TIME4CS

SUPPORTING SUSTAINABLE INSTITUTIONAL CHANGES TO PROMOTE CITIZEN SCIENCE IN SCIENCE AND TECHNOLOGY

D1.1: Collection of Case Studies of institutional adoption of CS

Mapping and analysing institutional CS adoption

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Executive Summary

The current document, titled “Collection of Case Studies of institutional adoption of CS” has been developed within the framework of the TIME4CS project which is funded by the European Union’s Horizon 2020 Research and Innovation Programme under Grant Agreement No 101006201.

The main objective of the document is to report on the case study analysis of institutional adoption of citizen science initiatives in Research Performing Organisations (RPOs) around the globe.

To this end, the report is divided in four main sections: the first section presents a brief literature review of the state-of the-art of adoption of citizen science within RPOs; the second section introduces the process of assessing institutional change in RPOs through the use of the Qualitative Comparative Analysis technique; a third section shows the data input from the case studies; and a four section introduces the Qualitative Comparative Analysis (QCA) analysis. We are using the Fuzzy Set version of QCA (known as FsQCA).

The report is providing details of the assessment of 37 organisations, which are evaluated across eight domains of indicators that can explain the change. These domains are:

- the number of citizen science projects and the disciplines in which they occur;
- the existence and participation in internal and external citizen science networks;
- provision of citizen science training;
- the role of citizen science champions;
- the existence of an institutional plan in the area of citizen science;
- the existence of an organisational citizen science coordinator;
- the type of funding that supports citizen science;
- and the existence of technical tools to support citizen science that were developed in the RPOs.

Within this report, we provide the full analysis of the 37 organisations and a preliminary analysis of the results. We show that FsQCA analysis can help in identifying that in disciplinary terms, it is likely to be a multi-faculty support to lead to institutional change. Further analysis on the data that was collected is outlined. The details on how FsQCA can support RPOs to address changes and actions in support of citizen science integration will be addressed in D1.3 Lesson learnt repository of TIME4CS.

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1. Introduction

The aim of the TIME4CS project is to support organisation changes to support Responsible Research and Innovation in general, and citizen science and public engagement in particular. As we pointed out in the Description of Action (DoA) the European Commission identified Institutional Change as a key strategy to address these challenges. Rephrasing our DoA, for TIME4CS purpose Institutional Change is defined as a type of change triggered in an organisation with four main dimensions:

- First, **the change is irreversible**, so it is visibly rooted in the practices and procedures of the organisation and last in time;
- Second, **the change is comprehensive**, so it exceeds changes only on rules and procedures and include other areas like organisational culture, the way it communicates internally and externally, invest resources, etc.;
- Third, **the change is inclusive**, which means that it involves all stakeholders in the organisation and beyond it;
- Fourth, **the change is contextualised**, since change must take into account the background of the organisation and tailor specific measures that are relevant to the organisation specifically.

Within TIME4CS, two theoretical approaches are used to lead to institutional change – the social approach and the organisational approach. The social approach starts from the modification of social patterns such as cognitive, emotional, relational, etc. which are largely shared by the people within an organisation. It assumes a major personal commitment of people to change their own behaviours, views and mindset (Berger & Luckmann 1966, North & Alt, 1990). The organisational approach, which should be seen as a complementary to the social one, tries to modify the organisational structures (i.e. norms, procedures, protocols, etc.) which are the basis for the organisational day to day activities. It primarily put the efforts on the involvement of leaders and managers which will use the hierarchical relations to change the norms that lead to further behavioural change in time (Coriat & Weinstein 2002; North & Alt, 1990).

The way in which these two approaches complement each other is that the social approach is offering a mostly bottom-up institutional change, the organisational approach works on a top-down basis. In practice, a combination of both approaches is needed to resolve their theoretical limitations. The social approach needs a certain level of stabilisation of the new “behavioural” practices of the organisation, which may be crystallised in clear norms, procedures and structures. Meanwhile, the organisational approach requires a certain level of consensus and involvement to legitimise the changes, as otherwise it will face resistance and dismissal from different parts of the organisation.

To achieve its overall aim, TIME4CS has identified 4 **Intervention Areas (IAs)** that alone or combined can stimulate the institutional changes necessary to promote citizen science in Research and Innovation processes: 1) *Research*, 2) *Education and Awareness*, 3) *Support resources and Infrastructure* and 4) *Policy and Assessment*. TIME4CS analyzes these areas to consolidate the knowledge about the institutional

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adoption, establishment and maintenance of citizen science capacity and to establish a model for citizen science expansion through Institutional Changes.

To support institutional change in Research Performing Organisation (RPOs), the first objective of TIME4CS, is "to increase knowledge on the actions leading to Institutional Changes in RPOs necessary to promote Public Engagement and citizen science in science and technology through a complete and up-to-date picture built upon the identification, mapping, monitoring and analysis of ongoing practices." To accomplish this objective, the expected result includes the initial analysis of at least 30 case studies of institutional adoption of citizen science and Open Science, which this deliverable addresses.

1.1 Literature Review

Citizen science encompasses different forms of public participation in research, and by its nature it would be expected that RPOs will have a big role within it. Yet, for a very long period, citizen science and participatory research were not an integral part of the practices of RPOs. Instead, they were more common within Non-Governmental Organisations (NGOs). For example, the Audubon society and the Cornell Lab of Ornithology (which is an NGO affiliated with Cornell University), were central to the emergence of citizen science in the 1990s (Bonney 1996). While researchers that develop citizen science were operating within RPOs, they didn't benefit from institutional level support and in many cases, the effort of engaging people from outside academic circles went unacknowledged (Cooper et al. 2014). Even today, scientists do not view citizen science as a worthwhile activity (Golumbic et al. 2017; Riesch & Potter 2013). This situation creates a challenge for the adoption of citizen science within universities and to make it a widespread and commonly used tool and approach. Elements of the integration of citizen science into RPOs practices are reported in the literature. For example, there is growing evidence on the value of integrating citizen science into undergraduate education (Mitchell et al. 2017; Hitchcock et la. 2021). In parallel, there is also evidence for its value for university research (Pettibone et al. 2017). These developments, and the growing awareness by research funders to the importance of citizen science, are mostly within the social approach for institutional transformation, and therefore call for an organisational response to complement it. Interestingly, in the case of citizen science, there are calls by members of the bottom-up community for an institutional response (Bonney et al. 2014). One of the clearest responses to this call is provided by the League of European Research University (LERU) report on citizen science (LERU 2016). There is further analysis on the need for universities to embrace citizen science and for the support that it will require in Wyler and Haklay (2018).

However, are there any guidelines that can be provided to RPOs about the transformation to support citizen science? Previous research that looks at a parallel problem – the ability of governments to accept geospatial data that was created by the public through crowdsourcing – can provide us with some hints. For an organisation to open up and accept data and information that was produced outside it, with a different framework for data collection and quality assurance, there are multiple challenges. These include existing practices and procedures, legal obligations, as well as resistance from within due to framing of such action as a threat. Research that was carried out with multiple international case studies (Haklay et al. 2014; GFDRR 2018), demonstrated the importance of different institutional and funding structures that are needed in order to enable such activities and the use of the resulting information.

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Based on this, this study aimed to identify:

What are the most desirable pathways to accomplish a sustainable institutional integration of citizen science in RPOs?

The approach that is taken here is integrating elements from the social and the organisational approach. We assume that a sustainable, irreversible, comprehensive, and inclusive change is the result of both bottom-up and top-down actions. However, institutional change requires a visible and sustained entity for the support of citizen science in a form of an office or a function that supports citizen science across the organisation. At the other end of the spectrum are institutions where some citizen science activities happen at a researcher or a project level, and either discontinued or never become more commonplace. Such cases show that the institution has not adopted citizen science across the organisation.

