (IA) is a design discipline that is focused on making information findable and understandable.⁶⁷ The aim of this discipline is to organize content in a way that users can find everything they need without much effort. As one can imagine, this is related not only to the structure of the Platform, but also to the chosen metadata and how the Platform makes use of it.

As has been repeated throughout the document, in the first version of the platform there will be two different types of items:

- Projects
- Resources (Tools, Material, Guidelines, etc.)

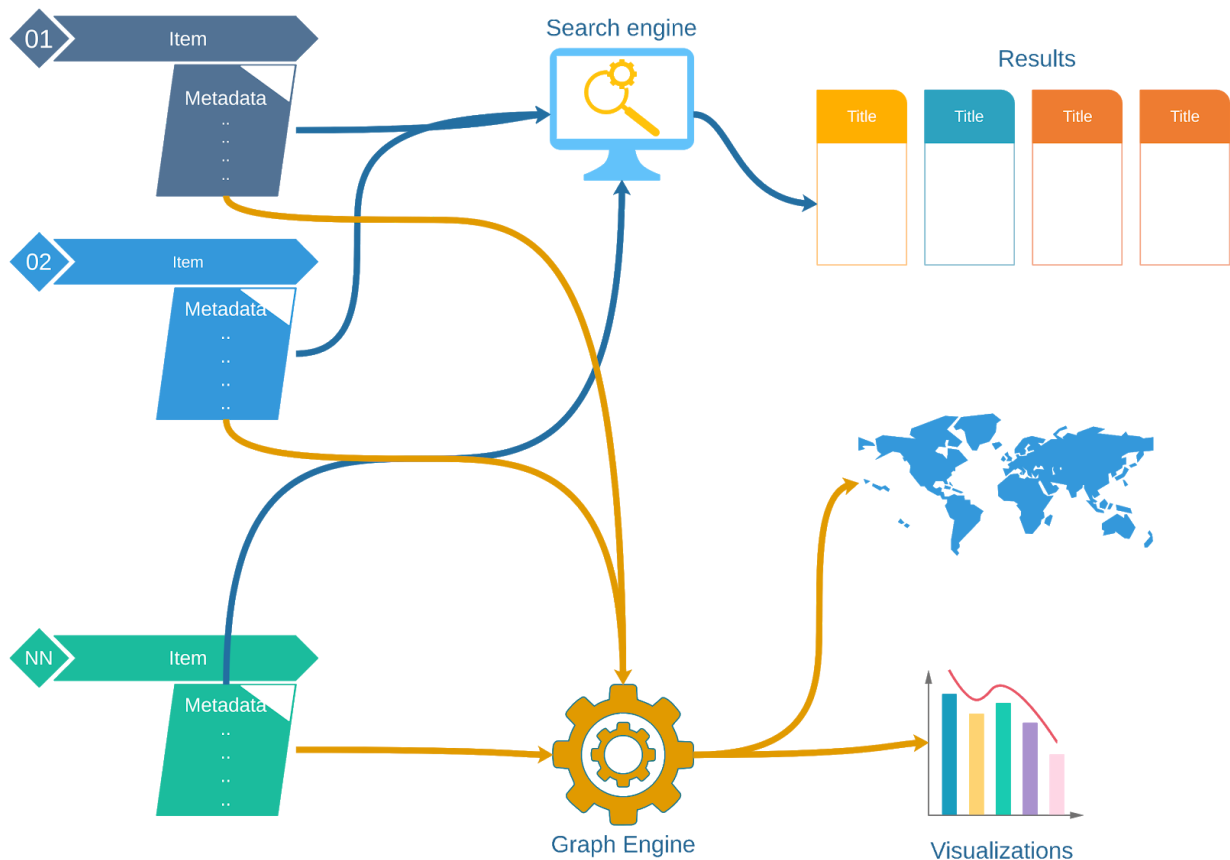


Figure 24: Graph and Search engines using metadata to show results and graphs

Each of them will have different types of metadata associated with it (described in this section), some of them will be optional and others mandatory.

⁶⁷ Louis Rosenfeld, Peter Morville. Information Architecture: For the Web and Beyond



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The main function of the metadata will be twofold, on the one hand, to feed the Platform's search engine so that the end user can find the desired item. We would like to emphasize at this point that one of the objectives of the development is to transfer the complexity of the search engine to the development phase, trying to avoid the need for the end user to fill in an endless number of fields and ticks to find the desired resource or project.

We will also use the metadata to provide global information on the items that are in the platform, through tools such as statistics, graphs and maps. These tools will be interactive, so that the end user can, at a glance, visually interpret a set of data related to the projects and resources stored on the platform.

The elements described in the following paragraphs are part of the first version of the Platform, and successive improvements will be introduced in the following releases. These improvements will obviously include, among others, aspects such as metadata definition, interoperability, UX, accessibility, etc.

7.2 Metadata

As outlined in [Section 4.3](#) above, our selection for metadata is based on existing work, following standards from schema.org for resource definition, PPSR Core and CA15212 - WG5 for project definition.

Although we are going to follow the selected standards, we are also looking for a compromise between quality and usability, so the metadata presented here represent the initial selection that will be incorporated in the first release of the Platform. This means that successive improvements with respect to the metadata selection might be included throughout the Project lifetime; always compatible with PPSR and CA15212 for project and schema.org for the rest of the resources. As we have said previously, compromise between quality and usability will be encouraged.

We are presenting in the next tables metadata we are going to use in the first release of the Platform. This selection has been made working together with the rest of the Work Packages (WPs) of the project, especially with WP3. For resources we are following the metadata proposed by schema.org for digital documents. Bold properties are mandatory.



Table 5: List of Metadata for Resources.

Metadata for Resources		
Property	Expected Type	Description
Properties from CreativeWork ⁶⁸		
about	thing	The subject matter of the content. Inverse property: subjectOf.
abstract	Text	An abstract is a short description that summarizes a CreativeWork.
aggregateRating	AggregateRating	The overall rating, based on a collection of reviews or ratings, of the item.
audience	Audience	An intended audience, i.e. a group for whom something was created. Supersedes serviceAudience.
author	Organization or Person	The author of this content or rating. Please note that author is special in that HTML 5 provides a special mechanism for indicating authorship via the rel tag. That is equivalent to this and may be used interchangeably.
datePublished	Date	Date of first broadcast/publication.

⁶⁸ CreativeWork is an item from schema.org. Each item in the vocabulary has a set of properties. New items can be created on top of others (for example, Digital Document is built on top of CreativeWork which is built on top of Thing). In this way, some of the Resources properties are inherited from CreativeWork and other properties are inherited from Thing. On the other hand, the Expected Type can be a Text, but also an Item (e.g. Thing), so this field is expected to have one or more of the properties of this type.

inLanguage	Language or Text	The language of the content or performance or used in an action. Please use one of the language codes from the IETF BCP 47 standard. See also availableLanguage. Supersedes language.
keywords	Text	Keywords or tags used to describe this content. Multiple entries in a keywords list are typically delimited by commas.
license	CreativeWork or URL	A license document that applies to this content, typically indicated by URL.
publisher	Organization or Person	The publisher of the creative work.
Properties from Thing		
image	imageObject or URL	An image of the item. This can be a URL or a fully described ImageObject.
name	Text	The name of the item
url	URL	URL of the item

For courses (e.g. Massive Online Open Courses, or MOOCs), we will follow the Course metadata from schema.org.

Table 6. List of Metadata for Courses.

Metadata for Courses		
Properties from Course		
CoursePrerequisites	AlignmentObject or Course or Text	Requirements for taking the Course. May be completion of another Course or a



		textual description like "permission of instructor". Requirements may be a pre-requisite competency, referenced using AlignmentObject.
Properties from CreativeWork		
about	Thing	The subject matter of the content. Inverse property: subjectOf.
abstract	Text	An abstract is a short description that summarizes a CreativeWork.
aggregateRating	AggregateRating	The overall rating, based on a collection of reviews or ratings, of the item.
audience	Audience	An intended audience, i.e. a group for whom something was created. Supersedes serviceAudience.
author	Organization or Person	The author of this content or rating. Please note that author is special in that HTML 5 provides a special mechanism for indicating authorship via the rel tag. That is equivalent to this and may be used interchangeably.
datePublished	Date	Date of first broadcast/publication.
inLanguage	Language or Text	The language of the content or performance or used in an action. Please use one of the language codes from the

		IETF BCP 47 standard. See also availableLanguage. Supersedes language.
keywords	Text	Keywords or tags used to describe this content. Multiple entries in a keywords list are typically delimited by commas.
license	CreativeWork or URL	A license document that applies to this content, typically indicated by URL.
publisher	Organization or Person	The publisher of the creative work.
Properties from Thing		
image	imageObject or URL	An image of the item. This can be a URL or a fully described ImageObject.
name	Text	The name of the item
url	URL	URL of the item

As stated above, we will follow the PPSR-CORE and WG5 from Citizen Science COST ACTION CA15212 standards for the selection of metadata to be used in project ontology. Although it has been said repeatedly in this document, it is worth remembering that this is an initial selection for the first release of the Platform. This list may be subject to variations in future releases - which will take place approximately every six months - according to the requirements of the rest of the project partners. Bold properties are mandatory.



Table 7. List of Metadata for Projects.

Metadata for projects		
Database information		
Property	Expected Type	Description
GUID	Text	Globally unique identifier (GUID) for the project; system generated.
DateCreated	dateTime	The date and time that the record was created in the database.
Origin	text	The name of the project database where a project was first registered. Allows traceability of a project in multiple databases to its original registration.
DateUpdated	dateTime	The date and time that the record was last updated in the database.
Basic Project Information		
Property	Expected Type	Description
Name	Text	Short name or title of the project
Aim	Text	Primary aim, goal or objective
Description	Text	Abstract or description of the project
Keywords	Text	Keywords (comma separated) which are indexed and aid in searching for and finding projects.



Status	Vocabulary	The activity status of the project.
StartDate	dateTime	The actual date that a project began
EndDate	dateTime	The actual date that a project ended
projectTopic	Vocabulary	The project topic or field of science
Images and communications		
Property	Expected Type	Description
Image	projectImage	An image to represent a project
Image credit	Text	A credit for the image used to represent a project
URL	Http uri	URL to an external web site for the project
Geography		
Property	Expected Type	Description
Project Latitude	Floating point	Latitude coordinate of the center of the project area. Typically this is where the project is hosted, e.g., a home institution.
Project Longitude	Floating point	Longitude coordinate of the center of the project area. Typically this is where the project is hosted, e.g., a home institution.
Personal and Organizational Affiliates		
Property	Expected Type	Description

Project host	text	Name of the primary organization responsible for hosting or implementing the project.
Supplementary information for Citizen Science		
Property	Expected Type	Description
How to participate	Text	Free text description of how people can get involved in the project. Textual instructions for joining the project
Equipment	Text	Required or suggested equipment

We will create the needed structure in the database in order to store the metadata information of each item. As previously, the metadata will be used twofold: search engine and information visualization.

When necessary - and this is one of the features of the Platform - the information will be embedded in the html as json-ld, so that it can be read by the search engines and similar platforms. In the same way, EU-CITIZEN.SCIENCE will be able to read metadata embedded in other similar platforms. These functionalities will provide, jointly with the API, the interoperability technically described in the next section.

7.3 Interoperability

Interoperability was one of the characteristics most demanded by the participants in the interviews that took place between months 1 and 8. An interoperability between platforms allows, for example, that a change in the web of a project (e.g. a certain project has achieved a political impact and this information is updated on its website) is projected to the rest of compatible platforms. It will also allow the resources added in a national CC observatory (e.g. in <http://ciencia-ciudadana.es>) to be automatically propagated to EU-CITIZEN.SCIENCE Platform. In short, interoperability will allow (among other things) to keep the platform updated without (almost) human intervention.

To carry it out, it is necessary first of all, a standardization of the (meta) data contained in the platform, this work has been explained in the previous section. It is worth remembering that we are going to follow the standards proposed for CS projects (PPSR core). As there is no defined



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standard for CS Resources, we are going to follow standards for Digital Document defined in schema.org.

We will encourage other platforms (CS national platform, CS project websites, etc.) to follow proposed standards in order to provide interoperability between platforms, websites and projects. In order to do that, we will publish the information needed to provide this interoperability from and to EU-CITIZEN.SCIENCE platform.

Moreover, within WP2 we are developing a Wordpress plugin that allows, in a simple way, to embed the information necessary to be interoperable through metadata and json-ld.

As a brief introduction, we are describing now the two ways in which the Platform will provide interoperability:

- Interoperability through metadata and JSON-LD: Metadata associated with each of the items (Projects, Resources, etc.) that are on the Platform fulfill at least two functions. The first one - not directly related with interoperability - is to enable an effective search on the resources that the Platforms contains. On the other hand, metadata can be inserted using JSON-LD language into the Platform HTML, so it can be crawled by search engines and other CS platform (CS National platforms, for example). In the same way, the EU-CITIZEN.SCIENCE platform will be able to crawl automatically CS project websites and CS platform, looking for new or updated projects and/or documents related with CS.
- Interoperability through API: Through the Application Program Interface (API) provided, third parties will be able to ask for certain information contained in the platform as well as perform some operations (such as login, logout, add a new project, etc.). Complete documentation of how to use the API as well as practical examples will be published in the 2.5 a 3.0 releases of the platform.

