Governance of Responsible Innovation

GREAT – 321480

Simulation Report			
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Deliverable D4.4

SIMULATION REPORT

GREAT

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Executive Summary

The 70 bill. EUR funding programme of the European Commission, Horizon 2020, is streamlined towards the concept of Responsible Research and Innovation (RRI): „Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation. Responsible Research and Innovation (RRI) implies that societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society. In practice, RRI is implemented as a package that includes multi-actor and public engagement in research and innovation, enabling easier access to scientific results, the take up of gender and ethics in the research and innovation content and process, and formal and informal science education." (http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation).

Especially, the involvement of civil society on the individual level as interested citizens and on the organisational level of Civil Society Organisations (CSOs), is supposed to change the research and innovation system towards RRI functions: by anticipation and foresight (e.g. to prevent harmful consequences), by permanent accompanying reflection concerning responsibility aspects in research and innovation; by discoursive, deliberative and participative opinion formation and decision making embedded in value discussions; and by responsive behaviour of all participants. Quality and accountability of research results will be assigned to the research and innovation process, and especially to the producers, i.e. the societal actors participating in research and innovation.

Has this RRI-led turn to co-creation, transdisciplinarity and tranformative science in European research and innovation already taken place? What is the current implementation degree of citizen participation in research and innovation? Did the participation of CSOs already change EU-funded research in terms of project/programme structures, in terms of knowledge production dynamics in research projects, and in terms of research outcomes/impacts? What will be potential future scenarios for following the RRI vision on CSOs through?

This Deliverable presents results from a simulation model calibrated by empirical data, which was set up to address these questions and to test some hypotheses on CSO participation in European research and innovation. As the empirical domain for calibrating the simulation, a particular funding scheme is used: the Competitiveness and Innovation Programme of the European Commission (CIP), and here the projects of the Information and Communication Technologies Policy Support Programme (CIP-ICT/PSP). This scheme of about 200 funded projects from 2007-2013 has been chosen due to its innovation focus, due to the comparatively many CSOs

participating in it, due to its aim to produce emerging technologies with potentially high social impact, and due to easy access for our in-depth case studies from prior research. Quantitative work on the CIP-ICT/PSP as a whole (programme statistics, network analysis, survey results) and qualitative case studies on selected projects have provided insights into the current extent, the role, and the possible determinants of CSO involvement in the CIP-ICT/PSP to inform the simulation model.

Especially with the empirical survey among CIP-ICT/PSP coordinators, which is the first RRI quantitative survey on a specific EU funding programme, a special focus on the current implementation degree of RRI elements on organisational and project level is provided: the RRI elements (anticipate, reflect, deliberate, respond) can be more or less “scored“ to provide as profile of a project participant (RRI score of organisations), and can be followed by a research project more or less sequentially in its life time (RRI score of research projects).

Using this empirical data as input, GREAT-SKIN offers the framework to simulate the impacts of CSO participation in EU-funded research and innovation projects.

In this Deliverable, the model is used for theory testing. In current RRI literature and in EC policy papers, a strong pattern can be detected saying that CSOs are crucial for realising RRI (or a 'societal perspective') in current research and innovation processes, and that, therefore, the participation of CSOs in these processes needs to be fostered. However, we found that our own empirical work on CIP-ICT/PSP strongly questioned the existence of this pattern.

The empirical findings of our survey, supported by similar insights provided by the GREAT case studies, challenged the commonly shared, popular conviction that CSOs act as the main facilitators of RRI among project participants and are mainly responsible for the “spread“ of RRI in the research and innovation system (RRI learning among actors, RRI diffusion).

Instead, our empirical findings indicated that other agent types (unis, research organisations, SMEs, MNEs, etc.) were likewise active in promoting RRI in European research and innovation: these other agent types carry RRI capabilities as well, and are major players for RRI diffusion. CSOs, in turn, are involved in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

Our empirical findings indicated this with data and correlations. They did not, however, offer the full causal explanation, because, of course, in empirical reality we cannot observe processes such as “RRI learning” of and between different agent types; we cannot observe and measure knowledge exchange, knowledge flows, knowledge diffusion etc.

This has been the task of the GREAT-SKIN simulation model. It allowed to check for the empirical “un-observables”: here, we could observe and measure “RRI capabilities” of agent types and “RRI learning/diffusion“ between them.

For the simulation, we dis-entangled the task into two evaluative questions framing one hypothesis:

Evaluative Question 1:
Are CSOs the main facilitators of RRI among project participants, and they are mainly responsible for the “spread” of RRI in the research and innovation system (RRI learning among actors, RRI diffusion)?

Hypothesis:
CSOs are considered as attractive partners in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

Evaluative Question 2:
Can we find out more about the effects and limits of the hybridity of CSOs if we “release them” from the – obviously wrong assumption – that they are mainly contributing to research and innovation by and due to their RRI capabilities?

To address these questions, we conducted three simulation experiments that changed the level of CSOs involvement in projects. The “No CSOs Experiment” addressed Evaluative Question 1: In summary, it showed that the number, identity and role of CSOs are *not critical* to the simulation outcomes. The “Attractive CSOs Experiment” tested and confirmed our Hypothesis providing causal insights. Finally, the “Hybrid CSOs Experiment”, which addressed Evaluative Question 2, provided more detail on the diffusion patterns of RRI: it showed that special RRI capabilities of CSOs are increasingly adopted and then contributed by other agent types, and via the same learning mechanisms, CSOs increasingly adopt and then contribute scientific capabilities.

With these results, our study contributed to the analysis of the RRI-led turn to co-creation, transdisciplinarity and tranformative science in European research and innovation. It especially sheds light on the role and involvement of civil society on the organisational level of Civil Society Organisations (CSOs), which are supposed to change the research and innovation system towards RRI functions. Our study has looked into this on the level of project/programme structures, in terms of knowledge production dynamics in research projects, and in terms of research outcomes/impacts.

1. Introduction

The 70 bill. EUR funding programme of the European Commission, Horizon 2020, is streamlined towards the concept of Responsible Research and Innovation (RRI): "Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation. Responsible Research and Innovation (RRI) implies that societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society. In practice, RRI is implemented as a package that includes multi-actor and public engagement in research and innovation, enabling easier access to scientific results, the take up of gender and ethics in the research and innovation content and process, and formal and informal science education" (http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation).

Especially, the involvement of civil society on the individual level as interested citizens and on the organisational level of Civil Society Organisations (CSOs), is supposed to change the research and innovation system towards RRI functions: by anticipation and foresight (e.g. to prevent harmful consequences), by permanent accompanying reflection concerning responsibility aspects in research and innovation; by discursive, deliberative and participative opinion formation and decision making embedded in value discussions; and by responsive behaviour of all participants. Quality and accountability of research results will be assigned to the research and innovation process, and especially to the producers, i.e. the societal actors participating in research and innovation.

Has this RRI-led turn to co-creation, transdisciplinarity and tranformative science in European research and innovation already taken place? What is the current implementation degree of citizen participation in research and innovation? Did the participation of CSOs already change EU-funded research in terms of project/programme structures, in terms of knowledge production dynamics in research projects, and in terms of research outcomes/impacts? What will be potential future scenarios for following the RRI vision on CSOs through?

This Deliverable presents results from the simulation model GREAT-SKIN, which was set up to address these questions and to test some hypotheses on CSO participation in European research and innovation. For doing so, we could build on the findings of Deliverable 2.1 and 2.2 of the GREAT project, which provided information on RRI stakeholders, defined their roles, and elaborated the notion of "responsibility". Furthermore, this Deliverable stands in line with Deliverable 4.1 (Database and Survey Report) and D4.2 (Case study report), which provided empirical data to inform our simulation model.

The Deliverable presenting our work is structured as follows: Section 2 provides a detailed overview of the GREAT-SKIN model, including its background and history, by describing the model's current form under the GREAT project with the integration of RRI elements. Section 3 introduces the calibration of the model with empirical data, Section 4 introduces the Baseline Scenario as the benchmark for the simulation experiments, Section 5 presents, analyses and discusses the simulation experiments and their results. Finally, the last section (Section 6) will draw some lessons from our findings.

2. The GREAT-SKIN model

Applying and further developing the highly-validated and widely-used SKIN model[1] (cf. http://cress.soc.surrey.ac.uk/SKIN/), we have created a simulation platform, the GREAT-SKIN model, which reflects the relationships between knowledge and agents[2], research outputs and organisations, and the evolution of RRI networks of research and of innovation.

SKIN is grounded in empirical research and theoretical frameworks from innovation economics and economic sociology. It is the result of a number of projects that combined empirical research into innovation networks with agent-based simulation. The work started with the EU project "Simulating self-organising Innovation Networks" (SEIN). This project combined five empirical case studies in different sectors of technological innovation and in different EU member states with agent-based simulation of these case studies. The results of the SEIN project are summarised in Pyka and Kueppers (2003). Case studies described knowledge-intensive European industry sectors such as the biotechnology-based pharmaceutical industry in France (Pyka and Saviotti 2002), combined heat and power technology networks in The Netherlands, Germany and the UK (Weber 2002), knowledge-intensive business services in the UK web design industry (Windrum 2003), and the UK Virtual Centre of Excellence in the European telecommunication industry (Vaux and Gilbert 2002). The task of the SEIN project was threefold: theory formation, empirical case studies, and agent-based simulation. The objective was to derive a theory of innovation networks from insights derived inductively from the case studies and to implement this theory of innovation networks into an agent-based model. The result of the modelling activities was an agent-based model – grounded in empirical research and informed by empirical data coming from the case studies (Gilbert, Pyka and Ahrweiler 2003). The model was used by the European Commission for scenario modelling of current and future innovation policy strategies (Ahrweiler, de Young and Windrum 2002) referring to the technological sectors and EU Member States of the case studies.
For our purposes here, we could build from two SKIN versions, which were already adapted to the application context of FP-funded R&D networks: one called "SKEIN" (cf. Scholz et al. 2010) created in the EU project "Network Models, Governance and R&D Collaboration Networks" (NEMO, NEST, FP6), and the other called INFSO-SKIN built in the EC tender study SMART 2010-0025 (cf. Ahrweiler et al. 2015).