At this stage of the study, our objective is to provide an explanation of the pathways that lead to successful (meeting the necessary or sufficient conditions) citizen science integration by analysing worldwide cases in RPOs. In our study, a successful citizen science integration indicates a "comparatively successful" outcome.

To explore the possible pathways, we have used fuzzy-set Qualitative Comparative Analysis (we hereinafter would be referred as "FsQCA"), which can support the identification of the specific conditions and their combination that can lead to understand sustainable support of citizen science practices in RPOs.

As a starting point for our analysis, we set up four propositions to identify the multiple configurations to be tested by the FsQCA to understand the drivers of successful institutional support of citizen science:

- **Proposition 1.** *A good and established number of CS projects is a necessary condition for the success of institutional transition in support of CS.*

  This proposition is based on the rationale that once there are enough citizen science projects happening within an organisation, the knowledge about them is emerging, as well as awareness. Beyond a certain point, the institution will pay attention to these activities and may provide central support to them. This, in turn, will lead to more citizen science activities.

- **Proposition 2.** *Because the participation in a local or national network could reinforce collaborations between different actors within the institution, different type of networks are necessary or/and sufficient conditions for the success of institutional transition in support of CS.*

  This proposition assumes that at the stage in which an organisation joins an international network (such as ECSA), there is a level of awareness and knowledge that can support transition. In addition, we assume that such participation can strengthen the activities within the organisation, due to knowledge sharing.

- **Proposition 3.** *CS champions at different levels are a necessary or/and sufficient condition for the success of institutional transition in support of CS.*

  This proposition is based on evidence for other institutional transformations which suggested that actors inside the organisation (champions) will influence the ability of the organisation to change.

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- **Proposition 4.** *The existence of a strategic plan in support of CS activities and to network learning and expertise is a necessary or/and sufficient condition for the success of institutional transition in support of CS.*

  The last proposition is that by the time the organisation sees the need for a strategic plan, there is enough awareness of citizen science within the organisation. Therefore it is more likely that they can complete the transition with additional support and resourcing.

2. Tracking institutional change in RPOs through QCA

2.1 Qualitative Comparative Analysis & institutional change

Institutional changes in Research Performing Organisations such as Universities and Research Centres involve the participation of many individual and collective actors that promote, cooperate, and sometimes challenge the inner policies in different ways. Institutional transformations and their outcomes in the form of policies get affected by different complex factors that interact and evolve over time (Sabatier, 2007). In that sense, developing a comparative analysis of those institutional transformations can help to understand the complex configurations of factors that influence such a change.

Qualitative Comparative Analysis is an analytical technique specifically designed to detect complex sets of conditions that are related to specific outcomes of interest (Ragin 1987). This technique is based on a backwards-looking research design (Scharpf 1997) that asks for the factors causing a given phenomenon i.e.. a policy change (Fischer 2014), or the success of a policy project (Verweij et al. 2013).

Furthermore, QCA is particularly suitable for researchers who want to systematically compare a small to medium number of observations and obtain in-depth insight into the complexity of cases while retaining capacity for some level of generalisation (Rihoux et al. 2011). It was originally developed within international relations and public policy research, but is increasingly used across the social sciences.

fsQCA was developed by integrating fuzzy sets (sets whose elements have degrees of membership) with QCA. This type of analysis results particularly helpful for researchers for whom regression-based techniques result insufficient, as it allows to identify the multiple pathways that can lead to a particular outcome.

The processes required to push for the recognition of citizen science initiatives as research practices in RPOs follow different paths, evolving over time within an environment shaped by different socioeconomic conditions, institutions, and cultures that impact and sometimes transform the organisational structures. Having so many different scenarios, requires a pragmatic tool such as FsQCA capable of shedding light on the complex configurations of factors that influence institutional transformations in support of citizen science.

QCA is based on assessing cause effect & relations. The causes are called conditions. The effect is called the outcome. QCA is a systematic cross-case comparison that operates in the following way. The fist step in QCA is to define the conditions of interest. Then, they need to be calibrated to score each case (that can be done using 1 or 0, to indicate “presence” and “absence” of the condition for the case of *Crisp-sets (csQCA)* or include a variance between 1 to 0 to express different degrees of membership for the case of *Fuzzy-*

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sets(FsQCA). Once the set of variables for all cases have been calibrated, a third step requires to set them together in an input table, it is possible to carry out the analysis. If a variable that participates in the analysis has both true and false values that are not in correlation to the outcome variable, then the variable cannot be explanatory. On the other hand, if a variable changes when the outcome variable changes, then there can be a relationship between them. The reduced table that contains the values of the variables and reduces the number of cases is called the "Truth table". The final boolean equation that links the variables with the outcome is called a "model" and it can take a form of And, Or, and Negation. The creation of the truth table then follows a process of logical minimization, which systematically compares combinations of conditions in the truth table. This comparison gives a more overall indication of which conditions or combinations of conditions produce the outcome. Logical minimization results in the so-called minimal formula. This formula indicates which absent and present conditions, and which combinations of absent and present conditions will lead to the outcome across cases.

2.2 Applying FsQCA

FsQCA allows the creation of a truth table of 2^k rows, where k represents each combination of all the causal conditions included in the analysis. The sufficient conditions analysis in FsQCA also looks at groupings combinations For every combination, the minimum membership value is calculated. The minimum membership value is the degree to which every case supports the specific combination. In FsQCA a threshold of 0.8 should be used in order to identify which combinations are supported at an acceptable level by the sample. In detail, it is needed that at least one case in the sample has a membership of at least 0.5 in a combination, for this combination to be supported. All combinations with membership level lower than 0.5 are removed from the further analysis.

To develop this FsQCA five steps were followed:

1. Grouping a dataset with information from RPOs including data on all relevant conditions and outcomes.
2. The dataset needs to be calibrated, which means that cases are coded according to the degrees of membership present in a condition.
3. An analysis of *necessity* is performed to identify the conditions required for an outcome to occur.
    - **Necessity** → inclN>=0.8
4. An analysis of *sufficiency* is performed by constructing a truth table and minimising it through Boolean algebra to identify the combinations of conditions associated with the outcome.
    - **Sufficiency** → Single Condition or Combination of Conditions → Truth Table (inclN>=0.8) logical minimisation
5. The combinations of conditions are assessed according to their *consistency* and *coverage*.
    - *Consistency* is the extent to which similar causal configurations give rise to the outcome (**inclN**)
    - *Coverage* refers to the number of cases for which a given combination is valid.

These steps will be further explained in the subsequent sections

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2.2 Grouping the Dataset

TIME4C-Cases Studies has identified *32 factors* (see Appendix A - Questionnaire Case Studies) in the literature, clustered within the 4 Intervention Areas, that seem to play an important role in the adoption, maintenance and consolidation of citizen science initiatives in RPOs.

These factors consider not only the challenges that an interactive and collaborative methodology requires but also the different contexts, assets and conditions of RPOs. Understanding the role of these factors in supporting or undermining institutional changes result vital for the implementation of sustainable citizen science initiatives.

2.2.1 Collection of Case Studies

By collecting multiple Case Studies from RPOs around the globe, WP1 (led by UCL) expects to identify how certain factors in their specific combination(s) with other factors lead to sustainable institutional changes that allow citizen science to flourish.

As Part of WP1 citizen science state of the art and overcoming challenges and T1.1 Mapping and analysing institutional citizen science adoption, University College London set up a four month effort reaching out to Research Performing Organisation (RPOs) - such as Universities and Research Centres and Offices-interested in or already performing activities using a citizen science methodology.