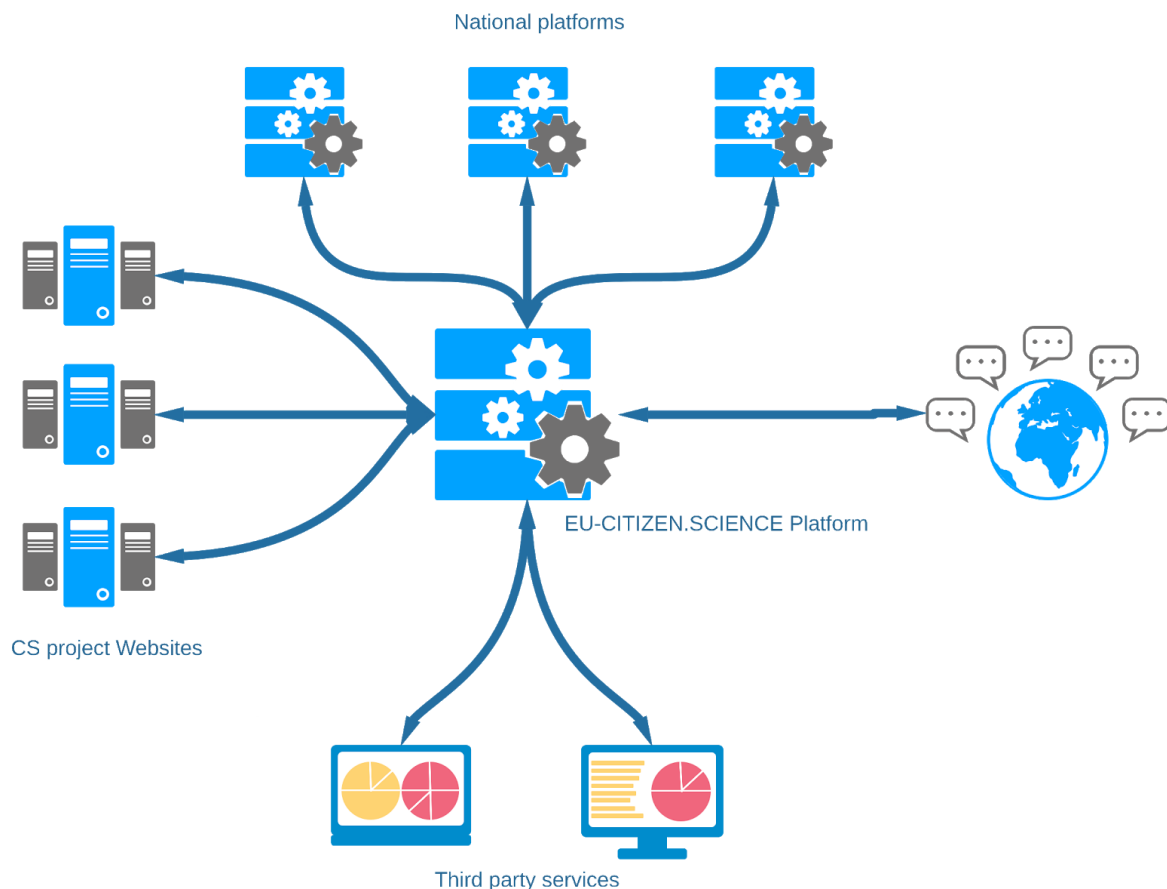


Figure 25: Interoperability between the platform, other National Platforms and CS project websites. The interoperability will be provided through shared ontology using JSON-LD language and through API

7.4 Accessibility, inclusion and other features

As stated in [section 4](#) diverse aspects about accessibility in a broad sense must be taken into account during the development process. In order to do that, the guidelines provided by the W3C⁶⁹ are a powerful starting point. In particular, the platform follows the Web Content Accessibility Guidelines WCAG 2.1⁷⁰. The criteria to meet WCAG 2.1 is established in a quick reference document inside the W3C website⁷¹. As shown, the criteria is ordered four principles, each of them has one of several guidelines. Each guideline contains some criteria to meet, with techniques to fulfill them (and failures to avoid).

- Principle 1 - Perceivable: Information and user interface components must be presentable in ways they can perceive.

⁶⁹ <https://www.w3.org/WAI/fundamentals/>

⁷⁰ <https://www.w3.org/TR/WCAG21/>

⁷¹ <https://www.w3.org/WAI/WCAG21/quickref/>

- Guideline 1.1 - Text alternatives: We will provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
- Guideline 1.2 - Time-based Media: We will provide alternatives for time-based media.
- Guideline 1.3 - Adaptable: We will create content that can be presented in different ways (for example simpler layout) without losing information or structure.
- Guideline 1.4 - Distinguishable: We will make easier for users to see and hear content including separating foreground from background.
- Principle 2 - Operable: User interface components and navigation must be operable.
 - Guideline 2.1 - Keyboard Accessible: We will make all functionality available from a keyboard
 - Guideline 2.2 - Enough Time: We will provide users enough time to read and use content
 - Guideline 2.3 - Seizures and Physical Reactions: We will not design content in a way that is known to cause seizure or physical reactions.
 - Guideline 2.4 - Navigable: We will provide ways to help users navigate, find content, and determine where they are.
 - Guideline 2.5 - Input Modalities: We will make easier for users to operate functionality through various inputs beyond keyboard.
- Principle 3 - Understandable: Information and the operation of the user interface must be understandable.
 - Guideline 3.1 - Readable: We will make text content readable and understandable
 - Guideline 3.2 - Predictable: Our platform pages will appear and operate in predictable ways
 - Guideline 3.3 - Input Assistance: Our platform will help users avoid and correct mistakes.
- Principle 4 - Robust: Content must be robust enough that it can be interpreted by a wide variety of user agents, including assistive technologies.
 - Guideline 4.1 - Compatible: We will maximize compatibility with current and future user agents, including assistive technologies.

7.4.1 Multi-language support

The Platform will provide internationalization and localization since the first release. The words *internationalization* and *localization* often cause confusion. Taken from Django documentation, here is a simplified definition:



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- Internationalization is the act of preparing the software for localization. It is usually done by developers.
- Localization is the act of writing the translations and local formats. It is usually done by translators.

Django - the framework selected to develop the platform - provides full support for translation of text, formatting of dates, times and numbers and timezones. Essentially, Django does two things:

- It allows developers to specify which parts should be translated or formatted for local languages.
- It uses these hooks to localize Web apps for particular users according to their preferences.

The translation of the platform is done through message files. A message file is a plain-text file, representing a single language, that contains all available translation strings and how they should be represented in the given language. Message files have a .po file extension. As the .po files are part of the source code (and therefore, licensed under EUPL) general public will be able to provide translations to their local language.

The Course Management Tool (Moodle) has been translated into several languages using the AMOS translation toolkit⁷². It is expected that no further work is needed to translate Moodle to any new language.

The project, however, will not have control over projects and/or resources language from third parties. In the event that the resource is licensed under CC-BY-SA or similar licenses, possible translations of such documents may be incorporated into the Platform.

7.4.2 Responsive design

Today's websites are seen on many devices such as tablets, smart phones, e-books, laptops, desktops, etc. Each of these devices has its own specific characteristics: screen resolution and density, operating system, browser, memories, etc. According to the study⁷³ published by Perficient Digital and based in more than 0.9 Trillion (American) of visits, 58 % of the visitors in the US used mobile devices (42% desktop devices). However, the percentages are reversed if we consider the total time spent visiting the website. 58% of the time is spent from Desktops and 42% from mobile devices. All this highlights the need to create a good responsive design, so that the page adapts to each of the visitors' screens.

⁷² <https://download.moodle.org/langpack/2.0/>

⁷³ <https://www.perficientdigital.com/insights/our-research/mobile-vs-desktop-usage-study>



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Django (the framework used for development) provides a set of guidelines in order to implement responsible design, and it is compatible with Bootstrap 4⁷⁴. Bootstrap is the world's most popular framework for building responsive, mobile-first sites, with BootstrapCDN and a template starter page.

Jointly with CSS3, Bootstrap, developed by twitter and published under MIT License will be used to format and style the Platform, thus providing the entire ecosystem necessary to ensure responsive design.

⁷⁴ <https://getbootstrap.com/docs/4.0/getting-started/introduction/>

8 Platform development

In view of the above, when developing the platform, the limited resources (technical and human) to carry out the development must be taken into account. It is very important to optimize available resources, relying on open source developments from third parties and always putting the focus on creating tools useful to those who visit the platform.

During the Project lifetime, four phases of requirements collection will be carried out. These requirements will be collected and through user stories transformed into items to be developed (backlog). The first collection of requirements was executed from month 0 to month 8. The results have been shown in the previous sections.

Each of these collection phases will result in 4 releases of the platform (as shown in Table 1 above) - three of them will coincide with the Milestones agreed in the DoA.

In each of these 4 phases of development, there will be sprints of 2 weeks. At the beginning of each of the sprints will be selected items of the backlog to be developed. As far as possible, items will be selected which, when developed, will provide the platform with a new user story.

The development of the platform will be carried out on local servers without public IP until it reaches the degree of maturity necessary to be tested by the rest of the consortium partners. Once this degree of maturity is reached, the platform will be available internally to the consortium. The development carried out in each of the sprints will be implemented in the internal platform.

8.1 Principles for development

As stated in the Description of Activities, our development methodology - from a technical point of view - is based on seven fundamental factors. These factors draw the methodology to be used, the technologies chosen, as well as our relationship with other CS agents. We understand from the beginning that our development should not be focused on output - what is developed - but on outcome - what happens after something that has been developed goes out into the real world. As said in *User Story Mapping* by Jeff Patton, “we don't measure outcome by the number of features delivered, or what people have the capability to now do. We measure what people actually do differently to reach their goals as a consequence of what you've built, and most important whether you've made their lives better”⁷⁵. The following is a summary of the seven factors taken into account.

⁷⁵ Jeff Patton, *User Story Mapping: Discover the Whole Story, Build the Right Product*, p. xxxix

Factor 1: User heterogeneity

The target user audience for the Platform includes a very broad range of actors, from individual members of the general public to well-established citizen science practitioners and the formal research institutes within which they work. As seen in the previous sections, Tasks 2.1 and 2.2, as well as Deliverables 2.1 and 2.2 have helped us to be aware of the suspected heterogeneity. The initial requirements of the platform has been co-designed with identified stakeholders from months 1-8 , and new consultations will be launched at least every six months to update the user requirements and allow for continuous improvement of the platform.

Factor 2: Sustainability

As a factor at the heart of our Mission statement, the Platform must be both technically sustainable and topically sustainable. In order to achieve the first one, all the technologies used for development are based on open standards and published under free licenses. Moreover, there is a large community of developers behind each of the chosen technologies, which ensures us medium- and long-term sustainability. On the other hand, conversations with the maintainers of similar platforms have shown us the need, as written in the proposal, to provide sustainability mechanisms from a 'content-feed' point of view. As seen throughout this deliverable, the existing ontologies regarding metadata in CS projects have been analysed. As far as possible and as long as it does not contradict the quality criteria of the Platform, these standards will be followed and compatibility will be sought between similar platforms, such as national CS observatories. The source code of the Platform will be published in GitHub, and joint development with other similar platforms is being encouraged (such as the Spanish Citizen Science Observatory and the Swedish ARCS project)

Factor 3: Usability in terms of UI, design and speed

Common reasons behind low rates of usage of a website are: (1) an unattractive visual layout; (2) poor user interface design; and (3) slow page-loading times. In order to avoid these issues, we will pay special attention to good-practice standards of visual design, and support a range of user journeys. The Platform's testing processes include desktop and mobile speed tests.

Factor 4: Accessibility in terms of responsiveness, visual impairment and language barriers

In order to ensure that the Platform is fully accessible from a user point of view, we will account for the three most common accessibility concerns and will address any others that come up during the requirements-gathering phase (see Section 2.2). Firstly, we will implement a responsive design such that any digital device may be used to access the platform. Secondly, we



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will take users with visual impairments into consideration by considering solutions such as CSS3 themes with bigger icons and fonts. And thirdly, we will look to implement multi-language support, for example by embedding Google translation, or turning to the community for the crowdsourcing of translations, such as the platforms developed within the DITOs project and successfully implemented in the aqua.ibercivis.es and odourcollect.socientize.eu projects delivered by Ibercivis.

Factor 5: Interconnectivity with other networks and platforms

During the development of the EU-Citizen.Science platform, we will take into account interoperability aspects. As we have seen throughout this document, interoperability will be ensured in two ways. The first, through metadata embedded in the source code of the page using JSON-LD. Furthermore, we will provide - although not in the first release of the Platform - an API allowing the creation of applications based on the data hosted on the Platform.

Factor 6: Flexibility

In order to guarantee the necessary flexibility during the development of the Platform, we will use agile methodologies. This choice will allow us to respond to new requirements throughout the Project, for example responding to our target audience during the development cycle. At this point, it is worth recalling the agile manifesto.

Agile manifesto: While there is value in the items on the right, we value the items on the left more

- Individuals and interactions, over processes and tools
- Working software, over comprehensive documentation
- Stakeholder/user collaboration, over contract negotiation
- Responding to changes over following a plan

Factor 7: Data management and ethics issues

Any Platform-related activities and data collection (e.g. user profiles, e-mails, etc.) will be fully compliant with the General Data Protection Regulation (GDPR)(see [Section 9](#) for further details). The GDPR is the new regulation that regulates the protection of the data of citizens living in the European Union.

The technical development of the platform will be carried out by the Ibercivis Foundation and will follow the Agile and Scrum methodologies described in [Section 4.4](#).





8.2 Technical aspects of development

Having explained the methodology that we are going to follow for the development of the platform, we now describe the technologies that we will use to develop the Platform. Here is a list of the main technologies we are going to use, although we will not limit ourselves to them.


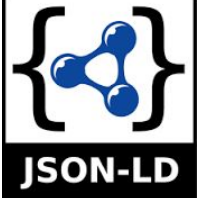




Table 8: List of main technologies to be used in the platform first release.

