This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 632694

INTERNAL REPORT

Project Acronym:	**CIVIC EPISTEMOLOGIES**
Grant Agreement number:	**632694**
Project Title:	**CIVIC EPISTEMOLOGIES: Development of a Roadmap for Citizen Researchers in the age of Digital Culture**

Second Draft Version of D3.2 Roadmap

Revision: Internal v0.4

Authors:

Borje Justrell, (Riksarkivet)

Contributors:

Daniela Azzopardi (University of Malta)
Milena Dobreva (University of Malta)
Neil Forbes (Coventry University)
Antonella Fresa (Promoter)
Michał Jankowski (PSNC)
Edel Jennings (Waterford Institute of Technology)
Sy Holsinger (EGI.eu)
Anders Nordström (Riksarkivet)
Roxanne Wyns (Katholieke Universiteit Leuven)

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Revision History

Version No.	Date	Author	Organisation	Description
0.1	2015-04-28	Borje Justrell	Riksarkivet	Structure of the document
0.2	2015- 05-25	Borje Justrell	Riksarkivet	Added text in most of the sections
0.3	2015-06-25	Borje Justrell Roxanne Wyns	Riksarkivet KU Leuven	Added text and correcting the language in all sections.
0.4	2015-07-02	Antonella Fresa	Promoter	Improvements as discussed between Borje, Claudio and Antonella online

Statement of originality:

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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Executive Summary

This is second draft version of the Civic Epistemology Roadmap. The first draft version was compiled in January 2015 with the objective to provide a first description of what a Roadmap for the use of e-Infrastructure to support citizen research could look like. This second version has the aim to take a step further in constructing the Roadmap. It takes into account the results from discussions with stakeholder groups and output from activities carried out in the project since January 2015. The main focus is more specifically on the interaction between digital cultural heritages, e-Infrastructure, citizen scientists and the possible mediation of artists, with the intention to find the shape or manner in which these elements can come together and connect. Creativity and arts have here a role as facilitator for establishing a dialogue that brings together different actors and citizens from across the society.

This second version points out where we want the Roadmap to lead us. It identifies and characterizes targeted stakeholder groups, describes the current situation, discusses lessons learned, and highlights the gaps that are expected to be filled by the implementation of the Roadmap.

This version ends with a tentative action plan and a list of recommendations for targeted stakeholder groups.

The final version of the Roadmap will be presented in deliverable D3.2, presented publicly at the final conference of the CIVIC EPISTEMOLOGIES project in Belin, in November 2015.

This final version will be however just another intermediate step, because the Roadmap will remain open, even beyond the end of the EC funding period, for future updates and improvements, as a living document, accessible online and ready for integrating contributions from all the members of the CIVIC EPISTEMOLOGIES Network of Common Interest.

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1 INTRODUCTION

1.1 STRUCTURE OF THE DOCUMENT

This is the second draft version of the Roadmap that the CIVIC EPISTEMOLOGIES project has been committed to design. The aim of it is to broaden e-Infrastructure deployment in order to support citizen researchers in digital culture.

This second draft version, submitted as an internal document, is organised as followed:

Section 1 (Introduction) - sets out the structure and the objectives of the document;

Section 2 (The scope of the Roadmap) – defines the challenges, objectives and targeted outcomes of the Roadmap**;**

Section 3 (Stakeholders) – presents and characterizes targeted stakeholder groups;

Section 4 (State of the art) – presents the current situation in terms of experiences in the domain of citizen science and crowdsourcing;

Section 5 (Lessons learned) – discusses a list of lessons learned gathered during the requirements analysis for the Roadmap;

Section 6 (Gaps) – highlights the gaps that are expected to be filled by the implementation of the Roadmap;

Section 7 (Our vision) – presents were we want to go**;**

Section 8 (A tentative action plan) – presents proposed actions;

Section 9 (Recommendations) – provides a list of recommendations for targeted stakeholder groups;

Glossary – provides explanations of key terms used in the Roadmap;

Abbreviations – provides explanations about the acronyms used in the Roadmap;

APPENDIX 1: Pilot study on Irish place names and place-based heritage research - overview of the technical environment and of findings and conclusions;

APPENDIX 2: e-Infrastructures sustainability models

APPENDIX 3: an initial Strategic Research Agenda for citizen science in digital cultural heritage and digital humanities

1.2 OBJECTIVES OF THE ROADMAP

The CIVIC EPISTEMOLOGIES project is about the participation of citizens in research in Digital Cultural Heritage and Humanities (DCHH). The term "CIVIC EPISTEMOLOGIES" is taken from the study of Sheila Jasanoff in 'Designs on Nature' (2007) in which she defines civic

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epistemologies as "*the institutionalized practices by which members of a given society test knowledge claims used as a basis for making collective choices*".

The CIVIC EPISTEMOLOGIES project aims to investigate these practices in the research domain of DCHH. The projects main outcome is a validated Roadmap for the use of e-Infrastructures to support the participation of citizens, together with cultural institutions, in the research processes and the participation of the creative sector, including artists and creative industries in the exploitation of digital cultural content.

The engagement of Europe's citizens in scientific research has just started to be exploited while it represents a big potential for improving European competitiveness. The case of DCHH is particularly relevant because:

- The Humanities play a major cross-cutting role in the evolvement of European research and innovation - acknowledged in Horizon2020;
- Cultural Heritage and Humanities as such is an area in which citizens are particularly active (recording, cataloguing, and discussing things on an individual, group/voluntary/amateur basis);
- The potential of broadening e-Infrastructure deployment to support the participation of citizens in DCHH research is not yet fully explored, although holding a potentially strong impact on social cohesion and job development, both aspects being important drivers in the European policy context.

The main objective of the CIVIC EPISTEMOLOGIES Roadmap is to illustrate a path towards the engagement of citizens in the research and valorisation of cultural heritage, by using digital tools and online communication offered by the e-Infrastructures.

The first draft version of the Roadmap, compiled in January 2015, provided an initial description of what a Roadmap for the use of e-Infrastructure to support citizen research could look like. It was presented early in the project (month 6) as an internal document for discussion and was also broadly disseminated with the aim to get as much feedback as possible from outside the project. The following supporting actions were conducted:

- a workshop on the Roadmap took place in Leuven in February 2015 with partners and stakeholders, representing the wider cultural heritage community, researcher's, citizens associations, creative enterprises and e-Infrastructures beyond the consortium;
- a dedicated web space was developed and published online, where it is possible for everyone to download the latest version of the Roadmap and provide feedback and comments http://www.civic-epistemologies.eu/outcomes/Roadmap.

The present document is the second draft version. It aims to take a step further in constructing the Roadmap. This version takes into account:

- feedbacks received from stakeholder groups (including comments from the participants at the workshop in Leuven and the comments gathers online)
- recommendations received at the 1st project's review in April 2015;
- outputs from activities carried out in the project from January to June 2015, with particular regard to the compilation of the deliverable D2.2 *Key characteristics and requirements of e-Infrastructure for citizen scientists in digital culture*.

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All this resulted in a decision to give the second draft version of the Roadmap an improved structure. This second draft version is focusing more specifically on the interaction between **digital cultural heritages, e-Infrastructure and citizen science**. The ambition is to find the shape or manner in which these elements can come together and connect.

The aim is that the Roadmap will lead to an implementation of an e-Infrastructure that will

- enable creation, access, use and re-use of DCHH content;
- provide learning resources;
- provide communication services to multidisciplinary research teams located in different geographic places;
- enable citizens to participate, together with cultural institutions and universities, in a range of research goals established at European level.

In this perspective, **creativity and arts can have a role as facilitator** for establishing a dialogue that brings together a range of different actors and citizens from across the society.

Supporting actions to the Roadmap are:

- a Registry of services;
- a common Strategic Research Agenda;
- one real-life pilot on Irish place names and place-based heritage research;
- two case studies: "'Hidden' Cultural Heritage: Inclusion, Access and Citizenship" and "Local Cultural Heritage: Inclusion, Access and Economic Development";
- A study about the business models for the sustainability of e-Infrastructures.

In this second draft version, the analyses of information gathered so far by the CIVIC EPISTEMOLOGIES project is not fully carried out. More information will be obtained in the coming months. The presentation of requirements given by different stakeholder groups will be completed in the final version of the Roadmap, which will be presented in deliverable D3.2 at the end of 2015.

It is worth to be noted that the Roadmap is conceived as the place where all the work of the CIVIC EPISTEMOLOGIES project is compiled, into a single aggregated document. In this light, some parts of this document are fully based on the material produced by the various project's work packages and reported separately in other individual deliverables.

1.3 WORK DONE TO BENEFIT FROM

1.3.1 Digital cultural heritage institutions using e-Infrastructures

The CIVIC EPISTEMOLOGIES project has looked into other domains, to find out if there are experiences of distributed services in the DCHH domain that are transferrable to the field of citizen science.

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Apparently, very little has been done so far, but digital preservation seems to be the domain in which distributed services offered by e-Infrastructure for the DCH sector that has been mostly explored. The underlying approach is in this case very clear: the DCH sector produces large volumes of digital content that needs to be safely stored, kept permanently accessible and easily re-useable over time by different end-user groups. This is a main challenge both for the DCH sector itself as content provider and for its end-users, among them researchers in citizen science.

The former DC-NET project[1] had as one of its main activities to explore how e-Infrastructure can add value to the research in the cultural heritage sector. Highest on the projects top-seven list of important new and improved services for the DCH sector, which can benefit from e-Infrastructure support, was long term preservation[2]. The need to address the current situation and to offer concrete and robust support to cultural heritage institutions in digital preservation was also identified by the INDICATE[3] project, a "sister" project to DC-NET.

As a follow-up of these two projects, a succeeding project, DCH-RP[4], was given the task to develop a Roadmap for preservation of digital cultural heritage content, mainly by using distributed services (e-Infrastructure). An example of good practice in this area, mentioned by DCH-RP, is the e-journal preservation community which has achieved much in terms of evolving mechanisms and organisations to look after services in their field of interest. The technical, organisational and financial challenges for distributed solutions have been proved to be solvable, given strong commitment from the communities involved. The key to solve these issues appears to be the ways in which these communities have organised themselves to bring about long-term agreements and infrastructures to make preservation services happen.[5]

The Europeana Cloud project also addresses the problem of storage and permanent accessibility of cultural data records. The Europeana Cloud system will be a service-oriented infrastructure with instances coming from a number of network services. The project is looking for a twofold solution where the private, community based cloud will consists of hardware resources provided by several technically advanced institution users, and a public part based on resources leased from commercial providers[6]. Challenges for Europeana Cloud and other SaaS providers with a cultural background are no less then big commercial providers such as Amazon and Google Cultural Institute offering a wide number of high-end services. Moreover, cultural heritage institutions might not be ready to adopt cloud solutions due to lack of experiences and a sense of losing control.

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[1] www.dc-net.org; DC-NET has been an ERA-NET project run from December 2009 until March 2012, funded by the European Commission under FP7-e-Infrastructures

[2] See Service Priorities and Best Practices for Digital Culture Heritage p. 32

[3] http://www.indicate-project.eu/; see also Digital Preservation Services: State of the Art Analysis by Raivo Ruusalepp and Milena Dobreva (for the DC-NET project) at http://www.dc-net.eu

[4] www.dch-rp.eu; Digital Cultural Heritage – Roadmap for Preservation

[5] See DCH-RP A Roadmap for Preservation of Digital Cultural heritage Content p. 35

[6] See Design of Europeana Cloud Technical Infrastructure, http://project.core.ac.uk/files/dl20140_submission_258.pdf

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An initiative with the aim to facilitate long-term access and use of European Arts and Humanities digital data is DARIAH, the Digital Research Infrastructure for the Arts and Humanities. Its focus is on enhancing and supporting digitally-enabled research and teaching across the humanities and arts. In August 2014, DARIAH was established as a European Research Infrastructure Consortium (ERIC).[7]

DARIAH-DE, which is partially funded by the German Federal Ministry of Education and Research (BMBF), has supported a study which takes a step further in the use of distributed services and addresses sharing software in a distributed infrastructure. This new approach is based on the fact that research infrastructures have become an everyday tool for doing science, but so far the focus has been mainly on sharing resources (especially data) and on offering services for processing and accessing the resources. However, there is a demand from the users to share not only the data they have gathered or created but also the software they implemented. Such a sharing has the potential to speed-up the scientific discovery - but only if the software can be applied by other researchers to address new problems. The situation today is, according to the study in mind, that software implemented in a project is often understandable and deployable only by the authors.[8]

Cost is of course a key variable when deciding whether or not to contract out services to an external service provider (e-Infrastructure). But there are also other factors to consider, and the advantages and disadvantages of each of them need to be balanced against the overall mission and the available resources of an organiser of projects that includes citizen engagement. Digital Preservation Coalition has listed a number of issues and potential advantages and disadvantages of using distributed services in digital preservation activities.[9] They can, to some extent, be applied to services supporting citizen science.

The following table summarises advantages and disadvantages of using 3rd party services, in relation to 5 general issues:

- Limited experience of users
- Access considerations
- Rights management
- Security
- Quality control

[7] https://wiki.egi.eu/wiki/Competence_centre_DARIAH

[8] https://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CDYQFjACahUKEwiq6dbejorGAhUKXhQKHcn4AIE&url=https%3A%2F%2Fdev2.dariah.eu%2Fwiki%2Fdownload%2Fattachments%2F14651583%2FM2.2.2%2520Appendix.pdf%3Fversion%3D1%26modificationDate%3D1430221094626%26api%3Dv2&ei=_Mp6Var7J4q8Ucnxg4gI&usg=AFQjCNE8YW4mHT9rVI6c2FSzExL6tB_I7A&bvm=bv.95515949,d.d24

[9] See Preservation Management of Digital Materials: The Handbook http://www.dpconline.org/advice/preservationhandbook /

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Issue	Potential advantage of using 3rd party services	Potential disadvantage of using 3rd party services
Limited practical experience	Avoids the need to develop costly infrastructure (particularly important for small institutions). Allows the institution to focus on other aspects of service provision. Provides specialist skills and experience which may not be available within the institution If there are economies of scale, outsourcing may well be cost effective. Allows action to be taken in the short to medium term, pending development of infrastructure.	Without some practical experience and expertise, it will be difficult to develop and monitor effective contracts. Without practical experience it will also be difficult to communicate the requirements of the organisation in an effective way (or to assess whether they are technically feasible or not). Danger of either not developing or losing skills base. There is no established bench marking. It is still too new an area. Risk of business failure Until the market increases there may be an over-dependency on one contractor. Unless there are adequate exit strategies, cultural heritage organisations may be locked into an outsourcing contract longer than intended.
Access considerations	Monitoring usage may be more efficient (assuming the contractor has a demonstrated ability to deliver meaningful usage statistics). There may be synergies and cost savings in outsourcing access and preservation together.	Difficult to control response times which may be unacceptably low and/or more costly, especially for high-use items.
Rights Management	Avoids what is often a resourceintensive activity for the institution.	May significantly increase the cost of the contract and/or complicate negotiations with rights holders.

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Security	Contract can guarantee security arrangements required by the institution.	Lack of control, especially for sensitive material.
Quality control	A watertight contract will build in stringent quality control requirements.	Risk of loss or distortion may still be unacceptably high for highly significant and/or sensitive material.

The DCH-RP project also identified a number of major advantages, specific for the DCHH domain, when using distributed services offered by e-Infrastructures.

- Long-term preservation (i.e., bit-level preservation) and access to digital objects of different kind, also so called "live" content (e.g., streaming audio and video collections);
- Multiple entry-points that suit a variety of user interfaces (e.g. APIs, protocols). New cloud based search engines are under development, based on multilevel nodes that can combine different data sources (documents, images, books etc) from multiple content providers;
- The DCHH domain can focus on its own areas of specialisation by deploying new services for monitoring and management tools that ensure smooth and secure running of distributed operations;
- Forming a community of practice or a Virtual Research Community that transcends discipline and national boundaries while achieving economies of scale by bringing together international communities;
- Benefitting from integration within the research and educational e-Infrastructures support framework;
- Central hosting and monitoring of middleware services;
- Simple authentication and authorisation infrastructures for large (and potentially unbounded) user groups;
- Connections to shared services in other countries and sectors. (e.g. research data centres, commercial businesses, etc.). [10]

1.3.2 Citizen science and e-Infrastructures

The advancement of ICT, Internet and mobile technologies opens a new perspective for bringing together different communities unified by their interest to contribute to research. This

[10] DCH-RP: A Roadmap for Preservation of Digital Cultural Heritage Content, p 73

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has resulted in a rapid growth of the citizen science initiatives around the globe, and subsequently in an increased body of academic publications discussing various aspects of it[11].

The current technological infrastructures facilitate two dimensions of citizen science: *scale* and *substance* of tasks performed. The current social media culture makes it easy to bring together big groups of people but modern technology also offers mobile devices and a wide range of tools which could engage citizens in a variety of research-related tasks. Thus it is not coming as a surprise that the number of projects experimenting with citizen involvement across various sciences constantly grows. The most typical scenario is the one of citizens directed by professional researchers in studies which revolves mostly around observation of natural phenomena and notation in multiple locations or across longer time spans.

The interest for such projects has grown to the extent that specialised platforms which allow defining research tasks and involving users have been created; e.g. Zooniverse and CrowdCrafting developed in collaboration between the Citizen Cyberscience Centre and the Open Knowledge Foundation (OKF). These platforms are used for research in different domains, but mostly in the Sciences with few implementations in the Humanities.[12] However, the spread of citizen science across domains is uneven. For example checking the numbers of projects offered on CrowdCrafting in the end of 2014 and 3 months later, it is noticeable that there is a very fast growth of the projects in the social science domain. Humanities mark growth but the number of such projects is considerably smaller than Science and Arts projects.

[11] See Dobreva, M., and D. Azzopardi (2014) Citizen Science in the Humanities: A Promise for Creativity. In: G.. Papadopoulos (ed.) Proceedings of the 9th International Conference on Knowledge, Information and Creativity Support Systems, Limassol, Cyprus, November 6-8, 2014, ISBN: 978-9963-700-84-4

[12] Smith A.M., Lynn, S., Lintott, C.J. (2013) An Introduction to the Zooniverse. Crowdsourcing: Works in Progress and Demonstration Abstracts. AAAI Technical Report CR-13-01.
CrowdCrafting. (2013) Online: http://blog.okfn.org/2013/09/17/crowdcrafting-putting-citizens-in-control-of-citizen-science

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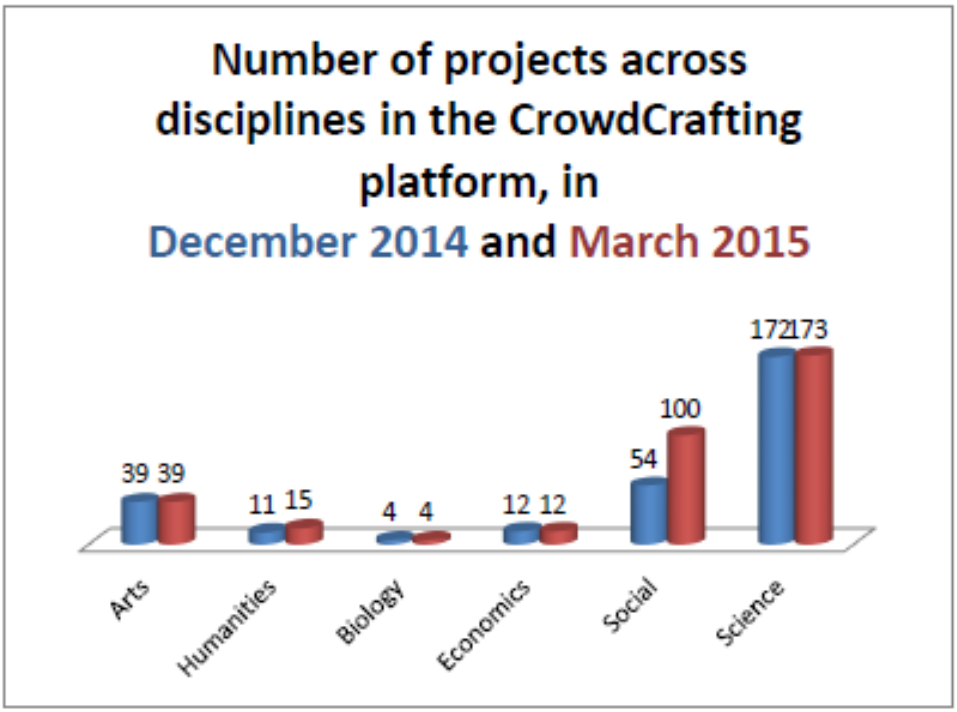

Figure 1: Dynamics of numbers of citizen projects

Digital cultural heritage is closely connected to Humanities and a logical question is: why Humanities are not using citizen science more actively?