In these two SKIN applications, the agents (research organisations, large diversified firms LDFs, and small and medium enterprises SMEs) follow the steps of network formation and evolution as outlined in the Framework Programmes (FP):

1 http://cress.soc.surrey.ac.uk/SKIN/

2 Throughout the study, the term "actor" is used for empirical organisations such as universities, firms NGOs etc., the term "agent" is used for the computational representation of an actor in the simulation model.

1. **Consortium formation/partner choice**: The agents form project consortia.
2. **Proposal production**: The consortium partners collaboratively produce proposals based on their combined knowledge. The consortium submits the proposal to the Commission.
3. **Proposal selection**: The Commission evaluates the proposals according to a template that emphasises the contents (programme match), quality and structure of the consortium (e.g. minimum number of members, industry involvement, etc.). The Commission selects projects to fund. The availability of funding limits the number of projects.
4. **R&D cooperation**: The consortia begin their research projects and cooperative learning activities. They produce deliverables (e.g. publications, patents, reports).
5. **Performance evaluation**: The Commission adjusts its criteria for funding, taking into account the success of projects.
6. Rules and incentives are formulated for a new FP (back to stage 1).

The following flowchart shows this modelling cycle of INFSO-SKIN:

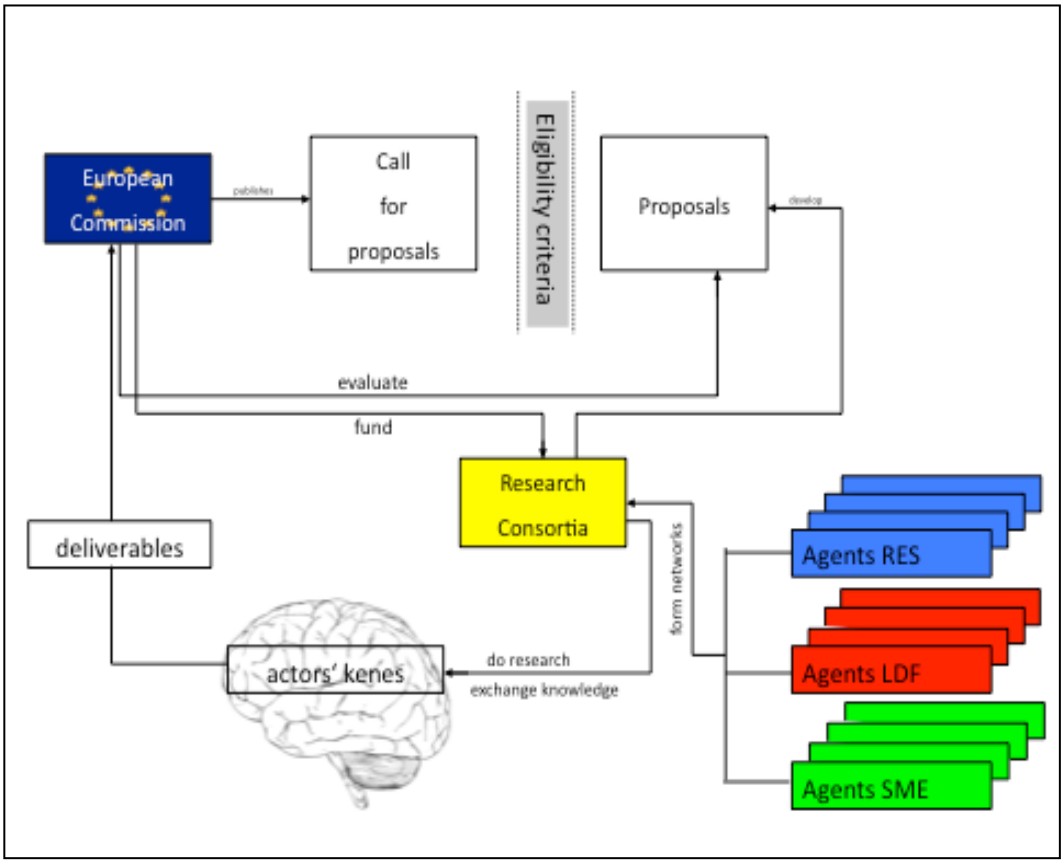

Figure 1: Flowchart of INFSO-SKIN

2.1. Knowledge and agents

The model takes into consideration a number of different agents, namely public sector agents (universities, public research organisations, governmental actors), private sector agents (large diversified firms LDFs, small and medium enterprises SMEs) and – in the case of GREAT-SKIN (see below) - civil sector agents (CSOs). The agent population represents the number and types of agents that are participating in EU-funded projects.

To understand how each of these agents interact and contribute their knowledge and skills to research and innovation, the model draws on the 'kene' concept, first introduced by Gilbert (1997). A kene conceptualises an agent's individual knowledge as a collection of 'units of knowledge' (kene elements), which are each comprised of four levels: Capability (C), Ability (A), Expertise Level (E) and Research Orientation (R).

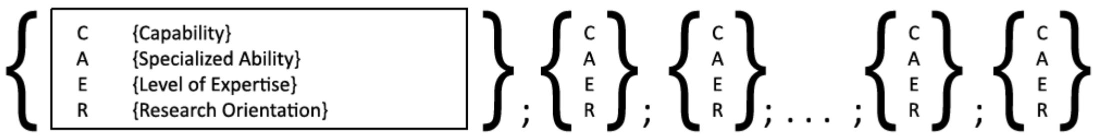

Figure 2: The kene structure

Capability C in the kene elements corresponds to an agent’s different knowledge areas and technological disciplines, such as biochemistry, telecommunications or mechanical engineering. In order to cover all potential research areas encompassed in the CIP-ICT/PSP call for proposals, the number of different possible capabilities in the whole system needs to be sufficiently large. In the model, the overall knowledge space is set up to contain 1,000 different capabilities, where each of 10 different research themes includes 100 capabilities in total.

Ability A represents an agent’s specialisations in specific fields. For example, within the field of software development, an agent's ability could include front-end development, graphical user interface development or back-end development.

A kene element's E value represents the advancement of skills with respect to the specific ability.

Lastly, Research Orientation R constitutes an agent’s orientation towards basic or applied research. R values start at zero, which indicates that an agent possesses entirely theoretical knowledge – that is, the agent falls within the realm of basic research. The highest R score, nine, signifies that the agent contributes exclusively through applied research. As expected, values between zero and nine represent a mix of basic and applied research.

2.2. Measures for knowledge

With the kene concept, we have the opportunity to measure empirical "un-observables", i.e. knowledge generation and knowledge flows.

First, we can measure an agent's knowledge level (*k*), which we calculate from the kene

$k_i = \|kene_i\|$ (where $||kene_i||$ is the length of the kene vector)

The average knowledge of each agent can be derived with

$$\bar{k} = \frac{1}{nParticipants} \sum_{i \in \{Participants\}} k_i$$

The standard deviation of knowledge among the agents is

$$\sigma_k = \sqrt{\frac{1}{nParticipants} \sum_{i \in \{Participants\}} \left(k_i - \bar{k}\right)^2}$$

Second, we measure the effects of knowledge exchange processes as knowledge flows between the participants of project networks. The knowledge flow is the total increase of knowledge over all participants arising from their learning from partners. If k_i^{t-1} is the knowledge level of a participant before exchange with partners and k_i^t is the knowledge of a participant after exchange with project partners, then the knowledge flow is:

$$kf = \sum_{i \in \{Partners\}} \left(k_i^t - k_i^{t-1}\right)$$

The model also includes a variable that focuses on the qualitative composition of project participants' knowledge. That is, by requesting that the call for proposals include a variety of different knowledge areas, we may exert an influence on the depth and breadth of the participants' knowledge base. We can measure this change with the number of shared capabilities among the participants.

We implemented *diffusion* and *frequency* indicators to track the spread of capabilities.

- 'Capabilities-diffusion' indicates the number of participants who possess a capability from a certain theme.
- 'Capabilities-frequency' entails the number of participants of a certain type that have a certain capability.

For example, if 20 participants have the capability "front-end programming in HTML" out of the capability area "Software development," then the diffusion number would be 20. Frequency: if 10 universities have the capability "front-end programming in HTML" then capabilities-frequency for this type of participant would be 10.

2.3. SCI Score: Measuring scientific performance

There are certain measures derived from the kene structure to evaluate the scientific performance of the agents:

The 'capability match' is the extent to which the range of capabilities required by the call for proposals is matched by the proposals themselves. This SCI criterion addresses whether the agents within the consortium are prepared to carry out their project. Similarly, the 'expertise level' is the average level of expertise that consortia members have in relation to the capabilities they are contributing to the proposals. For example, if two proposals have the same 'capability match', but one proposal has a higher 'expertise level', this means that both consortia include agents with all the necessary capabilities, but the latter proposal has a consortium with more expertise in those specific capabilities than the former. The third SCI criterion is the 'research orientation' score, which addresses whether the agents within the consortium have an orientation towards basic or applied research.

The 'capability match', 'expertise level' and 'research orientation' scores are all used to evaluate proposals. These three SCI scores have in common that they measure whether the proposals match what is required by the call, with a value of 0 indicating no match, and a value of 100 total match. These scores are computed while performing the initial eligibility check and are also used for the ranking of eligible proposals.

2.4. RRI Score: Measuring RRI performance

The GREAT-SKIN simulation prototype uses the same scientific (SCI) criteria for the evaluation of proposals as the previous model versions (e.g. INFSO-SKIN). However, the GREAT-SKIN measurement toolbox now additionally includes kene-related indicators for the four RRI elements (anticipation, participation, reflexivity and responsiveness).

The GREAT modelling strategy required to create a score for each of the four RRI elements in order to measure the "degree of RRI" in the simulation. For the purpose of the model, the RRI elements are connected to their scores as follows:

- The '**Anticipation**' score reflects the extent to which the utilisation of special capabilities required by a call for proposals (to anticipate changing issues pertinent to society, the economy and technological advance as well as prevent any harmful consequences of research and innovation) is mirrored by the proposals themselves.

- The '**Participation**' score or ratio reflects the extent to which the participation of RRI-sensitive agents such as CSOs required by the call for proposals is matched by the actual composition of the proposals and later on the projects themselves.
- The '**Reflection**' score reflects the extent to which the submitted proposals address the diversity of capabilities required by the original call for proposals. In other words, whether the proposal takes advantage of the diverse expertise possessed by different agents, whether the outcome of the proposal benefits one class of agents more than another, and whether the project provides a space for RRI-sensitive agents to engender constant reflection among other agents towards responsible research and innovation.
- The '**Responsiveness**' score reflects the extent to which strategy change is implemented during the projects. That is to say, this element addresses the capacity to change and adapt in response to the changing values of the different agents involved as well as those of society and the economy.