A first approach was made reaching out to citizen science networks such as the Australian Citizen Science Association, the European Citizen Science Association, the US Citizen Science Association and the Red de Ciencia Ciudadana Nodo Sur promoting the work done by TIME4CS and inviting RPOs to collaborate as case studies in the project. However, due to the lack of response a more focused approach was implemented, this included reaching out to “Citizen Science Champions”, understood as researchers who strongly support citizen science practices, and reaching out to partner projects such as HEIDI or EU-Citizen.Science.

Following the aforementioned strategies, over 37 citizen science champions around the world were contacted by email inviting them to collaborate in the TIME4CS project. Those who initially responded to the email invitation were introduced to the general aim and objectives of the TIME4CS and invited to further collaboration with the project by filling a survey about the state of the art of citizen science in their institutions. There was a positive response rate of 59.46%, which meant 22 researchers agreed and contributed with information about their organisation. This information added up to the 3 case studies from University College London, Aarhus University and the citizen science Centre Zurich (Front-Runners of TIME4CS) and 6 cases collected through desk analysis of literature looking particularly at the actions of RPOs on the adoption of citizen science.

The cases were added to the public website that was created as a repository for this case studies https://time4citizenscience.wordpress.com/. The website is on the Wordpress.com platform and is linked to the main website of the project. The purpose of the inclusion of the website is to follow principles of open science, and share information widely as it is being collected, but also to provide the RPOs with an

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opportunity to see the information that was collected about them and if needed, to update the information and correct misrepresentations.

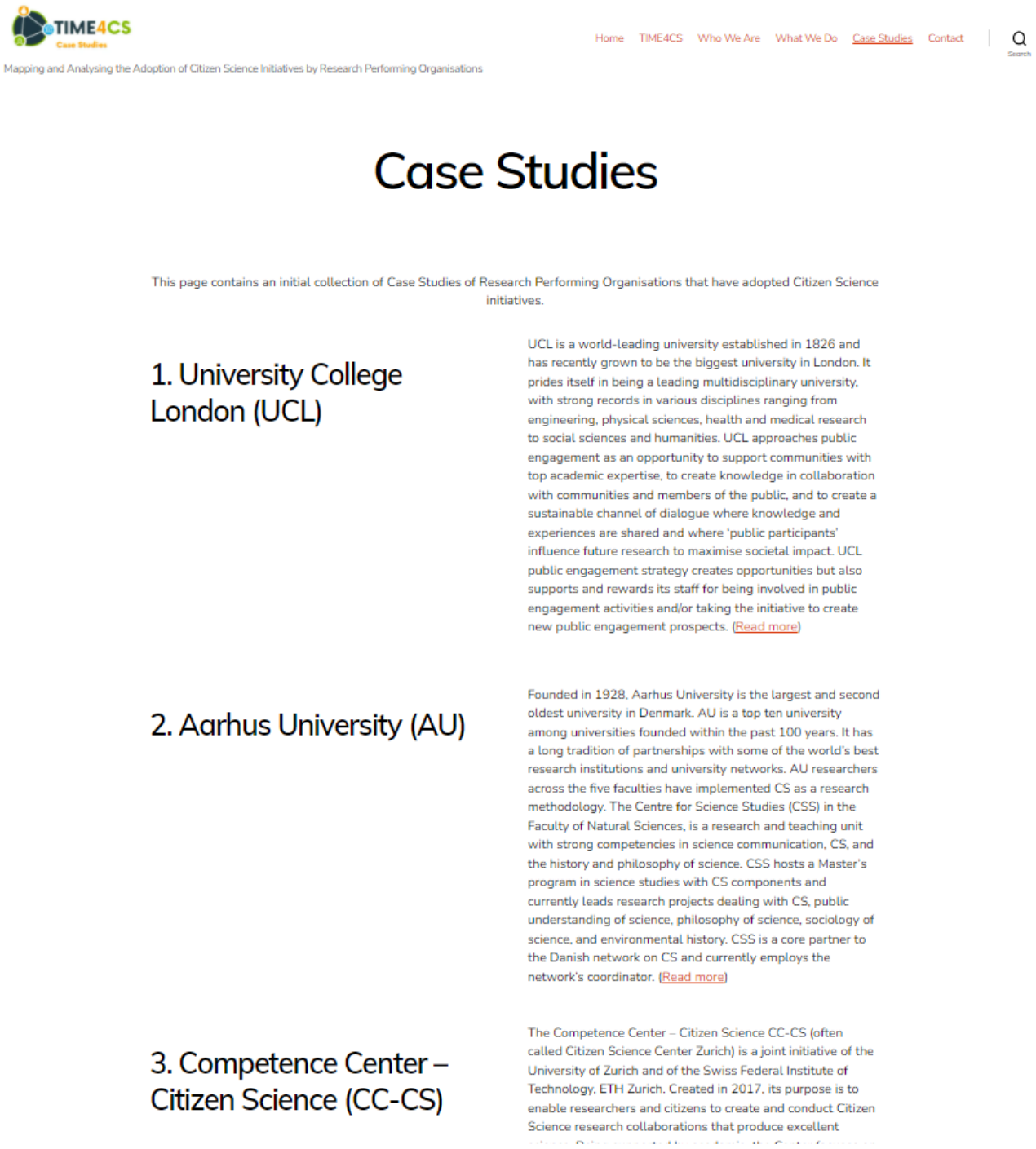

Figure 1 - TIME4CS case studies website

The website is expected to contain the different case studies in the same format as the initial questionnaire used to reach out to the different RPOs.

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Table 1 contains the complete list of collected case studies used during the FsQCA:

Table 1 Case studies distribution around the world

Europe	America	Asia
University College London (UK)	Universidad Javeriana (CO)	Israel institute of Technology (IL)
Imperial College London (UK)	Corporacion Universitaria Minuto de Dios (CO)	University of Haifa (IL)
Durham University (UK)	UNAM (MX)	
The Open University (UK)	Braindeis University (US)	
University College Cork (IE)	Cornell University (US)	
Oficina de Ciencia Ciudadana de Barcelona (ES)	Arizona State University (US)	
Leiden University (NL)		
University of Malta (MT)		
BOKU (AT)		
Universität Salzburg (AT)		
Tallin University (EE)		
IRBLleida (ES)		
UniSR (IT)		
Trinity College Dublin (IE)		
Thunen Institute (DE)		
Adam Mickiewicz University (PL)		
Czech University of Life Science (CZ)		
GFZ Potsdam (DE)		
University of Gothenburg (SE)		
TU Delft (NL)		

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Aarhus University (DK)		
citizen science Centre Zurich (CH)		
University Library of Southern Denmark (DK)		
University of Luxembourg (LU)		
Centre for Genomic Regulation (ES)		
Kaunas University of Technology (LT)		
Tyndall National Institute (UK)		
Muenster University (DE)		
citizen science Competence Centre Berlin (DE)		

2.3 Criteria, Definition and Calibration

To identify the institutional changes in RPOs in support of citizen science, the present FsQCA includes different Fuzzy-set variables which allow for a better description of the complexity of the analysed factors. Through two internal workshops, the different criteria for the analysis and for the ranking of the different activities were agreed with members of the TIME4CS consortium. The criteria that was set include the following areas and values:

1. Institutional Integration (outcome)

The transformation of science is a socio-technical process in which digital tools and infrastructure go hand in hand with a (social) opening of essential phases of publicly funded research and teaching, considering subject-specific cultures (Schirrwagen, 2020). The efforts of CS researchers are most often not recognised in the current evaluation system for science, and their specialist and social qualifications acquired within CS projects are rarely counted to enhance career options. Therefore, the scientific efforts behind CS initiatives should be appraised through appropriate recognition mechanisms that go beyond counting the number of publications in prestigious scientific journals and the success in grant applications. New institutional structures and frameworks should consider the scientific value of CS achievements by assessing their societal relevance, their capacity to engage different interest groups, the inclusion of new forms of knowledge and the communication of results via non-scientific channels (Bonn et al, 2016).