This is a complex question to answer, and one of the possible approaches is to better understand the expectations and requirements of various stakeholders and users. Exploring what kind of barriers prevents them from using existing tools is something that could be used to design a support program for advice, training and perhaps even a kind of helpdesk to set them on potential users on their way.

A possible reason for the lack of uptake is for example the limited technical skills and experiences in using online collaboration environments. This was demonstrated in a recent case at the faculty of economy and business at KU Leuven where the library tried to organise the transcription work of handwritten population and industrial censuses using CrowdCrafting platform so the raw data could be made accessible and reusable for research. The barrier to start up a project appeared too high and help was requested from the local library IT department to explore solutions and other tools they could more easily implement[13].

[13] Internal KU Leuven case June 2015

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The SOCIENTIZE project (Society as e-Infrastructure through technology, innovation and creativity) has as its task to "*coordinate all agents involved in the citizen science process, setting the basis for this new open science paradigm. The project will promote the usage of science infrastructures composed of dedicated and external resources, including professional and amateur scientists. SOCIENTIZE will set-up a network where infrastructure providers and researchers will recruit volunteers from a general public to perform science at home*."[14]

The project published in 2013 a Green Paper aimed as a consultation document to encourage interested parties to submit their experiences on citizen engagement. Based on the results a White Paper on Citizen Science was published in September 2014.

The SOCIENTIZE project has in these documents identified a number of drivers and barriers for citizen science, some of them with bearing on the use of e-Infrastructure.[15]

Main drivers:

- The use of e-Infrastructures enables citizen science by providing storage and accessibility but also computing power managing the data. Especially if citizen-based resources like networks of desktop computers, mobile phones and other private devices shall be used in a project. Some efforts have been done addressing common services but further progress is needed;
- Openness is normally considered as high priority. In a citizen science context openness relates both to the software used and to the data that has been gathered, allowing researchers and general public faster access to the information. But openness raises the question of authenticity of data, and there is also an on-going debate today about data reliability. Although there are many successful experiences using different techniques to ensure quality and accuracy of data, it is still a common issue in many scientific fields. Current projects on citizen science are normally based on a mix of proprietary software and open source software. But the trend is clearly towards openness. It improves speed and efficiency as well as efficacy of science policy measures. There is also a legal claim that public authorities provide open access to their data in order to be used by the public or by scholar in research. [16]
- Initiatives highlighting the value of artistic approaches for participatory science will bring a wider public into the process and encouraging creativity. The number of shared spaces of conceptualization, observation and interaction between science-technology-arts is growing complementing established meeting places like science museums. Participatory experiments are gaining wider acceptance as the impact of scientific advances, and awareness among researchers grows. All these trends create new challenges for the underlying technical infrastructure. It goes without saying that ICT will continue to foster and accelerate huge advance in citizen science although it is still in its infancy.

[14] See http://www.socientize.eu/?q=eu

[15] The Socienize project: "Green Paper on Citizen Science. Citizen Science for Europe. Towards a better society of empowered citizens an enhanced research", p. 29-30

[16] The EU directive of Public Sector Information (PSI), which is now under implementation in EUs Member States

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Main barriers:

- Access and interoperability of the citizen science data sets need – generally speaking - to be improved. When data sets based on citizen science data have been created by scientists for their own needs, these data are sometimes difficult to use for other groups, like citizens or researchers.
- Opening up for wider use of data sets, arises the question of ownership and IPR issues. Scientists who work in citizen science projects will sometimes not share and provide access to the collected data. The reasons behind differs, and it can be a serious hinder if too few projects have a clear policy about the ownership of the results. There are also a number of unknown cases when volunteers are not informed about the intellectual property rights of projects they have been involved in.
- Interoperability of data is built on standards for synchronise data; there is a need to define data standards that all citizen science projects can use.
- Citizen science platforms and software should be free to use and preferably open source, in order to support the basic ideas in citizen science: voluntariness, openness, and collaboration.

These barriers are also present in the current discussions on Research Data Management and Research Data sharing. With more funders requiring that the data gathered during a funded project will be made accessible for reuse by other scientist, discussions on data quality, data standardisation and ownership and IPR issues are getting more and more urgent to handle.

1.3.3 The inter-relation between arts, creativity and technologies

To be written later on

e.g. STARTS

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2 THE SCOPE OF THE ROADMAP

2.1 MAIN CHALLENGES

The participation of Europe's citizens in scientific research development has just started to be exploited while it represents a big potential for improving European competitiveness. The use of e-Infrastructures to the participation of citizens could provide relevant support, but e-Infrastructures need to broaden their deployment with new services targeted to this scope. The research on DCHH can play an important role in the development of the European research area, and can take the lead in the discovery of new directions of cross-disciplinary research; but this opportunity has not yet been fully developed.

The CIVIC EPISTEMOLOGIES project will with its Roadmap target towards use and usefulness of digital cultural heritage where citizens' engagement has a twofold benefit:

- for digital cultural heritage to be enriched by the citizens contributions;
- for digital cultural heritage to become more widely used and exploited (with the participation of creative industries).

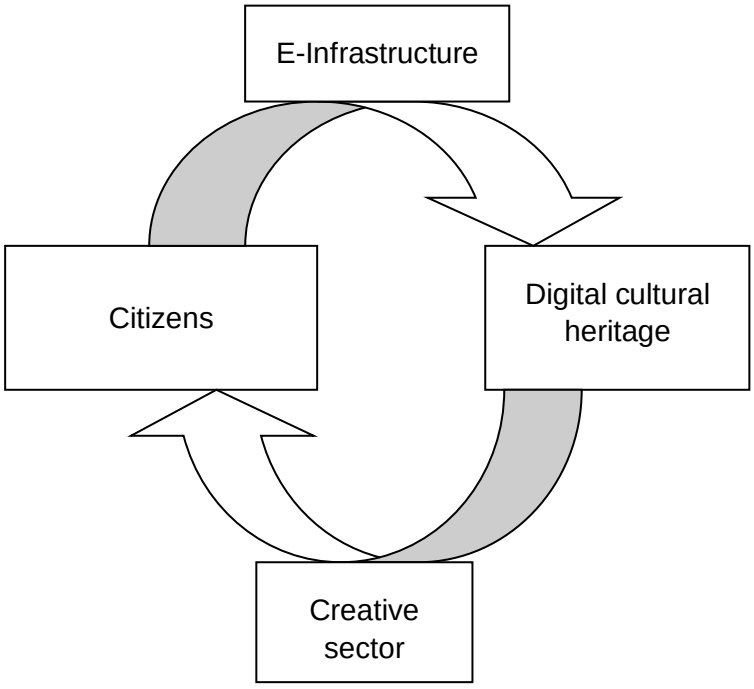

Figure 2: The "wheel" of citizen engagements

The proposed solution endorsed by the CIVIC EPISTEMOLOGIES project in order to get this "wheel" turning is to empower the existing e-Infrastructures with new services, targeted to the needs of specific research domains. The aim is to broaden the communities of users, including citizen scientists as an integrated part of the communities. It should be possible to tailor the new

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services to the requirements of each research community; at the same time, it should be necessary to identify common layers, tools and standards that can be shared among different domains. This scalable and modular approach to the e-infrastructures deployment will allow to serve better the research and to reduce costs of development.

The design of the new services for research, tailored on the needs of each research area, should be planned with a concrete approach, based on practical case studies and pilots with real users who should provide experimental proof-of-concepts defined in the theoretical sphere. It is also necessary to consider a shift of mentality in the cultural heritage sector, in order to accept the participation of non-professional curators in the development of new knowledge and for this purpose, naturally, design appropriate procedures and guidelines to be applied by the different subjects.

The new deployment should be carefully planned by indicating the steps that each stakeholder must take: decision-makers, policy-makers and programme owners to make available the necessary financial resources, research communities to identify the protocols of interaction with citizen scientists, citizens to associate and organise themselves into representative bodies, e-Infrastructure providers to plan for the future deployments, the creative sector to act as a catalyst of innovation. These steps and the concerned communities are described in the Roadmap.

Actions that are needed can on a general level be grouped in different stages:

- A **preparatory stage**, vital for the overall development of the project, and including activities such as:
    - Defining factors like essential PEST conditions, vision, scope and boundaries (physical, national, IP, other), short-, mid-, and long-term measures for awareness/leadership
    - Mapping to EC and national research agendas
    - Establishing key partnerships with relevant e-Infrastructures
    - Establishing key partnerships with citizen science networks
    - Analysing innovation drivers (economic, technical, other drivers)
- A **deployment stage and a monitoring stage** with activities like
    - Boosting work on filling the gaps
    - Promoting available toolkits
    - Implementing the new services in a range of sites (providing guidance/support), including the development of the repository of tools, services and digital cultural content
    - Evaluating the performance – planning for improvement and enlargement.

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2.2 CO-PRODUCING AND CO-CREATING KNOWLEDGE

In many areas, Cultural Heritage (CH) may exist in a fragile or degraded condition, may be rendered vulnerable by economic development such as urbanisation, or may simply be lost through neglect. However, there is considerable interest among the general public in exploring, recording and cataloguing their own CH or that of their community or locality. CH digital content is massively increasing. This data may be held within a dedicated online archive or it may be collected and form a contribution to an aggregated database or archive.

At the same time, an increasing number of citizens are engaged in and with online discussion fora and social networking platforms. However, the outcomes are not always easy to predict and are sometimes negative and undesirable. The danger is that, without the establishment of a civic epistemology, separate communities develop as exclusive and even elitist and, as a consequence, the range and scope of a common set of civic values and understandings related to CH is thereby diminished.

The CIVIC EPISTEMOLOGIES project aims to investigate how the phenomenon of citizen science can be encouraged and facilitated in a way that a shared or common CH discourse develops, knowledge is advanced and the exchange of ideas remains open and participatory. Cultural institutions and academies should welcome and embrace the opportunities implied in citizen science, as it offers occasions to be closer to citizens who are actually their audience. Next to this, a participatory and co-creative approach is positive and benefitting for cultural institutions as it adds to the knowledge-base of their collections, and opens up new ways for their collections to be used. However, it does also create challenges for institutions, raising issues about curatorial authority over interpretation and on skill development for making citizens satisfactorily participate in research. First, the citizen who is a culture consumer has to realize that he or she can become a producer, taking a more active role. This calls for a broad awareness campaign, where cultural institutions as well as platforms such as Europeana and specialized research infrastructures can make users aware of their shared responsibility to become caretakers of the cultural practices they engage in. Being conscious that one is a stakeholder in what happens is a first requirement in order to feel the need to intervene, to contribute, to have a voice. This is of the utmost importance, since in many instances of Cultural Heritage data part of the knowledge is not with the institutions but with the general public, in the stakeholder communities that have a relation to the subject matter (e.g. in the context of Orphan Works).

Participation however also means having the skills to do so:

- On one hand, this requires partly a rediscovery of skill considered dormant or forgotten by the large society (such as painting, drawing, creative writing) and activation of consumer-oriented skills (such as using a smartphone) into more active forms of creativity (such as making street photography). Especially on this level, artists and creatives could have a facilitating role since they can trigger these forgotten skills and show the citizen on how to use modern technologies in a creative way.
- On the other hand, specific training is needed on the technical and digital skills involved to participate in online culture. For example: understanding the Web language (HTML,

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CSS, XML), having notions of metadata, learning about digital formats and documents, and learning how to code small apps.

Finally, citizen authorship skills need to get the right visibility and recognition. By stimulating knowledge and use of Creative Commons licensing models and a deeper understanding of IPR issues it is possible to tap the hidden economic power of citizen cultural activities.

2.3 THE ROADMAP AS AN INSTRUMENT

The Roadmap will permit the implementation of an e-Infrastructure to enable creation, access, use and re-use of DCHH content, to provide learning resources, to provide communication services to multidisciplinary research teams located in different geographic places, and finally to enable citizens to participate in a range of research goals established at European level together with cultural institutions and universities.

The ultimate aim is to address the scientific processes in DCHH and to bring citizens, through their associations, into the process of planning research.

The Roadmap is organized in building blocks addressing the following questions:

WHY - overall objectives for making a Roadmap;

WHO - who to address: target groups and/or user groups, stakeholders in general, members of society;

WHERE- where to go (specific objectives and goals for the Roadmap to be a basis for requirements like improved access, enhanced quality of holdings/collections, social inclosure etc);

WHEN - when shall these specific objectives and goals be reached (time line for implementing the Roadmap);

WHAT - what to produce: a Roadmap, but what are the basic drivers and the added values of citizen research and crowd sourcing as a method and what are benefits of using distributed e-Infrastructure**;**

HOW - how shall the Roadmap be structured (address each targets groups and/or user group or be structured on general level).

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The CIVIC EPISTEMOLOGIES Roadmap will integrate three domains of necessary intervention (business change, policy framework and better tools) with the major PEST factors (political, economic, scientific, and technological). The compilation of the Roadmap will also need integration of a multitude of viewpoints and aspects, both those foreseen in the planning of the project and new ones discovered during the project's lifetime.

The Roadmap is built on two implicit assumptions:

- firstly, existing e-Infrastructures for research and academia are efficient channels also for the delivery of services to be used by the DCHH domain for supporting citizen science;
- secondly, it will be possible to establish common policies, processes and protocols which will allow the DCHH domain to access e-Infrastructures, despite the fact that e-Infrastructures often are national entities, sometimes with different policies and procedures for access and usage.

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3 STAKEHOLDERS

In this section the targeted groups of stakeholder are identified and characterized, who they are and which benefit they can expect from implementing the Roadmap.

The SOSCIENTIZE project, in its Green Paper, chooses to group feed back and recommendations on three levels: policy level, science and technology level, and society level.[17]

The CIVIC EPISTEMOLOGIES project has identified a set of key stakeholders more or less in line with this classification but - given the projects practical approach – with a clear focus on added value. The deployment of use of e-Infrastructure services to support citizen science must be carefully planned by indicating the steps that each stakeholder must take.

The following stakeholders are the key ones, all with different roles to play:

- **policymakers** to support institutional conditions and make necessary financial resources available;
- **cultural heritage institutions and academic institutions** (e.g. the research communities) to identify clear protocols of interaction with citizen scientists and internally, as programme owners and decision makers on different levels, allocate budgets and implement good governance;
- **e-Infrastructure providers** s to plan for the future deployments;
- **citizens activist organisations** to associate and organise activists into representative bodies.

An important aspect is that the academic institutions in their role to identify the protocols for citizens' engagement, not only shall enhance the citizen's roles within communities of interest at local, national and potentially global levels, but also greatly increase the reach and impact of their research.

Similarly, the role of cultural heritage institutions should enter into a phase a change: from traditionally becoming just content providers they will became also service providers like the e-infrastructures, giving them an opportunity to explore new audiences and markets for DCHH.

[17] SOSCIENTIZE proejct: "Green paper", p . 34

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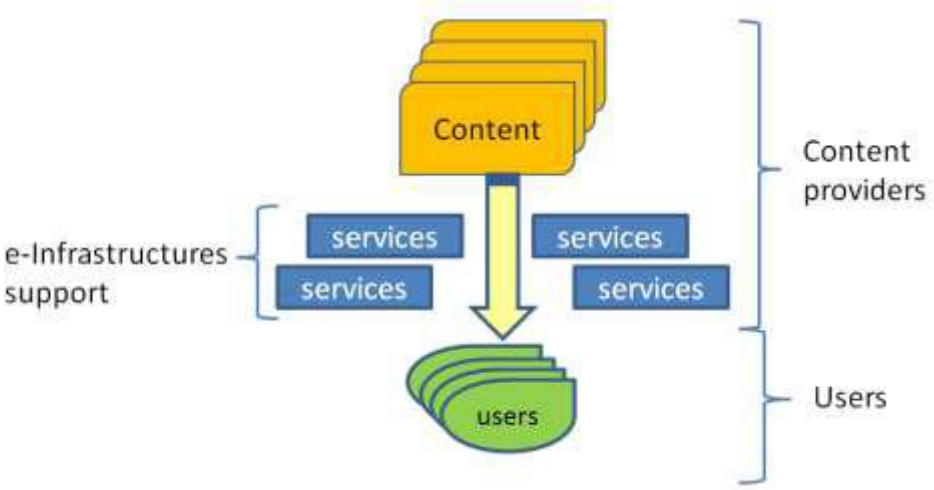

Figure 3: DCH institutions becoming providers of both content and services

There are also other identified stakeholders for whom citizen science can not be considered as a core activity, but whose contribution to the success of the CIVIC EPISTEMOLOGIES Roadmap can be relevant:

- artists;
- creative enterprises;
- funders of citizen science activities.

Artistic and creative practices in general contribute to the establishment of engagement processes. Artists can act as mediators between the cultural institutions and citizens, putting into place co-creation initiatives, which can take place both online and in the physical premises of museums, libraries and archives.

The fact that the stakeholders are of very different kinds with disparate needs and requirements makes the question of dialogue and establishing a common framework particularly important. A valuable reference is the RICHES Taxonomy, a theoretical framework of interrelated terms and definitions, referring to the new emerging meanings of the digital era (such as "preservation", "digital library", "virtual performance" and "co-creation), aimed at outlining the conceptual field of digital technologies applied to cultural heritage. It can be used as a basis to be extended with more terms specifically related to the themes of civic epistemologies.[18]

In this light, a Memorandum of Understanding has been established between RICHES and the CIVIC EPISTEMOLOGIES project.

[18] See http://www.riches-project.eu/riches-taxonomy.html

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4 UNDERSTANDING STAKEHOLDERS REQUIREMENTS

4.1 APPLIED METHODS

In order to define stakeholder's requirements, the CIVIC EPISTEMOLOGIES project has applied a mixed methods approach to understand different demands and expectations in the citizen science domain (cultural institutions, academic institutions, activist organisations, infrastructure providers). The project has explored the existing body of knowledge featuring general examples of citizen science work as well as examples of citizen science integrated in the DCHH context; one of the areas of particular interest is the link to the concepts of impact and value of digital cultural resources, an area of considerable interest as discussed in Hughes et al. (2013).[19]

The project has also undertaken specifically designed user studies aimed at investigating similarities and differences in requirements of various stakeholders. The methodology adopted is to combine a web survey with expert consultations within the project consortium with focus groups aiming to capture the opinions of different stakeholders (policy makers with a focus group held in Malta; citizen activist organizations with a focus group held in Sweden, and citizen scholars with a focus group held in Spain). The web survey gathered 85 responses, mostly from European countries.[20] Specific workshops aimed at catching user requirements has also been held in Malta in November 2014 (on requirements), in Leuven, Belgium, in February 2015 (on the Roadmap), and in Budapest in July 2015 (on CH institutions innovation).