	Technology	In which way we are going to use it?
	<p>HTML₅ is the fifth and current major version of HTML, and subsumes XHTML. The current standard, the HTML Living Standard is developed by WHATWG, which is made up of the major browser vendors (Apple, Google, Mozilla, and Microsoft), with the Living Standard also existing in an abridged version.</p>	<p>Ultimately we will send the client browser a mixture of html5, javascript, json, css3, etc.</p>
	<p>Django is an open source web development framework, written in Python, that respects the design pattern known as Model-View-Controller. It was originally developed to manage several news oriented pages of the World Company of Lawrence, Kansas, and was released to the public under a BSD license in July 2005.</p>	<p>Django is the framework we will use for platform development. We will use django 2.2 long term support (LTS) release, which has extended support until April 2022.</p>
	<p>Django framework uses Python as programming language. Python is an interpreted programming language whose philosophy emphasizes the legibility of its code. It is a multiparadigm programming language, as it supports object orientation, imperative programming and, to a lesser extent, functional programming.</p>	<p>As recommended by django, we will use Python3 for development.</p>
	<p>WordPress is a content management system launched on May 27, 2003, focused on the creation of any type of website. Originally reached a great popularity in the creation of blogs, to eventually become one of the main tools for creating commercial websites.</p>	<p>As explained, we will develop wordpress plugins to provide compatibility between wordpress-based websites and the eu-citizen.science platform.</p>



	<p>CSS3 is the latest evolution of the Cascading Style Sheets language, and aims to extend the CSS2.1 version. It brings with it many highly anticipated new features, such as rounded corners, shadows, gradients, transitions or animations, and new layouts such as multi-columns, flexible boxes or grid layouts..</p>	<p>We will use css3 together with bootstrap to manage the look and feel of the eu-citizen.science platform</p>
	<p>Bootstrap is a cross-platform library or set of open source tools for designing websites and web applications. It contains design templates with typography, forms, buttons, boxes, navigation menus, and other HTML and CSS-based design elements, as well as additional JavaScript extensions. Unlike many web frameworks, it only deals with front-end development.</p>	<p>We will use css3 together with bootstrap to manage the look and feel of the eu-citizen.science platform</p>
	<p>JavaScript (JS) is a light and interpreted, object-oriented language with first-class functions, better known as the scripting language for web pages, but also used in many browserless environments, such as node.js, Apache CouchDB and Adobe Acrobat. It is a multi-paradigm scripting language, prototype-based, dynamic, supports functional, object-oriented and imperative programming styles.</p>	<p>JavaScript is a must for web development. We will use javascript together with jQuery to provide interaction and ajax functionalities</p>
	<p>jQuery is a multi-platform JavaScript library, initially created by John Resig, which simplifies the way to interact with HTML documents, manipulate the DOM tree, manage events, develop animations and add interaction with the AJAX technique to web pages.</p>	<p>JavaScript is a must for web development. We will use javascript together with jQuery to provide interaction and ajax functionalities</p>



	JSON is a simple text format for data exchange. It is a subset of the literal notation of JavaScript objects, although, due to its wide adoption as an alternative to XML, it is considered a language-independent format.	We will use JSON to get information from the platform (for example thile using AJAX calls)
	JSON-LD, or JavaScript Object Notation for Linked Data, is a method of encoding data linked using JSON. One of its goals was to require as little effort as possible from developers to transform their existing JSON into JSON-LD.	JSON-LD is the selected language to describe resources and project metadata inserted in the HTML code
	SQLite is a relational database management system compatible with ACID, contained in a relatively small library written in C. SQLite is a public domain project created by D. Richard Hipp.	We will use SQLite as database while development
	PostgreSQL is an object-oriented relational open source database management system, published under the PostgreSQL license similar to BSD or MIT. P	PostgreSQL will be our production database.
	Moodle is a learning management tool, or more specifically Learning Content Management. It is released under free distribution and written in PHP.	We will user Moodle as MOOCs manager
	Leaflet is the leading open-source JavaScript library for mobile-friendly interactive maps. Weighing just about 38 KB of JS, it has all the mapping features most developers ever need. Leaflet is designed with simplicity, performance and usability in mind. It works efficiently across all major desktop and mobile platforms, can be extended with lots of plugins, has a beautiful, easy to use and well-documented API and a simple, readable source code that is a joy to contribute to.	Leaflet will be the main library to provide maps



	<p>OpenLayers is an open source JavaScript library under a derivation of the BSD license to display interactive maps in web browsers.</p>	<p>Openlayer will be another library to provide maps functionality</p>
	<p>Chart.js provides simple, clean and engaging HTML5 based JavaScript charts. Chart.js is an easy way to include animated, interactive graphs on your website for free.</p>	<p>We will use chart.js to show interactive graphs based on available metadata</p>
	<p>D3.js is a JavaScript library to produce dynamic and interactive infographics from data in web browsers. It makes use of well supported technologies such as SVG, HTML5, and CSS. This library is the successor to the Protovis library.</p>	<p>We will use chart.js to show interactive graphs based on available metadata</p>
	<p>Git is a version control software designed by Linus Torvalds, thinking about the efficiency and reliability of maintaining application versions when they have a large number of source code files.</p>	<p>Git is our version control software</p>
	<p>GitHub is a forge for hosting projects using the Git version control system. It is mainly used for creating source code for computer programs. The software that operates GitHub was written in Ruby on Rails. Since January 2010, GitHub operates under the name GitHub, Inc.</p>	<p>GitHub is our code repository: https://github.com/Ibercivis/EU-citizen-science</p>
	<p>The Apache HTTP server is an open source HTTP web server, for Unix, Microsoft Windows, Macintosh and other platforms, which implements the HTTP / 1.1 protocol and the virtual site notion according to RFC 2616</p>	<p>Apache will be our production web server.</p>
	<p>The Hypertext Transfer Protocol (abbreviated HTTP) is the communication protocol that enables the transfer of information on the World Wide Web.</p>	<p>Of course, we will use HTTP as transfer protocol</p>

	<p>HTTP was developed by the World Wide Web Consortium and the Internet Engineering Task Force, a collaboration that culminated in 1999 with the publication of a series of RFCs, the most important of which is RFC 2616, which specifies version 1.1. HTTP defines the syntax and semantics used by the software elements of the web architecture (clients, servers, proxies) to communicate.</p>	
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8.3 Testing plan

A multi-level testing plan has been designed. There may be up to three different instances (i.e. running code) of the Platform, but only one will be visible to the general public. To fully understand the testing process, Table 9 lists are the Platform instances, their why, and their visibility.

Table 9: The Platform instances for the testing plan.

Instance	Purpose	Visibility	Update
Local instances	Development, Django automated testing UI testing	Only to developers	Real time while development
Internal instance	Consortium testing. Specially WP3 and WP5 Speed testing UI testing	Only to consortium partners	Every two weeks (each sprint)
External instance	EU-Citizen.Science platform for general public. Feedback from the general public.	General public	Approximately every six month

Testing on local instances: Local instances are easily launched in Django, as this framework provides it natively. Each developer can launch its own instance in which new features can be programmed. These instances will be shared with the designer of the Ibercivis Foundation, who will check that the design conforms to what was previously specified. On the other hand, Django



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provides automatic testing tools⁷⁶, which will be used in these instances. As the hardware and software are not the final one in these instances, speed testing will not give us real results. A functional version of these instances will become the internal instance to be tested by the rest of the consortium.

Testing on internal instances: The internal instances will be implemented with the same hardware and software as the external instance, specifically, the same web server (Apache 2) and database (PostgreSQL) will be used. This will allow us to test the speed through tools such as Google Page Speed Insight and similar. Moreover, as this implementation will be available to the whole consortium, your feedback will help us look for possible platform bugs, as well as possible concept errors and improvements.

Testing on external instance: We will not test the public implementation of the platform. However, feedback from the general public will help us to find areas where we can improve in possible versions. The general public input will be part of the next development backlog.

⁷⁶ <https://docs.djangoproject.com/en/3.0/topics/testing/>

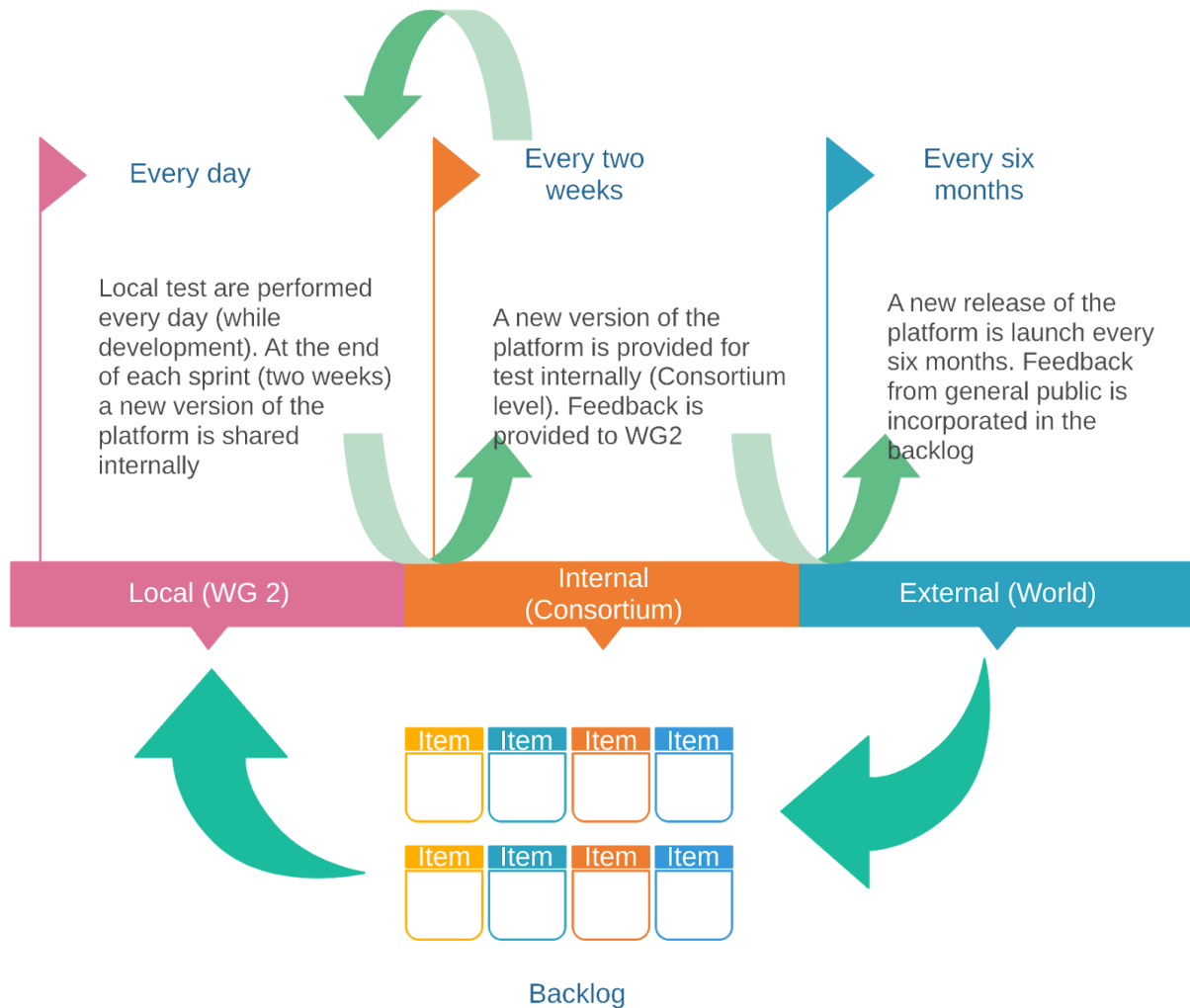


Figure 28: Testing plan Overview

8.3.1 Speed test

Page loading time is a very important aspect of user experience. In fact according to [kissmetrics⁷⁷](http://blog.kissmetrics.com/wp-content/uploads/2011/04/loading-time.pdf) 40% of visitors abandon a website that takes more than 3 seconds to load.

For this reason, we will use [PageSpeed Insights⁷⁸](https://developers.google.com/speed/pagespeed/insights/?hl=en) and [Lighthouse⁷⁹](https://developers.google.com/web/tools/lighthouse) in order to measure and improve page speed performance. This tool allows to analyze speed in both mobile and desktop devices, rating the website between 0 and 100, and provide useful guidelines to improve performance.

⁷⁷ <http://blog.kissmetrics.com/wp-content/uploads/2011/04/loading-time.pdf>

⁷⁸ <https://developers.google.com/speed/pagespeed/insights/?hl=en>

⁷⁹ <https://developers.google.com/web/tools/lighthouse>

The Lighthouse tools provides also information about Accessibility (although only a subset of accessibility issues can be automatically detected so manual testing is also encouraged), Best Practices and Search Engine Optimization (SEO).

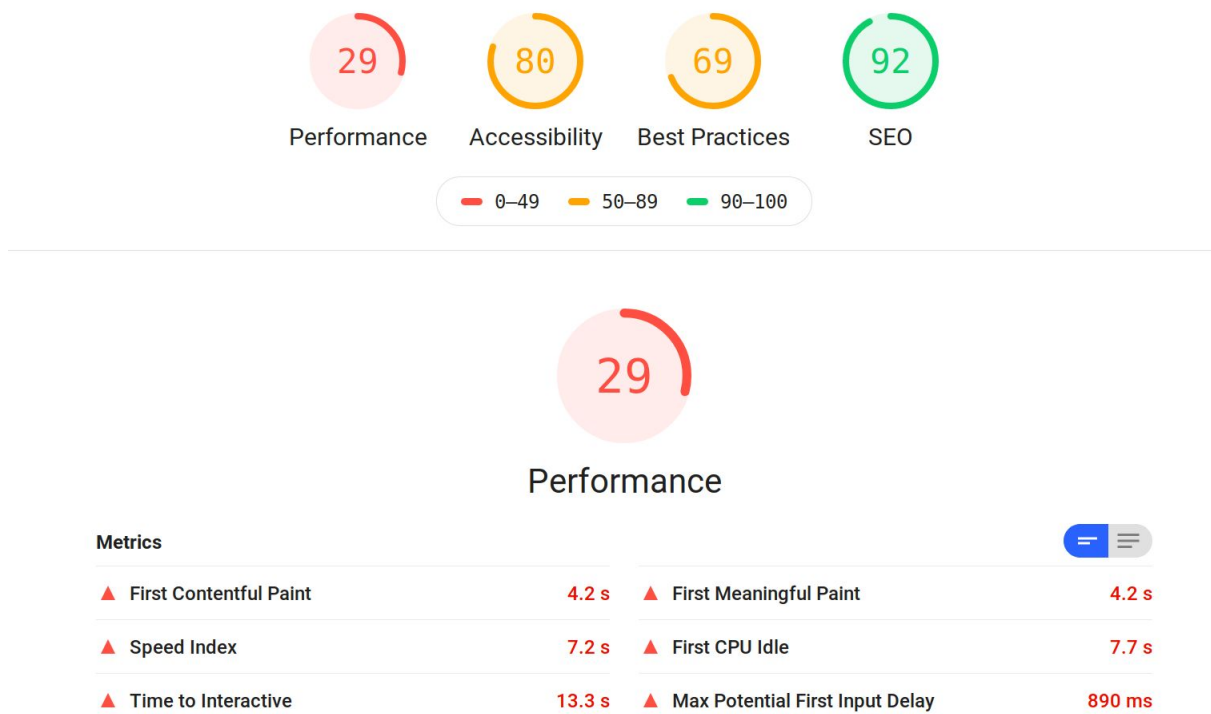


Figure 29: Lighthouse analyzing a website

9 License and ethical aspects

According to the terms of our Consortium Agreement in Section 10.4.1 ‘Object Code’ (pg. 24) , we have committed to making an unlimited number of copies of the source code for the Platform and any APIs that we develop available to all Consortium Partners, and to provide a sublicense for both to any Third Party involved in developing or maintaining the Platform.