Calibration

Accomplishing institutional integration of citizen science in RPOs is measured using different elements:

1 = office of citizen science, promotion criteria (with the above conditions)

0.8 = funding AND training activities, courses, talks etc.

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0.6 = funding or some recognition, but indirectly / or just training (e.g. public engagement)

0.4 = established CS activities but nothing more

0.2 = CS activities at individual researcher, but nothing more

0 = no indication for any institution level support

2. Number of CS projects

The rationale behind this condition is based on the idea that the more projects developed by researchers could lead to the recognition of the importance of the CS as a tool by the RPO. Less number of projects could mean less interest or lack of acknowledgement of its importance.

Calibration

Cumulative number of CS projects (Yes=1, No=0)::

*NCS - No CS projec*t = can't find an example of CS anywhere at the university

FCS - Few CS projects = 1 to 5 active projects in the last 5 years

LCS - Lots of CS projects = more than 5 active projects in the last 5 years

3. Disciplinary Contributions

The rationale behind the separation of ecology and biology from the other natural sciences is that many citizen science projects are focusing in the area of ecology and biology. It is highly likely that people within this domain will be familiar with citizen science, and in some cases, these were the first citizen science projects within an RPO. Therefore, it is valuable to separate these areas, as to verify if the area of ecology and biology is a necessary starting point for institutional transformation. It is also important to consider that a wider spectrum of CS projects could allow CS to "gain its full potential from broadening across research arenas" (Hecker et al, 2018)

Calibration

Existence of CS projects in different disciplines, such as (Yes=1, No=0):

Humanities - any project in the humanities area

Natural Sciences - anything in natural science beyond biology/ecology

Biology/Ecology

Social Sciences

Engineering

Interdisciplinary projects in citizen science

Multi-faculty - if more than one faculty 1 otherwise 0

4. CS Network

The rationale behind the network analysis is that the participation in a localise or a national network may lead to reinforcing collaborations between different actors within the institution, and that might lead to a social (or bottom-up) process of transformation. CS requires networking and the exchange of information between

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science and society, which requires regular communications between actors (Bonn et al, 2016). Networking facilitates passing on the experiences about the coordination and implementation of CS projects.

Calibration

Existence of collaboration networks in support of CS initiatives at different levels (Yes=1, No=0): :

Local

National

International

5. CS trainings

Because education is a prerequisite and an output of CS projects, RPOs should collaborate with schools, which needs to be reflected in scientific and educational value systems (Göbel et al, 2017). RPOs need to generate awareness amongst researchers of criteria for successful citizen science, including community management, pedagogical explanations, open science standards and social diversity by appropriate measures such as courses in citizen science (LERU, 2016).

Calibration

Existence of CS trainings initiatives available for different audiences (Yes=1, No=0):

Citizen Scientists (project participants)

Students

Staff

6. CS Champions

The rationale behind this condition is based on the idea that CS champions at different levels play a central role in supporting CS initiatives to become sustainable. Staff and senior management champions could play a lead role in encouraging successful integration of CS in the RPO. As it has been argued by the GFDRR (2018) “a handful of champions inside a public authority (or in this case organisation) can change and improve its culture and methodologies”.

Calibration

Existence of CS leaders at different levels (Yes=1, No=0):

Student champions (frequently a PhD student who is involved or running citizen science)

Staff champions (academic member of staff)

Senior mgmt (a senior member of staff - dean or other member of senior management)

Single champion - only one person promoting citizen science

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7. CS Institutional Plan

Institutions should have a strategic plan to focus its coordination of CS activities and to network learning and expertise (Blaney et al, 2016). The organisation should develop an official strategic plan for advancing citizen science, which includes viable short-term and long-term goals (Bonn et al, 2016). The relevance of and opportunities for CS should be identified in the organisation's official mission and in other key organisation-wide strategies, with success indicators identified (Bonn et al, 2016).

Calibration

Existence of an institutional plan that includes or considers CS and public engagement:

1 = dedicated CS strategy

0.67 = CS as part of OS or public engagement strategy

0.33 = CS briefly mentioned

0 = no institutional plan

8. CS Coordinator

This condition follows LERU (2016) recommendation stating that "A single CS point of contact within the institution can advise and support scientists and ensure liaison with national and regional citizen science associations".

Calibration

Existence of CS coordinator (Yes=1, No=0):

Centrally funded either coordinator or communicator

9. Funding (Internal)

CS activities tend to have multiple goals, which means their scale, reach and visibility have different funding requirements than more traditional and structured projects. Adequate funding that covers different lengths of projects is critical to the sustainability of citizen science efforts and ensuring that the information is being used in the long run (Haklay et al., 2018). It is assumed that long term funding increases the likelihood of institutional awareness and transformation.

Calibration

Existence of different forms of internal funding (Yes=1, No=0):

Internal short-term funding (6-12 months)

Internal medium-term funding (12-36)

Internal long-term funding (over 36)

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10. Funding (External)

Funding models should consider the particular requirements of CS projects in all their diverse formats: funding programmes should include different forms of participation and the diverse stages of the projects (Bonn et al, 2016). We assume that if the organisation receives funding in the area of citizen science from a prestigious source (e.g. highly competitive national fellowship, national academy, or international body like the European Research council) it might have an impact. We also assume that non-research funding (e.g. charity) might not have the same impact as competitive funding.

Calibration

Existence of different forms of external funding (Yes=1, No=0):

External funding national

External funding international

External funding prestige

External funding charity

11. Technical Tools

According to the Environmental Protection Agency (EPA, 2018), an identified barrier for CS projects has to do with making technology accessible and understood. As some citizen scientists lack technical understanding and capability for selecting the correct instrument for data collection that will validate data. In addition, it was also identified as a barrier in 'keeping up' with technological progress for the production of quality data.

Calibration

Existence of CS technical tools (Yes=1, No=0):

Development of CS technical tools by the RPO

2.4 Case Studies – Analysis

2.4.1 Analysing necessity & sufficiency

After reaching out to RPOs and receiving their responses -either through an Excel spreadsheet or during an online meeting- the information collected was coded and emptied in the Data Matrix (see Appendix B - Matrix of Case Studies), according to the criteria mentioned in subsection 2.3.1. Missing data were marked as *null* where information was unavailable.

In general, all 37 case studies reported having evidence of citizen science activities but just a few of them provided indication of reaching "institutional integration [InIn]" (Table 2) that could support sustainable citizen science practices (such as having set up a central office to coordinate and support citizen science activities and/or by including citizen science and public engagement strategies as part of the promotion criteria within the organisation).

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Table 2 Institutional Integration

Case	InIn
UCL	1
CScCZ	1
ICL	0.6
AU	0.8
UCC	0.6
LU	1
CU	0.8
OCCB	0.8
ASU	0.8
TU	0.4
DU	0.6
GFZP	0.4
IRBL	0.2
CzU	0.4
UM	0.2
UNAM	0.4
AMU	0.4
DU-T	0.6
BOKU	1
USz	0.8
IIT	0.4
UHa	0.4
UT	0.6
BrU	0.6
ThI	0.4
UGth	0.8
UAC	0.2
CUMD	0.2
OU	0.6
SRU	0.2
ULSD	1
UL	0.2
CGR	0.2
KUT	0.6
TNI	0.6
MU	0.6
CSCCB	0.8

For the case of this study, FsQCA started with a bivariate analysis to identify any individually necessary conditions. Using the fsQCA 3.1b (Charles and Davey, 2016) a preliminary analysis was run for all different conditions. Those conditions assessed as not necessary for Institutional Integration are presented in the next pages with a brief explanation of how these results were achieved.