4.2 VOLUNTEERS PARTICIPATION IN CITIZEN SCIENCE PROJECTS

Although the application of citizen science in the field of Humanities has been less common than in the sciences, there are a number of examples of crowd sourcing projects which recently had been presented in an edited collection) and in overview of activities in the British Library. [21]

Recently, Noordegraaf et al (2014) suggested a model for crowd sourcing in the CH context which explores six pillars: institution, collection, goal, crowd, infrastructure, and evaluation (see

[19] Hughes, L., Ell, P., Dobreva, M., Knight, G. (2013) *Assessing and Measuring Impact of a Digital Collection in the Humanities:* LLC: The Journal of Digital Scholarship in the Humanities

[20] The initial analysis of these user studies is presented in Dobreva, M., D. Azzopardi (2014) Citizen Science in the Humanities: A Promise for Creativity. In: G.. Papadopoulos (ed.) Proceedings of the 9th International Conference on Knowledge, Information and Creativity Support Systems, Limassol, Cyprus, November 6-8, 2014, ISBN: 978-9963-700-84-4, pp. 446-451. To appear as well in Springer series.

Dobreva, M. (2015) *Collective Knowledge and Creativity: The Future of Citizen Science in the Humanities.* In: KICSS 2014 (Post-)Proceedings , Springer AISS, ISSN 2194-5357 (in print

[21] See Ridge 2014 and Ellis, 2014

Fig. 4).[22] The rationale is that considering crowd sourcing should start with the major institutional dimensions (listed under *Institution*), then be narrowed down looking at the *Collection* pillar, and so on. One point of critique to this model is that the visual presentation can be confusing for some readers, the items below one category form the pillar, but there is no obvious horizontal connection between the components, as the table layout suggests.

Another possibly confusing point is who exactly from the various possible stakeholders should be in charge for various [components of] pillars. With these remarks it is informative to see the items identified by the authors of the model

Institution	Collection	Goal	Crowd	Infrastructure	Evaluation
Institution Type	Medium	Beneficiaries	Characteristics	Complexity of Task	Qualitative Measures
Culture of Digitization	Size	Task Type	Training	Evolution of Task	Quantitative Measures
Budget	Complexity	Timeframe	Attracting Participation	Level of Scaffolding	Incorporation of project results into collection
Intellectual Property Rights	Appeal	Accuracy	Sustaining Participation	Generic Platform or Devoted Project Site?	Incorporation of project findings into workflow

Figure 4: Model for crowd sourcing in the CH context

Other research publications provide additional insights into citizen science applications in DCH. Crowd sourcing is not necessarily aimed at research activities but is familiar to many cultural heritage institutions and can be used to explain how citizen science projects can be organised in real life practice.

The work of Burgoyne at al. (2013) informs another characteristic of e-Infrastructures: The outcomes of identical or similar e-Infrastructures in different cultural settings (e.g. countries) can result in different scales of uptake. This might be a surprising observation but it is based on the evidence that a similar game implemented in the Netherlands and the UK achieved citizen engagement of completely different scale which can not be simply explained with the difference in population in both countries. [23]

[22] Noordegraaf, J., Bartholomew A., Eveleigh, A. (2014) Modeling Crowdsourcing for Cultural Heritage. Museums and the Web, In: N. Proctor & R. Cherry (eds). Museums and the Web. (2014) Online: http://mw2014.museumsandtheweb.com/paper/modeling-crowdsourcing-for-cultural-heritage/

[23] Burgoyne, J. A., Balen, J. van, Bountouridis. D, & Honing, H. (2013). Hooked: A game for discovering what makes music catchy. Proceedings of the 14th International Society for Music Information Retrieval Conference, 245-250. Curitiba, Brazil.

While we have not the resources in the CIVIC EPISTEMOLOGIES project to carry out autonomously larger-scale surveys on citizen science applications in cultural heritage institutions, we will rely on other institutions working on this, around the world. In particular, large-scale surveys on citizen science was systematically done in the last years by Angela Wiggins and Steven Crowston from the Syracuse University in the USA. Wiggins and Crowston (2012a and 2012b) summarise results from 63 surveys completes as a result of 840 emailed requests for participation which were used to create 128 project profiles. [24]

The range of activities to which unprofessional researchers contribute in citizen-science projects as suggested by Wiggins and Crowston (2012b) include the following:

1. Define question
2. Gather information
3. Develop hypothesis
4. Design study
5. Data collection
6. Analyse sample
7. Analyse data
8. Interpret data
9. Draw conclusions
10. Disseminate results
11. Discuss results and ask new questions

Those activities assume different levels of creativity. The tasks of transcribing historical letters or providing geolocations would normally be considered to be quite trivial and are from the contributive type of citizen involvement in the CH domain as defined in (Bonne, 2009). Thus one research question for the future is how citizens involved in Humanities research could contribute to creative rather than trivial tasks?

In their further study (2015) they revise the granularity of their previous classification of activities. [25]

The following figure taken from the study of Wiggins and Crowston [Fig. 1 from Wiggins and Crowston, 2015] illustrates the intensity of the different types of citizens' participation, with

[24] Wiggins, A, K. Crowston (2012a) Goals and tasks: Two typologies of citizen science projects. System Science (HICSS), 2012 45th Hawaii International Conference on, 3426-3435.
Wiggins, A., K. Crowston. (2012b). Describing Public Participation in Scientific Research, iConference 2012 Toronto, Ontario, Canada. Available: http://crowston.syr.edu/system/files/iConference2012.pdf

[25] Wiggins, A., K. Crowston. (2015). Surveying the citizen science landscape. First Monday, Volume 20, Number 1 - 5 January 2015, http://firstmonday.org/ojs/index.php/fm/article/view/5520/4194

observation tasks in green, measurement tasks in blue, content processing tasks in orange, and site-based observation tasks in yellow.

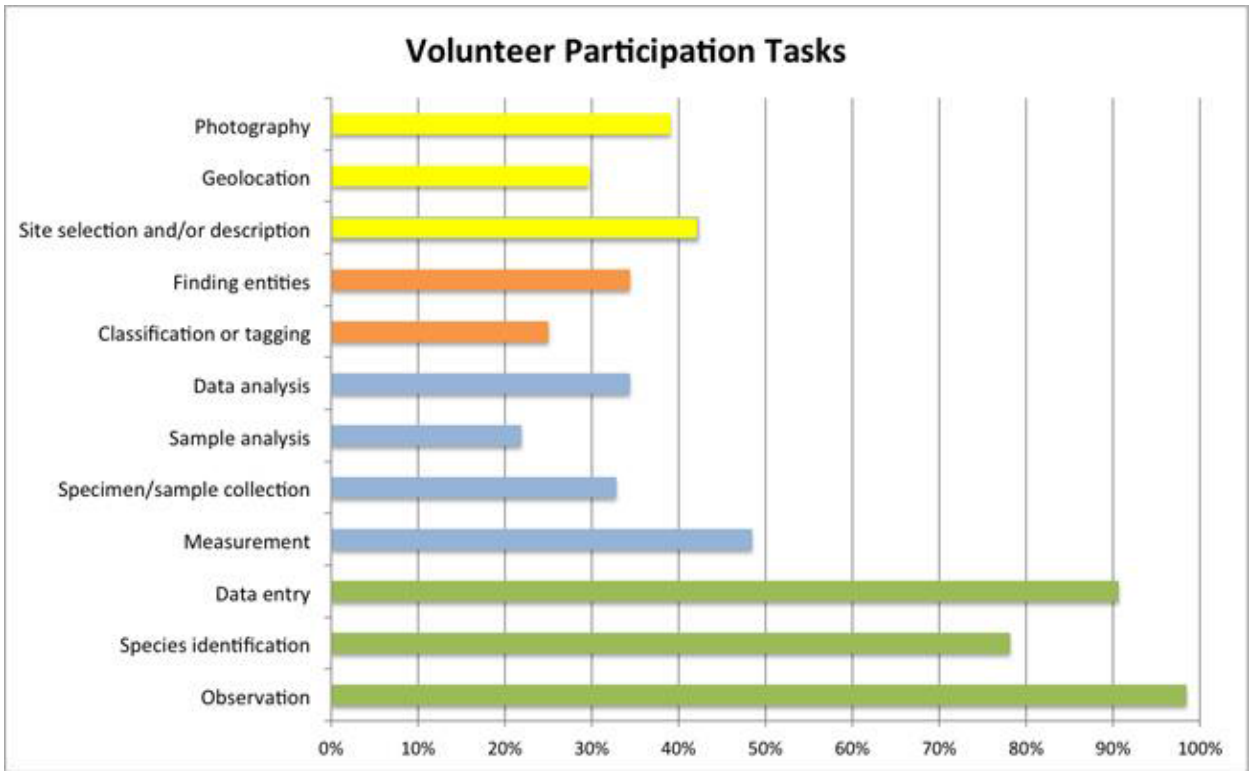

Figure 5: Volunteer participation in scientific work tasks

A popular classification of typologies of crowd sourcing project has been done by Oomen and Aroyo[26] They highlight six different typologies of citizen science Projects, each one linked to a different kind of study:

1. Correction and transcription - the citizen is given access to a database (this is usually a text-based database like scanned manuscripts) and then he gets the task of transcribing or making corrections to the text which was already transcribed electronically via a computer programme.

[26] Oomen, J., L. Aroyo. "Crowdsourcing in the Cultural Heritage Domain: Opportunities and Challenges." Proceedings of the 5th International Conference on Communities and Technologies (C&T '11). ACM, New York, NY, USA, 138-149.

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2. Contextualization - Citizens submit data such as letters, stories, films, photographs or other documentary material in order to gather a meaningful context.
3. Complementing Collection – Citizens are asked to submit data into databases with the ultimate aim of completing them or making the collection grow.
4. Classification – Citizens tag the data, or label it, in order to easily group similar data and make the information more easily retrievable in the future.
5. Co-curation – This practise occurs mostly with projects involving the aesthetic arts. Citizens interact with institutions and voice their opinions when it comes to choosing articles or items for publication.
6. Crowd funding – Citizens are asked to gather together money and/or resources in order to support efforts initiated by others. Popular platforms used specifically for this purpose are: Kickstarter (https://www.kickstarter.com/) and Indiegogo (https://www.indiegogo.com/).

A different approach is proposed by Tobias Blanke and Mark Hedges (2013) within the context of Humanities e-Science; while their paper is not focused on citizen science it identifies some typical scenarios and illustrates how all of them are integrating a number of scholarly primitives, namely collecting, discovering, comparing, delivering, and collaborating. While it would require an additional study to justify the use of the same or different set of primitives in citizen science, this is an approach which introduces different levels of granularity with the primitives as the smallest building blocks of more complex activities.

Such an approach might be particularly helpful within the DCH domain, because e-Infrastructures could concentrate on developing services which would implement such lowest level primitives. However this to the best of our knowledge has not been developed and implemented yet.

Citizen science is composed of various elements such as applications, volunteers, and institutions, which need to work harmoniously together in order to reach the project's goals. One of the big challenges of this domain is what evidence could help to support the selection of successful models for future implementations. The practical experiences of different studies vary dramatically – some attract a 'viral' spread of involvement and others – modest if any attention. Even studies prepared by the same team in different environments can lead to substantial differences in the engagement. Engagement itself is one of the easiest components which can be monitored as a quantitative measure, but to be successful a Roadmap should include a combination of wisely selected characteristics which can be realistically measured and interpreted.

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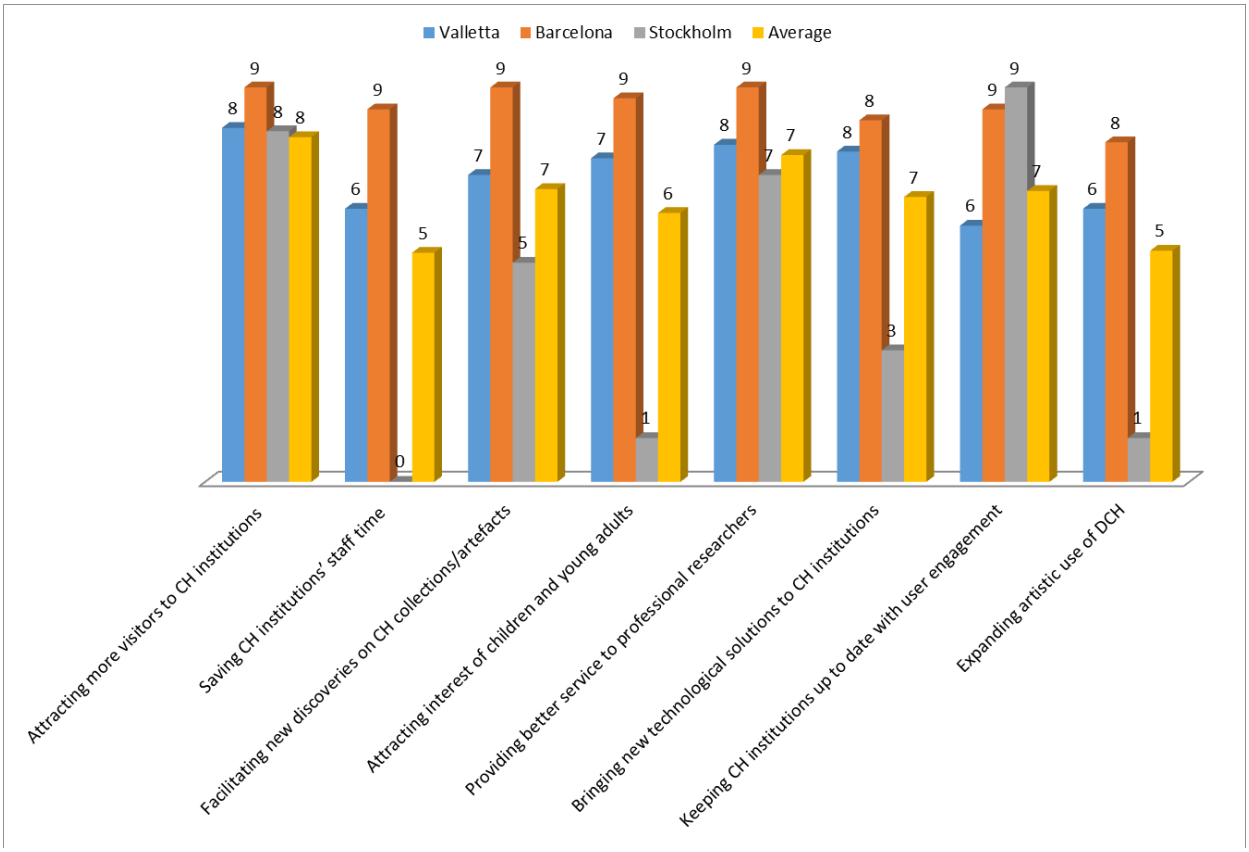

Figure 6: Views on usefulness of citizen science expressed on [1, 10] scale across focus groups

4.3 POLICYMAKERS

The general positive attitude towards citizen science was very strongly felt in the focus group with policymakers and managers of cultural heritage institutions. The participants discussed at length that the involvement of volunteers in the projects undertaken by institutions helps to establish a long lasting relationship and as such is a powerful way of engagement with the general public. Satisfied citizen scientists can help in future projects and might also serve as an effective "word-of-mouth" advertising, which would in turn bring more people to the institution. This could also help create dialogue with the community in terms of shared memories.

People do not attract more people with their enthusiasm only – one important point made was that if the people care, so will the governments. Political awareness might get the instruction more help from the government, making them dedicate more time and resources to the institutions.

To create a better communication with the communities, one must also get to the source of it – children. These young members of our societies are often not aware of what is going on in their own communities, let alone on a national level. By creating a better bridge between the community and the children, this would help nurture individuals who would grow up showing more interest in the cultural heritage domain and thus be more willing to volunteer their help and services in the future.

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The general feeling that seemed to stem from the discussions was that citizen science was a highly valued method which could be an immense source of data, but at that point was not necessarily accessible for the institutions to make use of. While it seemed easier to use citizens in a scientific research, the participants were finding it hard to clearly see a path one could take to make use of such an encompassing resource in the cultural heritage setting.

There were also some functional and non-functional requirements identified by the focus group. The functional requirements that include:

- recruiting participants from various backgrounds for experiments, panels, focus groups, interviews;
- being able to select and access certain crowds and populations;
- using existing platforms rather than creating new infrastructures which would allow specialized or diverse communities to connect.

Non-functional requirements included: availability, reliability, security, regulating investigations, data integrity and usability

4.4 CULTURAL HERITAGE INSTITUTIONS

The on-line survey

The CIVIC EPISTEMOLOGIES projects web survey (see section 4.3.1 above) was launched in November 2014 and available online for three weeks. The survey aimed to gather quantitative data which would help to get insights into:

- the current level of awareness on citizen science in memory institutions;
- the patterns of involvement of cultural heritage institutions in citizen science;
- the attractiveness factors seen by cultural heritage professionals;
- the need in specific tools which facilitate citizen science deployment in this specific setting;
- the awareness and interest in using citizen science in such domains like digital cultural content for creativity.

There were several aspects of the methodology of this study which deserve a special mention:

- The survey explores in parallel citizen science and crowd sourcing. Taking into account the project consortium observations that in many cases there is a confusion of these terms, and also that crowd sourcing gained popularity within the cultural heritage context, the project decided to make use of both concepts within the survey.
- For the first time we are aware of, a survey on citizen science allow comparing the outcomes of this questionnaire with previous surveys on citizen science (e.g. Wiggins and Crowston, 2012a, 2012b and 2015).
- The survey also allows comparing the data gathered with outcomes from the focus groups.