We have furthermore committed to making our Platform software interoperable in accordance with the Directive 2009/24/EC of the European Parliament and of the Council of 23 April 2009 on the legal protection of computer programs.

9.1 Chosen license for source code

The source code of the Platform is published under the European Union Public License version 1.2 (EUPL)⁸⁰ . The EUPL v. 1.0 (first release of the license) was approved on 9 January 2007. The last version v1.2 was published in May 2017. EUPL v1.2 is OSI certified in July 2017. The EUPL is the first open source license released by an international governing body.

The European Citizen Science Association (ECSA) is the Licensor of the source code.

Compatible Licenses according to Article 5 EUPL are:

- GNU General Public License (GPL) v. 2, v. 3
- GNU Affero General Public License (AGPL) v.3
- Open Software License (OSL) v. 2.1, v. 3.0
- Eclipse Public License (EPL) v. 1.0
- CeCILL v. 2.0 , v. 2.1
- Mozilla Public License (MPL) v. 2
- GNU Lesser General Public License (LGPL) v. 2..1, v. 3
- Creative Commons Attribution-ShareAlike v. 3.0 Unported (CC BY-SA 3.0) for works other than software
- European Union Public License (EUPL) v. 1.1., v. 1.2
- Québec Free and Open Source License - Reciprocity (LiLiQ-R) or Strong Reciprocity (LiliQ-R+)

The European Commission may update this list to later version of the above licenses without producing a new version of the EUPL, as long as they provide the rights granted in Article 2 of this License and protect the covered Source Code from exclusive appropriation.

The Article 14 (Jurisdiction) of the license says that, without prejudice to specific agreement between parties, any litigation resulting from the interpretation of the License, arising between the European Union institutions, bodies, offices or agencies, as a Licensor, and any Licensee, will

⁸⁰ https://joinup.ec.europa.eu/sites/default/files/custom-page/attachment/eupl_v1.2_en.pdf



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be subject to the jurisdiction of the Court of Justice of the European Union, as laid down in article 272 of the Treaty on the Functioning of the European Union. Any litigation arising between other parties and resulting from the interpretation of this License, will be subject to the exclusive jurisdiction of the competent court where the Licensor resides or conducts its primary business.

For the sake of clarity, the EUPL v. 1.2 is annexed to this document.

9.2 Ethical aspects of the Platform

As well as fulfilling the needs and expectations of our target users, the Platform will need to comply with current legal and ethical requirements, especially regarding data use, storage and management.

Legislation regarding data protection and privacy, such as the EU's General Data Protection Regulation (GDPR) is highly relevant for citizen science. It could bring benefits: for example, the GDPR could facilitate data portability (i.e. interoperability and transferability) within the EU, allowing initiatives associated with the concept of citizen science to prosper (Quinn 2018).⁸¹

However, such legislation may exacerbate tensions between scientific openness and data protection, especially for citizen science projects that use health-related data (Suman and Pierce 2018)⁸². These include, among others: the nature of consent given to the data gathered; whether privacy 'safeguards such as anonymisation diminish the value of citizen science projects by, for example, reducing the recognition given to volunteers. Furthermore, legislation such as GDPR only applies to personal data (Quinn 2018) while many citizen science projects deal in data of much wider scope.

The D1.1 'Data Management Plan'⁸³ (outlines the datasets we expect to generate through the platform, and describes how the consortium will "manage the datasets that will emerge from the project, and how best practice in terms of metadata and archiving will be used to ensure that the data will be findable, accessible, interoperable, and reusable (FAIR) for other potential users"

⁸¹ Article 20 states that data subjects have the right to receive data about them in a 'structured, commonly used and machine-readable format', which should make it easier to share this data with citizen science projects. See Quinn (2018) for further discussion on this: Quinn P, 2018. 'Is the GDPR and Its Right to Data Portability a Major Enabler of Citizen Science?', *Global Jurist* 18(2): 20180021, doi:10.1515/gj-2018-0021

⁸² Suman AB and Pierce R, 2018. 'Challenges for citizen science and the EU open science agenda under the GDPR', *European Data Protection Law Review* 4(3): 284-295, doi:10.21552/edpl/2018/3/7

⁸³ <https://zenodo.org/record/3478350>

(p.7). The *Data Management Plan* also specifies the measures we will take. In short, these include activities to:

- ensure that any personal data collected is protected in a safe and secure way, in full compliance with the GDPR, assuring privacy requirements and preventing improper use
- adhere to the principle of storage limitation
- identify and justify the length of time that any data is stored, and for what purposes
- store data in secure locations, in accordance with the data protection guidelines.⁸⁴

Given the complex and changing landscape around data use and privacy, EU-Citizen.Science will also work closely with two other EU-funded projects to learn from their expertise and experience. In this light, the project is co-organising a workshop with the H2020-funded Panelfit project⁸⁵ and will establish a memorandum of understanding with the H2020-funded Cos4Cloud project.⁸⁶

Further to these legal issues around data and privacy, a major ethical requirement will be inclusiveness and accessibility: in short, ensuring that the platform and its functionality do not exclude certain groups or individuals (e.g. physically or mentally disadvantaged people), or discriminate against people based on their gender, gender identity, race, religion, age, social status, etc.

Furthermore, WP8 of the project covers ethics requirements and outlines the ethical requirements that the project must comply with, which will be future deliverables of this work package.

⁸⁴ Please refer to the project's *Data Management Plan* for a fuller description of these procedures.

⁸⁵ Grant agreement 788039.

⁸⁶ Grant agreement 863463.

APPENDIX 1 - Anonymized interviews outcomes

	<p>Q: What are your expectations towards the EU-Citizen.Science platform, what would motivate you to use it, what would you like to find there (needs)?</p>
<p>P1 IT</p>	<ul style="list-style-type: none"> - The platform should provide access and support to important research about CS that we and other institutions are carrying out (i.e. become a repository for it). - The platform should take into account interoperability with what already exists (i.e. databases, other platforms, etc.). - The platform should be community-driven: the CS community defines what they need and projects decide which and what they address them. - The platform should be a Marketplace, brokered between community requests and projects offers. Matchmaking. - Policy impact: the platform could give important insights to the EC on what are blind posts, things missing in CS. - The platform should address key issues in CS we are aware of, or open up the discussion and decide with the community what are priorities to be addressed. <p>Other important elements for the platform:</p> <ul style="list-style-type: none"> - Links to SDGs + impact on policy making. - Technical management infrastructure. - Stakeholder analysis: look at already existing research. - Get together lots of CS national platform in a call, to check their expectations. - Data quality: provide standardisation at international level (follow up on COST WG activities, etc.). - Ethical issues. - Don't forget to consult libraries and librarians, they play a key role in some CS projects. Also city councils.
<p>P2 UK</p>	<ul style="list-style-type: none"> - Don't break it into categories which have similar characteristics. Don't provide more than one way to do the same task (it's frustrating for the users). - Identify the key stakeholders and how we want to break them into categories – classification of stakeholders. Think of stakeholders that belong to more than one group. - Have a good search function including an advanced search option. - Give the flexibility to the users to personalize their experience. Drag and drop, choose what you want to see based on what is your interest. - Create the information rather than making information available.



	<ul style="list-style-type: none"> - As entry point, provide no more than one interaction way or it gets confusing. <p>Suggestions on co-design process:</p> <ul style="list-style-type: none"> - Test user journeys through workshops and activities such as the following one: use a colored card game. “Imagine you are a science journalist and you are doing this and this. This is how we organize it for you, how would you do it?” This will help you come up with a pattern. For example, getting to a specific guideline, or how would you search for something. Use this activity to find the most popular patterns and start implementing them. - Will people be willing to share their protocols with us? What and how much are they willing to share? If they don’t share the protocol, ask them “how to” (through survey / interview).
<p>P3 SE</p>	<ul style="list-style-type: none"> - Build cooperations with existing or upcoming national networks (i.e. ARCS project in Sweden). - Provide a collection of projects through a federated systems that allows for countries to maintain their existing infrastructure, but also to be able to look at external resources and then put them into context nationally. - The source code of the platform should be open. Ontology: PPS hardcore metadata. Creating standards. Using Jingo or Flask or Wordpress. - Core features should be usable across all infrastructures (plus specific add-ins). Think of other open source platforms. - Training modules: take into account general elements and add modularity for the specifics of each context (leave a gap for users to be able to include specific elements). - Make already available content relevant to the local context. - Community translations, provide a system that supports it (and track changes) so that they don’t get pulled out (build an IP into it or a Wordpress plug in). So that the website remains a central point to it, by providing the right support to it. - The platform should provide information on other organizations/institutions working on CS in other countries, or leading national platforms. - The platform should provide policy documents to support work with policy makers. - The platform should provide guidelines, white papers, etc. - The platform should provide guidance on legislation linked to CS. - The platform should not provide support on recruiting participants for CS projects, as countries will be using their national platforms for that. The platform should rather focus on connecting CS practitioners in Europe. - The platform should provide an overview of research (up to date) that has been done on CS, what has worked or not worked, with a specific focus on data quality. - The platform should not necessarily be a repository for CS projects repository, this is already being done by other portals (internationally and locally).



<p>P4 IT</p>	<ul style="list-style-type: none"> - The platform should provide a methodology for citizens to check data methods and results from published research, to act as a citizen ‘watchdog’ of scientific integrity. - The platform should support easy contact between citizens and research teams: this should include notes on what researchers are looking for, to filter results. - The platform should provide journalists with contact details are essential, interviewees from a project, updates on progress. - The platform should provide an interactive map of current projects to provide an overview of what is happening across Europe, what stage they are at, the themes/subjects they are working on. - The platform should provide information on the expected impacts of projects before they start (or early on): this helps journalists to select projects to feature and give visibility to. It should also provide post-project information: actual impacts, so journalists can report on the outcomes.
<p>P5 IE</p>	<ul style="list-style-type: none"> - The platform should provide an overview of citizen science in Europe, or ideally globally. Papers, reports etc. often start with a review of the field, and a place to get statistics for that would be useful. This could be a map or similar, but ideally with filters, so that searches can be performed: “How many projects are there in a certain country that involve young people and focus on butterflies?”. This would be quicker than trawling through papers, and EU-Citizen.Science would be a credible alternative. - The platform could provide meta analysis on selected subjects, for example a collection of the leading papers - anything that saves us time is useful! This wouldn’t have to be a full repository, but the being hosted on the platform gives them credibility, like the ‘top five’ papers on citizen science. - We are often asked to give an overview of citizen science (places, websites, projects etc.). EU-Citizen.Science could play that role more effectively - i.e. go to this platform! As a one-stop shop for learning more about citizen science (e.g. definitions, explanations), it would have increased credibility, as it would be a consortium view, not just his as an individual. This should be the entry point, with layers of greater detail for people who need it.
<p>P6 DE</p>	<ul style="list-style-type: none"> - The platform should be easy and understandable. - The platform should not be overloaded but focus on quality over quantity. High quality only! - The platform should set a standard. - The platform should face the challenges of the difficult questions of Citizen Science, such as the (non)payment of citizen scientists, the power gap in CS projects, what is co-design really, or what can it achieve.



<p>P7 EE</p>	<ul style="list-style-type: none"> - The platform should provide a catalogue of existing CS projects. Along with colleagues working in CS, we are often looking for a marketplace so that researchers can find other researchers but also participants/volunteers in CS projects, as well as good quality CS projects. - The platform should provide a forum. A place where you can upload your project and people can join them. - The platform should provide explanatory resources but also a marketplace for CS projects. - The platform should provide best practice cases: in concrete, how things are managed, tools used, how communication is done, analytics. - The platform should take into account language issues. English is ok for resources to researchers, but they would need to be translated to be used by local citizens. In countries where CS is not strong yet, it would be important to have the portal in their own language, especially if we want to support grassroots projects. - Bio-blitzes are something that is spreading a lot in several countries, although there is very little information available about them. The platform should provide and share information and training modules about Bio-blitzes, but also how to get in touch with people working on similar things. - It should have a very wide and well working comprehensive engine search on CS, as right now I do a lot of work to collect and provide information to people/colleagues on CS, Bio-blitzes, etc. Scistarter is good but too much centered on the USA, there is too little on Europe. Some functionalities could be copied from there, but we should make it much more European. - The core objective of the platform should be: "Find all possible information on CS."
<p>P8 UK</p>	<ul style="list-style-type: none"> - Centralization of knowledge. It will be a very central platform, there is already a lot of info about CS out there and the platform should be collecting and summarizing it. The one place for CS. - The platform should provide learning materials. Examples and best practices, learning materials that tell you "how to ...", to be effective. - The platform should have a forum there, that would replace google. People would not be asking to google any more, but to peers. This is what I would personally use the most in the platform. - It should be interactive but also very easy to use.
<p>P9 FR</p>	<ul style="list-style-type: none"> - The platform should provide a contacts database, and present CS projects and initiatives all over the world. We don't know the contacts, we would benefit from a discussion space, forum, where we could ask questions and share views. - The platform should have an interdisciplinary approach, find a common language in a way that a project in archeology or biodiversity can share resources and expertise. It should have for example a thesaurus making programmes used in certain countries being easily usable in other countries, to overcome linguistic



	<p>fronteers. A “CS dictionary”. Allowing a collaboration via translation over similar tools.</p> <ul style="list-style-type: none"> - The platform should support sharing volunteers between projects. So that each project doesn’t have to start from scratch (create a community of participants/volunteers). - The platform should support lobbying/promotion of CS towards policy makers, funding institutions, etc. in support of CS.
<p>P10 BE</p>	<ul style="list-style-type: none"> - The platform should be the first place to go for citizen science. There are others (e.g. Sciencetech (?) for teachers) but it needs to create a reputation for being the best place to go. - The platform should provide starter guides for those starting a project. There are so many resources out there, so this needs to be curated into a toolkit, examples etc. - A platform tailored to different stakeholders would be useful. For example, if the platform asks who you are, it would provide you the most useful resources for your background, rather than having to wade through everything on the site. It could be addressed to very different people (e.g. a citizen - what is citizen science?, a researcher - what are the best data collection apps?). It might also be useful for people to have the platform tailored according to their level of experience (i.e. beginner to expert). - For CS practitioners, it would be good to have ideas and inspiration in their field. For example, if I am starting a project on biodiversity (specifically birds or insects) then I want to know what is happening out there, for inspiration, best practice, case studies etc. - A definition of citizen science. This will be essential for beginners who aren’t familiar with the concept.
<p>P11 LT</p>	<ul style="list-style-type: none"> - The platform should support CS in countries such as Lithuania where CS is very little used, through explanations of what CS is and why it is beneficial, examples of projects from other countries using it. Help us make people understand why CS is needed and why it is beneficial. - The platform should provide guidelines for public policy makers, to support us getting CS into official documents, policies and guidelines. - The platform should provide guidelines on how to introduce this concept to scientists, as in several countries they are still not open to CS. How to talk to them, or for them to talk to their management, get funding, etc? - The platform should provide a list of apps that can be used in CS projects (that scientists can use, adapting to their needs).