Number of CS projects

Collaborators of the case studies were asked about the number of citizen science projects that have been developed within their RPOs (Table 3) in the last 5 years, to understand how accepted the use of a citizen

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science methodology in their institution is. Important is to notice that while the reported data provides an overview of the poll of different citizen science projects, in those RPOs without a central office (see Table 2) the exact number of citizen science projects might vary to the one reported (this is due the apparent lack of internal awareness of the type of research done at different departments and faculties even within the same RPO). Also, some other RPOs in this list are the recent result of the conjoint work of Universities and Research Institutes in support of citizen science practices and therefore, while they are at a high or highest level of Institutional Integration as their main aim is to support citizen science projects they have just reported the work they have directly coordinated, not the work previously done by Higher Education Institutions (HEIs).

Table 3 Number of citizen science Projects

Case	NCS	FCS	LCS
UCL	0	0	1
CScCZ	0	0	1
ICL	0	0	1
AU	0	0	1
UCC	0	0	1
LU	0	0	1
CU	0	0	1
OCCB	0	0	1
ASU	0	0	1
TU	0	1	0
DU	0	1	0
GFZP	0	1	0
IRBL	0	1	0
CzU	0	1	0
UM	0	1	0
UNAM	0	1	0
AMU	0	1	0
DU-T	0	0	1
BOKU	0	0	1
USz	0	0	1
IIT	0	0	1
UHa	0	1	0
UT	0	0	1
BrU	0	1	0
ThI	0	1	0
UGth	0	0	1
UAC	0	1	0
CUMD	0	1	0
OU	0	1	0
SRU	0	1	0
ULSD	0	0	1
UL	0	1	0
CGR	0	1	0
KUT	0	0	1
TNI	0	0	0
MU	0	0	1
CSCCB	0	1	0

However, when Institutional Integration (InIn) was tested (Figure 2) by the number of citizen science projects (NCS, FCS, LCS) the configuration was not a consistent subset of and sufficient for the outcome and therefore, the analysis of consistency and coverage didn't provide any significant result.

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```
*** ERROR(Quine-McCluskey): The 1 Matrix is Empty. ***

Algorithm: Quine-McCluskey

--- COMPLEX SOLUTION ---
frequency cutoff: 1
consistency cutoff: 1
**********************
*TRUTH TABLE ANALYSIS*
**********************

File:  /Users/abrilh/Desktop/TIME4CS-DataMatrix.csv
Model: InIn = f(NCS, FCS, LCS)
Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 1
consistency cutoff: 1
                     raw       unique
                   coverage    coverage   consistency
                  ----------  ----------  ----------
NCS*FCS           0           0           nan
NCS*LCS           0           0           nan
FCS*LCS           0           0           nan
~NCS*~FCS*~LCS    0           0           nan
solution coverage: 0
solution consistency: nan


No cases with greater than 0.5 membership in term NCS*FCS
No cases with greater than 0.5 membership in term NCS*LCS
No cases with greater than 0.5 membership in term FCS*LCS
No cases with greater than 0.5 membership in term ~NCS*~FCS*~LCS
*** ERROR(Quine-McCluskey): The 1 Matrix is Empty. ***

Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1
consistency cutoff: 1
Assumptions:
```

Figure 2 FsQCA by the number of CS projects

The error messages are returned when all output values are negative, i.e. when there is not a single row in the truth table which is accepted as being sufficient for the outcome. This happens when the consistency cut-off (0.8) is higher than the consistency score of the best-performing row).

Type of CS Networks

Belonging to an interest network oriented to favour or/and support citizen science and Public Engagement activities was thought to play an important role in pushing for the institutional recognition of a citizen science methodology. Collaborators of the case studies were asked about their link to citizen science networks at different spatial levels -from local to international-(Table 4).

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Table 4 Type of Citizen Science Networks

CaseID	*Local*	*National*	*International*
UCL	1	1	1
CScCZ	1	1	1
ICL	1	0	1
AU	1	1	1
UCC	1	1	1
LU	1	1	1
CU	1	1	1
OCCB	1	1	1
ASU	1	1	1
TU	0	0	1
DU	1	1	1
GFZP	0	1	1
IRBL	1	0	0
CzU	1	1	0
UM	0	0	1
UNAM	1	1	0
AMU	0	0	1
DU-T	0	0	1
BOKU	1	1	1
USz	1	1	1
IIT	1	1	0
UHa	1	1	0
UT	1	1	1
BrU	1	1	1
ThI	1	1	1
UGth	1	1	1
UAC	1	1	0
CUMD	1	1	0
OU	1	1	0
SRU	1	1	1
ULSD	1	1	1
UL	1	0	1
CGR	1	0	1
KUT	0	1	1
TNI	0	0	1

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MU	1	1	1
CSCCB	1	1	1

However, when Institutional Integration (InIn) was tested (Figure 3) by the number of citizen science projects (NCS, FCS, LCS) the configuration was not a consistent subset of and sufficient for the outcome and therefore, the analysis of consistency and coverage didn't provide any significant result.

```
*** ERROR(Quine-McCluskey): The 1 Matrix is Empty. ***
Algorithm: Quine-McCluskey

--- COMPLEX SOLUTION ---
frequency cutoff: 1
consistency cutoff: 1
**********************
*TRUTH TABLE ANALYSIS*
**********************

File:  /Users/abrilh/Desktop/TIME4CS-DataMatrix.csv
Model: InIn = f(NLo, Nna, Nin)
Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 1
consistency cutoff: 1
                raw       unique
              coverage    coverage   consistency
             ----------  ----------  ----------
~NLo*~Nin     0           0           nan
solution coverage: 0
solution consistency: nan