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Here we capture some of the comparative outcomes of the survey

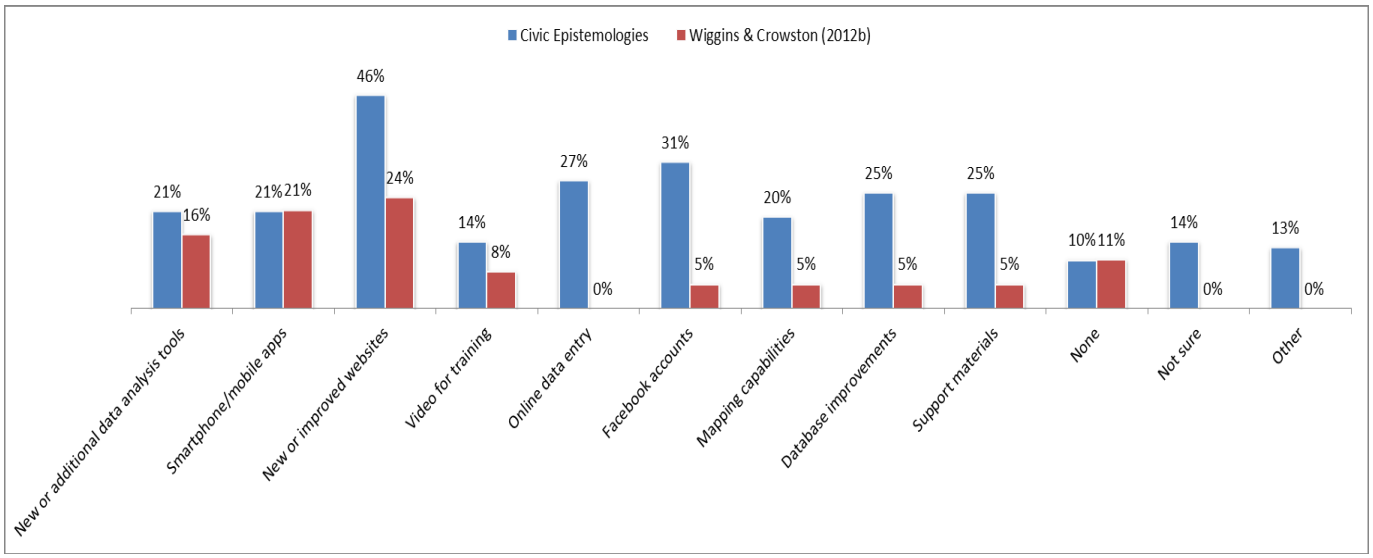

Figure 7: Comparison of technological tools in place according to CIVIC EPISTEMOLOGIES web survey and Wiggins and Crowston (2012

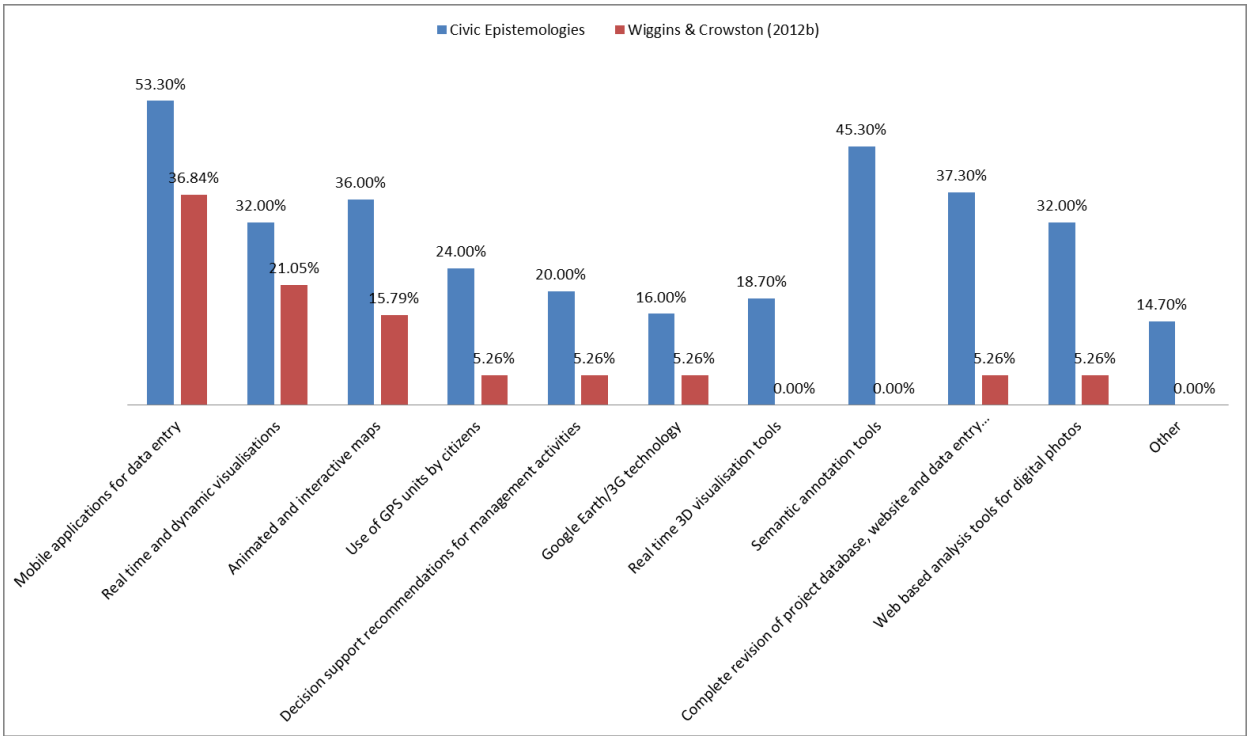

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Figure 8: Tools which are currently lacking in institutions but would need to be deployed in the future according to CIVIC EPISTEMOLOGIES web survey and Wiggins and Crowston (2012b)

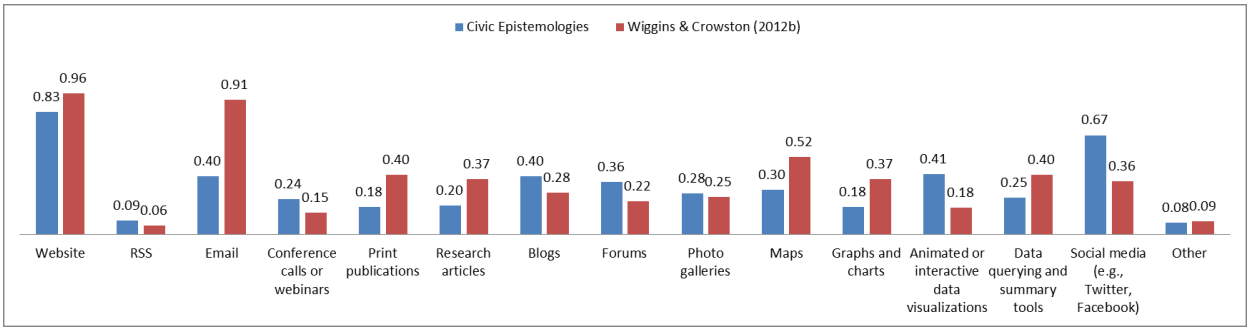

Figure 9: Comparison of the response on use of communication tools perceived as most useful in citizen science projects according to CIVIC EPISTEMOLOGIES web survey and Wiggins and Crowston (2012b)

The workshop on the Roadmap

This workshop was held on the 20th of February 2015 in the Erasmushuis premises of the Faculty of Art of the Katholieke Universiteit, Leuven (see section 1.2 above). More than 35 experts attended the event, showing their interest in the theme of citizen science.

During the panel and round table discussions, one group focused on the needs of cultural heritage institutions (CHI) and came up with the following aspects:

- The technical perspective (i.e. hardware) is not of highest priority for CHI. What is needed is different kind of applications like automatic control systems for data checking, data format checking etc., but also applications for crowd sourcing. It is important to look for good examples. FamilySearch was one example mentioned.
- Training of the staff of CH institutions is crucial for success. Otherwise the role of CH institutions will be taken up by others. It is also important for CH institutions to interact with educational institutions, schools as well as academies.
- Multilingualism is rapidly being of high importance when the world is being multi-cultural.
- IPR issues are always important, and there are best practices available to look into (for example Wikimedia).
- An overview of available tools/services is of importance for CH institutions; the Registry that the CIVIC EPISTEMOLOGIES project is producing will be very useful.
- Simple interfaces are crucial for the use of distributed services for citizen science or crowd sourcing offered by e-Infrastructures.

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4.5 ACADEMIC INSTITUTIONS

To be written later on

4.6 CITIZEN SCIENTISTS

All participants in the focus group with non-professional researchers had citizen science experience. Each member of the group had been involved in various projects and investigations – ranging from EU-Funded projects, international, national and local projects as well as Lifelong Learning Council of Europe initiatives. All of the participants were using museums, archives and library collections 'for personal use' but this was directly related to their activist organisation activities. Half of the participants highlighted that the local museums and cultural heritage institutions in the area, all played a key role in shaping their personal activities which directly linked with their activist role and work.

There was a unanimous agreement among the participants that the experts, technicians and specialists have to incorporate the people and average citizens into the work carried out in cultural heritage institutions. The use of citizen engagement enhances the work and the quality of data collection, leading to a more enhanced project that is responding to the shift taking place in technology obsessed society.

The best way to include the voices of the unprofessional researchers is to ask them to get involved. Oftentimes the unprofessional researchers, those at a grassroots level, are not included and do not feel they can participate or be included in such projects. The participants highlighted that many of the projects that they have been a part of, asked them and others to be a part of the research. There was an active recruitment process from that took place and an effort made in trying to include them.

The types of digital technologies that citizen scientists can use, was discussed. There was an agreement that TV and media contribute a lot to the cultural heritage of a community and country. Through their programming and commissioned projects, media offers a way for citizens to engage with cultural heritage content. There is a risk when using these tools. A couple of participants stated that there must be a balanced approach to digital technologies. There is an agreement by all that tools can help and allow many people from various backgrounds, even those that are often excluded and marginalized, get involved and offer an opinion or contribute to the investigation(s). The digital tools cannot be the central point. The participants all stressed that there has to be a balanced approach to gathering data as it can either isolate or create community. One participant said that writing, letters and telegrams were a huge way that people shared their knowledge and were included in previous projects.

Best practice digital technology tools that can be used or that they personally use in their own work are:

a) Computers, phones, music CD's, DVD's, informal talks that incorporate digital technologies, Internet, specifically YouTube and Skype. Skype allows people to share knowledge, engage and contribute.

b) Social media can be used to recruit and engage with various citizens from various socioeconomic backgrounds and ages, and offers an immediate way to contribute.

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4.7 ACTIVISTS

This focus group consisted of participants representing local/regional and central/national levels of activist organisations.

The general pattern, as the participants saw it, is that citizens normally participate in research activities through their local or regional societies. The cultural heritage institutions are seldom first on stage in these topics.

The most useful outcomes of organising citizen science projects are, from the perspective of a cultural heritage institution:

- increased interest in the institution and its collections/holdings;
- more work will be done;
- an opportunity to engage competences that are normally not available internally.

The discussion showed that it is obvious that the activist organisations (genealogical societies) in Sweden see themselves as an important part of the knowledge society with an ability to participate in citizen research projects, mainly crowd sourcing initiatives. If there are no cultural heritage institutions in place (or not willing) to support them, they have the strength to organise and run some of these projects themselves using cultural heritage institutions as "a source for crowding".

It did not become clear if this is the case in other Member States as well or in other countries around the world. In any case, genealogical societies and other activist organisations represent a strong movement that is using different strategies for reaching their goals: in Sweden by organising themselves in a nation wide federation strong enough at a political level to be recognised as an important partner to cooperate with or to listen to; in some other countries by using media or connecting themselves to research projects or programmes at universities with high level of awareness

The drivers behind private persons taking part in citizen science projects are normally:

- reward of some kind (could be small, symbolic and of less monetary value);
- personal interest;
- idealism (helping the local society in some way, religious duty, etc.);
- that the results could be used in the person's private research.

The conditions for organising citizens' research activities (becoming obstacles if they are not fulfilled) are mainly:

- the results of the activities have to be open for all to use ("open source");
- the technical facilities have to be in place from the beginning and also easy to use;
- the planning of the activities has to be made in cooperation with citizens research representatives, in order to incorporate their knowledge right from the beginning.

In earlier days most of the knowledge and expertise connected to the cultural heritage institutions holdings and collections were held by the institutions' own staff members. Today, with more and more of these the institutions' data and metadata available on the Internet, important parts of this knowledge and expertise are located outside the institutions, in the hands of users who also advance it by using different kinds of IT tools. An important issue for the cultural heritage institutions therefore is how to harvest this increasing external knowledge and expertise and make use of it in their internal work.

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4.8 ARTISTIC AND CREATIVE SECTOR

To be written later on

4.9 FUNDING BODIES

To be written later on

4.10 E-INFRASTRUCTURES

One of the basic assumptions for the CIVIC EPISTEMOLOGIES project is that grid and clouds approaches (e-Infrastructures) can offer a stable and reliable storage and computing platform to the DCHH domain. In general it seems that this domains first priority, when it comes to citizen science activities, is a flexible and stable technical environment. Other identified priorities are computer capacity for integrity checks and access to advanced virtualisation services. One conclusion is, therefore, that at least two main approaches to services supporting citizen science must be in place for distributed solutions. We can refer to them as the "kiosk" model and the "turn-key" model respectively.

This "kiosk-model" could contain supplementary services like federated authentication, audit and certification, persistent identifiers distribution, which are typical network services that would make work easier for institutions or networks of institutions that manage digital preservation "on their own".

The "turn-key" model could contain cloud or grid based services that offer the entire process covering all the phases and functions needed in citizen science activities model, eventually with a particular focus on storage, curation services and other organisational aspects like trust.

Close to the "kiosk-model" is an approach called "micro services" presented just a few years ago. The key idea with "micro services" is that they allow flexible combinations of specialised solutions depending on the requirements of a DCH institution.

When representatives of the e-Infrastructure community express their view on requirements on distributed services for citizen science, they high light the following ones:[27]

- Citizen scientist's basic needs of IT-services are normally very "hands on"

- Fast and reliable public internet access.
- Adequate "portals" to access and deposit data

[27] Based on a presentation by Rosette Vandenbroucke, Vrije Universiteit Brussels

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- Adequate "portals" to data analysis tools
- Clear and understandable documentation.

As an example the project Digitisation of a dictionary for a Flemsih dialect on agriculture, which is a crowd typing project, needs essentially just a mail service and editing tools.

- Citizen science projects have some ordinary basic underlying needs

DCH organisations need to have robust e-Infrastructure in place, including a data management policy and a data management plan; It can be a mix of private and public e-Infrastructures and corresponding services offered by a mix of providers.

- The Data management policy should address
    - Access rights and restrictions
    - Long term usability
    - Data format
    - Metadata structures
    - Interoperability with existing frameworks

- The Data management plan
    - Should cover how data will be handled during the research and after completion of the research project
    - Can include data services
    - Can include plans for collaboration at the data level
    - Can reference procedures and resources needed for long -term preservation

- Beware of extending e-Infrastructures for research to the citizen environment:

- Do not scale - it would be too expensive
- Some concepts like the federated identity are not possible when extending to any citizen

- Basic requirements on e-Infrastructure services should be

- Independent of e-Infrastructure technologies
- To be usable from "anywhere" where anywhere can depend on the case
- Easy to use

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4.11 THE CIVIC EPISTEMOLOGIES WORKSHOPS

CIVIC EPISTEMOLOGIES organised three workshops where representatives of the different stakeholders were invited and contributed to the understanding of their interests, needs and requirements.

4.11.1 Workshop in Malta

The CIVIC EPISTEMOLOGIES workshop in November 2014 in Malta with local Maltese cultural heritage professionals and policy makers delivered also gave recommendations to improve the research of the project. Some of the key points that were raised in the discussion were as follows:

- Real accessibility needs to be available, not a theoretical one. The findings and results need to be shared with the community, with which a connection needs to be built and maintained;
- When presenting the data, or connecting to the general public, one must not be too technical, specific, or academically snobbish since this might repel the people one is trying to connect with;
- A key factor to remember is that cultural heritage belongs to the people – the job of cultural heritage institutions is to protect the embodiment of our culture and present it back to the people;
- An issue that arose with great enthusiasm during the workshop was the element of FUN. Fun has the capability to make an activity a good experience which would help increase the popularity and would encourage people to take part in it and to disseminate it;
- Getting the commitment from the government in the aid of these institutions would also be a plus;
- For any endeavor making use of citizen science to succeed, three key factors need to be connected:
    1. Research
    2. Institution
    3. Citizens
- Artifacts or data which embody a community's cultural heritage need to be equally accessible to everyone. No curators or directors should deem themselves the exclusive owners of such a collection;
- Citizens should never be considered as a subject in the research, or as a source. Their role should be that of an active participant in the research;

Amongst these and other comments that were voiced during the discussion, multiple people shared one common thought; that they were all eager to see the results of the CIVIC EPISTEMOLOGIES project.

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A discussion on the technological infrastructure took place during the workshop, throughout which these issues were brought up:

- A basic framework needs to be developed which can then be adapted and reworked depending on the nature of the citizen science project that is being undertaken. This needs to be produced as a software or application;
- Constant support for the software needs to be available to whoever is using it;
- A serious issue that arose was the way users should be authenticated. A simple login via Facebook might not be enough, but users generally dislike creating and using additional accounts.

4.11.2 Workshop in Leuven

At the workshop in Leuven in February 2015 (see above) one of the groups during the panel and round table discussed as follows:

Which kinds of infrastructures are needed to support citizen science and collaborative approaches to culture and arts research?

It is important to connect to existing e-Infrastructures, and to use tools and services that people are already familiar with.

The results of citizen science and crowd sourcing activities can only become science when the results are shared, so there need to be sharing possibilities. This requires authentication services (such as Shibboleth, but social services like ResearchGate offer a lot more possibilities). The question of user authentication and access control systems need, therefore, to be discussed in the Roadmap.

Which are the requirements that cannot be served by the existing Internet services?

The following requirements were mentioned:

- Requirements of the creative industries
- Possibilities to add different layers to data and to separate user input from validated and curated data
- Peer reviewing

Which are the new scenarios that can be developed for digital heritage and citizen engagement thanks to the availability of novel infrastructure services?

- Best practices listing
- Showcases
- Good examples and bad experiences
- Proven examples (role models)
- Models and methods for peer reviewing

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- Defining communities

4.11.3 Workshop in Budapest

To be written later on

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5 STATE OF THE ART AND BEST PRACTICES

5.1 THE CONCEPT OF CITIZEN SCIENCE

Citizen science has gained substantial popularity and is becoming a new outlet for people who are not professionally trained to be researchers but have the possibility to contribute to a wide range of research. As a concept it refers to the engagement of the general public in scientific research activities when citizens actively contribute to science either with intellectual efforts, surrounding knowledge, or with their tools and other resources. The modern technological environments allow for innovative ways to involve vast groups of such voluntary researchers in different ways.

The increasing popularity of citizen science is demonstrated by the growing number of publications in this area.[28] However, there are also substantial differences in the understanding what citizen science actually is. The definition of the term "Citizen Science" differs across the various papers written on the subject.

The SOCIENTIZE project ascertains that "Citizen Science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources."[29] It has also looked for one generally accepted definition but not found it yet. Instead, different definitions are used, where some take up more traditional aspects, like understanding citizen science as an approach, which involves volunteers from the general public in scientific investigations during data collection and analysis. Others define it more broadly, as the public participating in scientific research, which includes also scientific activities like the asking of questions, formulation of hypotheses, and interpretation of results. Current discussions around the definition of citizen science not only focus on the scope of activities but also what to understand under "volunteers" and how to composite citizen science teams.[30]

In summary, the most common aspect seems to point out the nature of citizen scientists as being amateur researchers who gather scientific information on a voluntary basis, their only incentive being their participation to the project.

Citizen science is often used as a synonym for *crowd sourcing*, and there are significant similarities in both domains, including the participation of the citizens and the technological infrastructures used. The use of the term "Citizen Science" however is justified when the effort

[28] Dobreva, M., and D. Azzopardi "Citizen Science in the Humanities: A Promise for Creativity". In: G.. Papadopoulos (ed.) Proceedings of the 9th International Conference on Knowledge, Information and Creativity Support Systems, Limassol, Cyprus, November 6-8, 2014, ISBN: 978-9963-700-84-4, pp. 446-451.

[29] The SOCIENTIZE project: "Green paper on Citizen Science", p.6

[30] The SOCIENTIZE project: "Green paper on Citizen Science", p. 21

involving citizens is aiming at research project guided by an academic where there is a generation of genuine new knowledge. When considering the digital cultural heritage domain, crowd sourcing is still more popular.