	<ul style="list-style-type: none"> - The platform should be a place to share experiences on what works in projects, so that you don't have to create everything yourself.
P12 PT	<ul style="list-style-type: none"> - Although databases for CS sometimes already exist at country level (repositories with categories) the platform should also host CS projects but by focusing on highlighting impactful projects in CS. I would like for the platform to be providing filtering as if it was a reviewing process, so that users can find there good practices, but also what do we mean by good practices, by impact etc. A good framework definition, which are relevant criteria etc. - The platform target groups could be defined by what they are looking for, i.e. groups of people that look for good examples based on impacts. For example, I have been searching for projects focused on measuring water quality. And I would like to know which projects have had an impact in terms of public policy, or which projects have managed to engage schools in an efficient way, etc? - The platform should provide statistics at EU level for CS, i.e. number of projects, who is involved, etc. and infographics. - The platform should provide information about funding, networking etc. especially for specific groups, specific best practices, etc.
P13 ES	<ul style="list-style-type: none"> - Interoperability: if I create a project profile on the platform, it would be good if this could be easily shared with other platforms, such as SciStarter, ACSA, etc. with a simple click, so I don't have to create it lots of times. There should also be a way to exchange between projects (data, tools, etc). - The platform should have several communities, such as stakeholders (citizens) and also around shared communities of interest. For example, if I am working on butterflies: who else in Europe is working on this? - There needs to be a way to match people to projects, and different ways to offer information to them. - In my project profile, I should be able to follow people, projects etc. and get updates. - The platform should provide a map that shows what is going on where, in terms of CS, all over Europe. - Compared to big platforms such as LinkedIn or ResearchGate, EU-Citizen.Science will focus on a smaller community, specific fora, where everyone will be focused on citizen science. But there are many social networks out there: it needs to be competitive: I need to be able to upload a profile easily, or I will go elsewhere. If the latest tech isn't up there, I'll go elsewhere. It cannot be static; people want to engage, so forums must be active, up to date, the site must have the latest news and developments.
P14 BE	<ul style="list-style-type: none"> - The platform should provide the possibility to search CS projects and activities in CS by theme, i.e. air, pollution, urbanization, etc. It should also allow to search



	<p>them by the type of impact in society that they have, at local national and international levels.</p> <ul style="list-style-type: none"> - The platform should provide information on policies supporting CS, countries with policy makers involved, supporting stakeholders etc. It should provide an overview of existing regional and national networks. - The platform should provide resources such as a methodology to obtain good outputs and results in CS activities; explanations on topic-specific jargon (a CS glossary - hackathon, bio-blitzes, etc.), as to create a common understanding of the topic; a library, linking to major books and documents, a calendar of CS events. - The platform should have a very good search tool. - The platform should provide information on funding opportunities and contacts. - The platform should provide a way to collect concerns amongst the citizens, understand how we can help, and how people can reach us so that we can help them answer their questions. The Platform should be the place where concerns from citizens express, and we (CS community) help to provide answers. A meeting point. Not sure how: maybe through a list of concerns, cities sharing the same issues, etc. It could also be a place where scientists express their research questions and citizens help to answer. Two-way communication, the platform is where it takes place. - The platform should also support scientists on how to train citizens/volunteers when starting CS projects.
<p>P15 NL</p>	<ul style="list-style-type: none"> - The platform should provide something like the Guide to Citizen Science in a digital way, as web tool, covering all stages of project duration: creating a team, finding funding, technical aspects, communication and dissemination, data usage etc. These guidelines should be understood as a living document, regularly being updated and containing links to examples or helping webpages (github e.g.) - In the platform, this more or less “static” informative sector should be combined with a more dynamic Forum for exchanging and interaction, e.g. the section of “data usage” should be linked to a forum about “data usage” - easier to update, to discuss etc.
<p>P16 AT</p>	<ul style="list-style-type: none"> - I expect to have a large number of EU CS projects. Find examples. Have an overview of EU CS projects. - I expect the platform to provide literature, materials, access to resources, as well as info on calls, events, etc. - The platform should also provide an overview of what is going on in EU countries for CS, contacts, who are the focal points in each EU country. - The platform should support searching by impact of CS projects, as well as searching by discipline. - The platform should match needs to offer. For example, in our institution we have the tools to offer, but people don't know we exist so they don't know about them.



	<ul style="list-style-type: none"> - The platform should give citizen scientists more visibility, more voice: i.e. personal stories of people who participate in CS projects. Support the citizens perspective.
P17 LT	<ul style="list-style-type: none"> - The platform should provide contents for different types of stakeholders, organised differently for each stakeholder type. Some content might be for everyone, of course, such as best practice examples. - The platform should provide a mapping of citizen science projects: a database of projects, past and present, a bit like Zooniverse. Having everything in one place will make collaboration easier. - The platform should tell stories. Databases can be boring, but stories told by different stakeholders (their journey in citizen science) are more interesting. These would be personal experiences of citizen science, and contact details to follow up. - The platform should be a useful database for researchers: it should contain information on funding calls, open access literature, books etc. - The platform should provide a list of events, plus reports (of past events). - In my views, future users will visit the platform to see what's going on in citizen science, find out what is happening and which projects are going on. But the platform needs to be a "living organism" that is always being updated. - Spaces to contribute are also a motivation, but there needs to be a person to encourage this (i.e. working for the platform).
P18 UK	<ul style="list-style-type: none"> - One of the core issues that the platform should address is how to deal with Data Protection, Data Usage in general and Data Management. For example, it should provide a factsheet on this topic, which can be applied to different projects. - In general terms, the platform should join forces with what is already being done, ongoing initiatives, etc. - Users would visit the platform mostly to exchange with other colleagues and people being engaged in CS, and finding answers to questions you normally have in mind when you want to start a CS project. - The platform must be lively and animated, somehow attractive and interactive, playing with different formats (video, text, forum etc.).
P19 IT	<ul style="list-style-type: none"> - The platform should deal with the issue of languages: it should be multilingual, especially if we want citizens to be able to use it. This would be very useful in particular in countries where there are no national platforms for citizen science (although there are countries like the UK where they have CS highly developed but no centralized platform). - The platform should have separate entry points, depending on whether you are a: professional (with experience in CS), amateur (little or no experience in CS) and citizen scientist (looking for answers on CS). - The platform should support the creation of EU-wide projects. It should provide a catalogue of institutions / individuals and what CS they do (such as a list of projects, possibly by topic).



	<ul style="list-style-type: none"> - The platform should provide a lot of visibility to individual CS projects. - It should support matchmaking and facilitate contacts.
P20 HU	<ul style="list-style-type: none"> - I would like for the platform to be a sort of toolbox repository, a database, a list of good projects and initiatives where I can easily find resources on a specific topic, etc. - On the homepage, it should have a visible list of “top 5” CS projects, especially for EU projects. - The platform should link with already existing resources, take over what good already exists (i.e. DITOs). - Focus on usability: the simpler, the better. - Have a long-term view, provide something which can be extended beyond the duration of the project. - Make a selection, out of all the resources available, have a ranking of the best ones, or a curated list of resources. Something like a resources assessment. - The platform should provide a CS definition that should be something open and flexible.
P21 AT	<ul style="list-style-type: none"> - The platform should provide short and easily understandable online resources. I.e. most of the resources (i.e. papers) are difficult to use for users who are not from academia. My suggestion is not to use complex language. - The platform should provide information on what’s new about citizen science - for example through a monthly call for news to be included in a newsletter. Getting the feeling of what is important for CS. - It should collaborate with already existing platforms for citizen science, promote their work, help them connect with research teams, etc. (visibility, promotion). - It should provide direct communication channels, like a forum (an evolution of the ECSA mailing list). Something simple. Communication with other stakeholders is key to the platform, support networking, collaboration - It should provide a search engine at European level for setting up EU projects, but also searching for project managers, projects, etc. - To start with, the platform should have a team to initiate the community channels. Someone who posts every day there. Otherwise communities don’t kick-off. - The platform should aim at highest compatibility for API: not only wordpress but also Drupal and Joomla. - The platform should not include google analytics plugins, google maps plugins, facebook plugins, etc. Don’t give away data for free, respect the users. No user tracking all across the platform.
P22 ES	<ul style="list-style-type: none"> - The platform should provide overarching methodologies and tools which are applicable to citizen science projects. A lot of the methodologies that already exist could fit most of the needs and issues of all projects on a specific topic. The platform should address the need of broadening existing methodologies to a wider



	<p>usage and approach.</p> <ul style="list-style-type: none"> - The platform should not provide a mapping of projects, as there is no added value in having a map of projects, categorized by geographical spread. - The platform should provide guidelines or information about how to manage citizen science projects. It should not just provide simple profiles of other projects, but rather specific information about the implementation of projects - in other words, really how to research and work with citizen science. - The platform should address the issue of how to handle data management in citizen science projects. - A database to be used as source of inspiration (“not perfect, but usable”) is RRI Tools: https://www.rri-tools.eu/ - The vision for the platform should be that of becoming a permanent place for citizen science in Europe.
<p>P23 ES</p>	<ul style="list-style-type: none"> - The platform should be complete and dynamic. Not just a repository of documents, but it should also allow interaction (i.e. policy makers to citizens). - The platform should provide an “experts directory”, in order to support mentoring. I.e. who can help me in developing a CS project? - The platform should provide information that helps researchers, citizens and policy makers to understand what CS is and how it is being done. - The platform should provide a catalogue of resources and services and best practices, information, how to set up a project, software, hardware, etc. - A catalogue of which kind of institutions do CS, especially at local level (even in a neighborhood, locally). - The platform should be connected to social networks. Meeting point for people with different interests. - The platform should provide strong communication tools, it is very important in CS, and it should allow to understand the objectives of CS, not just describe it, it should also provide information on impacts and outcomes. - The platform should explain the research process in CS. - The platform should have a specific section on education and how educators can involve citizens in CS projects. They see it as a great way to do science, but they lack information to introduce CS in the school. - The platform should motivate you to get involved in CS, and give you the feeling that you can get involved, and how. It must be attractive, involving, support recognition for getting involved in CS. - It should be very dynamic and participatory.
<p>P24 IL</p>	<ul style="list-style-type: none"> - Overall, it should include anything that facilitates collaboration. In an ideal world, it should host all CS datasets. - There should be datasets on the platform. Some CS data is not published (except in papers), and people often look for data from projects. The data should be cleaned, treated and downloadable, and the owners acknowledged. A lack of data



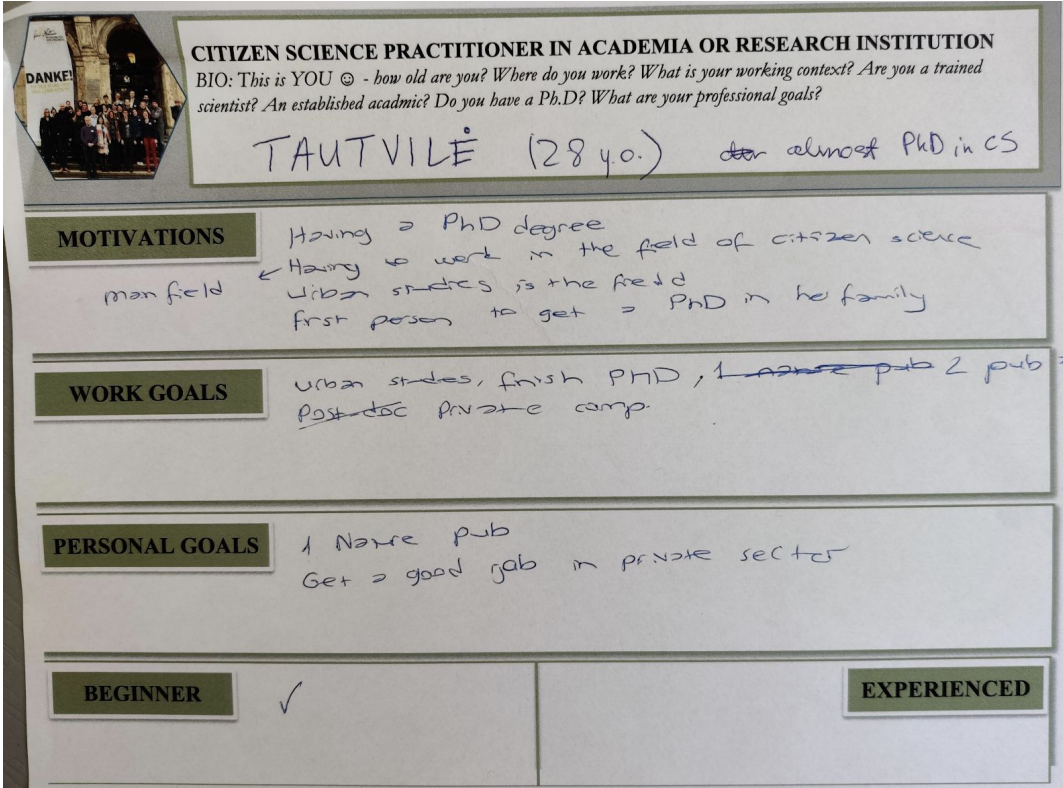
	<p>availability slows progress down (e.g. towards conservation efforts). Even old data (i.e. +10 years) could be added.</p> <ul style="list-style-type: none">- The platform should provide project synopses. We reinvent the wheel too often. It would be useful to know what is being done. For example, if I am planning a project on millipedes: what has been done already? What is being done now? Such insights would be useful, but need to be easy to find: the platform should have search terms or categories (e.g. Nature/Insects/millipedes). Project contacts also needed.- The platform should provide opportunities. A forum for projects looking for support, or ways to collaborate across regions/countries/cities.- The platform should provide policy perspectives. What do policymakers want/need? For example, if my project is collecting data on birds - how can this help policy? Often PMs don't look at projects, but also don't want to be seen as telling projects what to do. This could be: "We need data about... can CS help us?" This could also be part of the forum.- The platform should provide a code of conduct for CS. What is CS? What is good CS?- The platform should support the dissemination of outcomes. There should be advice on how to share project results and lessons. The platform could also do this, sharing some outcomes and linking to the full results.- The platform should have a specific area for reporters (journalists). In our country, for example, there is a 'newsagent' for conservation which shares project results. The platform needs an area for reporters to find project results, findings, outcomes. Journalists need to be "first" to a story, though, so there should be a project synopsis that they can follow up on if interested (and quickly).- The platform should help in designing data collection. Some open source tools for methods would be useful. Businesses that create these could also market them on the platform.- On the platform, it should be easy to upload data and publish it, so it is easy for journalists to find, as well as policymakers. If the platform helps with dissemination, this will motivate people to share their data. If not all data can be uploaded, then a sample with a link to the full database.- "If the vast majority of projects are on there, I'll use it!". The platform should make you save time in searching for CS projects. Knowing that you can find data on there is also necessary and comprehensiveness (of project data) will motivate people to upload their own data.
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APPENDIX 2 - Consortium Persona Development Workshop Outputs

The first periodic meeting of the EU-Citizen.Science consortium took place in Vilnius in September 2019, providing an excellent opportunity to engage a representative group of CS practitioners in the development of personas, value propositions and customer journeys for the Platform. The methodological approach of these workshops is described in Section 2.1 above. Here we share the work produced by the consortium team members during these workshops.