No cases with greater than 0.5 membership in term ~NLo*~Nin
*** ERROR(Quine-McCluskey): The 1 Matrix is Empty. ***
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1
consistency cutoff: 1
Assumptions:
```

The error messages are returned when all output values are negative, i.e. when there is not a single row in the truth table which is accepted as being sufficient for the outcome. This happens when the consistency cut-off (0.8) is higher than the consistency score of the best-performing row).

The same message repeated for the conditions of citizen science training and internal funding. In both cases, just as in the previous two examples the truth tables didn't return output values sufficient for the outcome.

Collaborators from the case study were also asked about the availability of technological tools to develop citizen science activities in their institutions (Table 5).

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Table 5 Development of citizen science Technological Tools

CaseID	Tech Tools
UCL	1
CScCZ	1
ICL	1
AU	1
UCC	1
LU	1
CU	1
OCCB	1
ASU	1
TU	1
DU	null
GFZP	1
IRBL	null
CzU	1
UM	null
UNAM	null
AMU	null
DU-T	null
BOKU	null
USz	null
IIT	1
UHa	0
UT	null
BrU	null
ThI	null
UGth	null
UAC	null
CUMD	null
OU	1
SRU	null
ULSD	1
UL	1
CGR	0
KUT	0
TNI	0
MU	0
CSCCB	0

However, this condition was dropped as many RPOs could not fully report about this factor, leaving the results of any analysis as inconclusive.

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When conditions were found necessary for Institutional Integration, the analysis aiming to identify if they were also necessary AND-configurations of conditions was also performed. The next series of conditions proved to be necessary as it will be presented.

Disciplinary focus

Because a more widespread application of a citizen science methodology within different departments and faculties in the RPOs could indicate a higher level of institutional acceptance, collaborators were asked about the disciplinary focus of the citizen science projects taking place in their institutions (Table 6).

Table 6 Disciplinary Focus

CaseID	*Humanities*	*Natural Sciences*	*Biology/Ecology*	*Social Sciences*	*Engineering*	*Multifaculty*
UCL	1	1	1	1	1	1
CScCZ	1	1	1	0	0	1
ICL	0	1	1	0	1	1
AU	1	1	1	1	1	1
UCC	0	1	1	1	1	1
LU	1	1	1	0	1	1
CU	0	0	1	0	0	0
OCCB	1	1	1	1	1	1
ASU	1	1	1	1	1	1
TU	0	0	1	1	0	1
DU	0	0	1	0	0	0
GFZP	0	1	1	0	1	0
IRBL	0	1	1	0	0	1
CzU	0	0	1	0	0	0
UM	0	0	1	0	0	0
UNAM	1	1	1	1	0	1
AMU	0	0	1	0	0	0
DU-T	0	0	1	0	1	0
BOKU	0	1	1	0	0	1
USz	1	1	1	1	0	0
IIT	0	1	1	0	1	0
UHa	0	0	1	0	1	1
UT	0	1	1	1	0	1
BrU	0	0	1	0	0	0
ThI	0	0	1	0	0	0
UGth	1	1	1	1	1	1
UAC	0	0	0	1	0	0
CUMD	0	0	0	1	0	0
OU	0	1	1	0	1	0
SRU	0	0	0	1	1	0
ULSD	1	0	1	1	1	1
UL	0	0	1	1	0	0
CGR	0	1	0	0	0	0
KUT	1	1	1	0	1	1
TNI	0	0	0	0	0	0
MU	1	1	1	1	0	1
CSCCB	0	1	1	0	0	0

Champions help raise awareness about the benefits of a citizen science methodology within the RPOs, but their capacity to influence institutional changes could be restricted by their role in the organisation. Table 7 captures such figures.

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Table 7 Citizen Science Champions (by type)

CaseID	*Student Champions*	*Staff Champions*	*Senior Mgmt Champions*	*Single Champion*
UCL	1	1	1	0
CScCZ	0	1	1	0
ICL	1	1	1	0
AU	1	1	1	0
UCC	1	1	0	0
LU	1	1	1	0
CU	1	1	1	0
OCCB	0	1	0	0
ASU	1	1	1	0
TU	0	1	0	0
DU	0	1	1	0
GFZP	0	1	1	0
IRBL	0	1	0	0
CzU	0	1	1	0
UM	0	0	0	1
UNAM	0	1	0	0
AMU	0	0	0	1
DU-T	0	0	1	0
BOKU	0	1	0	0
USz	0	1	1	0
IIT	0	1	0	0
UHa	0	1	0	0
UT	1	1	1	0
BrU	0	1	1	0
ThI	0	1	1	0
UGth	0	1	0	0
UAC	0	1	0	1
CUMD	0	1	0	1
OU	0	1	0	0
SRU	0	0	0	0
ULSD	1	1	1	0
UL	0	1	0	0
CGR	0	1	0	1
KUT	0	1	1	0
TNI	0	0	0	0
MU	1	1	0	0
CSCCB	1	1	1	0

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Institutional Plan

Recognising the role of public engagement and citizen science in the institutional plan of RPOs can lead to further internal changes. Table 8 presents the different degree in which citizen science is recognised (or not) in the institutional plan.

Table 8 Citizen Science in the Institutional Plan

CaseID	*CS Institutional Plan*
UCL	1
CScCZ	0
ICL	1
AU	1
UCC	1
LU	1
CU	1
OCCB	0
ASU	1
TU	0
DU	0
GFZP	0
IRBL	0
CzU	0
UM	0
UNAM	0
AMU	0
DU-T	0
BOKU	0
USz	0
IIT	0
UHa	0
UT	1
BrU	0
ThI	0
UGth	0
UAC	0
CUMD	0
OU	0
SRU	0
ULSD	1
UL	0
CGR	0
KUT	0
TNI	0
MU	1
CSCCB	1

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Funded Coordinator

While having an office that can coordinate citizen science activities in RPOs can be seen as a proof of success in the institutional adoption of citizen science, having a funded coordinator (Table 9) that works as the liaison between staff, researchers, students, and citizen scientists could be a first step on the same direction.

Table 9 Funded Coordinator

CaseID	Funded Coordinator
UCL	0
CScCZ	1
ICL	1
AU	1
UCC	1
LU	1
CU	1
OCCB	1
ASU	0
TU	0
DU	1
GFZP	0
IRBL	0
CzU	0
UM	0
UNAM	0
AMU	0
DU-T	1
BOKU	1
USz	0
IIT	0
UHa	0
UT	0
BrU	1
ThI	0
UGth	0
UAC	0
CUMD	0
OU	0
SRU	0
ULSD	1
UL	0
CGR	1
KUT	0
TNI	0
MU	1
CSCCB	1

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External citizen science Funding for Projects

Receiving external funding for projects (Table 11) might not have a direct impact on the way RPOs modify their norms in support (or not) of citizen science initiatives. In general, making funds available for citizen science projects can have a positive impact on the amount and quality of the citizen science projects developed at the interior of the RPOs.

Table 10 . External Citizen Science Funding for Projects

CaseID	*National*	*International*	*Charity*	*Prestigious*
UCL	1	1	1	1
CScCZ	0	1	1	0
ICL	1	1	1	0
AU	1	1	1	0
UCC	1	1	0	0
LU	1	1	0	1
CU	1	0	1	0
OCCB	1	1	0	1
ASU	1	0	1	1
TU	1	1	0	0
DU	1	1	1	0
GFZP	1	1	0	0
IRBL	0	0	0	0
CzU	1	0	0	0
UM	0	0	0	0
UNAM	1	0	0	0
AMU	1	1	0	0
DU-T	1	0	0	0
BOKU	1	0	0	1
USz	1	0	0	0
IIT	1	0	0	0
UHa	1	0	1	0
UT	1	1	1	1
BrU	0	0	0	0
ThI	1	0	0	0
UGth	1	1	0	1
UAC	0	0	0	0
CUMD	0	0	0	0
OU	1	0	1	0
SRU	0	0	0	1
ULSD	1	1	0	1
UL	1	1	1	0
CGR	0	0	1	1
KUT	1	1	0	1
TNI	1	0	0	0
MU	1	1	1	1
CSCCB	1	1	1	1

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4 Demonstration of the analysis

Based on the preliminary analysis ran on all different conditions, we ran a second analysis selecting some proved necessary conditions such as institutional & disciplinary focus (humanities, natural sciences, biology/ecology & Multi-faculty), citizen science Champion (Single citizen science Champion which based in the evidence would be negated [~]), Institutional Plan & Funded Coordinator, and National and International Funding available.

In the following sections, we present the resulting truth table from fsQCA. The RAW consist column gives the measure of consistency. It means that the membership score on the outcome is consistently higher than the membership score of the causal combination, weighted by the relevance of each case. Consistency scores of less than 0.8 mean that there is considerable inconsistency. Scores should desirably be above 0.9. The frequency threshold was set at 2 (Fiss, 2011; Ragin, 2008b).

fsQCA software calculates PRI consistency, which stands for 'Proportional Reduction in Inconsistency' and is an alternate measure of the consistency of subset relations in social research, and only relevant to fuzzy sets. PRI consistency allow to avoid simultaneous subset relations of configurations in both the outcome and the absence of the outcome (i.e., negation). PRI consistency scores should be high and close to raw consistency scores (e.g., 0.7), while configurations with PRI scores below 0.5 indicate significant inconsistency (Greckhamer et al., 2018).

Table 11 Truth Table

DFH	DFNS	DFBE	DFM	SCh	InPl	FuCo	ExFN	ExFl	number	InIn	cases	raw consist.	PRI consist.	SYM consist
1	1	1	1	0	1	0	1	1	3	1		0.965174	0.950355	1
1	1	1	1	0	1	1	1	1	2	1		0.880239	0.84252	1
1	1	1	1	0	0	1	1	1	2	1		0.828326	0.768786	1
1	1	1	1	0	1	0	1	0	2	0		0.798508	0.635135	0.701493
0	1	1	0	0	0	0	1	0	2	0		0.5	0.166667	0.5
0	0	1	0	0	0	0	1	0	2	0		0.4	0	0
0	0	0	0	1	0	0	0	0	2	0		0.2	0	0

The intermediate solution uses a subset of simplifying assumptions used to compute the parsimonious solution, which should be consistent with theoretical and empirical knowledge.

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```
--- INTERMEDIATE SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.828326
Assumptions:
~SCh (absent)
                                                  raw        unique
                                                coverage    coverage   consistency
                                               ----------  ----------  ----------
DFH*DFNS*DFBE*DFM*~SCh*InPl*ExFN*ExFI          0.160849    0.0915094   0.92663
DFH*DFNS*DFBE*DFM*~SCh*FuCo*ExFN*ExFI          0.150943    0.0816038   0.8
solution coverage: 0.242453
solution consistency: 0.855241


Cases with greater than 0.5 membership in term DFH*DFNS*DFBE*DFM*~SCh*InPl*ExFN*ExFI:
OCCB (1,0.8),
  UCL (0.67,1), AU (0.67,0.8), UGth (0.67,0.8),
  KUT (0.67,0.6)
Cases with greater than 0.5 membership in term DFH*DFNS*DFBE*DFM*~SCh*FuCo*ExFN*ExFI:
AU (1,0.8),
  LU (1,1), OCCB (1,0.8), MU (1,0.6)
```