5.2 CITIZEN SCIENCE IN AN EUROPEAN CONTEXT

Citizen science is well established in European funding programmes. In its 7th Framework Programme EU has supported several citizen science initiatives, including the SOCIENTIZE project mentioned earlier. Many of these projects are concentrated on environmental issues, but some that are shaped at very specific tasks.[31] A few are also related to citizen science and the use of e-Infrastructure, the most well known probably being ScienceTalk. It is a so called Support Action with the aim to bring success stories of European e-Infrastructures to a wider audience through key dissemination activities.[32]

Other examples are:

- the IDGF-SP project with the main objective to involve and engage (in long-term) significantly more citizens and new communities in the volunteer and private (campus-wide or enterprise) Distributed Computing Infrastructures;[33]
- the CHAIN-RED project aiming at promoting and supporting technological and scientific collaboration across different e-Infrastructures established and operated in various continents, in order to define a path towards a global e-Infrastructure ecosystem that will allow Virtual Research Communities (VRCs), research groups and even single researchers to access and efficiently use worldwide distributed resources (i.e., computing, storage, data, services, tools, applications).[34]

In the Digital Agenda of the EU, a new term "Digital Science" has been adopted in order to promote excellent science in the context of the Digital Agenda, Digital ERA and Horizon 2020. This new term refers to the ICT-enabled transformation of science and innovation within a culture of openness and sharing. One of the bases of the Digital Agenda is the e-Infrastructures, services and tools for data and computing intensive research in virtual and collaborative environments.

Examples of initiatives on European base built on citizen engagement are:

[31] See for example GAP2 (http://gap2.eu) about stakeholder driven science within the context of fisheries governance.

[32] http://www.e-sciencetalk.org/
[33] http://idgf-sp.eu/
[34] www.chain-project.eu/

- Europeana and the collection of users-content from the first world war
- Europeana Photography and the collection of pictures from the visitors of "All Our Yesterdays". The exhibition showcases masterpieces from the first 100 years of photography (1839-1939) from the most famous European collections of in total 19 partner institutions: photo-archives, photo-agencies, and museums.[35]
- The artistic experiment that is creating a statue made of building blocks provided by researchers from all over Europe and that will be on show in Lisbon in the occasion of ICT 2015. This initiative was presented at Net Futures 2015, an event organised in Brussels by the European Commission.[36]

The CIVIC EPISTEMOLOGIES project is in line with the Horizon2020 strategy, in which the research on cultural heritage and on social sciences and humanities is embedded in cross-cutting initiatives.

Critically, the CIVIC EPISTEMOLOGIES Roadmap will offer practical support for improved social cohesion arising from the sharing across all DCHH sectors of common and individual European cultures.

5.3 CIVIC EPISTEMOLOGIES STUDIES

5.3.1 Pilot study

As a part of the CIVIC EPISTEMOLOGIES project, a pilot study has been conducted which explores whether teenage citizen volunteers could record valuable data related to Irish place names and place-based heritage research, through conducing interviews with senior citizens. In the project plan three distinct phases to the pilot was identified.

1. Design and development of Intergenerational Digital Toolkit, based on existing digital apps and services in the marketplace.
2. Use and evaluation the developed toolkit in fieldwork interviewing older people recording placenames.
3. Presentation and dissemination of recorded data and final toolkit.

The Intergenerational Digital Toolkit is the title the pilot study gave to the set of digital applications, services and tools selected for use with this study and recommended for use for future expansion of the recording heritage with teenagers and seniors.

The Toolkit consists of audio recorder, audio editor, audio file portal for exchange and sharing, a website for presenting files, inviting participation, advising on approaches, sharing tips, and blogging about the experience of recording. It is described on a website created by the pilot study to present the sample recordings, share the approaches taken, and invite other citizens to

[35] See http://www.europeana-photography.eu/index.php?en/91/events-archive/57/all-our-yesterdays
[36] See http://ec.europa.eu/digital-agenda/en/news/net-futures-2015

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participate – http://heritagerecording.tssg.org/. ("| A Revival of Oral History and Loganimeacha Recording," n.d.).

An overview of the technical environment and of findings and results is presented in Appendix 1

5.3.2 Case studies

The Civic Epistemology project has conducted two case studies: "'Hidden' Cultural Heritage: Inclusion, Access and Citizenship" and "Local Cultural Heritage: Inclusion, Access and Economic Development"

The rest of this section will be written later on.

5.4 EXAMPLES OF THE USE OF CITIZEN SCIENCE IN THE DCHH DOMAIN

Although the use of citizen science in the DCHH is less popular than in the Sciences, this does not mean that these do not exist. This section contains of two parts: firstly a presentation of the main tool for accessing good examples of services, the Registry of Services; secondly a presentation of examples accessible through the Registry in order to highlight success stories and best practices.

5.4.1 The Registry of Services

One defined task for the Civic Epistemology project is to identify tools, workflows, approaches, solutions, demonstrators, and applications useful for supporting the involvement of citizens in the scientific development process. These tools and services have to be collected and stored in a publicly available, on-line registry. Requirements and assumptions for the design of the registry has been discussed during the *Workshop on User Requirements.* The most important identified requirements are:

- easy, public, on-line access (WWW);
- possibility to filter the content of the Registry using wide set of criteria in order to easy select interested tools;
- content of the Registry is going to be dynamic, thus user friendly, online interface to add and modify items collected in the registry must be provided. The interface will be available for all project participants and later on for wider group of experts (user-password access);
- possibility of importing data from existing data sets.

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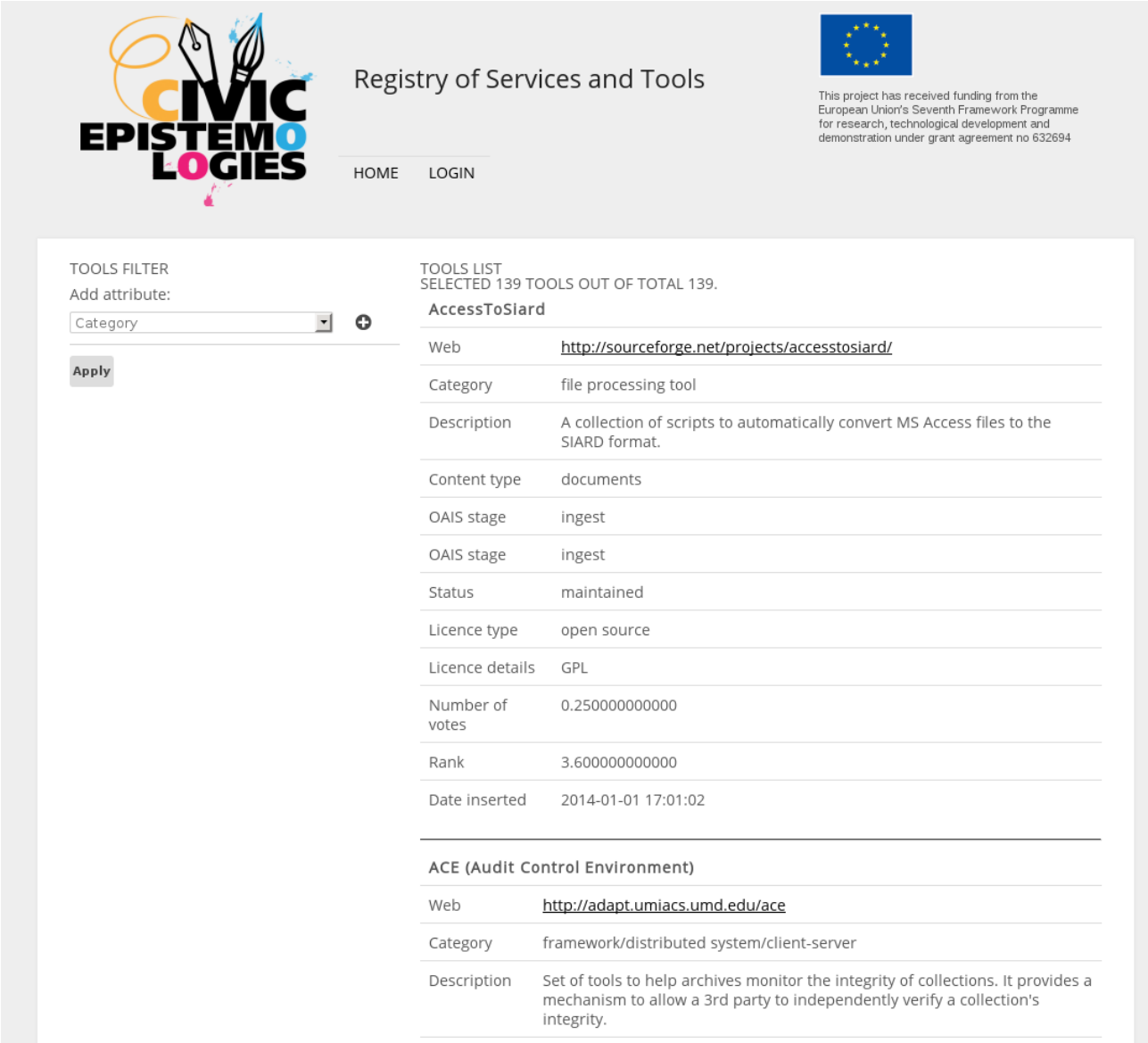

Figure 10 : The home page of the Registry

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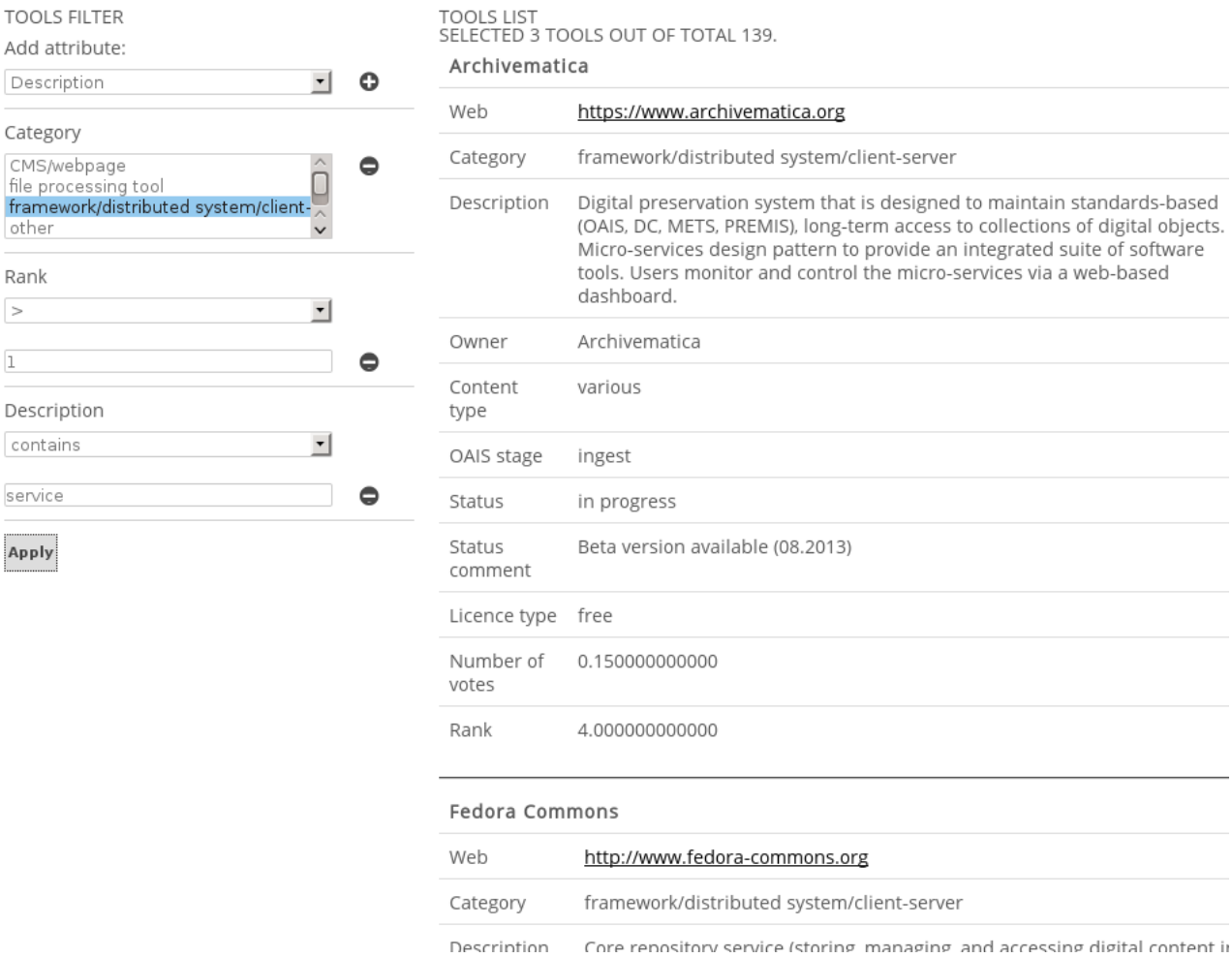

Figure 11: Defined and applied tools filter: subset of tools is selected

5.4.2 Success stories and Best practices

- "Letters of 1916" project, a website which gathers letters to or from Irishmen submitted from all around the world. These letters can also be translated or transcribed by anyone on the website. This project helped shed light on that year's lifestyle, thus bringing academics and enthusiasts of those times closer to that era. http://dh.tcd.ie/letters1916/
- "Georeferencing: help us place our digitized maps" is another project which makes use of an online interface and of citizen scientists to decode their data. This project's aim is to help the British Library identify their historic maps and correctly place them in their modern day location http://www.bl.uk/maps/
- The crowdsourcing projects directed by Lorna Hughes at the National Library of Wales
- Historypin project

To be written later on

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More examples will be provided by the partner in the project, by associate partners in the network of common interest and will come from the edit-a-thon session at the workshop in Budapest.

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6 LESSONS LEARNED

This chapter aims to discuss a list of lessons learned during the requirements analysis, the pilot and the case studies.

To be written later on

It will be finished later on when the final results of the pilot and the case studies are in place.

6.1 INTELLECTUAL PROPERTY RIGHTS

Almost all content providers would like to see their content being made widely available and reused, but only in manners that complies their own legitimate interests and policies. These interests and policies vary from one content provider to another, reflecting different missions and tasks, but they all require that access to their content is controlled, recorded and acknowledged.

It should be noted, that technology is only part of the solution to IPR and rights management and that the legal basis and the agreements between content owners and those who enable access to the content, as well as end users, are critically important.

6.2 AUTHORISATION AND AUTHENTICATION

The needs to access networked applications and remote/distributed data is evolving dramatically. User authentication is a basic requirement for community related services and for controlling access to restricted resources not available to the public. User authentication and authorisation to access controlled resources are high-priority services because of their central role in the digital rights management and the enforcements of IPR. User authentication and access control are services which are useful to both content providers and to content users.

Authentication and authorisation are often separated from the application and the data themselves: authentication of the users is done by the users Identity Providers while the authorisation is done by the services based on the information received by the Identity Providers.

Access that follows this model is known as federated access and it has brought several advantages both for users, who can benefit from a better user experience (fewer credentials to remember, log in once and access multiple applications, lower risk of forgetting their credentials) and for the service operators, who in practice outsource the user management life-cycle and can focus on authorisation. Federated access also increases security, by using a trusted connection between the identity provider (IdP) and the service provider; this trust connection is built by using standard protocols, legal framework and policies that are shared by the participating entities.

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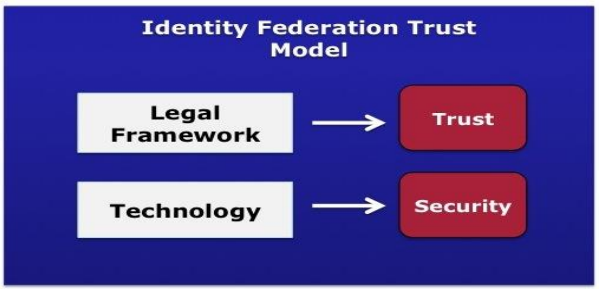

Fig 11:Trust Model in Federated Access

For the CIVIC EPISTEMOLOGIES project federated access is a key element, both in terms of using federated storage to handle data distributed all over Europe and in terms of user management. Federated access is in fact particularly desirable in a situation where services are offered across institutions and to users that do not belong to the institution that offers the service or technical facilities.

Federated access provides the technical and policy framework to allow for services to be shared in a trustworthy fashion across borders. How authentication is carried out by the institutions and how rights management is carried out by the service provider is left up to the respective parties.

When deciding whether to offer federated access, e-Infrastructures offering services should assess their potential user-base: whether they expect many local users or many users coming from different institutions. Federated access caters for the latter use-case and brings the following benefits:

- *Users* will be able to log in once (single sign-in) using their institutional credentials and access multiple services (sign on), Single Sign-On, whilst having the assurance that their personal data will not be disclosed to third parties.
- *Cultural heritage institutions and academic institutions participating* will be free of the burden of user name and password administration, and will have access to more tools for managing data. On a large scale of users this means reduced administration and service provisioning costs; and it avoids duplications of identity stores.
- *Collaboration* among different parties becomes easier.

The first step to join a federation is to talk to the federation operator in a specific country. The list of existing federations is available online at: https://refeds.org/federations.

6.3 THE ROLE OF CITIZEN ACTIVIST ORGANISATIONS

To be written later on.

6.4 THE VALUE OF AN OPEN PLATFORM

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To be written later on.

6.5 TRANSGENERATIONAL EXCHANGES

To be written later on.

6.6 CITIZEN'S ENGAGEMENT IN DIGITAL HERITAGE FOR SOCIAL INNOVATION AND SOCIAL COHESION

To be written later on.

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7 GAPS

This section will highlight the gaps that are expected to be filled in by implementing the Roadmap.

7.1 THE LAST MILE – AN OVERVIEW

ICT are powerful drivers of creativity, but specific technical know-how is still generally lacking:

- in the creative industries sectors in making digital cultural heritage more widely used and exploited;
- in Humanities, where humanities scholarship is not yet taking full advantage of ICT to engage with wider audiences;
- in the cultural heritage sector wher new skills are needed to enable DCHH institutions to grasp employment and commercial opportunities.

European e-Infrastructures have been built over the last decade with support from the European Commission. These e-Infrastrucutures are able to support the participation of European citizens in research on cultural heritage and digital humanities. This capability – when being used - will ultimately improve social cohesion arising from the sharing of knowledge and understanding of Europe's citizens common and individual cultures (see also section 5.6).

The keys to success that are taken up by the Civic Epistemology project are:

- analysing the needs of researchers, citizens, cultural institutions and creative enterprises;
- developing a Roadmap based on key findings;
- validating the Roadmap through one Pilot in Ireland and two case studies;
- encouraging Research institutions to establish clear protocols for citizen engagement and shared research goals where achievable;
- ensuring widespread impact of the project findings with a strong communication and dissemination plan;
- establishing a durable network of common interest to connect cultural heritage institutions, research bodies, creative industries, e-infrastructures and citizen associations.

7.2 E-INFRASTRUCTURE SERVICES FOR CITIZEN SCIENCE

Different parts of the DCHH domain have different needs, depending on if they are small or large, the kind of projects they have etc. The conditions (e.g. resources) for managing these projects differ also quite much. Services for supporting citizen research, therefore, have not only to be flexible, but also easy to adapt and utilise, and address several areas. That is a clear message from most stakeholder groups.

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E-Infrastructure services for citizen science, including crowd sourcing, are normally structured around development of tools, but need also to involve policy instruments necessary to achieve efficient intervention in the DCHH sector.

A ground breaking part of the concept that the Civic Epistemoloy project is aiming to introduce, is the possibilities to customise the citizen science focus services provided by e-Infrastructure, i.e. tailoring the service portfolio and characteristics to the actual tasks and requirements. However, even if the e-Infrastructure resources seems to be allocated in ways that could support citizen science activities quite well, the general conclusion must be that the market for those distributed services is still in its infancy, even if this market is developing quiet rapidly with a focus on the reach domain.