Academic / Research Practitioner - Tautvile

Tautvile Persona Description



CITIZEN SCIENCE PRACTITIONER IN ACADEMIA OR RESEARCH INSTITUTION
 BIO: This is YOU © - how old are you? Where do you work? What is your working context? Are you a trained scientist? An established academic? Do you have a Ph.D? What are your professional goals?

TAUTVILĖ (28 y.o.) ~~don~~ almost PhD in CS

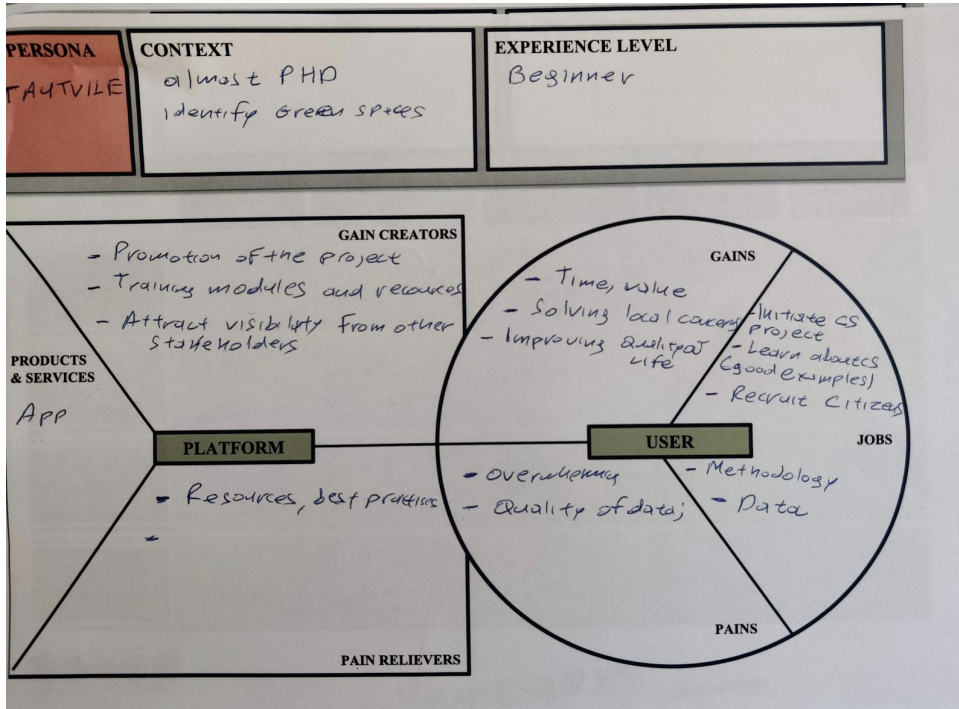
MOTIVATIONS
 Having a PhD degree
 ← Having to work in the field of citizen science
 urban studies is the field
 first person to get a PhD in her family

WORK GOALS
 urban studies, finish PhD, 1 ~~paper~~ pub 2 pub =
 post-doc private comp.

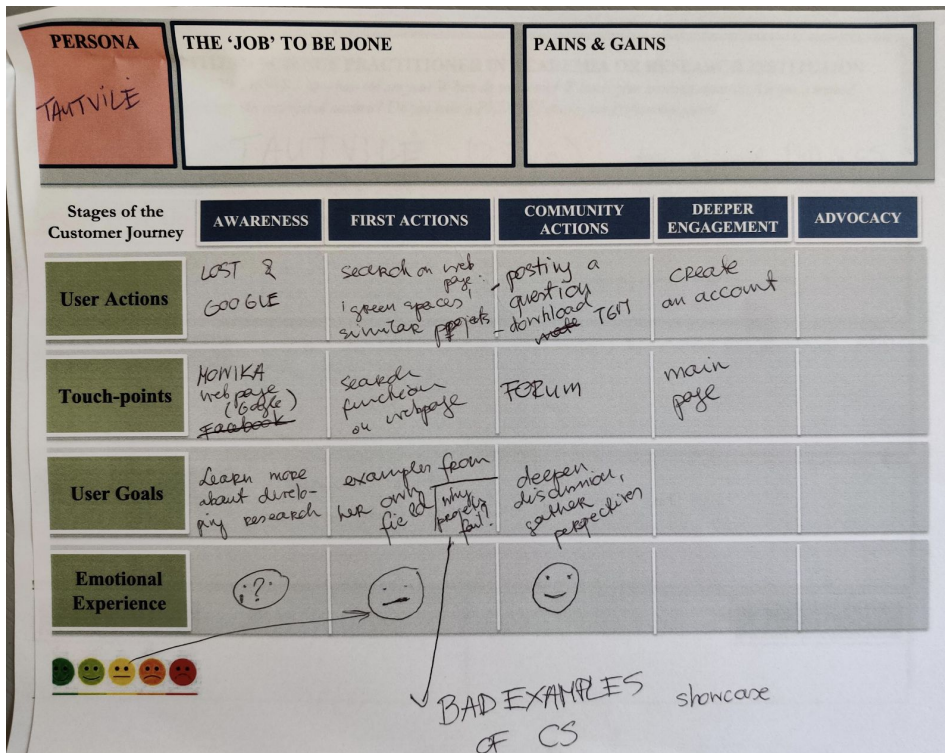
PERSONAL GOALS
 1 Nature pub
 Get a good job in private sector

BEGINNER ✓ **EXPERIENCED**

Tautvile Value Proposition



Tautville User Journey





Educator Practitioner - Biology Teacher

Biology Teacher Persona Description

CITIZEN SCIENCE PRACTITIONER IN EDUCATION
 BIO: How old are you? Where do you work? What is your working context? Are you a trained scientist? What age group do you teach? What level do you teach?? What are your professional goals?
 School teacher : age 55 : local village school teaching
 biology : secondary level : Age 11-14

MOTIVATIONS ~~learn by doing~~ Innovation in teaching, heard of CS and want to use it themselves, personal interest in a project or subject.

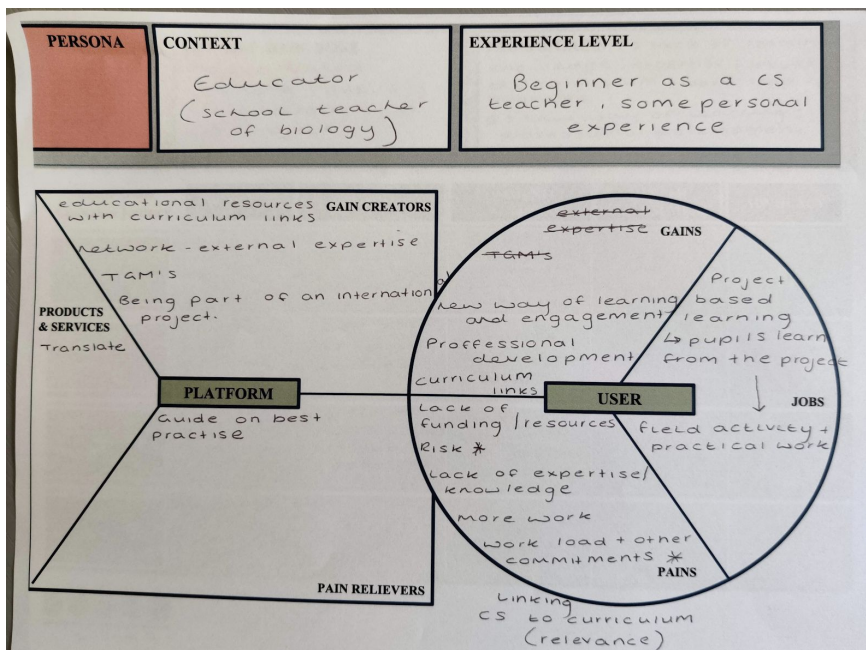
WORK GOALS Learn by doing - use CS to teach scientific methods

PERSONAL GOALS Transmit a personal interest e.g. nature
 improve on / engage with local interest
 progression in career

BEGINNER

EXPERIENCED

Biology Teacher Value Proposition



Biology Teacher User Journey

PERSONA	THE 'JOB' TO BE DONE		PAINS & GAINS		
Educator - biology teacher	Project based learning - pupils learn through a CS project		P: lack of resource, knowledge, expertise; links to the curriculum; work load + priorities G: new way of learning; professional development		
Stages of the Customer Journey	AWARENESS	FIRST ACTIONS	COMMUNITY ACTIONS	DEEPER ENGAGEMENT	ADVOCACY
User Actions	Google	• Browse • Translate? • look for the appropriate heading.	• Forums • social media interaction		
Touch-points	click the link Education Portal	click the appropriate heading	Forum #		
User Goals	explore possibility/feasibility	explore the choice within this sub-section	Engage with community and refine research		
Emotional Experience	Inquisitive 3	2	2		

1 2 3 4 5

Citizen Scientist / DIY Practitioner - Student Student Persona Description

CITIZEN SCIENTIST / DIY PRACTITIONER IN 'THE PUBLIC'
 BIO: How old are you? Where do you work? What is your working context? Are you a trained scientist? An established academic? Are you a volunteer? What are your professional goals?

Student, Female, 23, social sciences, wants to be a social ecologist volunteer

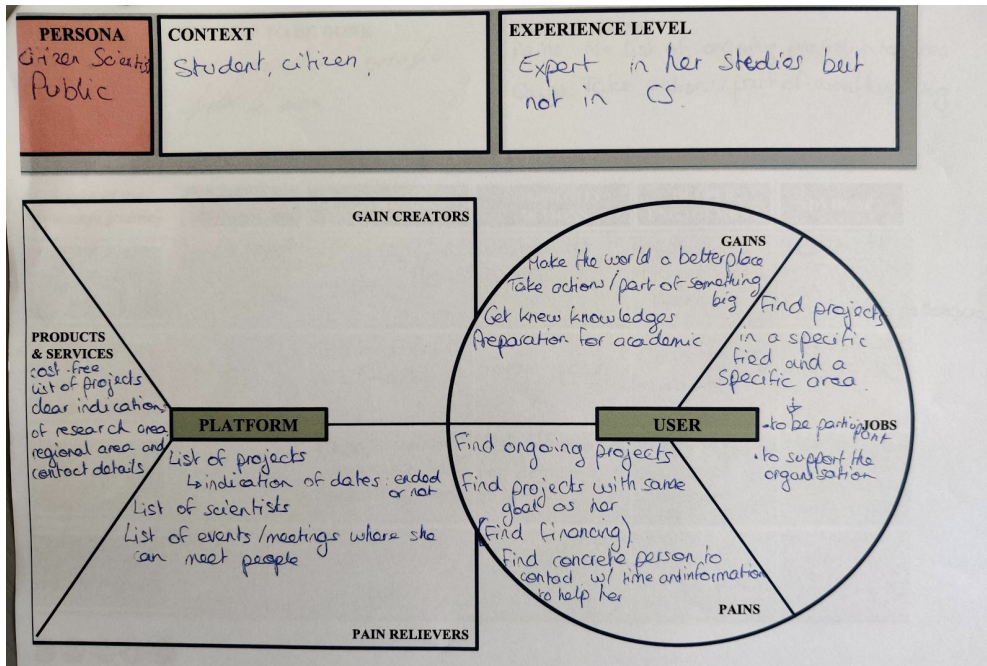
MOTIVATIONS
 Make the world a better place
 Take actions / part of something big
 Get new knowledges
 Preparation for academic

WORK GOALS
 Preparation for academic
 Being a part of the CS community.