As such, what these results tell us is that there are at least two main paths which have supported institutional integration of citizen science in the RPOs included in this FsQCA. On the one hand, the development of citizen science projects from different disciplines including but not limited to the Humanities, Sciences, Biology/Ecology and Multi-disciplines seem essential for both successful paths. In addition to this, both paths share the existence of Multiple citizen science Champions results, also an essential condition as students, and staff can provide the bottom-up pressure that encourages the institutional transformations. Senior citizen science Champions play a top-down role in the decision-making for modifying the structures in the organisations. The availability of National and International funding that can be used to fund citizen science initiatives is also a necessary condition for both paths. On the other hand, the only evident difference for each successful path seems to be either the inclusion of citizen science in the Institutional Plan (this path proved useful for University College London, Aarhus University, University of Gothemburg, and Kaunas University of Technology), while if this was not possible/or available counting with a citizen science Coordinator proved to be the necessary condition for Leiden University, Oficina de Ciencia Ciudadana de Barcelona and Muenster University.

As per the initial propositions we can conclude that a good and established number of CS projects in an RPO is not a necessary condition for the success of institutional transition in support of CS, neither it is the participation in a local or national network as different type of networks are not sufficient condition for the success of institutional transition in support of CS.

On the contrary, having CS champions at different levels proved to be a necessary but not a sufficient condition for the success of institutional transition in support of CS. In a similar way, the existence of a strategic plan in support of CS activities resulted a necessary condition for the success of institutional transition in support of CS.

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5 Areas of further analysis

From the internal TIME4CS workshop carried out on the 9 December 2021, with the attendance of Front-Runners and Implementers from the TIME4CS project, suggestions have emerged as to the possibility to expand some of the criteria of analysis to include more details about the researchers doing citizen science (such as their belonging to informal citizen science networks) and about the citizen science projects in general (their discipline or possibility of being multidisciplinary).

The analysis in the next stages (D1.3) will include the development of successful models of Institutional Integration bases on the necessary conditions. This will allow us to re-examine the robustness of the models and the exceptions that appeared within the truth tables.

The analysis of D1.3 will also include reaching out to the institutions and checking if the outcomes match their internal perceptions, so we can add some qualitative assessment of change.

6 Conclusion

In this deliverable, we provided the details of the process of collecting information about institutional transformation from 37 RPOs. The task of gathering and organising the information proved more complex than originally envisaged due to the workload that RPOs experienced in 2020 due to the Covid-19 pandemic. Yet, a clear framework has been established and set for the collection and sharing of information: a website to share the case studies was set, and the Data Matrix for the FsQCA was built. This first analysis is being used to build a framework with clear indicators and evidence for different conditions which will be used to complete the knowledge base about the state of CS adoptions at RPOs across Europe.

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Appendix A - Questionnaire Case Studies

For the case of this research, RPOs were approached and asked to provide details about their engagement with CS projects and the institutional support received through a questionnaire composed of two sections:

- **CS Projects,** and
- **CS Factors**

CS Projects Section

Asked participants detailed information related to citizen science projects and initiatives in the RPO, such as:

- Department
- Name of citizen science project/initiative
- Starting year/Ending year
- Objectives
- Contact person/email
- Project website
- Funding body/amount of time founded

CS Factors-Section

Included 4 subsections with questions related to Research, Education & Awareness, Support Resources / Infrastructure, and Policy & Assessment.

Research

1.1 Are there research projects using CS methodology? (Yes/ No) If yes, provide a description of any tracked past and present projects employing CS, Crowdsourcing, Participatory-Action-Research or a Co-productive approach. For definition of citizen science, see ECSA characteristics of citizen science

1.2 Do researchers and students belong to a CS network? (Yes/No) If yes, provide details of the different links with CS networks. A citizen science network can be formal (e.g. an association or organisation) or informal (a shared mailing list)

1.3 Do researchers and students have established working collaborations with CS groups? (Yes/ No) If yes, state name of projects and type of collaboration with external CS groups or projects. External CS groups can be existing organisations or ad-hoc nature observation club, or a group of people that are self-quantifying. It can also be a collaboration with an organisation that runs CS programmes such as Earthwatch.

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1.4 Do researchers and students participate in national or international CS projects? (Yes, national; Yes, international; Yes, both national and international; No CS collaborations yet) If yes, provide a brief description of past and present cases. In some countries, there are no official networks, such as the UK, but informal networks can run and be active

Education & Awareness (E&A)

2.1 Does the institution have training programmes on CS? (Yes, for students; Yes, for researchers; Yes, for citizen scientist; Yes, for different actors [state]; No, training programmes) If yes, provide a brief description of past and present training programmes

2.2 Does the institution provide CS activities in both formal and informal education? (Yes, formal; Yes, informal; Yes, as part of a research project without a link to education; Yes, a mix of formal and informal[state]; No, no CS activities are organised). If yes, provide a brief description of past and present training programmes

2.3 Does the institution offer assistance for scientists and partners (recipients, stakeholders and groups of interest) regarding cooperative CS activities? (Yes, advice on participatory activities; Yes, courses and training; Yes, both participatory activities and courses and trainings; No, there is no assistance from the institution for CS activities) If yes, provide a brief description of activities.

2.4 Does the institution have "CS champions" at the research level? (Yes, there is a point of contact in the institution; Yes, there is an unofficial champion (person that people get in touch with); Yes, there is a person who pushes citizen science in the institution and promote it; No, there is not such a thing as a CS Champion). If yes, please provide more details about the CS Champion.

2.5 Does the institution have more than one CS Champion? (Yes, there are different points of contact in different labs/research groups; Yes, there are different points of contact in different departments; Yes, other [list]; No, there are no more CS champions in the institution). If yes, please provide more details.