All RRI element scores are numbers between 0 and 100 and can be plotted in histograms. They are measured for the evaluation of proposals and projects as part of eligibility and ranking criteria.

While the anticipation, participation and reflexivity scores are used to evaluate the proposals, the responsiveness score is used in addition to evaluate and monitor projects. This is because responsiveness can only be assessed once the project encounters the necessity of change and adaptation (this element is not implemented in the current prototype).

The GREAT-SKIN model assesses a proposal's total balanced score derived from both the SCI described in the above section and the RRI scores, using a weighted average. The GREAT-SKIN model also includes a parameter that allows the user to alter the balance between the RRI and SCI scores.

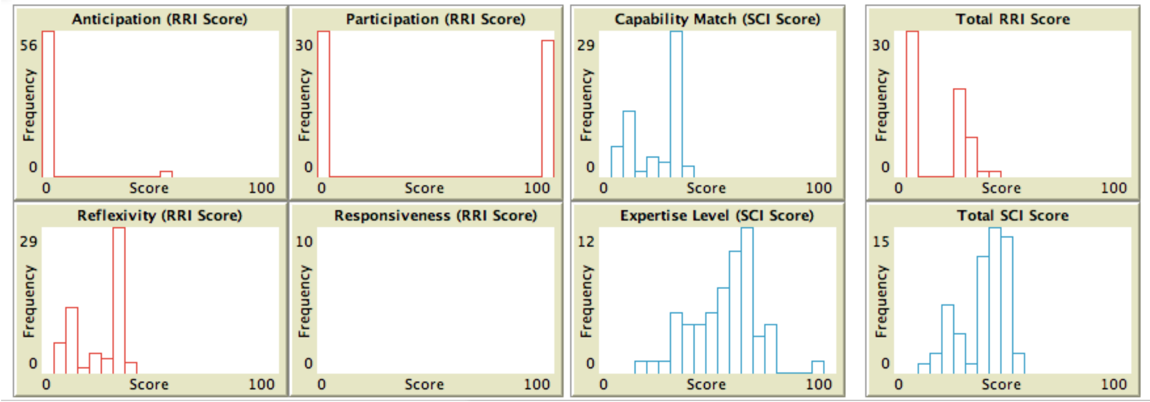

Figure 3: SCI and RRI score histograms

The SCI and RRI scores are used in the main loop of the simulation as follows:

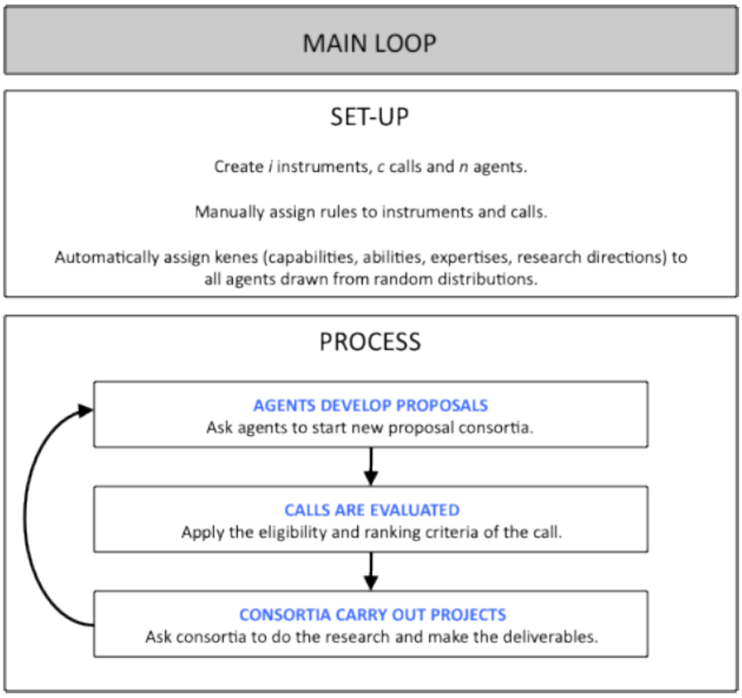

Figure 4: Overview of the GREAT SKIN simulation model

The first stage begins when a call for proposals opens and the second stage when a call closes. The commencement of the third and fourth stages depends on the start and end dates of accepted projects. One cycle of the simulation corresponds to one month.

In the first stage, agents write and submit proposals. To simulate this process, the GREAT model first evaluates the capabilities (C) possessed by a particular agent and its previous partners. If the consortia still lack necessary capabilities the model searches the entire population of agents randomly for the lacking capabilities. When the model invites agents to join a consortium, the new agents check their capacity for collaborating on new proposals, which depends on the strength of their kene scores and the number of proposals and projects to which they are already committed. After all partners are selected, a proposal is produced and submitted to the EC.

In the second stage, the GREAT model evaluates the submitted proposals and selects a subset of those submissions. The EC can evaluate and select proposals by ranking them by either according to their SCI score only or by both their SCI and RRI scores. In both cases the EC selects the top proposals in the ranking, the number of which is determined by available funding and the eligibility threshold designated by the GREAT model's user. Only the proposals that are selected can start their projects. All other proposal consortia are dissolved.
After a proposal is selected and funded, the project begins, commencing the third stage. All consortium members are first allocated to sub-projects. Within each sub-project, the kene values of the partners involved are combined to form a sub-project's 'innovation hypothesis'. For simplicity, a sub-project's innovation hypothesis will be referred to as a 'deliverable' from here on out. Deliverables roughly correspond to the sub-project's potential (quantified by the contributing agents' kene values) to materialise its goals through collaborative research and knowledge sharing.

As expected, progress within the sub-projects is taken to be incremental. However, 'radical innovation', or bursts in innovation, may occur when the project commences, as new and unexpected combinations of capabilities may appear in the consortia. In particular, the involvement of SMEs increases the likelihood for radical innovation, as they often possess entirely new knowledge. In order to give SMEs the opportunity to play their unique role, the GREAT-SKIN model allots 10 capabilities per theme as 'rare' capabilities, which are distributed exclusively to SMEs. Similarly, 'special' capabilities are also exclusively given to CSOs, as their involvement is also likely to increase responsible innovation. When a project ends, it is delivered to and evaluated by the EC.

In the fourth stage of the simulation, the EC uses both RRI scores and SCI scores to evaluate of the projects. In contrast to the evaluation of proposals, however, the EC evaluates completed projects based on all four elements of RRI by adding the responsiveness element. Based on this evaluation, the simulation model provides a detailed set of information on RRI aspects in projects. The information can be used as criteria for strategy changes within projects, changes for future proposals and finally changes for the specifications of calls for proposals.

3. Calibrating the GREAT-SKIN model with empirical data

We used empirical data to calibrate the GREAT-SKIN model, i.e. data coming from a particular funding scheme of the European Commission: the Competitiveness and Innovation Programme (CIP), and here the projects of the Information and Communication Technologies Policy Support Programme (CIP-ICT/PSP). This scheme of about 200 funded projects from 2007-2013 has been chosen due to its innovation focus, due to the comparatively many CSOs participating in it, due to its aim to produce emerging technologies with potentially high social impact, and due to easy access for our in-depth case studies from prior research.

Quantitative work on the CIP-ICT/PSP as a whole (programme statistics, network analysis, survey results) and qualitative case studies on selected projects have provided insights into the current extent, the role, and the possible determinants of CSO involvement in the CIP-ICT/PSP to inform the simulation model. Especially with the empirical survey among CIP-ICT/PSP coordinators, which is the first RRI quantitative survey on a specific EU funding programme, a special focus on the current implementation degree of the four RRI elements on organisational and project level could be empirically provided.

Calibrating from the CORDIS statistical database on CIP-ICT/PSP

The starting configuration of the model (number of agents, number of participations, number of projects, funding distribution among projects etc.) could be constructed using the CIP-ICT/PSP projects database, which is taken from CORDIS data.

However, this data was incomplete. In a perfect world, we would have had empirical data corresponding one-to-one to data requirements of GREAT-SKIN. However, the CORDIS data on CIP-ICT/PSP did not offer this amount of detail. Though we knew that the earliest projects of CIP-ICT/PSP started in 2008 and the last projects will end in early 2016, that, in total, there were 213 projects, which included 3,685 project participations from 2,474 organisations, how much funding each organisation received, which projects the organisations were involved in, and which projects answered which calls for proposals, we, however, could not learn from the data, for example, how many of the participating organisations were small and medium enterprises (SMEs). As a result, we could not calibrate the GREAT-SKIN simulation with the number of participating SMEs but had to estimate it, and so on.

Furthermore, even the best statistical CORDIS data would not have provided us with empirical information about the presence and implementation degree of the four RRI elements in CIP-ICT/PSP, we were mainly interested in.

Calibrating from data provided by the CIP-ICT/PSP survey

Due to such data deficiencies, we chose additional data sources for calibration – data we had to collect and analyse ourselves. The main source was the conduction of a big online survey[3]. While we would have preferred to conduct a survey among all project participants of CIP-ICT/PSP, this task would have proven difficult, given the resources available. Furthermore, access to representatives of all funded organisations was not possible. As an alternative we chose the coordinators as project representatives, as they were best equipped to provide a bird's-eye view of their projects and the roles of its partners. Concerning the example above, the coordinators provided us with some information on all participants in their project—including what percentage of their consortium were SMEs.

We contacted all 213 coordinators by email and asked for their participation in our survey. By following a link provided by email, the CIP project coordinators were brought to the introduction page of the survey. This page contained information about the scope, goals, data collection, storage methods and organiser of the survey. It also included links to the European Academy (EA) and GREAT home pages.

The survey consisted of a series of 21 questions which have been reproduced in Annex 4. The analysis has been included in the same Annex with figures illustrating the responses to each question. There have been two general questions, three questions related to anticipation, four questions related to reflexivity, nine questions relating to participation, two questions related to responsiveness and one question relating to the thank you gift choice. We organised the questions according to a project's life cycle (i.e. before the project, during the project, after the project). We also provided coordinators with definitions or terms where needed.