We know that ICT are powerful drivers of creativity in a number of areas, but technical know-how is still often lacking. An important issue is, therefore, the level of maturity in the DCHH domain to handle distributed services for citizen science. E-Infrastructures can reach their maximum potential in serving the DCHH domain in practice only if the domain is prepared to exploit the opportunities offered by using e-Infrastructures.

From contacts with different stakeholders it is clear that parts of the DCHH domain is not yet taking full advantage of technologies to engage with wider audiences.

This section will be finished later on.

7.3 NEED FOR A NEW MINDSET

7.3.1 Defining drivers for making a shift in institutional practices in the cultural heritage sector and the Humanities research

In addition to the technological challenges, innovations around the internal workflows of the organisations operating in the DCHH domain is of great importance for the achievement of the vision of the CIVIC EPISTEMOLOGIES project. Internal workflows currently encountered among DCHH players imply that a number of actions need to be taken by many institutions that are engaged in citizen science, in order to make their digital resources more usable. Firstly, roles inside the organisation have to be re-organised to guarantee that citizen science is accepted as a method of work. Secondly, in order to create new skills and competences, practitioners have to be trained in both understanding and the handling of the new conditions associated with citizen science in a digital context i.e. the changing forms of artefacts and metadata, the changing methods of work, and the rapid changes in technology itself. Furthermore, decisions have to be taken about the procurement of services related to citizen science and computing resources. All these actions require time to be performed and financially resourced. Advocacy of the need for citizen science is, therefore, another important action in order to create the conditions required for understanding, acceptance, and endorsement by decision makers.

This section will be finished later on.

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7.3.2 Engagement processes

This section will be finished later on.

7.4 TRAINING

This section will be written later on.

7.5 TECHNOLOGY GAPS

7.5.1 Type of service architecture

The EUDAT project has presented the architecture of a conceptual model that integrates various infrastructures with vast amounts of research data, and adds services for curation and trust in addition to the interface to users.

As it stands, this model represents basic stakeholder needs in the research area: ensure the trustworthiness of data, provide for its curation, and permit an easy interchange among the generators and users of data. These needs could also be said to be basic ones in the DCHH domain, and the EUDAT projects conceptual model can, therefore, serve as a base for further development.

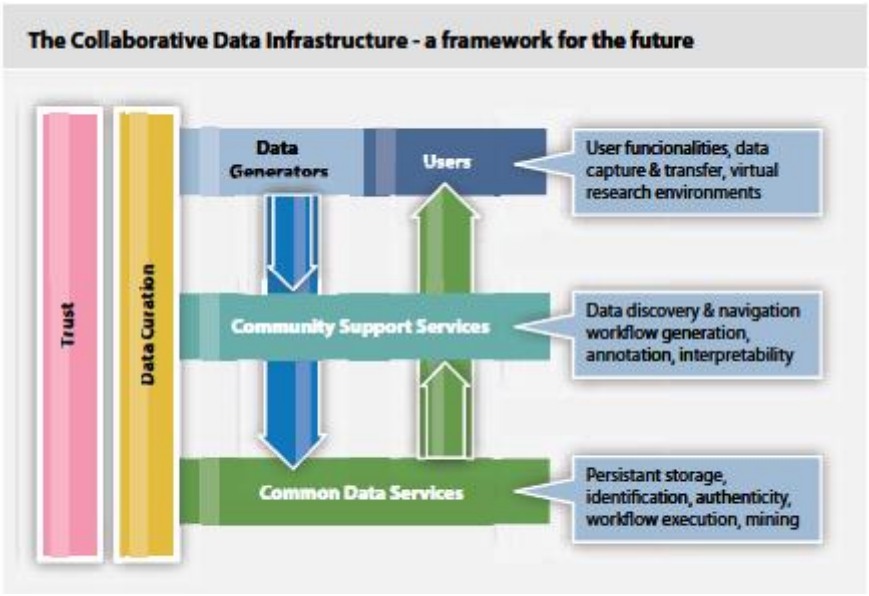

Figure 12: : The collaborative data infrastructure - a framework for the future (from "Riding the Wave", p. 31)

Improvements and adjustments of the model have already been made in, for example, the area of research data. The Data Archiving and Networking Services (DANS) in the Netherlands has developed based on the EUDAT conceptual model a federated data infrastructure with three

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layers of roles and responsibilities for the various stakeholders (The Front office – Back office model) [37]

Cultural heritage institutions as well as research centers of different kind have sometimes built up their own infrastructure or handling digital resources. But it is undoubtedly true, that continuing investment in in-house solutions for citizen science will contribute to the lack of interoperability and fragmentation of resources into "digital silos". Stand-alone solutions that are not transferrable and interchangeable lead to fragmentation and do not offer economies of scale. Instead, shared solutions for creation, storage and use of digital resources, including the e-Infrastructures, will become the major component of the future knowledge economy.

In order to move ahead from the current state into shared, decentralised solutions, it is important to define key institutional requirements in a standardised way. The use of enterprise architecture models is one possible approach because enterprise architectures seek to address system complexity while aligning technological developments with the institutional needs. There are a number of approaches for defining enterprise architectures; one of the popular ones is the Open Group Architectural Framework (TOGAF)[38] and its eight-stage Architecture Development Method that help to manage requirements within complex systems.

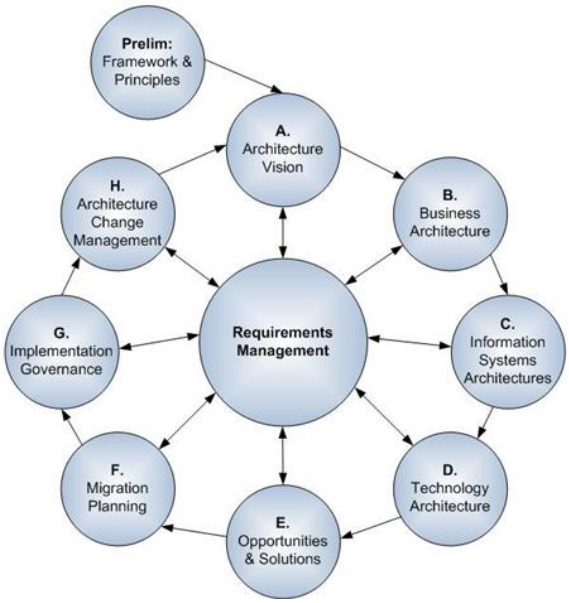

Fig 12: Architecture Development Method, TOGAF.

Service architecture as a technical area is very close to service-oriented architecture (SOA), which is a software design and software architecture design pattern based on pieces of software that provides functionality as a service easy to combine into different kind of

[37] See www.dans.knaw.nl

[38] http://www.opengroup.org/togaf/

applications. Services mean in this case not services for the users but services in terms of written functions ready to be used by programmers, and by other applications.

SOA can be seen in a continuum: from older concepts of distributed computing and modular programming on to current practices of mashups, SaaS, and cloud computing, which some see as the offspring of SOA. In the context of the CIVIC EPISTEMOLOGIES Roadmap, aiming at the use of e-Infrastructure, SOA can clearly be regarded as a concept to get inspiration from.

7.5.2 Technological offers and gaps

Citizen science is composed of various elements such as applications, performers ("workers"), and institutions, which need to work harmoniously together in order to reach the project's goals. Various infrastructures are employed to make the process run as smoothly and seamlessly as possible. In previous sections, examples have been mentioned of technological devices used in citizen science initiatives and those devices that has been asked for. These devices will be presented and discussed in more detail in this section.

This section will be finished later on.

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8 OUR VISION

New skills are needed in our changing society. Underinvestment in skills renewal and knowledge / technology transfer and the loss of traditional skills leads to the risk of innovation deficit and of a general lack of diversity and choice across design, production and markets, resulting in missed employment and commercial opportunities. A Roadmap which offers new understandings and ways of grasping opportunity can also lead to economic as well as social benefits. CIVIC EPISTEMOLOGIES is a project which shares its commitment to the values of openness, collaboration and wide participation.

The project's over-riding strategic objective is to support the development of a policy on the role e-Infrastructures can play in encouraging and facilitating the mediation process of citizen science in the area of DCHH, in order to bring about a closer alignment between the private and public spheres. It seeks to identify and deploy new services and protocols enabled by e-Infrastructures, which will in turn support Europe's citizens, its creative enterprises and its wider cultural industries to enter into productive technology-enabled dialogue with cultural heritage institutions and Humanities research. CIVIC EPISTEMOLOGIES is engendering dialogue, which is still relatively infrequent, between the different actors in the Cultural Heritage (CH) and DCHH sectors - research bodies (creativity, digital humanities, and digital libraries), e-Infrastructure providers and citizens' associations, and the artistic sector in general, all of which seldom share their specialist knowledge outside their immediate groupings, whether professional or interest-based. Larger industries in the cultural sector, including the owners of industry archives as well as national public heritage bodies, will be supported to open up their innovation potential through informal dialogue with interested volunteer users and experts.

The CIVIC EPISTEMOLOGIES project is informed by the consortium's awareness that new technologies are very powerful tools in the processes of creativity, co-creation and innovation; but that the creative and cultural sectors are both highly segmented and small-scale (many SMEs, micro-enterprises) and are lacking in technical know-how. Further, much Humanities-based scholarship is both mistrustful of new technologies (for example much scholarship is still highly traditional in terms of the means of publication and dissemination of written outputs) and faces difficulties in engaging with wider audiences. The notion of the 'prosumer' – the reader of published research who also contributes interactively with that research via new technologies – has not yet fully penetrated either the academy or the cultural heritage sector.

Finally, the consortium considers it vital to ask the following question: how can Humanities-based research in which the citizen is invited to play an active role, support re-conceptualization of the ways in which cultural heritage can reflect, construct and enrich individual and collective identities, and represent these increasingly fluid identities more fully, within a context of continuing social change?

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9 A TENTATIVE ACTION PLAN

9.1 MAIN COMPONENTS OF THE ACTION PLAN

9.1.1 Selected areas for actions

Based on an analysis of state of the art and requirements expressed by different stakeholder groups, five main areas have been selected for actions:

- ***Empowering existing e-Infrastructures with new services*** targeted to the needs of specific research domains;
- ***Tailoring new services to the requirements of each research community***;
- ***Improved interoperability*****:** includes better integration of internal and external digital resources within the overall workflows for handling research data; in a way this is a set of measures to avoid building 'digital silos' within the organisation;
- ***Establishment of conditions for cross-sector integration***: a key condition for maximising the efficiency of successful solutions, transferring knowledge and know-how; a scalable and modular approach to the e-Infrastructures deployment is needed that will allow serving research better and reduce costs of development.
- ***Governance models for infrastructure integration***: a necessary condition for successful institutional participation in larger e-Infrastructure initiatives, and aggregation and re-use of digital resources.
- ***Artistic and creative practices as an instrument for engagement***: this is an area which is still requiring to be valorise and exploited in terms of its potential for social innovation and cohesion.

For each area a set of prioritised actions are suggested.

9.1.2 Empowering existing e-Infrastructures with new services

To be written later on

9.1.3 Tailoring new services to the requirements of each research community

To be written later on.

9.1.4 Improved interoperability

Identify and promote best practices

In section 4.5 above best practices are presented, and in section 5 lessons learned connected with the integration between the DCHH domain and the e-Infrastructure providers are reported.

Analyse interoperability issues

To avoid building 'digital silos' within the DCH and research organisations, the following aspects need to be considered:

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1. *Technical aspects: hardware and software solutions have to be in balance and based on official standards*;

2. *Semantic aspects*: there are many vocabulary sources already available and it makes sense to check these out before inventing a new one.;

3. Organisational and inter-community issues;

4. *Legal issues*: the transfer of personal data has to be in line with European directives on data protection and their implementation in national legislation; harmonisation of legal frameworks in general have also to be addressed, for example concerning the issue of cross boarder storage and differences in legal positions regarding preservation of master files;

5. *Political/human aspects*.

9.1.5 Establish conditions for cross-sector integration

Identify common layers and standards to be shared among different domains

One of the challenges for the DCHH domain is to choose among the vast number of standards that are already available. This may be problematic, especially for small institutions with limited knowledge in and/or resources in this field. There are also non-technical issues that have to be resolved. One is differences in the legal system between countries, especially when data is covered by copyright or classified.

The conclusion is that much work has already been done, but more efforts are still needed before these standards (including guides and tools etc.) can give substantial help to the DCHH domain. For example, many of them need to be more user-friendly in order to be understandable for non-technical personnel. Furthermore, practical tests made within the different EU financed project have shown that already developed e-Infrastructure services must be modified and/or improved in order to provide a "pan-European" solution for the DCHH domain.

Registry of services and tools

The development of the CIVIC EPISTEMOLOGIES services registry is a key step in the construction of the Roadmap. In this regard, it should be noted that the collection and summarisation of information on services is quite an onerous task. The Registry is presented in section 4.5.1 above.

9.1.6 Establish a governance model for infrastructure integration

One way of establish good governance is to implement a model based on three levels:

- Strategic level: aiming at securing the long-term perspective; this is done from both an internal and an external perspective through, firstly, follow up and managing a consolidated service provider portfolio, and, secondly, establishing a forward-looking relation between the client and the service-provider (e-Infrastructure);
- Tactical level: has a time middle-term perspective with focus on securing services and agreements at hand and that they are up to date;

- Operative level: focus is here on securing the follow up of the daily work and that problem and incidents that arise are handled in a proper way.

Depending on which type of service is involved the service providers can be classified as being strategic/non-strategic and providing services that are easily accessible/not easily accessible. For the institutions in the DCHH domain the results of such a classification will inform their approach to managing the situation.

9.1.7 Artistic and creative practices as an instrument for engagement

To be written later on.

9.2 A TIME LINE

The CIVIC EPISTEMOLOGIES Roadmap should make it possible for each institution in the DCCH domain to define its own practical action plan with a realistic timeframe for the implementation of its stages.

- Short-term (2016- 2017)

  The purpose of proposing a short-term action plan (2016) is to initiate the development of e-Infrastructure services on a level that will be self-sustainable and continue to progress on its own. This further progress is defined in terms of two further proposed time spans:

- Medium-term (2018-2019), i.e. two years after the end of the CIVIC EPISTEMOLOGIES project), and
- Long-term (2020 and beyond) for the logical continuation of the work.

The remaining text in this section will be written later on.

9.3 AN ON-LINE FORUM

The Roadmap for the implementation of an e-Infrastructure to support citizen science and crowed sourcing in the area of cultural heritage and humanities represents the main outcome of the CIVIC EPISTEMOLOGIES project.

By definition, a Roadmap is not useful if it is not widely disseminated, validated and endorsed by the user groups that it aims to target. The Civic Epistemology project contributed substantially to the creation of a wide community of people coming from different sectors (policymakers, cultural heritage institutions, citizen scientists, activists, e-Infrastructure providers, etc.) who demonstrated interest in the work done for the development of the Roadmap. Now it is important to keep alive and continue to nurture this community, creating awareness about the final version of the Roadmap and fostering its diffusion and implementation in Europe and worldwide.

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Furthermore, a Roadmap cannot be considered as a final step. It has on the contrary to be considered as a living document that needs to be continuously maintained, updated and improved as time passes, technology changes, new requirements have to be taken into account, and so on.

It is for these reasons that the CIVIC EPISTEMOLOGIES project has created a dedicated web-space where it is possible to download the last version of the Roadmap, but also where it is possible for everyone to provide feedback and comments, a kind of Forum dedicated to the use of e-Infrastructure services and facilities for citizen science and crowd sourcing targeting the DCHH domain.

Apart from presenting and discussing the Roadmap, this web-space will link also to other relevant material, information and services that are linked to the Roadmap itself and that contribute to supplement it.

In particular, a section will be dedicated to the Registry of Services and Tools that was developed in the CIVIC EPISTEMOLOGIES project as a practical instrument to help different stakeholders.

By the end of the project, the web-space will be hosted as a section in Digital meets Culture (http://www.digitalmeetsculture.net/heritage-showcases/dch-rp/). The partners are committed to continue the work on the Roadmap even after the end of the project period and in this framework they are discussing about creating a URL dedicated to the Roadmap to be maintained on a longer period.

9.4 NETWORK OF COMMON INTEREST

To be written later on.

9.5 A COMMON STRATEGIC RESEARCH AGENDA

One of the tasks of the CIVIC EPISTEMOLOGIES project is to realise a Strategic Research Agenda (SRA) that is part of this Roadmap.

The SRA aims to cover the following elements:

- E-Infrastructures technical evolution;
- The research goals of ICT technologies applied to DCHH;
- Digital Humanities research goals;
- Digital libraries development;
- Engagement with creative industry;
- Involvement of cultural institutions in cross-cutting research
- A study of metadata enhancements that can allow citizen data input and data from (Do It Yourself) DIY-platforms to feed into museum and archival information systems.

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Full details of the SRA are provided in Appendix 3.

9.6 E-INFRASTRUCTURES SUSTAINABILITY MODELS

The CIVIC EPISTEMOLOGIES project has also the task to develop a business model for the e-Infrastructure services needed to support civic epistemologies and citizen scientists, primarily based on the requirements collected in the project. A first attempt is presented in Appendix 2.

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10 RECOMMENDATIONS

This section will provide a list of recommendations aggregated around each targeted stakeholder group. For each group the general requirements for fulfilling a citizen science project are identified and connected to the three stages of a citizen science project described in section 2.1 above (preparatory, deployment, and monitoring). The recommendations are adapted to these requirements.

10.1 CULTURAL Heritage Institutions

10.1.1 Project stages and requirements

Preparatory stage

Cultural heritage institutions should:

- have sufficient experience to advice on the tasks within the citizen science projects and be able to resolve right concerns related to the citizen science project;
- have a clear value proposition for the types of citizens they seek to engage in their citizen science initiative and need to have an idea of minimum necessary involvement and implement suitable incentives to create long-term relationships with engaged public members;.
- define image of the desired quality of volunteers' contributions to citizen science projects activities and make sure the volunteers understand what does the citizen science concept entail when recruiting novices;
- identify the most essential benefits they aim to achieve and to plan their citizen science activities accordingly and make regular audits of the specialised tools/services available to them which can be deployed for citizen science initiatives;
- have a responsibility for technology watch and liaison with e-Infrastructure providers and have also to select an appropriate communication channels to reach volunteers, meet any relevant dissemination requirements of funders and maintain contacts with other stakeholders, including academics and e-Infrastructure providers;
- consider introducing policies regulating their citizen science activities and, more important, choose and implement a strategy for training their staff;
- choose and implement a dissemination strategy and monitor the extension of the network and encourage via suitable incentives volunteers whose input is meeting or exceeding the quality standards to also work on expanding the network. They could be considered potential champions of the citizen science initiative. CH institutions should create a culture of appreciation of different personal motivations and introduce suitable reward mechanisms.
- decide early on the granularity of tasks where citizen's contribution will be expected and together with the intermediaries involved in citizen science projects be familiar with main attractors and factors helping engagement.

Deployment stage

Cultural heritage institutions should

- be able to train the members of the crowd for the citizen science task, have the capacity to attract citizens, and , as a result of that, be able to sustain the citizen community involved in the project;
- jointly with the e-Infrastructure provider should identify the most useful workflow, monitor the quality issues and revise accordingly workflows adopted within particular projects.
- have a clear business model for the citizen science project.

Monitoring stage

Cultural heritage institutions should:

- be capable to provide feedback on the workflow to their e-Infrastructure provider(s);
- monitoring citizen science experiences, include a summative evaluation of the experiences of using technological tools within this context, and plan for any necessary future changes either of the tools, or of aspects such as training.