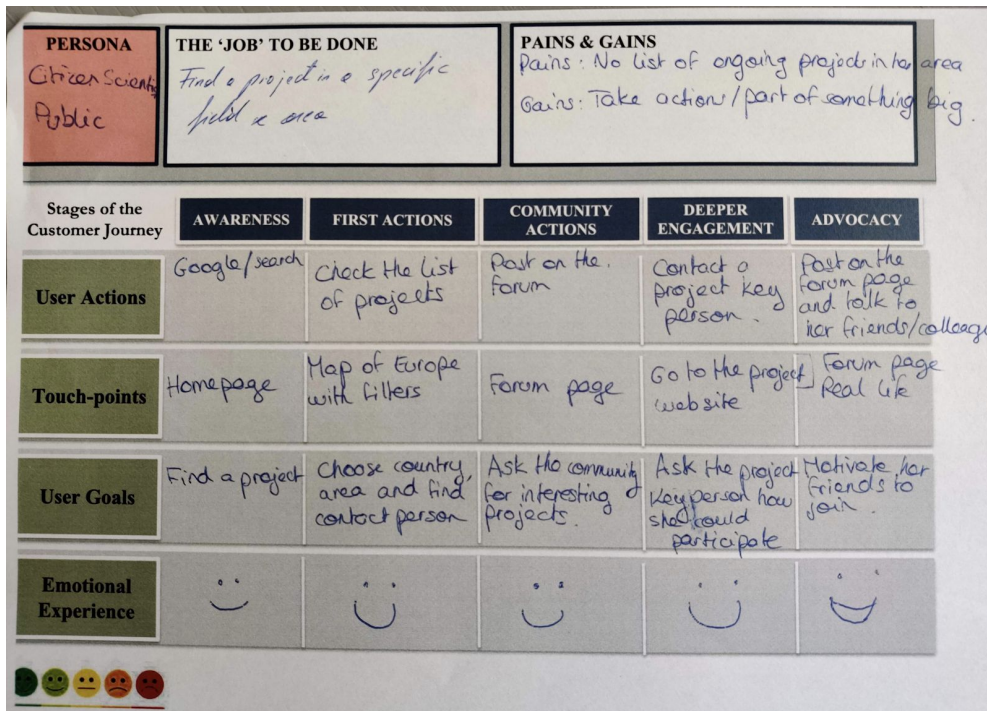
PERSONAL GOALS

BEGINNER **EXPERIENCED**

Student Value Proposition




Student User Journey



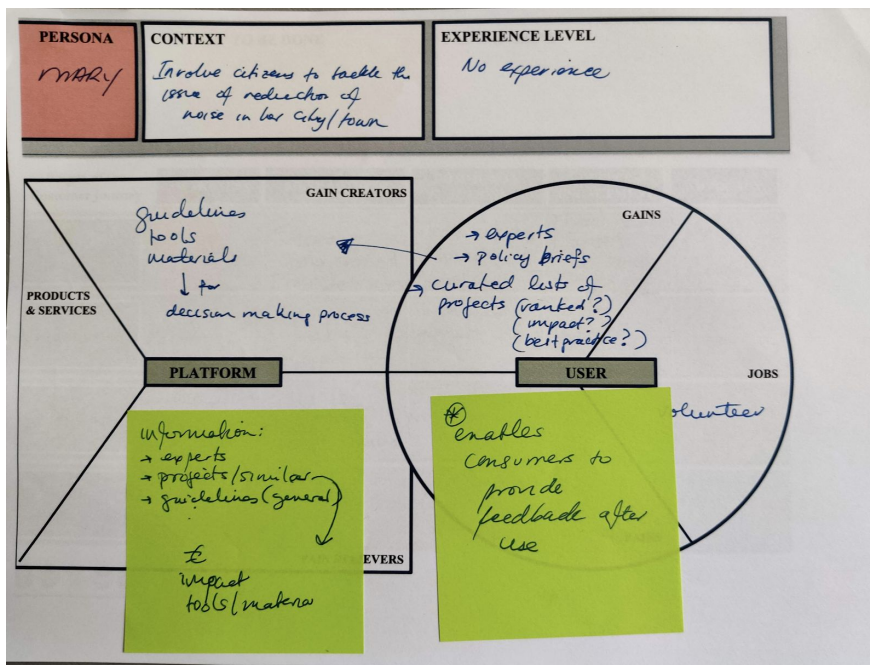
Decision Maker - Mary

Mary Persona Description



	<p>DECISION MAKER <i>MARY</i></p> <p>BIO: How old are you? Where do you work? What is your working context? Are you a trained scientist? What CS information is interesting for you? What kind of decisions do you make? What data do you need professionally? What are your concerns about the data? <i>Local administration, 43 yrs, No science background</i></p>
MOTIVATIONS	<p>→ she wants to better understand what CS is about because she wants/thinking about approaching CS.</p> <p>→ How CS can be helpful to <u>make</u> decisions?</p> <p>→</p>
WORK GOALS	<p>→ Very noisy local town</p> <p>→ Problems arise and decisions needs to made</p> <p>→ citizen involvement to increase awareness</p>
PERSONAL GOALS	<p>→ major next elections</p> <p>→ sustainable environment local community</p>
CURIOS	<p>→ Read</p> <p>→ biologist vocation</p> <p>data driven decision making</p>
	<p>NO</p>
	CS USER

Mary Value Proposition





Mary User Journey

PERSONA	THE 'JOB' TO BE DONE		PAINS & GAINS		
MARY					
Stages of the Customer Journey	AWARENESS	FIRST ACTIONS	COMMUNITY ACTIONS	DEEPER ENGAGEMENT	ADVOCACY
User Actions	Google	Search wrote "noise" Filter "decision maker" "noise" community	Need what's happening in "noise" community	Find resources Engage the team Feedback to the platform	Quality Successful
Touch-points	None	Very friendly interface	To technical answers.	to be approved by local administration	
User Goals	Involve citizens tackle noise issue.	Find the right information	Find the proper help.	/ /	
Emotional Experience					

Press & Media - Journalist

Journalist Persona Description

PRESS & MEDIA
BIO: How old are you? Where do you work? What is your working context? Are you a trained scientist? What CS information is interesting for you? What is your medium? What kind of reporting or writing do you do? What CS stories are interesting for you?
Journalist - science articles where possible. Stressed for a local audience, mostly not expert.

MOTIVATIONS

WORK GOALS

Images
media
clips

Overview of Community + facts to cite and a project progress story
- # of posts
- # of posts

Newspaper reporter

Scientist w contradictory opinion to put in the end paragraph
Venchy of voices eg Pl of project + some phlogenic hid enjoying it deal context or interesting find
Journalist will want a quick fix for getting a feel for the project w/out spending too much time. Need a good long tutorial!
Frustrations of journalist: what might they be looking for in media to EUCS?

Need!
- Contact point @ project for press
- Network the community
- Image, media (video)
- Shippers of info
- Goals of the project
- Press release

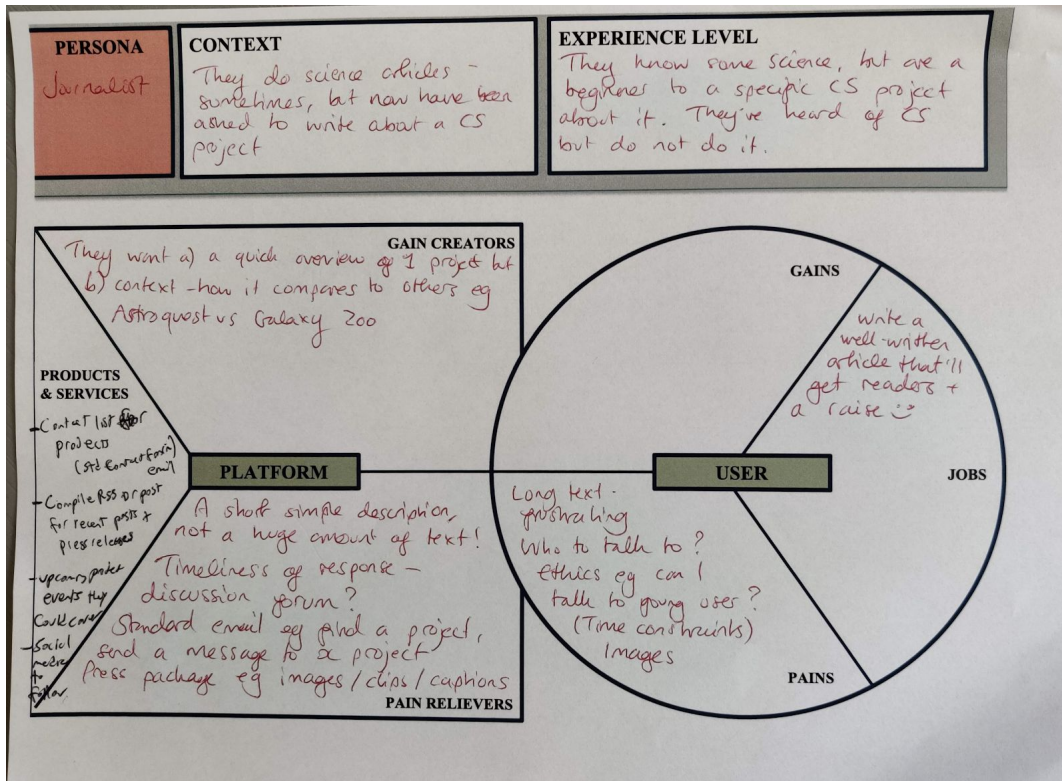
Follow News coverage of citizen science
social media (who to follow)

Find projects near to them

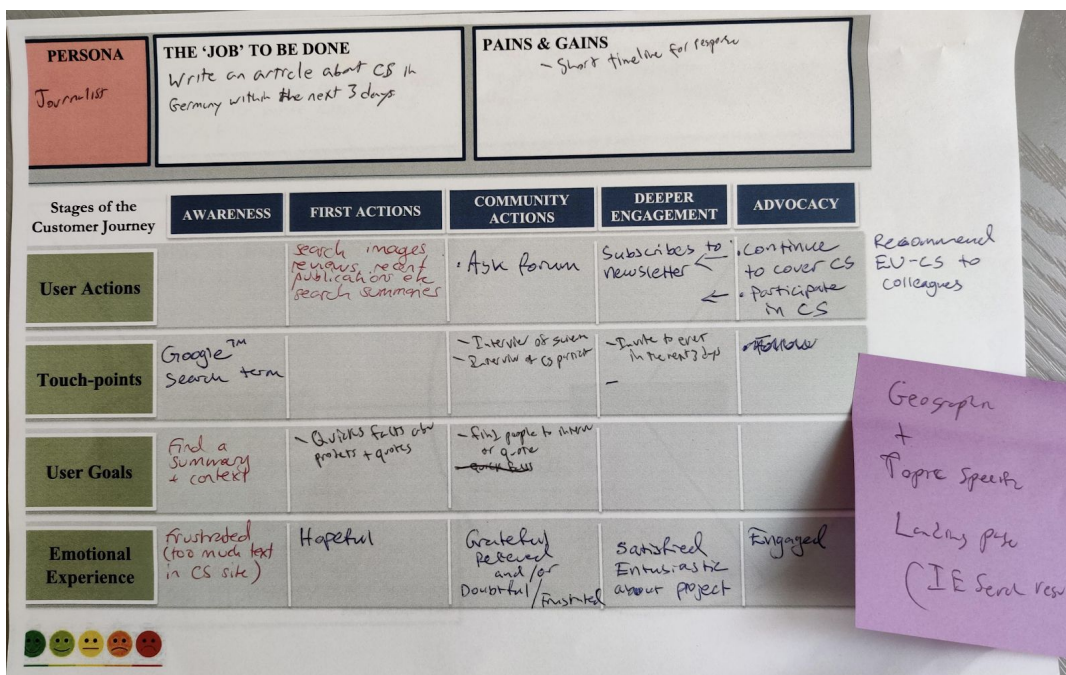
Find people the voices to interview and tell the story



Journalist Value Proposition



Journalist User Journey



APPENDIX 3 - COST Action WG2 Workshop in Brussels, 1-2 April 2019

The workshop entitled *‘Building a community network for educators, teachers, Citizen Science practitioners and researchers on synergies between Citizen Science and Education’*⁸⁷ was organised and run by members of the Citizen Science COST Action CA15212 Working Group 2 ‘Education’, in collaboration with ECSA and other project partners. The main goal of the workshop was to effectively and sustainably connect the diverse stakeholders in the field of Citizen Science and Education by contributing to the development of:

- a) a platform that enables us to easily share existing resources and to collaborate openly on creating new ones, and
- b) a communication strategy that is tailored to the stakeholders’ needs.

*“With a growing number of key players, the risks of duplications, competition and fragmentation increases. To avoid this, we decided to join forces and use this workshop to explore the needs of the community and develop a vision that would feed into the development of the new platform EU-Citizen.Science as well as a concrete communication strategy to collaborate and reach out to further stakeholders until the platform is established.”*⁸⁸

Participants at the workshop came from nine different countries and represented teachers, educators, scientists, citizen science researchers, national hubs, the Citizen Science COST Action, the European Citizen Science Association, and EU-Citizen.Science.

In the first session, participants shared, clustered and discussed the ideas they had pre-prepared regarding what makes a lively community of practice in the field of citizen science and Education.

⁸⁷ <https://cs-eu.net/news/workshop-report-wg-2-building-community-network-educators-teachers-citizen-science>

⁸⁸ Lorke, Julia. Thursday, June 27th, 2019. ‘Workshop Report WG 2: Building a community network for educators, teachers, Citizen Science practitioners and researchers on synergies between Citizen Science and Education’ <https://www.cs-eu.net/news/workshop-report-wg-2-building-community-network-educators-teachers-citizen-science>

Figure: The CS COST Action WG2 Workshop



During the second session, participants looked at the profiles of potential platform users, in keeping with the [Personas and Pathways](#) approach taken from the Mozilla Open Leadership Training Series. The four key personas that the group chose to focus on were 1) Teachers, 2) Science educators / Scientists, 3) CS participants, and 4) Informal educators. The group then discussed the characteristics of each identified persona, the expected pathway into the network, some of the key barriers to engagement, and possible solutions.

At the end of this second session, time was taken to identify actors who were not represented by the personas selected, and their relation to the proposed citizen science community network. These were, determined by category:

- Higher Education
 - Public engagement departments
 - University professionals
 - Degree programmes
 - Initial teacher education
- Teacher Leadership
 - Head of Department
 - Headteachers
 - Local Authority
- Other Education
 - Parent associations



eu-citizen.science

- Home school networks
- Museum educators
- Programme/project managers within organisations
 - Government organisations (National Parks, Forestry etc)
 - Civic organisations (libraries, community hubs)
 - Non-profit/NGOs
- Media
 - Mainstream journalism
 - Social media influencers
- Policy Makers
 - Educational policy makers
 - Environmental/planning policy makers
- Trade Unions
- Wider community members
 - Retired/elderly people (often have time/money or come with young people)
 - Young people directly (not through formal/informal learning mechanisms)⁸⁹.

⁸⁹ Lorke 2019

APPENDIX 4 - Joint Workshop with COST Action WG4 in Brussels, 10-11 April 2019

The workshop entitled ‘Co-creating the European citizen science platform of the future’ was organised by ECSA in co-operation with the Museum fur Naturkunde (MfN) and the members of the Citizen Science COST Action CA15212 Working Group 4 ‘Enhance the role of CS for civil society’. It had the dual aim of actively contributing to the collaborative development of the Platform, and identifying potential collaborations between the ongoing COST Action and the Platform, throughout its development. The 18 participants from 11 countries in attendance were invited to share their expectations for the platform, and to contribute their expertise by identifying potential features and functionalities.