We used the Sawtooth software package[4] , which proved to be the right choice for our analyses since it provided all functions we required—an easy-to-use interface, web server management and useful website templates. It also included all online-survey functions required for our survey—for example, tick-box questions, ranking questions, open questions and drop-down menus. The data gathered could be filtered and analysed using the web interface as well as Microsoft Excel.

We completed a first draft of the survey in December 2014, launched a small test run of the survey in May 2015, and began the survey in full scale shortly afterwards. We sent out the following email to the 213 CIP project coordinators:

[3] However, to help control for any bias, we also more deeply investigated a small sample of CIP-ICT/PSP projects. GREAT partners at the University of Oxford in the United Kingdom conducted these in-depth case studies (cf. Deliverable D4.2).

[4] http://www.sawtoothsoftware.com

Dear project coordinator,

We are contacting you in your role as the coordinator of a project funded by the ***European Commission under the ICT Policy Support Programme (CIP-ICT/PSP)*** *funding scheme. As part of the GREAT-project (www.great-project.eu), the EA European Academy (www.ea-aw.org) conducts a survey among all project coordinators of the ICT Policy Support Programme (CIP-ICT/PSP).*

In most of the projects, many different types of organisations were involved (e.g. research organisations, firms, NGOs etc.), either as members of the partner consortium or of boards and committees.

The objective of our survey is to examine the participation dynamics for this heterogeneous set of organisations during the different stages of the project with a view on their contribution to reflecting ethical or societal issues around the project research.

In your position as a coordinator of a CIP-ICT/PSP project, which was focussed on developing new information and communication technologies, we would like to ask you for participation in the survey under this link:

http://greatdec2014.cloudssi.com/login.html

(If the link does not open, please copy and paste this URL to the address bar of your browser)

We would be very grateful if you could fill in the survey until ***June 23, 2015****.*

At the end of the survey you will be asked to choose your preferred ***thank you gift****. The two options are: (1) An Amazon voucher of 10 Euros or (2) an ego-network analysis of your own organisation and your own project in the funding programme with figures and graphs. You may use this analysis e.g. for your internal reporting.*

Thank you for your time!

Best regards,

[Signature]

From the 213 email addresses provided by the European Commission, 26 turned out to be inactive. Thus, we assumed that 187 coordinators received our email. Within 14 days we sent out five reminder emails—namely at five, three and two days before the deadline as well as on the day before and of the deadline. During this two-week period another 10 email addresses became invalid or the respective receivers did not respond due to, for example, holidays or having left the company. In total 57 coordinators completed the survey, giving us a response rate of 26.7% (or 30.9% if only the 187 viable email addresses are considered).

Besides completing our survey, several coordinators contacted us to express interest in the importance of our project's results. Only two coordinators contacted us in a negative manner by asking us to stop sending them reminder emails. In order to deliver the thank-you gifts, we asked the respondents to provide their email addresses (for the vouchers) and the name of their institution (for the network analyses) at the end of the survey. 33 respondents chose the Amazon voucher and 14 respondents opted for the ego-network analyses. The vouchers were sent out one week after the end of the survey. Network analyses took a couple of weeks to complete.

Key findings from the survey data

The main findings of the survey concerned CSOs. CSOs were partners in 53% of all projects. In the projects with CSO participation, at least two CSOs participated (Q.1.2). In 40% of all projects, CSOs were approached for advice prior to the project. 39% included CSOs in their project (Q.4.3.). Therefore Q.4.3 somewhat contradicts Q.1.2 because the percentage of respondents who had a CSO in the project was 39% and 53%, respectively.

For those who reported that CSOs were interested in the project results, 69% (11 out of 16) state that CSOs had a big influence in their projects and 56% (9 out of 17) stated that the involvement of the CSOs was about the same during all phases of the project.

Irrespective of CSO participation, 35% of all coordinators at least somewhat agreed that CSOs had a big overall influence in their project (Q.4.7). 39% of all coordinators at least somewhat agree that CSOs contributed something unique to their project (Q.4.7). For project who did not have a CSO partner, CSOs could still have some influence as an associated partner (not a beneficiary partner) or by sitting on the board of project partners.

Even though CSOs were not among the three most active partners in most projects, their overall influence was at least as high as the influence of governmental and customers of a potential result of the project. Their influence was also larger than the influence of experts (Q.4.5). The survey report shows that when this question was answered, customers had a large influence in 67% of cases compared to 51% when for experts.

Of the projects to which CSOs contributed unique expertise, 82% (18 out of 22) agreed that CSOs also had a big overall influence. For only two projects CSOs had a big overall influence without contributing something unique.

For the anticipation RRI element, CSOs were mentioned among the three most active partners in ten projects. For the responsiveness and participation RRI elements CSOs were mentioned among the three most active partners in seven projects. For the reflexivity RRI element CSOs were mentioned among the three most active partners in five projects. Overall, the participation of CSOs is much less central than expected for representing the RRI functions.

1,485 institutions participated in the respondents' projects, of which 150 (10%) organisations were CSOs. This relation is not reflected in the reflexivity (11%) and participation (14%) rankings (adding up first, second and third most active positions). In the responsiveness ranking, CSOs were mentioned on these positions in 17% of all cases and in 23% for the anticipation ranking. The expectation was that the 10% of all participants being CSOs, there should be a comparable proportion of first/second/third most active participants. But this is not the case, not even in the anticipation criterion.

Even though CSOs participated in more than half of the projects (Q.1.2), contributed unique expertise (Q.4.7) and had a big overall influence (Q.4.5), they participated in only 19% of all projects (Q.4.3) on deciphering societal needs and solving ethical issues. This could be interpreted as the contribution of their unique knowledge. Mostly, CSOs seem to have been asked to participate because of their scientific excellence (56%) and for the provision of data (31%). This means that CSOs are not involved in the project because they are sought for their bettering the responsibility of the project (which is what could be expected). Instead, they are included for other reasons including their expertise and data provision in the respective projects (e.g. customer data, patient data, etc.).

SMES, governmental organisations and public and semi-public bodies coordinated 50% of all projects. While 37% of all projects did not systematically take steps to anticipate the project outcomes, 63% did. In order to assess the possible impacts of projects, experts in the field relevant for each project were primarily approached (54%). But customers (40%) of the potential project results (which could be hospitals, governments, patients, etc.) also had their say. Interestingly, universities were the more active consortia partners than SMEs in representing the RRI functions.

58% (33 projects) did not include any boards, committees or dedicated groups who were tasked with reflecting upon ethical, political, societal or environmental issues. Similarly, ethical committees were in place in only 21% of the projects. If any issues were considered during the project, it was mainly societal ones (in 44% of all projects), such as, for example, software use which could exclude old people. In general, issues arose mainly in the earlier phases of the projects, with environmental issues, such as for example, the impact of some piece of software on energy consumption of servers, arising almost exclusively before the project started.

Despite general absence from projects, project committees and dedicated work packages were found most helpful for reflecting upon ethical, social environmental or political aspects of the projects. Such project committee were helping in 79% of cases (Q.3.3.)

Customers/end users were mainly involved either towards the end of the project (39%) or their involvement stayed roughly the same throughout the project (37%). End users were mainly involved for supplying data provision (56%) and for reflecting upon societal needs and ethical issues (38%).

Calibrating RRI scores from the survey data

The survey provided data on the RRI elements, including how many and what types of agents contributed to the four RRI elements. Information is comprehensive, as it comprised not only who contributed to RRI, but also when in the project cycle and to what degree. Each agent obtained a kene score based on this data.

The survey also provided unexpected insights - some of the results contradicted some of the expectations we had previously derived from literature on RRI. In particular, the idea that more CSO contribution leads to more RRI is in the consortium—was contradicted. As a result, we concluded it is not the CSOs, but the amount of agents who possess high RRI scores, which make the difference. It is essential to note that research agents themselves already have some RRI capabilities and do not necessarily have to cooperate with CSO to have a high RRI score. In other words, the theory relating RRI to the presence of CSOs has over-emphasised their role, as this assumption has not been verified in practice.

When allocating RRI scores, all agents had the potential to score highly. To calculate these scores, the survey data proved vital, as they provided empirical distributions on the scores for the different agent types concerning the four RRI elements. Thus, what we refer to as the "weak calibration" aims to establish similarity between the survey data and simulation distributions of RRI scores during the proposal phase. It makes sense to establish similarity during this early phase, as this is when agents are selected and successful projects are defined.

In the simulation, the RRI scores are part of the evaluation criteria for proposals, but with relatively small weight compared to the scientific (SCI) scores. Visual comparison of the survey and simulation distributions suggests that numerical experiments, whereby we assign a RRI score a relative small weight relative to the SCI score, produce distributions that are most similar to the empirical distributions.

In all the simulation experiments, RRI scores are computed for each submitted proposal first and then for each completed project. The scores computed for each submitted proposal include anticipation, participation and reflexivity. The score computed for each finished project includes responsiveness.

For the **anticipation** RRI element, the survey and simulation relate on the level of the influence that certain types of agents (information provided by the survey) have on inclusion of special capabilities (anticipation score) in a particular project. In other words, a high number of agents possessing special capabilities would be reflected by a high anticipation score for their proposal.

For the **participation** RRI element, the survey and simulation relate on the level of the structure of the proposal consortia (information provided by the survey) and the roles and contributions of different agents in the consortia (participation score). That is, a relatively high participation rate of agents with special capabilities in a consortium would be reflected by a high participation score for the proposal. For example, the inclusion of many CSOs, which possess these special capabilities, would lead to a high RRI score corresponding to a better level of participation.

For the **reflexivity** RRI element, the survey and simulation relate on the level of the ability of agents to respond to diverse issues (information provided by the survey) and diversity of their capabilities (reflexivity score). Namely, a high number of diverse capabilities in the proposal would be reflected by a high reflexivity score for a proposal. For example, if many different participants are involved in the proposal, display the same or very similar capabilities, leads to a low reflexivity score.

For the **responsiveness** RRI element, the survey and simulation relate on the level of strategy change, which is reflected by a better overall match between the RRI requirements and the proposals. The calculation of the empirical distribution of the responsiveness score was calculated on basis of the responses of question 3.5. Each change was assigned a score. Scores ware added up over all issues (ethical issues, legal framework, government policy, and social values) and normalised to a maximum score of 100.

4. The baseline scenario as benchmark: Reproducing main empirical observations by simulation

Calibration of a simulation model means that there is empirical information available, which can inform the parameters and processes of the model.