2.6 Does the institution have "CS champions" at the student level? (Yes/No). If yes, please provide more details about department/projects with CS student champions.

2.7 Does the institution offer information sessions on CS? (Yes, for researchers; Yes, for students; Yes, for management; No, no information sessions are provided). If yes, please provide more details.

2.8 Does the institution offer informal occasions for interactions with CS researchers? (Yes/ No). If yes, please provide more details.

2.9 Does the institution nurture "CS champions"? (Yes, at the management level; Yes, at the student level; Yes, at the researchers level; No, CS Champions don't have any institutional recognition). If yes, please provide more details.

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2.10 Does the institution include CS into scientific research in university teaching programmes? (Yes, Undergrad 1 programme; Yes, Postgrad 1 programme; Yes, Undergrad multiple programmes; Yes, Postgrad multiple programmes; No, CS is not included in the teaching curricula). If yes, please provide more details.

Support Resources / Infrastructure

3.1 Does the institution have an official strategic plan for advancing CS? (Yes, short [a year or less]; Yes, medium [between 1-3 years]; Yes, long term goals [4+ years]) . If yes, please provide more details.

3.2 Does the institution promote and fund CS coordinators? (Yes/ No). If yes, please provide more details.

3.3 Does the institution promote and fund CS communicators? (Yes/ No). If yes, please provide more details.

3.4 Do the CS projects at the institution receive any Short Term Funding (6-12 months) ? (Yes, full; Yes, partial; Yes, other; No, there are no short term funding options). If yes, please provide more details.

3.5 Do the CS projects at the institution receive any Medium Term Funding (12-36 months)? (Yes, full; Yes, partial; Yes, other; No, there are no medium term funding options). If yes, please provide more details.

3.6 Do the CS projects at the institution receive any Long Term Funding (Over 36 months)? (Yes, full; Yes, partial; Yes, other; No, there are no long term funding options). If yes, please provide more details.

3.7 Does the institution have internal funds that can be used for CS initiatives? (Yes, public engagement; Yes, science communication; Other, list; No, there are no internal funds available). If yes, please provide more details.

3.8 Has any of the CS initiatives in your institution received external funding (research national)? (Yes/ No) . If yes, please provide more details.

3.9 Has any of the CS initiatives in your institution received external funding (research international)? (Yes/ No). If yes, please provide more details.

3.10 Has any of the CS initiatives in your institution received external funding (Prestige funding [ERC, UKRI future research leaders and other high profile])? (Yes/ No). If yes, please provide more details.

3.11 Has any of the CS initiatives in your institution received external funding (Charity Funding)? (Yes/ No). If yes, please provide more details.

3.12 How many projects were funded in the institution over the past 5 years in the area of citizen science? (provide number)

3.13 Does the institution offer the researchers adequate communication channels to reach relevant partners? (Yes, support for public communication; Yes, media relations department; Yes, community engagement expertise; No, there is no support to reach relevant partners). If yes, please provide more details.

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3.14 Does the institution develop/ make available open and free tools or technical know-how solutions that can be used in CS projects? (Yes/No). If yes, please provide more details.

Policy & Assessment

4.1 Has the institution adopted explicit mission statements and strategies regarding CS? (Yes/No). If yes, please provide more details.

4.2 Has the institution developed institutional norms, regulations, policies or agreements in support of CS? (Yes/No/Other). If yes or other, please provide more details.

4.3 Has the institution developed or consider public engagement and CS contributions in the evaluation of researcher? (Yes/No). If yes, please provide more details.

4.4 Does the institution have a set of guidelines for collaboration agreements between institutionally-affiliated and independent CS partners? (Yes/No). If yes, please provide more details.

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Data Matrix

		# of CS Projects			Disciplines						Networks			Training			Champions				Plan	Coord	Internal Funding			External Funding				
Case	InIn	NCS	FCS	LCS	DFH	DFNS	DFBE	DFSS	DFE	DFM	NLo	Nna	Nin	Tci	TSt	TStf	StCh	StfCh	SMCh	SCh	InPl	FuCo	ShF	MeF	LoF	ExFN	ExFI	ExFCh	ExFP	TT
UCL	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.67	0	1	0	0	1	1	1	1	1
CScCZ	1	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	0	0	1	1	0	1
ICL	0.6	0	0	1	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	0.67	1	1	0	0	1	1	1	0	1
AU	0.8	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0.67	1	1	1	0	1	1	1	0	1
UCC	0.6	0	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	1	1	0	0	1	1	0	0	1
LU	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	1	0	1	1
CU	0.8	0	0	1	0	0	1	0	0	0	1	1	1	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	0	1
OCCB	0.8	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	0	0	0	1	1	0	1	1
ASU	0.8	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.67	0	1	1	0	1	0	1	1	1
TU	0.4	0	1	0	0	0	1	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1
DU	0.6	0	1	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	1	0	0	1	1	1	0	1	1	1	0	null
GFZP	0.4	0	1	0	0	1	1	0	1	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	0	1	1	0	0	1
IRBL	0.2	0	1	0	0	1	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	null
CzU	0.4	0	1	0	0	0	1	0	0	0	1	1	0	0	1	0	0	1	1	0	0	0	1	1	1	1	0	0	0	1
UM	0.2	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	null
UNAM	0.4	0	1	0	1	1	1	1	0	1	1	1	0	1	0	0	0	1	0	0	0.67	0	1	1	0	1	0	0	0	null
AMU	0.4	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	1	1	0	0	null
DU-T	0.6	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0.67	1	1	0	0	1	0	0	0	null
BOKU	1	0	0	1	0	1	1	0	0	1	1	1	1	1	1	1	0	1	0	0	0.67	1	1	0	0	1	0	0	1	null
USz	0.8	0	0	1	1	1	1	1	0	0	1	1	1	0	1	1	0	1	1	0	0.67	0	1	0	0	1	0	0	0	null
IIT	0.4	0	0	1	0	1	1	0	1	0	1	1	0	1	1	1	0	1	0	0	0	0	1	1	0	1	0	0	0	1
UHa	0.4	0	1	0	0	0	1	0	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0
UT	0.6	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0.67	0	0	0	0	1	1	1	1	null
BrU	0.6	0	1	0	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	0	0	1	1	0	0	0	0	0	0	null
ThI	0.4	0	1	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	1	0	0	0	0	0	0	1	0	0	0	null
UGth	0.8	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0.67	0	0	0	0	1	1	0	1	null
UAC	0.2	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	null
CUMD	0.2	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	null
OU	0.6	0	1	0	0	1	1	0	1	0	1	1	0	1	1	1	0	1	0	0	0	0	1	1	0	1	0	1	0	1
SRU	0.2	0	1	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	null
ULSD	1	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	0	0	1	1	0	1	1
UL	0.2	0	1	0	0	0	1	1	0	0	1	0	1	0	0	0	0	1	0	0	0.33	0	0	1	0	1	1	1	0	1
CGR	0.2	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1	0	1	0	1	0.33	1	0	0	0	0	0	1	1	0
KUT	0.6	0	0	1	1	1	1	0	1	1	0	1	1	0	0	0	0	1	1	0	0.67	0	0	0	0	1	1	0	1	0
TNI	0.6	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.33	0	0	0	0	1	0	0	0	0
MU	0.6	0	0	1	1	1	1	1	0	1	1	1	1	0	1	0	1	1	0	0	0	1	0	0	0	1	1	1	1	0
CSCCB	0.8	0	1	0	0	1	1	0	0	0	1	1	1	0	0	0	1	1	1	0	1	1	0	0	0	1	1	1	1	0

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