All stages

Cultural heritage institutions should:

- be able to plan, obtain and maintain the budget necessary for the citizen science project;;
- be familiar with characteristics of the targeted crowd;
- be capable to identify and apply quantitative and qualitative evaluation metrics to follow the development of the project.
- have the capacity to incorporate the project outcomes into its collections or their digital presentation, depending on the nature of the project;
- pay attention to the dynamics of satisfaction of volunteers.

10.1.2 Recommendations

To be written late on

10.2 E-Infrastructure Providers

10.2.1 Project stages and requirements

Preparatory stage

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Citizen science e-Infrastructure should:

- address how the task(s) can be broken down into components;
- reflect scaffolding of user interface;
- be chosen to reflect the best solution in terms of generic platform or the design of a designated project infrastructure.

E-Infrastructure should take into account:

- the complexity of the task;
- be familiar with the policies in place.

E-Infrastructure providers could:

- pay special attention to solutions which help engagement (or at least do not contribute to disengagement, e.g. too complicated or confusing interfaces);
- contribute on technological aspects of the training;
- could contribute with appropriate dissemination infrastructure;
- could contribute to the network extension with tools which maximise the use of personal social media networks of the volunteers;

E-Infrastructure providers may introduce various gamification-style rewards (levels, badges, points, etc.) to meet popular personal motivation styles.

E-Infrastructure can explore the feasibility of offering 'citizen science primitives.

Preparatory and Deployment stages

CH institution jointly with the e-Infrastructure provider should identify the most useful workflow.

The outcomes of identical or similar e-Infrastructures in different cultural settings (e.g. countries) can result in different scales of uptake.

E-Infrastructures:

- could implement suitable tools supporting volunteers; it could be expected that these will be cross-fertilised with personalisation technologies;
- need to integrate tools which help to filter or correct erroneous inputs by volunteers;
- are most likely to form a key partnership with CH institutions providing technological services and expertise.

E-Infrastructure providers should:

- not rely on complete familiarity with citizens with basic concepts and activities; this requires efficient help; possibly end user training, as well as potentially some resources for end user support;
- adjust their services to the anticipated benefits; the different beneficent focus would have implications on the overall look and feel of their services, e.g. design aimed at

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supporting artistic use would differ from design for better service for professional researchers.

All stages

Citizen science e-Infrastructure provider should be able to support CH institution in the implementation of suitable evaluation metrics.
E-Infrastructures should:

- implement analytics which could help to analyse what causes volunteers to stop their contribution (complexity of tasks; repetitiveness, or other factors);
- test and make available tools for verifying data provenance in citizen science projects;
- offer tools for verifications of remediated primary sources;
- have the capacity not only to develop but also to assess and integrate emerging (and open) services and tools, and support modernisation of workflows according to CH institution needs and joint evaluation.

E-Infrastructure providers should:

- gather feedback from CH institutions on various aspects of use of tools/services they are providing and plan for improvements accordingly;
- provide easy real time help on the most popular communication channels preferred by the volunteers.

10.2.2 Recommendations

To be written late on

10.3 Academic Institutions

10.3.1 Project stages and requirements

Preparatory stage

Academic institutions:

- could boost the development of citizen science by furthering research on citizens' tasks and their granularity in the CH domain;
- could extend the understanding of longer-term engagement of different profiles of volunteers;
- and especially information behaviour scientists could help with more extensive motivational studies of volunteers in CH initiatives;
- and especially information behaviour scientists should advance in modelling behavioural norms for various types of volunteer contributions.

Within the Business Canvas model, academic institutions can play a key partnership role in citizen science projects initiated by CH institutions, but they can also be a customer of citizen science. The specific case needs to be clear in the beginning of the project.

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Academic institutions have further space for spreading awareness on citizen science in DH/Humanities.

Academic institutions can benefit from some of the benefits for CH institutions directly (e.g. "providing better service to professional researchers" or could enhance other benefits (e.g. "Facilitating new discoveries on CH collections".

All stages

Academic institutions should develop and brand their competences related to citizen science initiatives implemented by CH institutions.

10.3.2 Recommendations

To be written later on.

10.4 Citizen Activists' Organisations

Citizen organizations should consolidate and brand their competences related to citizen science initiatives implemented by CH institutions.

Importance of artistic practices: to be written later on.

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GLOSSARY

Specific terms and the definitions used or to be used in the final version of the Roadmap.

Born Digital - Digital materials which are not intended to have an analogue equivalent.

Cloud computing - a phrase used to describe a variety of computing concepts involving a large number of computers connected through a real-time communication network such as the Internet.

Digital asset – the material produced as a result of digitisation or digital photography; the term includes also more complex accumulations such as online learning resources, web pages, virtual reality tours and digital/visual files.

Digital curation - has wider coverage than digital preservation and involves maintaining, preserving and adding value to digital data throughout its life-cycle.

Digital preservation - a set of activities required to make sure digital objects can be located, rendered, used and understood in the future.

Digital record – any information that is recorded in a form that only a computer can process and that satisfies the definition of a record as stated in the formal regulation and/or the policy for the cultural institution in mind.

Digital resources – encompasses both digital records and digital assets.

Digitisation – the process of converting analogue data carriers (parchment and paper records, microforms, photos, film and audio and video tapes) into digital form using scanning, digital photography, or other conversion methods.

E-Infrastructure - the term used for the technology and organisations that support research undertaken through distributed regional, national and global collaborations enabled by the Internet. It embraces networks, grids, data centres, and collaborative environments; it can also include supporting operations centres, service registries, single sign-on, certificate authorities, training, and help-desk services.

Grid computing - the collection of computer resources from multiple locations to reach a common goal.

Hub - a common connection point for devices in a network (could be of different kind).

Memory institutions - a metaphor used about a repository of public knowledge; a generic term used about institutions such as libraries, archives, museums, clearinghouses, electronic databases, and data archives, which serve as memories for given societies or mankind as a whole.

Metadata – information about data required to manage, search, understand, use, and preserve it.

Mashup - in web development, a web page, or web application, that uses content from more than one source to create a single new service displayed in a single graphical interface.

Ontology – a structural framework for organising information; used in artificial intelligence, the Semantic Web, systems engineering, library science, information architecture etc as a form of knowledge representation about the world or some part of it.

Persistent identifier - a long-lasting unique reference to a digital object, which could be a single file or set of files.

Virtualisation - refers in computing to the act of creating a virtual (rather than actual) version of something, including a virtual computer hardware platform, operating system (OS), storage device, or computer network resources.

Visualisation - any technique for creating images, diagrams, or animations to communicate a message. Visualisation today has ever-expanding applications in science, education, engineering (e.g., product visualisation), interactive multimedia, medicine, etc.

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ABBREVIATIONS

Acronyms used or to be used in the final version of the Roadmap.

AAI	Authentication and Authorization Infrastructure
API	Application Programming Interface
AQuA	Automated Quality Assurance Project
CHI	Cultural Heritage Institution
COPTR	Community Owned Preservation Tool Registry
CLARIN	Common Language Resources and Technology Infrastructure
DARIAH	Digital Research Infrastructure for the Arts and Humanities
DIP	Dissemination Information Package
DCHH	Digital Cultural Heritage and Humanities
DCH-RP	Digital Cultural Heritage – Roadmap for Preservation
DP	Digital preservation
EC	European Commission
e-IRG	e-Infrastructure Reflection Group
EU	European Union
EUDAT	European Data Infrastructure project
4C Project	4C (Collaboration to Clarify the Costs of Curation)
GRID	See Grid computing
ICT	Information and Communication Technologies
HPC	High Performance Computing
HW	Hardware
IaaS	Infrastructure as a Service
ICT	Information and Communication Technology
INDICATE	International Network for a Digital Cultural Heritage e-Infrastructure
MW	Middleware
NGI	National Grid Initiative
NARA	National Archives and Records Administration (US)
NREN	National Research and Education Network
OAIS	Open Archival Information System
PaaS	Platform as a service
PB	PetaBytes
PEST	Political, Economic, Scientific, Technological
PraaS	Preservation as a Servic
PSNC	Poznań Supercomputing and Networking Center
RAID	Redundant array of independent disks (earlier: Redundant array of inexpensive disks)
SaaS	Software as a Service
SCAPE	SCAlable Preservation Environments
SOA	Service Oriented Architecture
SW	Software
TDR	Trusted Digital Repository
TB	TeraBytes
VPN	Virtual Private Network
VRC	Virtual research Community
VRE	Virtual Research Environment
VRO	Virtual Research Organization
WP	Work Package

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APPENDIX 1: PILOT STUDY ON IRISH PLACENAMES AND PLACE-BASED HERITAGE RESEARCH

This appendix provides a summary of the pilot study conducted in Ireland in the frame of the CIVIC EPISTEMOLOGIES project, with an overview of the technical environment, and of findings and conclusions. For full information about the pilot, please refer to the concerned deliverable *D4.1 Ethnographic Pilot report.*

1. TECHNICAL ENVIRONMENT

Audio Recorder – Default on participants' own device

We recommend the use of the default audio recorder on smart phones, or tablets. In our experience the default recorder on most modern smart phones, or tablet devices is perfectly adequate for the task

Editing Application - Audacity

Once the audio file in its entirety is recorded, it usually needs to be edited. Again there are many audio editing tools available but at the time of doing this pilot, Audacity was recommended as one of the best options. We used this and found it to be both flexible, usable, and well documented, and therefore would recommend it. Audacity is free software, developed by a group of volunteers and distributed under the GNU General Public License (GPL). It is available to download at Sourceforge.

Cloud Storage and Sharing Application - SoundCloud

We used a cloud based service to upload and save the audio file snippets from the interviews for sharing called SoundCloud. This is a streaming service, a distribution platform and an online community. SoundCloud has a *free* version, which we used for the project, which allows a limited but relatively large 120 minutes of audio files to be uploaded and shared. It provides for some privacy options such as private, sharing with friends or sharing with everyone. These options allowed us to set up a system where the interviewee retained control and ownership of their own recordings, and with whom they shared the links to those recordings.

Website - Wordpress

Wordpress.org was chosen as the preferred tool to quickly generate a flexible website using free templates in a short space of time that could easily incorporate the features required. TSSG agreed to host the site for the pilot project. The cost for site hosting and domain name registration would be required for future similar projects.

Information Architecture

The information architecture for the website was drawn up using an approach known as Card Sorting. Headings for the different types of site content planned and envisioned were drawn up on post-it notes. These were then organized into groups firstly on the floor and then on a whiteboard. The groups of post-its showing categorized information were given an overarching label, and then the labels were ordered to define the sites main navigation links. Cross-links

between many various information sections were then considered and also included. Once the navigational and page structure had been decided the pages were created.

Access to historical photographs and copyrighted resources

The students would have very much liked to show images from the Waterford County museum (http://www.waterfordmuseum.ie/exhibit/web ("Waterford County Museum," n.d.)) - which is a wonderful resource providing access to a wealth of old photographs - on their own recording heritage website or use sections from embedded maps from the OSI such as those used on the official placenames site loganim (www.loganim.ie). But the museum did not respond to enquires for usage and other researchers told us the cost for copyrighted images would be prohibitive. Similarly access to the official ordinace survey maps with layered historical maps would be costly. This meant that no historical images were available for use on the site.

This matter raises an issue for future consideration in the synching-up of citizen led projects with official institutions and services run with commercial aspects, as the output from the citizen volunteer work would be significantly enhanced by if access to such services could be legitimately and transparently improved beyond making resources available on their own website to extending permissions for particular and considered usage by citizens.

Plugins

Features required for the website were: inclusion of integrated social media links throughout, interactive maps with links to audio snippets, clear navigation elements, attractive slider with links to featured content. WordPress offered various options for template theme designs and plugins, which facilitated including both the social media and mapping elements into the site. The students tested several free templates before settling on *Catch Katmandu* by Catch Themes. We decided to use the *GoogleMapsReady* plugin (https://wordpress.org/plugins/google-maps-ready/) to show a map in our site, as it was easy to use to mark places associated with the audio recordings. We used the *SoundcloudIsGold* plugin from the mightymess.com developers to present the audio snippets shared on SoundCloud.

In most cases a student was tasked with doing a short technology review to justify the selection of a particular plugin.

Logos and design

One student working in the final week of the project focused on design elements for the website. We considered the presentation of the methodology for citizen engagement and guidelines for participation to be part of the pilot project. The recording heritage logo went through various iterations before a final logo was designed by one of the students. It references Reginalds Tower - a noted heritage site in Waterford city. It also features a red button to reference the recording button on audio recording applications. The students came up with the following tagline to introduct the project with the logo - *"A revival of oral history and logainmneacha".*

In addition to the website the students generation social media presences and accounts in Twitter and Facebook, which were linked into the main website.

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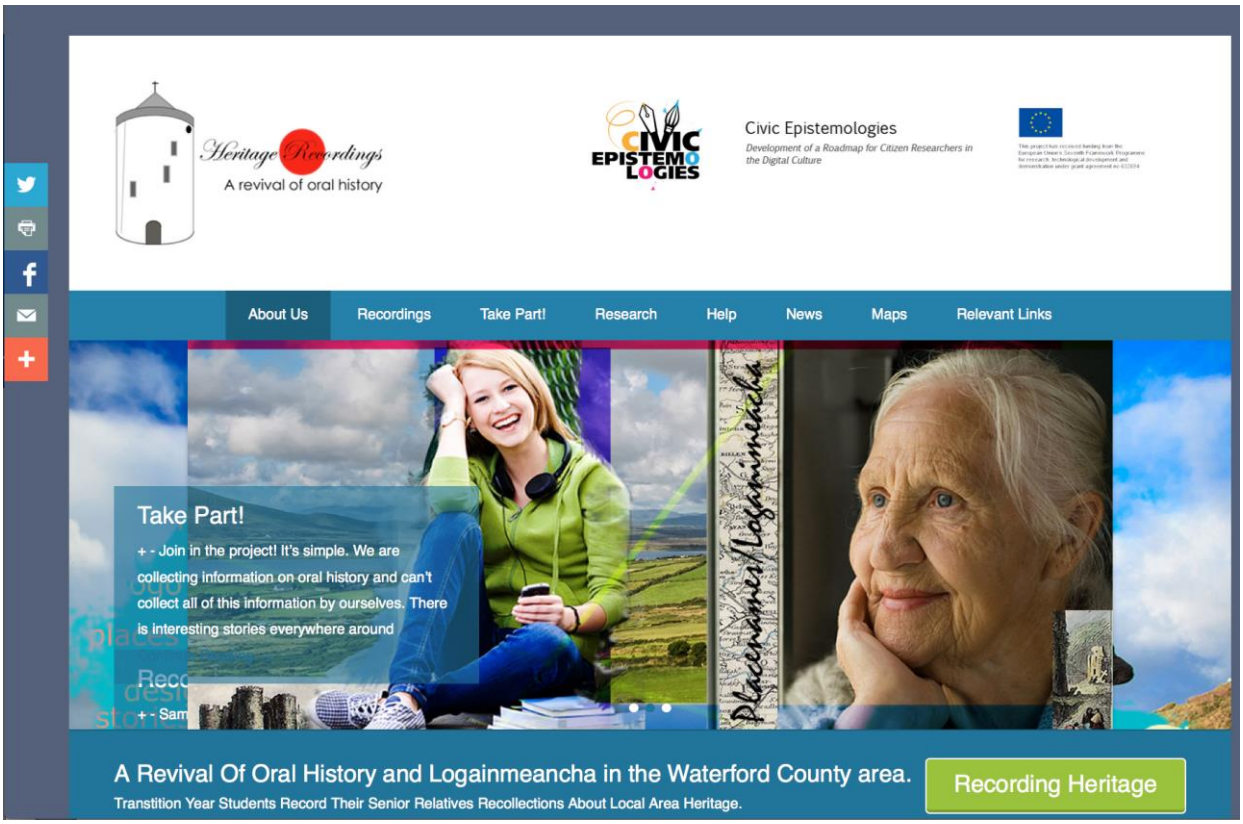

Figure13: The Heritage Recording website generated for the pilot study

The creation of a Heritage Recording website("| A Revival of Oral History and Loganimeacha Recording," n.d.) was a key output for the pilot study. It had two primary functions, to showcase the audio segments from the interviews conducted during the course of the pilot project, and to provide a call to action for other schools and teenagers to replicate the place-based cultural heritage recording work. It includes guidelines on how to set up and conduct oral history interviews, and simplified approaches to conducting placenames research interviews.

It also features a map-based interface which provides an alternative means of navigating the audio clips based on geographical references within their content. This feature proved technically challenging to implement, with several different approaches tried before succeeding. It also raises a number of issues which exemplify how categorizing data for this type of project is not straightforward. Should the audio clips be linked to the place where the person interviewed now lives, lived at an earlier time, or to the place or places referenced in the audio content? Where should the meta-data related to the audio clips be published and stored?

For practical reasons we used an established web application SoundCloud to store the audio clips and therefore also used that service's metadata elements, to provide dates, and keywords associated with the clips. This approach is dependent on the continuation of this independent service. Generating a bespoke online database cloud solution for the interview and ethnographic audio segments with a distinctive metadata structure was considered. A list of data attributes desired is available in the annex. However, due to time constraints other work was prioritized for this pilot. Finding a clear solution to managing file storage, respectful to

agreed privacy permissions with the projects participants, and suitable creative commons licensing, from the outset, would be advisable for similar future projects.

We wanted the pilot to create a citizen science project template that could have a daisy chain structure that allows more students and senior citizens to easy adopt the project structure and generate follow on contributions to link up together. The website demonstrates how this objective could be met this fairly successfully, however we were limited by time and resources constraints from really testing the potential to create a network effect by extending the project to use within other schools. Also it would be beneficial to seek feedback on the whether the quality of the samples already generated during the pilot is sufficient from an expert perspective. We think with some tweaking the approach developed during this pilot study could be extended and enhanced for more widespread use and hope to have the opportunity to do this in the future.

Dissemination

We have been lucky enough to present the project at the Digital Enlightenment Forum 2015 in Kilkenny, Ireland, and also had an opportunity to present the project to the Irish Minister for Minister for Skills Research and Innovation who expressed particular interest in supporting such Intergeneration projects in an educational context in the future.

2. FINDINGS AND CONCLUSIONS

Planning work with an unknown quantity of two different groups of citizen volunteers who have not a prior commitment to participate in a project is challenging. We found that the schools and students did not respond until very close to the commencement of the students' work experience, and suggest that it would be better to seek agreement to work with particular schools several months in advance. Also while the senior citizen groups were open to considering engagement and eager to contribute; as they are composed of individuals with varied commitments and activities, agreeing schedules can be tricky. This is compounded by the fact that whereas some of the senior citizen groups we contacted usually meet in the evening out in the community, the teenage students aged between 15 and 17 usually expect to do these activites within the school day.

Having clear documentation about the project vision and proposed work for the engaging with the citizen volunteers is needed to explain the participation proposed to prospective volunteers. We prepared three distinct documents to support engagement – a Digital Recap document, which was the invitation to the secondary schools and their students to participate; a sample itinerary of a week's work experience, and a leaflet on heritage recording for dissemination to attendees at the Tramore Active Retirement AGM. This requires detailed project definition and planning upfront from a project coordinator of a citizen science for humanities pilot study, which is time consuming, and limits somewhat the potential for cooperative project definition and goal setting. In an ideal situation, the participants would be fully enaged in the project definition and planning. Additionally as the citizens in this pilot study are comprised of two vulnerable groups, in society, particular care needed to be taken with ethical issues.