The statistical database of CORDIS data about CIP-ICT/PSP, the survey results and the information coming from the qualitative case studies helped us to calibrate the model to have a "CIP-ICT/PSP on the computer".

Letting this artificial CIP-ICT/PSP run with starting values from the first calls in this programme should reproduce the later stages of this programme with output that resembles relatively closely what the empirical world actually did in CIP-ICT/PSP.

Once the calibrated model is able to produce this similarity between empirical and artificial data, we have our "baseline scenario" for simulation experiments. We can use it as benchmark for effects of parameter changes.

Simulating proposals in the baseline scenario

We recorded the number of proposals in the simulation as one of the "un-observables" for the baseline scenario. However, the number of participants involved in proposal writing activities and engaged in projects can be observed. In the tables for the experiments, there are two possible indicators of data sources listed for the proposals: the actual real-world number of proposals (*proposals*) and the thematic match between proposal requirements in terms of knowledge capabilities and the capabilities recorded for the submitted proposals (*cap-match*). The latter is the percentage of capabilities in the proposal which match the capabilities required in the call. So, e.g. 51.0 means 51% of capabilities in the proposal match the capabilities required in the call.

Overall, our simulation produced three times as many proposals as the number of funded projects. This outcome suggests we should aim for a proposal success rate of around 33%, which is higher than the real-world success rate of 20%, according to FP7 subscription statistics (European Commission, 2009).

However, we do not need a match in this case because the simulation's participant population does not mirror the number of organisations in the European funding landscape that could potentially submit proposals. We just needed a realistic evaluation procedure for submitted proposals to turn them into accepted proposals (= funded projects), where the number of accepted proposals, i.e. projects, matches the project number empirically recorded. The acceptance conditions for proposals has been set to mirror as closely as possible the empirical size distribution of projects. Therefore, the basic routine in the real world is that a consortium hands in a proposal and gets accepted (20% success rate) or not (80%).

Simulating projects in the baseline scenario

Our aim when establishing the baseline scenario was to parallel the real-world and the simulated number of participants and projects. To do so, we defined the reasonable boundaries within which our simulation parameters could fall. If the simulated numbers fell within these boundaries, then they would be deemed sufficiently matched with the real-word numbers. This process provided us with a timeline for active projects and a distribution of the number of participants per project (project size) for our baseline scenario (see graphs below).

Please note, Figure 7 illustrates a distribution, which resembles a normal distribution concerning the number of participants in projects (projects size). However, a few projects were larger than the rest. The statistics of this distribution are summarised in Table 1 below.

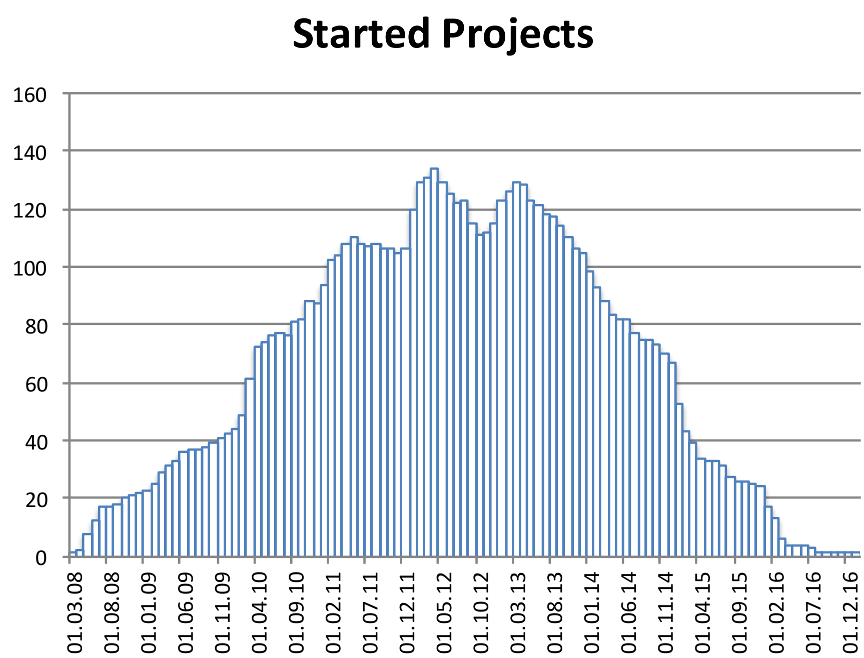

Figure 5: Number of active projects in the real-world Case

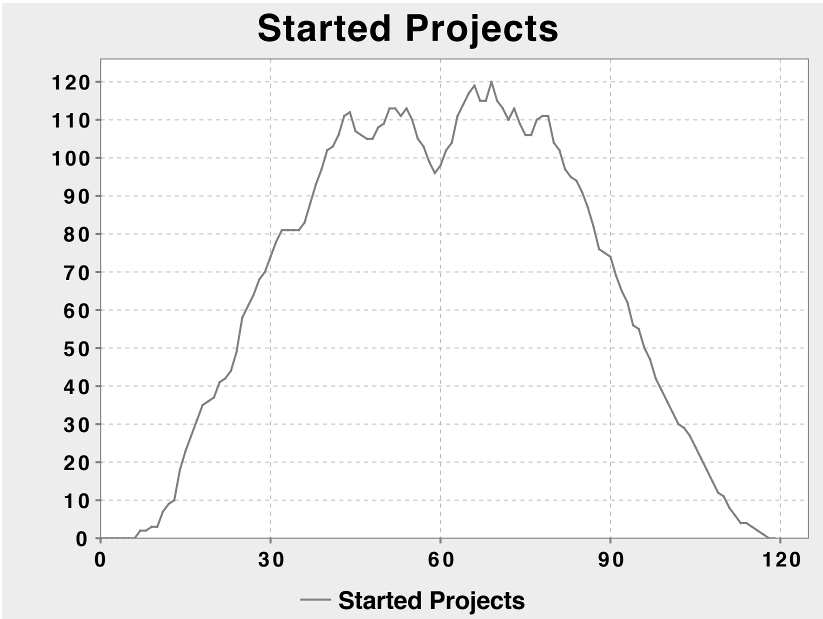

Figure 6: Number of active projects in the baseline scenario

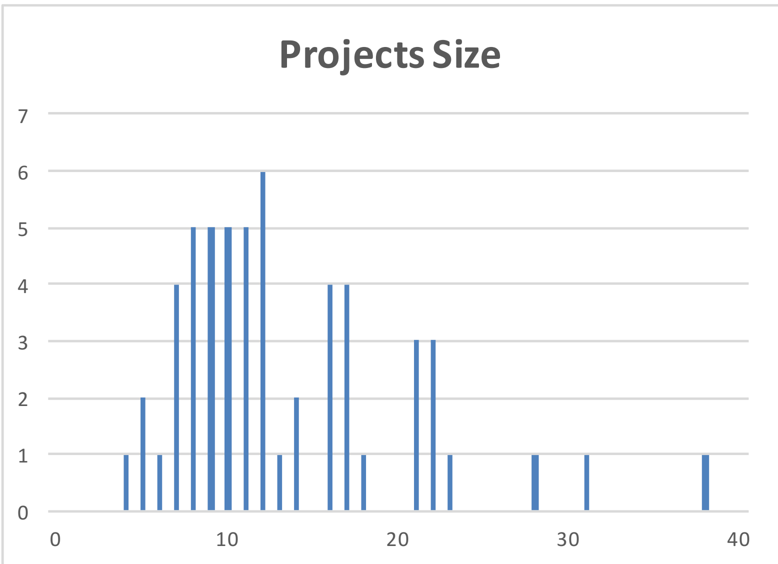

Figure 7: Distribution of projects size in the real-world case (from survey)

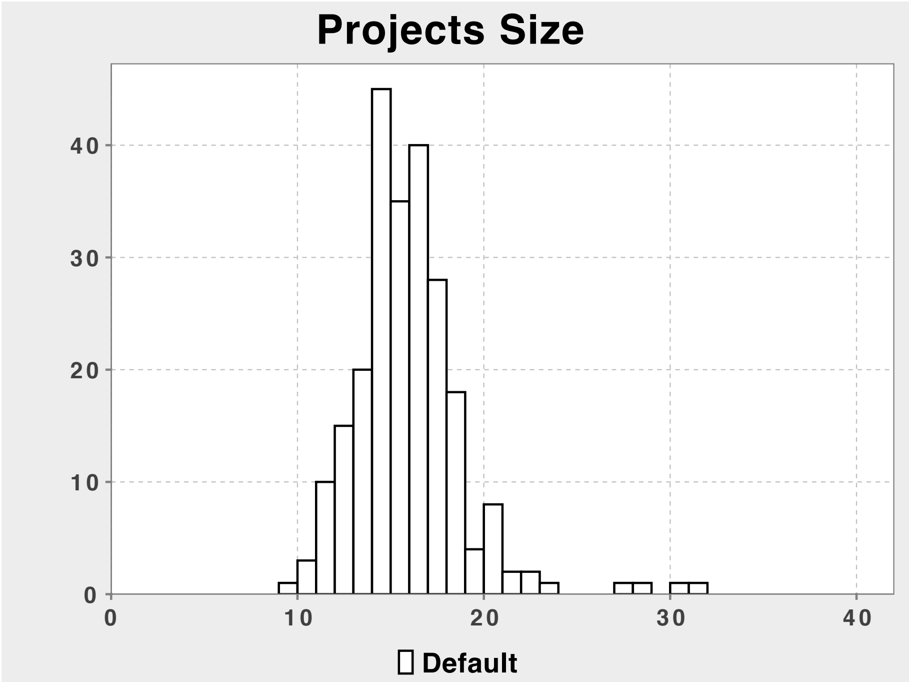

Figure 8: Distribution of projects size in the baseline scenario

	Empirical Case	Baseline Scenario
projects-size-avg	14	15.5
projects-size-med	12	15.0
projects-size-min	4	9.1
projects-size-max	55	30.2

Table 1: Projects size in the Empirical Case and the Baseline Scenario

With respect to knowledge, the real-world projects that fell under CIP-ICT/PSP and those simulated by the GREAT-SKIN model correspond closely qualitatively. Therefore, the simulation experiments can be characterised as historically-friendly experiments, as they reproduce the real-world decisive mechanisms and dynamics of projects. This supports the GREAT-SKIN model's potential as an *in silico* experiment that can be used to test theoretic questions pertaining to RRI stylised facts and the role of CSOs in facilitating RRI.