Following an exercise to allow participants to get to know each other, the opening session explained the EU-Citizen.Science platform to ensure that all participants had a good understanding of the platform and its aims. The next session was a collaborative exploration of the challenges of mainstreaming citizen science, such as:

- Raising awareness about CS
- Making CS part of more scientific activities
- Increasing participation among the public
- Ensuring scientists plan for citizens’ involvement as a central part of research

The participants discussed and debated these; there was broad agreement that it can and does mean all of these things. Following this, the participants were asked: what is the biggest challenge you face when mainstreaming citizen science? They wrote one sentence on a card in response and then ranked these through a game called ‘35’. During five rounds of scoring, participants paired up to assign seven points across the cards, sharing them according to the issue that was seen as most relevant. These scores were tallied to give each challenge a mark out of 35; these are shown in Table 6 below.

Table: Ranking of challenges to mainstreaming citizen science

Challenge	Score
Ignorance on policy level that leads to low awareness of the issue among people	22
Find places/opportunities to explain citizen science to “people not used to science” (minorities)	22
A lot of people are already doing citizen science, but they don’t call it ‘citizen science’, so it is hard to find them and connect with them	21



The biggest challenge is to find a (structured) way to include different citizen science initiatives so that many practitioners & newcomers in the field realize that they are to some extent part of the same group. The need to define citizen science can, therefore, come up.	21
Effort ≠ Outcome: comparing effort to outcome - one of the biggest challenges is to make the outcome more attractive - why should scientists make the effort to join citizens? (Researchers' perspective)	20
Limited number of people (intermediaries / influencers) that can translate the need for citizen science to the general public	19
Increasing diversity of participants, reaching under-represented communities	19
Convince people that the task is useful and meaningful	19
(Local) governments, in general, don't know / understand what citizen science is and are not aware that citizens can contribute to tackling societal challenges	18
Raising awareness of the fact that citizen science can be a powerful tool to improve quality of life/ communities/ etc → concrete impacts, not just one more fun activity	18
To not disappoint participants on citizen science outputs and outcomes	17
Lack of funds	17
Convince citizens about the importance of science	16
Funding: the current funding system doesn't make it attractive for scientists to do citizen science	15
Time: people's lives are busy, there are already too many competing interests / activities / distractions	15
Engage all partners involved, all the way	13
Time-consuming (resource intensive!) e.g. local governments	13
Making people understand citizen science as different forms, structures and outcomes	10

In the second collaborative activity, participants were invited to think about possible users of the EU-Citizen.Science platform: their profile and their motivations for engaging with the platform. Each group of four created a profile for an imaginary platform user, as shown in Figure 12 below, defining who she/he is and listing motivations and barriers to using the future EU-Citizen.Science platform. Table 7 summarizes the profiles created.

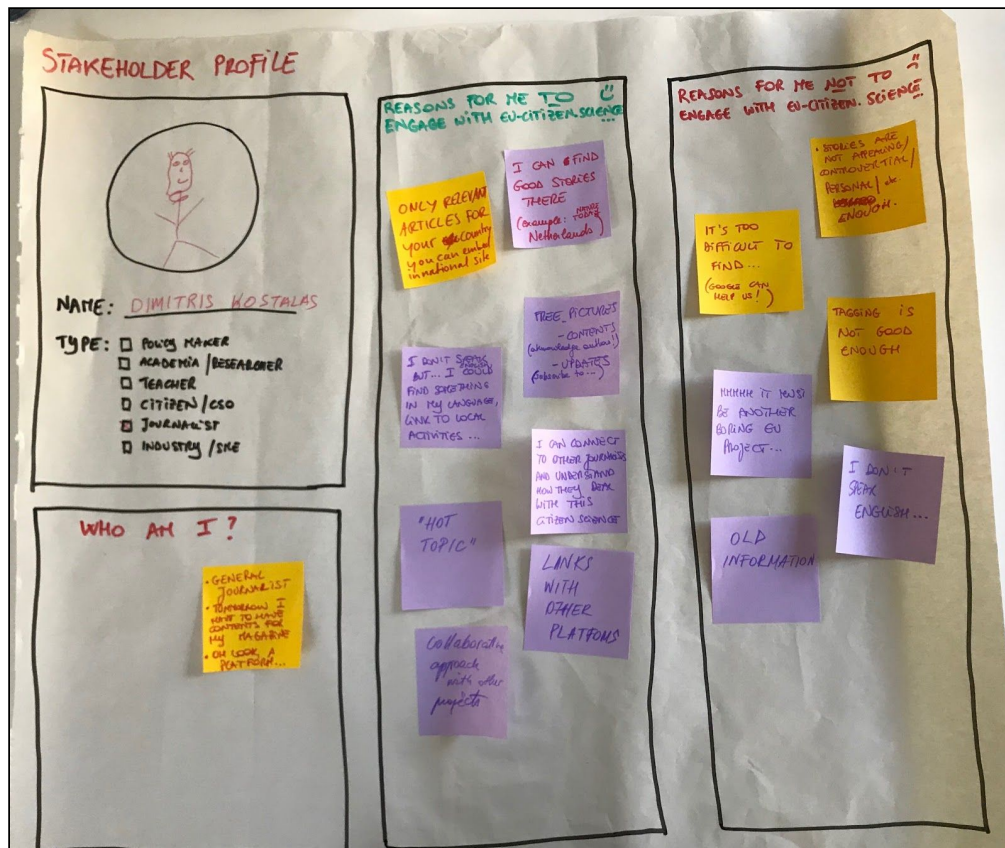
Table: User profiles for EU-Citizen.Science



Who am I?	Reasons for me to engage with EU-Citizen.Science	Reasons for me not to engage with EU-Citizen.Science
<p>Dimitris Kostalas, a journalist “Tomorrow I need to have contents for my magazine. Oh look, a platform ...”</p>	<ul style="list-style-type: none"> -Relevant articles for my country that I can embed into a national site -I can find good stories there (example: Nature Today, Netherlands) -I don't speak English but I can find something in my language, link to local activities -Free pictures, contents (acknowledge authors!), updates (subscribe to...) -I can connect to other journalists and understand how they deal with this citizen science -‘Hot topics’ -Links to other platforms -Collaborative approach with other projects 	<ul style="list-style-type: none"> -Stories are not appealing / controversial / personal / enough -It's too difficult to find (Google can help us!) -Tagging is not good enough -It will be another boring EU project -I don't speak English ‘Old’ information
<p>Kristina, a biology teacher to 12-13 years old in Belgium “I found a way to make my pupils more active in my class by installing nest boxes in the school's playground to observe the nesting process through a camera. I managed to engage other teachers in this project. The kids are very keen on participating in this and they are actively engaged in it.”</p>	<ul style="list-style-type: none"> -To get tools, guidelines and materials (TGMs) and develop / innovate my project -To connect with other teachers and their citizen science initiatives -Make the biology class more interesting for both teachers and pupils -To promote my project and its results -Add value to my own professional career -Increase the school's visibility 	<ul style="list-style-type: none"> -Too much additional effort and time used for this -Doesn't know / ignores the existence of the EU-Citizen.Science platform -Not allowed by the school's director → permission issue -Lack of support from the other teachers → afraid of involvement
<p>A PhD student looking for arguments to convince her / his boss to do citizen science</p>	<ul style="list-style-type: none"> -Not publishable -Data quality (improve) -Examples/success stories -Networking -Personal stories -Photos, not only text -Show ways how to engage public (H2020 calls) 	<ul style="list-style-type: none"> -Language -Too focused on specific fields of science -Time engagement too big -How to find the platform? -Complex information / structure
<p>A person working in the waste management industry: -burning some garbage</p>	<ul style="list-style-type: none"> -To make similar projects (e.g. air quality sensors) 	<ul style="list-style-type: none"> -Costly -Too complicated -Not in my language

<p>-recycling some -complying to a lot of EU -regulations and standards</p> <p>Interested in citizen science because:</p> <ul style="list-style-type: none"> ● We can focus on the CSB rules (public support, etc.) ● Open innovation (we love it!) ● To increase our transparency in front of the public ● Marketing ● Air quality for OVB neighbours ● Because OVB CEO wants it! 	<p>-To look for inspiring examples of similar projects -To test new devices/solutions -To look for training materials on citizen science -To ask for help (Help. Help. Help. SOS!) -Tips for finding funds -Looking for partners (eg. research partners / building a consortium)</p>	<p>-Nobody will come anyway -I don't trust you -Low quality of inputs from the citizens -IPR issues -I can't find you online -You are not responding to my mail in three days</p>
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Figure: Profile of an imaginary platform user



The second day started with a workshop where participants were asked to assess the state of citizen science in their own country or region, on a scale of 0 to 10. To unpack this further, they were also asked to explain specificities and think about the most important training needs to address. Table 8 lists the results of this exercise.

Table: Assessing the state of citizen science in participants' own countries

Country	Score	Specificities	Training needs
Albania	3	<ul style="list-style-type: none"> -Individual initiatives -Spontaneous/from researchers -Sporadic topics: <ul style="list-style-type: none"> Waste Air Quality -Media talk about it 	<ul style="list-style-type: none"> -Creating an event specifically for Balkan countries
Lithuania	3-	<ul style="list-style-type: none"> -Not much in the media -Only international projects -Not one centre or rep. institution -No national strategy -Some scholars involved -In 2 / 3 years ... 	<ul style="list-style-type: none"> -Data quality & protocols (share what is already there) -Empowerment, inclusiveness and equity



		-Invisible citizen science projects	
Portugal	5	<ul style="list-style-type: none"> -In one year... -Moving up! -“Niches” -Scarce and sparse -Policymakers have been engaged (in the past) -Participatory budget -A website collecting citizen science projects -National meetings (2017/2019) -Two big projects (biodiversity) -Active labs -Not much in the news -Teachers not much aware -Strategy for citizenship 	<ul style="list-style-type: none"> -Mentoring programme (better than training) better than theoretical examples (continuous support) -Institutional incentives to use citizen science, how to do advocacy, not only to policymakers but also school boards, etc ... -Competition between countries or joint project
Czech Republic	5	<ul style="list-style-type: none"> -What does citizen science mean? -Crowdsourcing mapping -NGOs T-opics: Environment (water), nature -Popular in elementary schools -Policymakers absent 	<ul style="list-style-type: none"> -Good / well-prepared examples but adapted to: <ul style="list-style-type: none"> -How to translate it to your local community? -How to [...] to offer local projects
Greece	3-	<ul style="list-style-type: none"> -Air quality, birdwatching, wildlife, marine biology -‘Invisible’ citizen science (biodiversity) -Meteorology -Astronomy -No government funding -Researchers don’t know about it -More popular since 2015 	
Poland	4	<ul style="list-style-type: none"> -Topics: Environmental, observations, Fab Labs -Only in big cities -No belonging to community/movement -‘Hobby’ -A few organizations for promoting it -‘Show us the money!’ -What is the advantage of it? -Barriers institutional / mental -Need for systemic change 	-No training; we need money
France	8	<ul style="list-style-type: none"> -National recognition of citizen science -Ministry of Research / Education -To agronomy; big study in 2016 -National chapter for citizen science (Part. Science & Research) 	<ul style="list-style-type: none"> -Reuse as much as possible of what is already there and adapt to citizen science -How to change ways of doing things.



		<ul style="list-style-type: none"> -Every research institute has it in their agenda -Infrastructure for citizen science is developing -Medical / cultural / eEnvironmental research -not connected -Mix (lots of things are citizen science) -Five years of research 	<ul style="list-style-type: none"> -Relate to the stakeholders → I used to do that, but if I do that ... change research method -‘Everyone is doing it’
UK	8	<ul style="list-style-type: none"> -Five years old -Supported by big institutions -In public discourse: Public engagement (i.e. Science Festival involved) -Zooniverse -Strong push to open science -No clear rewarding system -Almost any researcher / cultural institutions would have done citizen science -No national programmes 	<ul style="list-style-type: none"> -Product: How to communicate what you want to do -Service design process -How to use your (limited) resources efficiently (internal management, etc.) -Template for processes (especially for public institutions)
Spain	9	<ul style="list-style-type: none"> -Recognized discipline -National platform -Five national meetings -National Strategy for citizen science -Specific funding for citizen science (not mixed with public engagement) -Lots of initiatives (both bottom-up and institutional) -Lots of things in it (not citizen science) -Twitter chats with experts 	
Barcelona	10	<ul style="list-style-type: none"> -Seven years of citizen science: office of the city council (started as a group of five projects applying for funding to bring citizen science to schools and together) -Festival connecting municipalities, etc. → 15 projects -Big diversity of projects (biodiversity and social) -Co-creation with citizens in some projects -Connect with policymakers (city using the data) i.e. BioBlitzes -Criteria for assessing / letting projects in -Barrios adapted projects to co-create School, teacher trainings (use data to change things) 	<ul style="list-style-type: none"> -Good examples of good local projects - help us scale-up (to policymakers, etc) -If you don’t have one, pick up one from another region/country -How to collaborate rather than compete (for funding) -Show how many people and who you need to set up a project citizen science
Flanders	8+	<ul style="list-style-type: none"> -Citizen science definitely developing -List of criteria 	<ul style="list-style-type: none"> -Networking - where/ how to find the right partners

		<p>-Flemish government calls for citizen science projects</p> <p>-Stakeholder engagement encouraged in research calls</p> <p>-‘Everybody SC’ platform for citizen science + nature organizations (biodiversity)</p> <p>-20,000 → citizen science on the map</p> <p style="padding-left: 40px;">In the media</p> <p style="padding-left: 40px;">Made people aware (but not using citizen science name)</p> <p>-Cities getting interested</p> <p>-Bottom-up initiatives (e.g. air quality)</p>	<p>-Lots of scientists still think it’s not applicable to their research</p>
Netherlands	8	<p>-95% of data provided (to EU) would not be known without citizen science</p> <p>-Everyone talking about it, but not as citizen science</p> <p>-Lots of initiatives</p> <p>-NWO: if you include citizen science in research you get Δ+</p> <p>-Meetings etc.</p> <p>-On policy level → it is called citizen science!</p>	

The second day concluded with participants splitting into groups of four, where they drew the homepage of the EU-Citizen.Science platform, as they imagined it. During a plenary after these results were presented, the participants made additional comments:

- Will it have consumer fragmentation or be product oriented? (Who am I or what I want to find here?)
- It could include a ‘What is citizen science?’ 3-minute movie
- It should highlight ‘star’ projects
- Don’t make it look like a project!
- It should have filters to sort information



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