We found that the pilot being linked to a well-known trusted organization - the Waterford Institute of Technology leant the project credibility in the local community, which made

engagement with groups easier. Trust, clear privacy policies, well formed consent forms, and security are required to assure people taking part that their personal privacy is being protected. This is quite difficult to manage as digital technologies, are increasingly difficult to gauge for privacy and security factors. There is a balance to be struck between privacy, trust, documenting, sharing and connectivity. Each individual must make her or his own decisions about what is acceptable to her or him to share, of course vulnerable people should be supported if they want or need further information about the potential extent and implications of sharing information online. This Irish Heritage Recording pilot project attempts to share power by asking the interviewees retain ownership of the audio files, and only sharing access to snippet of them via links provided by the interviewees to the cloud service – SoundCloud – links that they can remove access to at any time. The heritage recording website retains the power to disconnect and not publish access to any SoundCloud files submitted by users with unsuitable content.

These factors mean that while the Irish pilot coordinator wanted to share power with the pilot project's citizen participants, quite a lot of decisions had to be made at the outset before any volunteer participants had signed up. A comprehensive written consent form is required which clearly outlines the project aims, intentions and the planned usage of all data collected. One must ensure that it meets the requirements for the particular group one is inviting to engage with citizen led activities. In the case of underage people, for example, the student's guardians or parents must also sign the consent form. Additionally when working with younger people the researcher needs to be aware of the potential for power relations imbalance within the group.

Recording information and stories shared from the personal recollections of seniors also presents challenges. Trust and an openness of communication needs to be established in a short space of time if the recordings are to be worthwhile for both interviewer and interviewee. We think that drawing up general codes of conduct for mutual respect between all participants in all project interactions, would be useful to establish the outset a tone of respect. It would be useful if template documents for code of conduct and consent forms could be generally available for reuse in citizen science for humanities projects. We also suggest that if this project is to be extended into schools in the future that students should be encouraged to interview their own relatives where possible.

Young students do not ordinarily have experience of being "professional" or conducting recordings, so it is useful to set ground rules, discuss expectations, and practice through role-play prior to being in a live interview situation. Practising interview techniques in a supportive encouraging environment - from checking equipment, question preparation, intial greetings, getting consent, active listening, politely directing the interview back to focus on desired subject matter, and closing - is important to ensure everyone is ready for real interviews, and will give students a chance to gain confidence and focus. Having two or more students conduct interviews simultaneously allows them to share tasks and can work well, with one person asking questions for example, while the other manages the recording technology, as long as who is responsible for which tasks is absolutely clear to everyone.

As the activities involved in the project are novel to the students, there is, despite their familiarity with digital applications and devices for their own social activities, still a steep leaning curve. Planning time for preparation in finding and using applications, and role-play of interview scenario is very valuable to support students in building confidence and skills. Providing students with access to an experienced interviewer and community leader who can give insight

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into the social and environmental factors of conducting interviews is very advantageous and we would encourage a similar approach for future citizen powered intergenerational projects.

Being very well prepared for interviews - conducting research about places, becoming familiar with local maps and having a prepared list of topics for discussion is essential for interviewers. If introducing stimuli could enhance the interview, then students should allow adequate time to accessing online archives for supporting material like historical photographs and caching them for showing during an interview, and the use of video for recording the interviewees interaction with those cultural artifacts may result in more useful material than audio alone. Setting up the right environment for an interview is important - we learned

Senior citizens, who are being asked to participate in interviews and share personal reflections, should be given ample time to consider questions and general subject matter in advance. Interviewers and should be sensitive to people who may have age-related issues which might affect their participation, e.g. with hearing, sight or memory. Also as one does not know what might be meaningful for an interviewee about place, while questions can and should be prepared, one should also be prepared for the interviews to go off on unexpected tangents. Including a community leader or family member in the engagement process with seniors can help to establish trust. Also for future intergenerational citizen science cultural heritage projects, we suggest introducing a step which enables the senior interviewees become more involved in the editorial selection process. It is important we think that they can remain involved in the decision making and control of what happens to the presentation of their stories.

Taking short segments of audio from the longer interviews for publication on the Internet, is a preferred approach to give visitors to the pilot project's website a flavor of the interviews most interesting parts, but deciding which segments should be selected and shared is subjective. This necessary reduction may cause confusion, and care should be taken to try to ensure these segments are not likely to be misconstrued, out of the context of a longer interview. Personal information may be shared during interviews in conversational asides, and younger editors may appreciate support in deciding what to share and what should remain private from interview data.

The pilot projects success was a high risk and entirely dependent on the willingness to participate and availability to cooperate of three distinct volunteer groups: the teenage school students to make the recordings and design the toolkit, the senior citizens to take part and share their knowledge, the experts in placenames and cultural heritage who provided necessary guidance. We were fortunate to encounter really enthusiastic and hard working teenage students, patient and generous interview subjects, and supportive, cooperative experts and advisors who made this pilot feasible.

Having received feedback and support from experts in placenames, architectural conservation, oral history, and community heritage, was very informative in guiding this citizen science pilot's progress. However, in many cases, the methodologies developed for professional researchers need to be adapted and simplified to make them accessible and usable for citizen volunteers, working with time constraints. This raises an issue of whether this means citizen-led research compromises on quality, and here there are several factors to consider. Are the citizens, who are volunteering in the project motivated to gain skills, or volunteering to give back to society or get social benefits from participation? Is the task involved in the citizen science requiring a highly skilled approach? Will the citizens be repeating the volunteer work, and thus gaining

expertise in the process or will they be once off participants? What will motivate people to take part, and how much effort will they make for their contribution? What expectations will they have if any in return for volunteering their time and effort?

We identified some pertinent issues where there are unsolved dilemmas between professional and citizens researchers for humanities in this pilot: the required simplification of methods for acquiring knowledge, access to copyright material such as photographs is an issue; issues arising at editing and analysis stages (where mature studious reflection and experience of researchers directly affects the quality of the selected recordings); and how to manage attribution, ownership and archiving of data collected. All of these issues can been adequately if not perfectly resolved and clarified, within a citizen science project in our experience on this pilot, through supportive networking and ongoing discussion between citizen amateurs and professionals. However formal structures and supports for citizen-powered cultural heritage projects, if available, at the level of institutions, universities, museums, schools and community organizations if available would greatly facilitate the process and improve the quality of project outputs. This does indicate that citizen powered cultural heritage projects are dependent on access to professional humanities researchers and resources. There is the issue of resourcing these services on an ongoing basis would have to be resolved, as while the experts approached for this pilot agreed to help for no payment - that is not a sustainable approach for rolling out citizen powered cultural heritage projects on a large scale.

Ideally for future citizen led research, there would be the potential to establish networks of support with professionals, and allow time to clarify adaptation of methods & acceptable approaches for non-professionals, whether for placenames research or oral history recording. While we failed to establish a generic focused approach that any student could use with any senior interviewee, to digitize placenames; we did include a simplified set of steps that would enable placenames to be recorded if it so happened that a suitable senior informant for placenames and sufficiently interested student decided to focus on this. We accept that the results of these recordings may not be at the same standard and quality as professional researchers, but the potential for a broader reach across the country is a real possibility.

We gratefully acknowledge the four expert volunteers who agreed to voluntarily provide information and support to this pilot study's research into placenames – Dr Finnegan from Loganim.ie, oral history – Cormac McCarthy from Cuimhneamh an Chlair, architectural conservation – Risteard UaCróinín and community heritage groups – Dr Maxine Keoghan. We did not have capacity to seek these experts feedback to the pilot projects outputs and website produced, to date, but we suggest that getting experts to evaluate the audio quality and content of the recordings would also be a useful step in future similar projects.

The feedback from the students and senior volunteers was indicative that the process of being actively engaged in such a project was enjoyable and rewarding. The students all reported enjoying working on a project with such varied tasks and challenges that traversed both cultural heritage and digital technologies. Some students excelled at design, others became immersed in new challenges editing audio, organizing content or building features for the website. The students involved in the participatory meeting particularly enjoyed meeting with the senior volunteers and conducting the interviews. They were surprised by how interesting they found the stories about known places that made history come alive. The senior volunteers who agreed to take part, also reported enjoying their participation in the recordings, and meeting with the students. We acknowledge that this pilot study would not have been possible without the

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dedication and willingness of these senior citizens from the Tramore Local Family Heritage Group, and teenage Transition Year students from the Gaelcholaist Phortlairge, and De La Salle College, to take part.

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APPENDIX 2: E-INFRASTRUCTURES SUSTAINABILITY MODELS

EXECUTIVE SUMMARY

The CIVIC EPISTOMOLGIES has a dedicated task (3.5), which is designed to develop a business model for an e-Infrastructure to support civic epistemologies and citizen scientists, primarily based on the requirements collected (WP2). It looks at several alternative revenue streams that alone or in a mix and match model may cover the costs of such an e-Infrastructure. Due to the nature of the subject at hand, the business model development activities also examines IPR issues and how they may contribute to, or hamper with cost recovery strategies. Curation of data for payment as well as business relations with the creative industry will be taken into account in the proposed model.

This document serves as an internal report to be used as background for the discussion at the workshop on the Roadmap to be held 19-20 February in Leuven. Overall, the document is structured as a business plan that takes into consideration the value of the proposed services, a market analysis, market segmentations, organisational and management aspects, service portfolio and corresponding business models and an implementation strategy.

The report is purposefully written in a way that implies this is the final report of the project, which can be updated as the project progresses and information is gathered. There are also several places where information is missing, this also done on purpose as it provides open questions to be answered over the course of the project and can be used as a living document.

1. INTRODUCTION

1.1 STRUCTURE OF THE DOCUMENT

This internal report aims to outline the sustainability and business model activities that are to be put in place by the end of the project as initial input to the Roadmap, which will have its first consultation during a dedicated workshop 19-20 February 2015 in Leuven.

The current document is comprised of seven main sections and an Executive Summary that will be completed over the course of the project comprising:

Section 1 is the introduction and describes the structure of the document, the objectives and the relationship with the other deliverables.

Section 2 - value proposition of the proposed services.

Section 3 - a market analysis describing the current landscape and future opportunities and target segmentations outlining the groups of potential beneficiaries.

Section 4 - service portfolio and corresponding business models offered.

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Section 5 - organisational and management aspects describing the structures to deliver those services and Intellectual Property Rights (IPR) issues.

Section 6 - an implementation strategy for how the activities will be carried out and objectives achieved.

Chapter 7 - concludes the document.

1.2 Relationship with other tasks/reports

This internal report has been developed in the framework of activities planned in tasks 3.5, under the responsibility of EGI.eu as task leader within WP3 "Roadmap Development". This activity is closely tied to the user requirements coming out of WP2 "Identify requirements".

1.3 Value proposition

CIVIC EPISTEMOLOGIES is about the participation of citizens in research on cultural heritage and humanities. ICT are powerful drivers of creativity, but specific technical know-how is still generally lacking in the creative industries sectors. In addition, humanities scholarship is not yet taking full advantage of ICT to engage with wider audiences. New skills are needed to enable the cultural sector to grasp employment and commercial opportunities.

European e-Infrastructures have been built over the last decade with support from the European Commission, which are able to support the participation of European citizens in research on cultural heritage and digital humanities. This capability will ultimately improve social cohesion arising from the sharing of knowledge and understanding of Europe's citizens common and individual cultures.

The keys to success are:

- Analyzing the needs of researchers, citizens, cultural institutions and creative enterprises
- Developing a new Roadmap based on key findings
- Validating the Roadmap through one Pilot in Ireland and two case studies in the UK
- Encouraging Research institutions to establish clear protocols for citizen engagement and shared research goals where achievable
- Ensuring widespread impact of the project findings with a strong communication and dissemination plan
- Establishing a durable network of common interest to connect cultural institutions, research bodies, creative industries, e-infrastructures and citizen associations.

The central components to achieving these objectives are:

- A study of metadata enhancements that can allow citizen data to feed into museum and archival information systems
- A registry of services which can support the involvement of citizens in scientific development processes
- An analysis of the requirements of citizens, researchers and cultural institutions, gathered through dedicated Focus Groups

- One real-life pilot: "Archaeology in Rural Ireland" and two case studies: "'Hidden' Cultural Heritage: Inclusion, Access and Citizenship"; "Local Cultural Heritage: Inclusion, Access and Economic Development"

2. MARKET ANALYSIS AND SEGMENTATION

2.1 MARKET ANALYSIS

Cultural heritage is defined as the legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations. Cultural heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art, and artifacts), intangible culture (such as folklore, traditions, language, and knowledge), and natural heritage (including culturally significant landscapes, and biodiversity).[39]

In an increasing digital world, citizens in every part of the globe are assessing and consuming digital information than before and not just private companies, but public institutions are looking for ways to better reach and engage audiences. Other the other hand, the preservation of physical artifacts is becoming a concern for future generations.

The European Commission has taken an active role in supporting cultural heritage based on the Lisbon Treaty which states: "The Union shall respect its rich cultural and linguistic diversity, and [...] ensure that Europe's cultural heritage is safeguarded and enhanced". In fact, the EC has made several invests ranging from €3.2 billion over 2007-13 in heritage from the European Regional Development Fund and a further €1.2 billion on rural heritage from the European Agricultural Fund for Rural Development, and around €100 million worth of heritage research was funded from the 7th Framework Programme[40].

This is matched by conclusions from the EUMED 2012 International Conference on Cultural Heritage, which mentioned two very key points[41]:

1. Cultural Heritage research in Horizon 2020 will increasingly have to address and integrate a wide range of digital, intangible and tangible aspects. In particular, research on tangible heritage will also have to focus on societal challenges and technological developments as well as the impacts of climate and environmental changes, resource and energy efficiency, adaptation and upgrading of heritage resilience.
2. Easier and open access to results, knowledge resources and data of scientific activities, from EU and Member States, by end-users and stakeholders will enable better exploitation of results from research to enhance growth and job creation. To achieve this in the future, action has to be taken from the start of Horizon 2020, in order to gather

[39] http://en.wikipedia.org/wiki/Cultural_heritage
[40] http://ec.europa.eu/culture/policy/culture-policies/cultural-heritage_en.htm
[41] http://ec.europa.eu/research/environment/pdf/euromed2012_conclusions.pdf

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results of projects in an interdisciplinary consistent, standardized and computer intelligent manner through strong EU coordination and financial support.

2.2 TARGET SEGMENTATION

Based on a growing market is need of digital services, CIVIC EPISTOMOLOGIES therefore targets the following segmentation with specific sector areas defined in the table below and their individual requirements.

	Archives	Audio-visual collections	Libraries	Museums
Management	• Archives directly – human resources, infrastructure, political appeal, public funding, sustainability • Project management – definition of data (including levels of openness) • Archivists • IT staff	• Value for money • In line with their mission • Realistic scale • Clear how info can be used (IPR) • Sustainability	• Sustainability • Accountability of resources (IT, funding, personnel) • Visibility (more funding, visitors…) – institutional image	• A clear definition of the project • Ownership • The last word • Control of the collection • The latest resources (up-to-date infrastructure)
General public	• Infrastructure – access, authentication and authorisation • Motivation • Time • Skills and training • Ownership of the results	• Robust and user friendly infrastructures • ROI – recognition • Clear IPR • FUN!	• Full accessibility and usability • Opportunity to contribute (wiki style) • Motivation/encouragement/reward (not financial!) • Improvement of the CH institution relationship • Multilanguage data	• Training and motivation • Reward and recognition • Easy and direct communication • Support • Feeling of being accepted • Attachment and ownership
Researchers	• Infrastructure • Awareness of public skills • Access to data	• Clear benefits • Recognition for results • Quality control procedures and tools in place when project starts • Output (open for reuse)	• Greater sharing opportunity (data etc.) • Cross language research •	• Cooperation without hassles • Good reception • Easy access to resources •
Funding bodies	• Foundations • Public funding • Crowd funding • Auditors	• Spotlight • Credit • Value for money	• PR • Value of the results • Usage of end results (variety of users)	• Exposure and recognition • Feel part of the project • Attachment/significance to the material

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3. SERVICE PORTFOLIO

As use cases and pilots move to service delivery, the project must ensure that each services is well defined for technology transfer/adoption to be ensured. This involves building a clear concept of how the services will be deployed and what hooks are necessary in order to facilitate service management, including clear SLAs.

The approach taken will use the EC-supported FitSM[42] standard, which is in itself compatible with the major IT Service Management approaches used in the commercial and public sectors across Europe e.g. ITIL, ISO/IEC 2000043.

The following table presents the initial CIVIC EPISTOMOLOGIES service portfolio, delivery type/IPR, service owner and associated business model. As mentioned, this list will evolve over the course of the project and revised according to its strategy.

Service Name	Delivery Type / IPR	Target User	Service Owner	Long-term Business Model
Service Registry		*Researchers*	PSNC	Subscription
Compute and Storage			EGI …	Combination: Free / pay-for-use
Knowledge Base		• General Public • Funding Agencies	Promoter	
Consultancy and Development	• Internal product development	Researchers	All partners	• Joint projects • €/hr.

**Mock table for discussion*

4. ORGANISATION, MANAGEMENT AND IPR

4.1 ORGANISATION AND MANAGEMENT

This is one area that will need to be explored during the project, who will manage what service and under what organizational and governance structure.

[42] www.fitsm.eu

[43] http://www.iprhelpdesk.eu/sites/default/files/newsdocuments/IP%20Management%20in%20Horizon%202020_the%20proposal%20stage_0.pdf

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4.2 INTELLECTUAL PROPERTY RIGHTS (IPR)

Regarding project outputs, the only information currently available is stipulated in the project Consortium Agreement regarding transfer of foreground:

- 8.2.1 Each Party may transfer ownership of its own Foreground following the procedures of the EC-GA Article II 27.
- 8.2.2 It may identify specific third parties it intends to transfer the ownership of its Foreground to in Attachment (5) to this Consortium Agreement. The other Parties hereby waive their right to object to a transfer to listed third parties according to the EC-GA Article II.27.3.
- 8.2.3 The transferring Party shall, however, notify the other Parties of such transfer and shall ensure that the rights of the other Parties will not be affected by such transfer.

Any addition to Attachment (5) after signature of this Agreement requires a decision of the Project Board.

- 8.2.4 The Parties recognize that in the framework of a merger or an acquisition of an important part of its assets, a Party may be subject to confidentiality obligations, which prevent it from giving the full 45 days prior notice for the transfer as foreseen in the EC-GA, Article II 27.2

5. IMPLEMENTATION STRATEGY

Once the previous sections have been agreed, then an implementation strategy should be prepared that takes into account a marketing strategy, transfer of any services, what resources (both human and technical) will be needed and how they will be financially sustained and the critical checkpoints along the way to monitor progress.

Marketing strategy:

How this be communicated and through what channels?

Service sustainability:

Describe how each e-Infrastructure will sustain the technical services and what other project partner future roles will be.

Resources and funding:

What activities will need to be carried out by the partners and at what effort levels?

What are the expected costs of services to be run by external organizations?

How will this be funded or costs be recovered?

Milestones:

The Roadmap will include several milestones covering short-, medium-, and long-term recommendations. These should also be captured here.

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6. CONCLUSIONS

This document provides an initial structure for the CIVIC EPISTOMOLOGIES business plan that takes into consideration the value of the proposed services, a market analysis, market segmentations, organisational and management aspects, service portfolio and corresponding business models and an implementation strategy. The report was written in a way that can be used as a living document to be completed over the course of the project.

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APPENDIX 3: STRATEGIC RESEARCH AGENDA

To be written later on