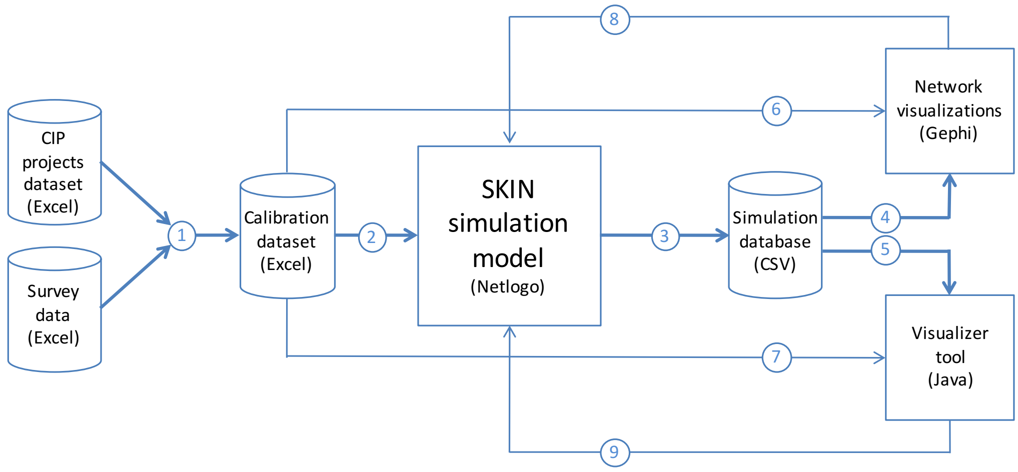

Figure 9: Workflow of the study's methodological framework (numbers Indicate the single steps; circles indicate the software interfaces between the single steps)

Baseline scenario results

Comparing the real-world data with the simulated data of the baseline scenario, the table below summarises all values. We coded the real-world values in black. We labelled the real-world "un-observables" in blue. These consist of data points and information that cannot be observed (e.g. length of time required for proposal writing, the amount of knowledge held by the agents and knowledge flows between the agents in the network). In addition, these are data points, which we can generate in the simulation, for example the numbers of proposals written, but cannot observe in the real world because we do not know how many proposals were written, we only know about the proposals accepted, because they became projects. It is worth noting that the tables do not contain any real-world information, which is indicated by N/A in the respective cells.

We chose a modified Monte-Carlo approach, a type of algorithm that relies on repeated and random sampling. In particular, we repeated experiments 15 times and included several stochastic components in our simulation model. Based on visual inspection of the convergence plots for the indicators in Table 2, the choice of 15 runs for simulation of the baseline scenario proved sufficient for reliable and stable results. Scattered tests also show that 15 repetitions produce reasonably smooth results and excludes outliers due to stochastic fluctuations. In the result tables we displayed the average values of these computations. Admittedly, the number of repetitions does not completely fulfil the requirements of Monte-Carlo method, which requires knowing the number of parameters and their values. However, due to computational intensity - given the amount of parameters and values we have, we would need tens of thousands of repetitions each taking more than half an hour - it is a suitable way to go.

		Emp CIP	Sim CIP (15 runs)			
			mean	*sd*	*dif*	
Participants	Public sector agents[5] in projects	619	677	10	58	*
	LDFs in projects	272	332	13	60	*
	SMEs in projects	594	604	20	10	
	CSOs in projects	223	199	12	-24	
	participations in proposals (avg)	N/A	4.4	0.2		
	participations in projects (avg)	2.2	2.0	0.0	-0.2	*
Proposals	number of proposals	N/A	736	52		
	consortium size (avg)	N/A	14.7	0.2		
	capability match (avg)	N/A	51.0	0.1		
Projects	number of projects	213	234	4	21	
	consortium size (avg)	14.1	15.5	0.2	1.4	*
	project duration (avg)	31.8	32.0	0.4	0.2	
	project funding (avg)	2.5	2.2	0.0	-0.3	*
Knowledge	knowledge per participant	N/A	12.1			
	knowledge flow per project	N/A	15.1			
Capabilities	capability diffusion per theme	N/A	0.67	0.01		
	capability frequency (avg)	N/A	36.3	0.1		
Network	density	0.012	0.016	0.0	0.004	*
	number of components	1	1	0.0	0	
	size of the largest component	1708	1812	37	104	*
	Diameter	7	4	0.3	-3	*
	path length (avg)	3.1	2.8	0.0	-0.3	*
	degree (avg)	29.6	28.9	0.7	-0.7	
	clustering (avg)	0.9	0.7	0.0	-0.2	*

[5] There is one further disclaimer in relation to our calibration exercise: Since the CIP-ICT/PSP was a policy support programme (PSP), it also comprised many government-related agents compared to other funding programmes. For our calibration, this characteristic presented two issues: (1) since our simulation aims at elucidating the role of CSOs, we were not specifically interested in the contribution of government agents. (2) We would like our simulation to provide insights on any funding programme regardless of the specific user community involved. Thus, to make our simulation results more applicable and transferable to all funding programmes, we ignored this specific aspect of the composition of the participant community. We accomplished "black-boxing" governmental agents for our calibration by grouping these agents under "public" agents, along with universities. We also grouped SMEs and private research organisations under "private" agents and CSOs under "civil" agents. There is one risk we run with grouping or agents in this way, namely that the special characteristics and behaviours of the (now neutralised) governmental agents are causally responsible for the RRI behaviour of CSOs. This would now be hidden in the black-box. However, no empirical evidence suggests that governmental agents are the most influential of all agents. As a result, we feel comfortable neutralising them in a black-box with 'public' agents.

Table 2: Results of Baseline Scenario

With the baseline scenario, we have reproduced qualitatively the structural patterns of CIP-ICT/PSP, based on historical data. The structural patterns comprise basic architectural characteristics concerning the density of the networks and the degree distribution among agents. Furthermore, the model reproduced the process of network development. This yielded a baseline model which makes it possible to extend the time horizon of the simulation beyond existing historical data, into the future, and to perform simulations. The baseline scenario can be used as benchmark for the effects of changes.

5. Simulation experiments

The empirical findings of our survey, supported by similar insights provided by the GREAT case studies, have challenged the commonly shared, popular conviction that CSOs act as the main facilitators of RRI among project participants and are mainly responsible for the “spread“ of RRI in the research and innovation system (RRI learning among actors, RRI diffusion).

Instead, our empirical findings indicate that other agent types (unis, research organisations, SMEs, MNEs, etc.) are likewise active in promoting RRI in European research and innovation: these other agent types carry RRI capabilities as well, and are major players for RRI diffusion. CSOs, in turn, are involved in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

Our empirical findings indicate this with data and correlations (see survey results). They do not, however, offer the full causal explanation, because, of course, in empirical reality we cannot observe processes such as “RRI learning” of and between different agent types; we cannot observe and measure knowledge exchange, knowledge flows, knowledge diffusion etc.

This is now the task of the simulation model. It allows to check for these empirical “un-observables”: here we can observe and measure “RRI capabilities” of agent types and “RRI learning/diffusion” between them.

For the simulation, we dis-entangle the task into two evaluative questions framing one hypothesis:

Evaluative Question 1:
Are CSOs the main facilitators of RRI among project participants, and they are mainly responsible for the “spread” of RRI in the research and innovation system (RRI learning among actors, RRI diffusion)?

Hypothesis:
CSOs are considered as attractive partners in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

Evaluative Question 2:
Can we find out more about the effects and limits of the hybridity of CSOs if we “release them” from the – obviously wrong assumption – that they are mainly contributing to research and innovation by and due to their RRI capabilities?

To address these questions, we conducted three simulation experiments that changed the level of CSOs involvement in projects.

To illustrate the results of our different experiments and to systematise the effects on the various targets, we organised our major results in tables (see below).

All information in the following tables must be viewed in light of the baseline scenario discussed above. To evaluate whether any given scenario differed substantially from the baseline scenario, we used an independent two-sample t-test with equal sample sizes and unequal variance. Statistical significance entails values less than 0.05.

In order to cover the multi-facetted aspect of the projects and their dynamics, we separated the experiments in different columns and the effects of the modified policy design in different rows (see Table 3). The heads of the columns label the different experiments performed. The rows label the variables under investigation.

	A. No CSOs	B. Attractive CSOs	C. Hybrid CSOs
Participants	public sector PUBs (-0+); private sector (-0+) ((SMEs (-0+) LDFs (-+0)); civil sector CSOs (-0+)		
Proposals	more submitted proposals (+); less submitted proposals (-)		
RRI/SCI	higher (+) or lower (-) RRI scores and SCI scores		
Projects	size of consortia (+0-); participation of PUBs, LDFs, SMEs, CSOs (+0-)		
Knowledge	increasing (+) or decreasing (-) knowledge exchange among agents		
Capabilities	wide (+) or narrow (-) diffusion of capabilities		
Network	average number of partners (-0+)		

Table 3: Results of experiments

In the first row we listed the effect on the number of participants and their rate of participation in the projects. In particular, we differentiate between public sector participants (Public), private sector participants (large diversified firms LDFs, small and medium sized enterprises SMEs) and civil sector participants (civil society organisations CSOs). We indicate an increasing rate of participation with a (+) and a decreasing participation rate with (-). The second row lists the number of proposals as well as whether proposal writing activities increased (plus) or decreased (minus). This figure indicates the potential for network growth.

The third row concerns the RRI and SCI scores. The GREAT-SKIN model allocates a score for all four RRI elements, namely anticipation, participation, reflection and responsiveness. The first three are used to evaluate proposals and projects, while the last is used to evaluate projects only. Like the INFSO-SKIN model, the GREAT model uses a SCI score for the evaluation of proposals - namely it assesses them in terms of „capability match", „expertise level" and „research orientation". The „capability match" is the extent to which the range of capabilities required by the call for proposals is matched by the proposals themselves. Similarly, the "expertise level" is the average level of expertise that consortia members have in relation to the capabilities they are contributing to the proposals. The "research orientation" addresses whether the agents within the consortium have an orientation towards basic or applied research.

In the fourth row, we list the effects of each experiment change on the projects. Especially, we differentiate between the number of projects, the size of the projects as measured by the number of participants, the proportion of each participant type and the average funding per project. The respective figures allow us to evaluate the effects of various sizes and forms of project consortia on the overall network evolution. It is worth noting that, in the case where the project consortia members are in two or more project consortia at the same time, a connection then exists between the project networks, and an overarching network, in which all participants are in some way (either directly or indirectly connected to each other).

The fifth row deals with the effects of knowledge exchange processes measured as knowledge flows between the participants in projects. The modifications in the various experiments can lead either to increasing or decreasing mutual learning triggered by knowledge flows and therefore allows for the evaluation of the effectiveness of various policy designs for knowledge diffusion.

The last row deals with the overarching network as a whole, in which all project networks come together. To illustrate deviations from the baseline scenario, the effects of the experiments on important network indicators –which are developed to measure the nature of the network, and can include the average number of connections per participant—are documented in the table and their development over time is displayed in various figures (see description for baseline scenario above).

Any significant deviation from the baseline scenario figures for these indicators (assessed with a t-test) is marked by a plus (+) or a (-). No significant effect is recorded by the entry "no effect" in the respective cell. Values highlighted with an asterisk in the tables are those intended to be changed by the experiment; the others are unintended side-effects.

In the next section we describe each experiment individually, noting their motivations, the parameters changed from the baseline scenario settings and the consequences for the indicators listed in the rows of Table 3.

5.1. The “No CSOs” Experiment

The “No CSOs” Experiment (Experiment A) addresses

Evaluative Question 1:
Are CSOs the main facilitators of RRI among project participants, and they are mainly responsible for the “spread” of RRI in the research and innovation system (RRI learning among actors, RRI diffusion)?

By excluding CSOs from the baseline scenario, we can evaluate whether CSOs have any effect on a project's RRI output. If this change has an effect, we can also evaluate the size and nature of that effect. What if no CSOs participate in a project? The idea to query whether a lack of CSOs has an effect or not on the overall RRI scores of the projects and proposals constitutes a test of whether CSOs are central or less/not vital to fostering RRI.

Experiment A is designed to track the impact of removing the CSOs (Table 4). In the simulation’s set-up, this experiment can be implemented by replacing the CSOs by SMEs, thus keeping the total number of participants the same.

EXPERIMENT	Public	LDFs	SMEs	CSOs
Baseline Scenario	900	500	1200	400
A. No CSOs	900	500	1600	0

Table 4: Removing the CSOs

This experiment is designed to provide us with information about the GREAT-SKIN model’s sensitivity to a scarcity or total absence of CSOs. If the results are very different from the Baseline Scenario, this will tell us about the model’s sensitivity to the parameters in Table 3. More importantly, it will highlight the particular role of CSOs in in our model, namely the pertinence of their special capabilities to proposals and projects.

For this experiment, we chose to replace CSOs with SMEs (instead of leave out CSOs altogether) because the two types of project participants are similar in some respects (e.g. their size and research orientations). However, they are different when it comes to the kind of capabilities they contribute to projects. Thus, all other things being equal, this experiment shows the sensitivity of the model to the scarcity or absence of special capabilities.

Results of the "No CSO" Experiment

Intuitively, removing CSOs should make it more difficult for proposals to meet funding eligibility criteria. Therefore, we expected a significant decrease in the number of proposals for this experiment. However, this outcome depends on whether there are any hard criteria—i.e. absolute requirements for the proposal to be deemed eligible for funding—with regard to CSO presence in proposals. Since there are not, proposals may still pass the eligibility test despite some poorly met criteria (i.e. most of the RRI scores). Table 5 illustrates the outcome of the experiment.

	Experiment A. *No CSOs*
Participants	0 participants-net + participants-SME-net (*) - participants-CSO-net (*)
Proposals	- proposals 0 proposals-with-SME - proposals-with-CSO
	0 proposals-size-avg + proposals-SME-avg - proposals-CSO-avg
RRI/SCI	- proposals-anticipation-avg - proposals-participation-avg - proposals-reflexivity-avg - proposals-responsiveness-avg
	- proposals-capability-match-avg 0 proposals-expertise-level-avg 0 proposals-orientation-avg
Projects	0 projects 0 projects-with-SME - projects-with-CSO
	0 projects-size-avg + projects-SME-avg - projects-CSO-avg
Knowledge	0 knowledge-flow
Capabilities	- capabilities 0 capabilities-diffusion 0 capabilities-frequency
Network	0 density 0 size-of-largest-component 0 diameter 0 avg-path-length 0 avg-degree 0 avg-clustering

Table 5: No CSOs Scenario (*) = intended effect

The results of Experiment A confirm the accuracy of our model: The number, identity and role of CSOs are *not critical* to the simulation outcomes. The model does show sensitivity to changes: RRI scores for anticipation, participation and responsiveness among participants decreased due to the removal of CSOs. However, since there are no hard eligibility criteria in connection to these RRI scores, the change does not affect the number of proposals and projects. In this case, this does limit the sensitivity of the model to the presence of CSOs and their special capabilities.

If hard criteria would be introduced for the individual RRI scores, the model would undoubtedly be more sensitive. The results of this experiment should be discussed with reference to policy design in relation to the four RRI categories. That is, if policymakers aim to increase or decrease the number of proposals and projects with any given research network, they may want to impose hard criteria for RRI scores. Not only would this ensure a higher standard for RRI in research proposals, but it would also allow policy analysts to easier measure RRI in future projects.

Answer to Evaluative Question 1:
Are CSOs the main facilitators of RRI among project participants, and they are mainly responsible for the "spread" of RRI in the research and innovation system (RRI learning among actors, RRI diffusion)?

In summary, this "No CSOs" Experiment shows that the number, identity and role of CSOs are *not critical* to the simulation outcomes and that the model has a relatively limited sensitivity when it comes to CSOs in relations to the scarcity or absence of special capabilities.

5.2. The "Attractive CSOs" Experiment

The "Attractive CSOs" Experiment (Experiment B) addresses our

Hypothesis
CSOs are considered as attractive partners in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

This hypothesis was triggered by results of our empirical survey:

Of the 57 projects in the survey, only 24 projects (42%) have one or more CSOs (Figure 10).

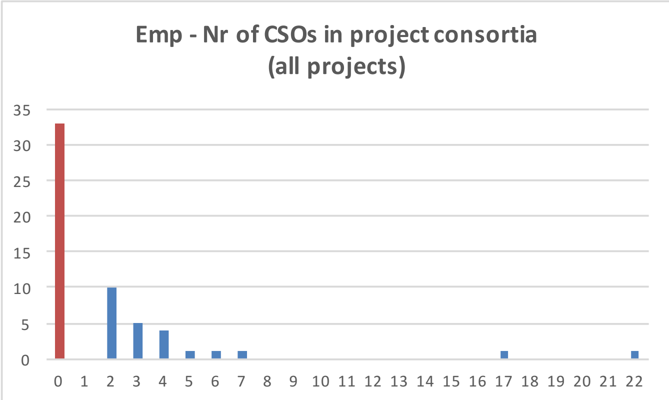

Figure 10: Number of CSOs in project consortia – survey (red: no CSOs; blue: with CSOs)

Of those 24 projects with CSOs, the number of CSOs is always higher than one, on average 4.5 (26% of the average consortium size) (Figure 11).

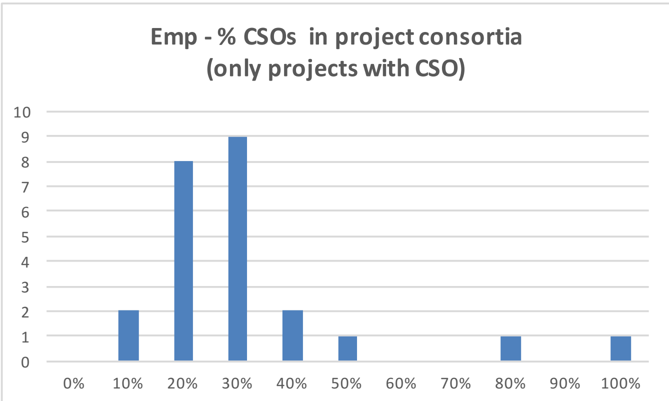

Figure 11: Percentage CSOs in project consortia – survey

The survey response (Q4.3) provides insight into what are the main motivations for inclusion of CSOs. They are principally professional/scientific excellence (56% of response), provision of data (31%) and reflection (19%). Formal requirements are generally not the main motivation (only 6%).

The Baseline Scenario of the simulation does not produce the same results. The number of projects that have one or more CSOs is higher (77%) (Figure 12).

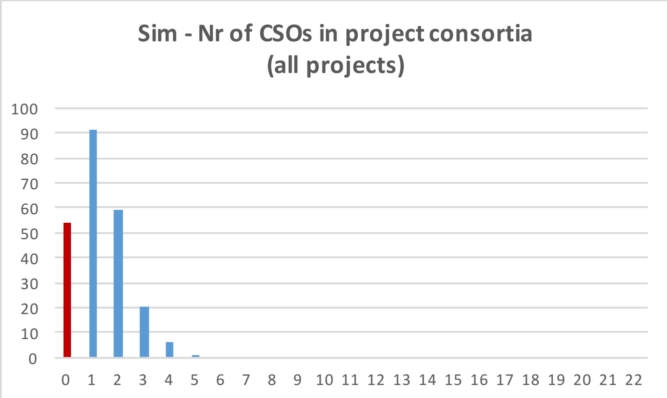

Figure 12: Number of CSOs in project consortia – Baseline (red: no CSOs; blue: with CSOs)

Moreover, considering the projects that have CSOs, the number of CSOs tends to be 1 or 2 (Figure 13), but generally not higher than that.

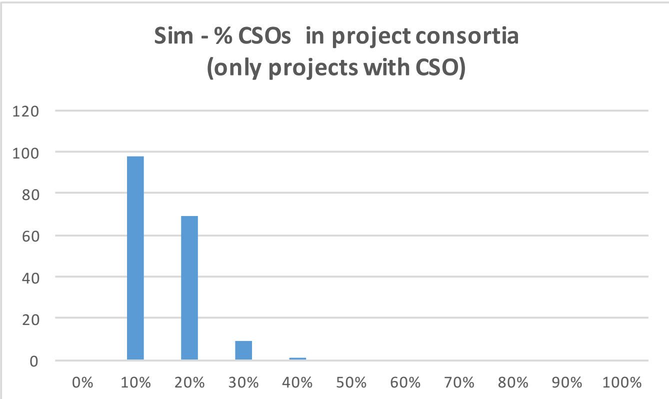

Figure 13: Percentage CSOs in project consortia – Baseline

Experiment B is designed to help clarify what makes CSOs attractive partners for some projects, and not so for other projects. The proposition used in the Baseline scenario is that CSOs are attractive because of their special RRI capabilities. However, this proposition, by itself, does not explain the survey response. The hypothesis used in Experiment B is that CSOs may be considered attractive partners also for other motivations (expertise, data).

We test this by a slight change to the programming of the search algorithm for proposal partners:

Search process for proposal partners & attractiveness of CSOs

5.2.1.1.1.1.1 This changes the model's standard algorithm that describes how agents search for partners for joining a proposal consortium. This algorithm describes a three-step random search process, programmed with the idea that attractive candidate partners are generally found in the networks of previous partners of its members. For joining the proposal, candidates need to be able to contribute capabilities that are relevant to the call. In the case of candidate CSOs, those relevant capabilities might be special RRI capabilities.

5.2.1.1.1.1.2 For Experiment B, we make a slight change to the standard algorithm, introducing the "attractiveness" parameter α. The effect of this parameter is the following: throughout the three-step search process, whenever one most attractive candidate is picked out of a list of attractive candidate partners (e.g. all previous collaborations), with a likelihood α a CSO will be picked (if there are any listed, otherwise the pick is random). So, α represents the general bias for picking a CSO as the 'most' attractive candidate partner.

5.2.1.1.1.1.3 In the Baseline Scenario, $\alpha = 0$, which means there is no bias for picking CSOs (i.e. the standard algorithm). In experiment B, α is set to the value 0.25 and so there is a strong bias for picking CSOs (taking into account that the value is much higher than the percentage of CSOs in the population of agents).

One underlying assumption is that inclusion of CSOs in proposal consortia is generally positively evaluated by the Commission.

(One reason) why CSOs are attractive proposal partners

5.2.1.1.1.1.4 Proposals that include CSOs have higher RRI scores than proposals that have no CSOs. The ranking procedure used by the Commission for the evaluation of proposals applies two ranking criteria: the total RRI score and the total SCI score, which are combined in one overall (RRI/SCI) score.

5.2.1.1.1.1.5 The "RRI-balance" parameter β is used to specify the weight of the RRI score: total ranking score = $\beta \bullet$ RRI score + $(1 - \beta) \bullet$ SCI score. The standard value for β, used in the Baseline scenario and all the experiments, is 0.25 so that a high RRI score is relevant (but not as important as a high SCI score). It means that the inclusion of CSOs puts proposals higher up in the ranking, making CSOs attractive proposal partners.

This provides an incentive for proposal consortia to include CSOs, which corresponds with the survey outcome that reflection (19%) is a motivation for inclusion of CSOs, but not the main motivation.

The idea that is tested in Experiment B is whether the hypothesis (multiple motivations for inclusion of CSOs in the formation of proposal consortia) provides a better explanation of why CSOs may be attractive partners for inclusion in proposal consortia.

The specific relationship that is tested is between the value of the attractiveness parameter α and the number of CSOs in proposal consortia.

Table 6 illustrates the outcome of the experiment.

	Experiment B. *Attractive CSOs*
Participants	- participants-net - participants-PUB-net - participants-LDF-net - participants-SME-net + participants-CSO-net
Proposals	- proposals - proposals-with-CSO + proposals-with-CSO-perc (*)
	- proposals-size-avg - proposals-PUB-avg - proposals-LDF-avg 0 proposals-SME-avg + proposals-CSO-avg (*)
RRI/SCI	+ proposals-anticipation-avg + proposals-participation-avg - proposals-reflexivity-avg + proposals-responsiveness-avg
	- proposals-capability-match-avg 0 proposals-expertise-level-avg + proposals-orientation-avg
Projects	0 projects + projects-with-CSO + projects-with-CSO-perc
	- projects-size-avg - projects-SME-avg + projects-CSO-avg
Knowledge	- knowledge-flow
Capabilities	+ capabilities 0 capabilities-diffusion - capabilities-frequency
Network	+ density - size-of-largest-component 0 diameter 0 avg-path-length 0 avg-degree + avg-degree-CSO 0 avg-clustering - avg-clustering-CSO + avg-betweenness-CSO

Table 6: Attractive CSOs Scenario (*) = intended effect

The outcomes of Experiment B show a generally higher number of CSOs in project consortia compared to the Baseline scenario (projects-CSO-avg in Table 6, with details in Figures 14 and 15).

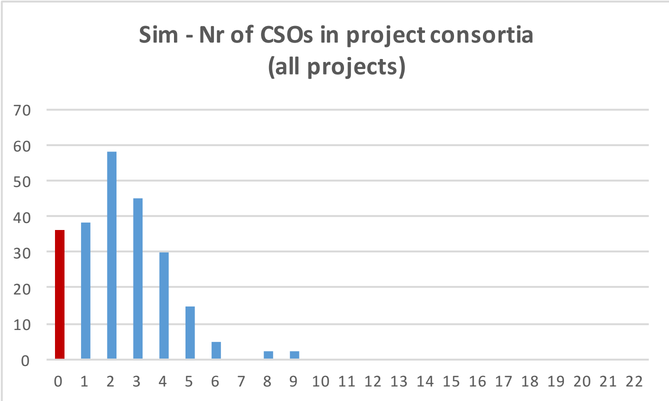

Figure 14: Number of CSOs in project consortia – Experiment B (red: no CSOs; blue: with CSOs)

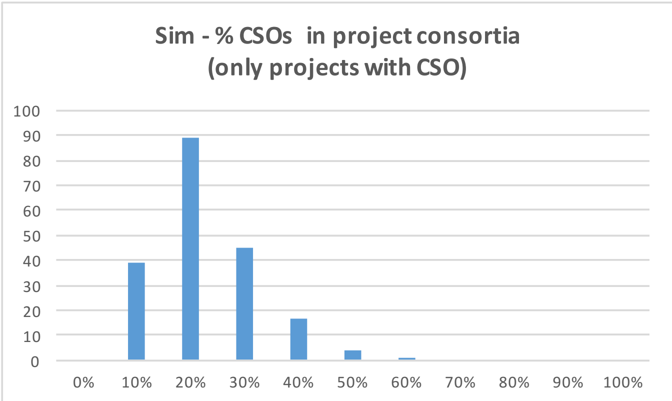

Figure 15: Percentage CSOs in project consortia – Experiment B

The proposition, in the form it is implemented in Experiment B, cannot however explain the high number of projects with no CSOs (the red bar in Figure 14 clearly indicates a too low share of projects in comparison to Figure 12). In fact, the percentage of projects *with* CSOs in experiment B (projects-with-CSO-perc in Table 6) is even higher than in the Baseline scenario. Therefore, the proposition needs to be reformulated to take account the high number of projects with no CSOs.

Taking into account the discontinuity in Figure 10 (no projects with only one CSO) and the multiplicity of motivations for inclusion of CSOs shown by the survey response, it is not possible to replicate these outcomes with the current proposition.

Furthermore, it can be shown that for some projects CSOs are not attractive at all, whereas for other projects CSOs are attractive to a great degree. Further analysis is needed to identify the type of relationship(s), with help of simulation for experimentation with and testing alternative propositions.

Confirmation of the Hypothesis
CSOs are considered as attractive partners in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

The confirmation rests on the insight that, considering Figure 14, no single value for the attractiveness parameter α can replicate the outcomes. Instead, what is needed is to suppose different values of α depending on project-specific information.

CSOs are chosen as attractive partners for projects due to various capabilities they own: on the one hand, they contribute special RRI capabilities that help the projects reflecting upon societal needs and ethical issues, on the other hand, they provide SCI capabilities that help the projects in knowledge production. Having special RRI capabilities as well as professional/scientific SCI capabilities makes the CSOs "masters of two trades": hybrid CSOs.

5.3. The "Hybrid CSOs" Experiment

The "Hybrid CSOs" Experiment (Experiment C) addresses

Evaluative Question 2:
Can we find out more about the effects and limits of the hybridity of CSOs if we "release them" from the – obviously wrong assumption – that they are mainly contributing to research and innovation by and due to their RRI capabilities?

Following the survey results and simulation results for Experiment B, the role of CSOs in projects is influenced by their "hybrid nature": on the one hand, they contribute special RRI capabilities that help the projects reflecting upon societal needs and ethical issues, on the other hand, they provide SCI capabilities that help the projects in the knowledge creation. Having special RRI capabilities as well as professional/scientific SCI capabilities makes the CSOs "masters of two trades": hybrid CSOs.

In the survey, most respondents selected the professional/scientific excellence that CSOs may contribute as the main motivation for their inclusion (Q4.3; 56% agree), CSOs may contribute unique expertise to projects (Q4.7; 35% agree) and there is multiplicity in the roles of CSOs in projects (Q4.2).

A potential explanation for the "hybrid nature" of CSOs and the multiplicity of their roles in projects - despite the fact that they are generally perceived as "small and not highly institutionalised“ actors - could be related to their ability to fundraising, which allows them to become more hybrid.

Already the Baseline Scenario produces outcomes that point in the direction of hybridity though it largely follows the proposition put forward by the RRI literature and the EC policy discourse that CSOs mainly contribute in the domain of RRI capabilities in research and innovation. Therefore, the proposition used in the Baseline scenario is that CSOs have a small capacity to join proposals and adopt new capabilities. It is possible to track the dynamics of learning/diffusion of special RRI capabilities and SCI capabilities (Tables 7 and 8).

PUBs	27	8.2%
LDFs	4	1.2%
SMEs	6	2.0%
CSOs	287	88.5%

Table 7: Diffusion of special RRI capabilities in the Baseline Scenario

PUBs	17911	49.7%
LDFs	5993	16.6%
SMEs	9326	25.9%
CSOs	2793	7.8%

Table 8: Diffusion of SCI capabilities in the Baseline Scenario

Experiment C is designed to clarify what the effects and limits are concerning the hybrid nature of CSOs and the general diffusion/learning mechanisms that such hybridity entails. One underlying assumption is that the general mechanisms for learning and diffusion apply equally to CSOs as to other agents. Some support for this assumption is found in the survey response to Q3.6: respondents were asked ‘who were the most-three-active partners’ when project changes were made. This response shows that in some projects CSOs were among the most active partners.

We address the evaluative question for the experiment by a slight change to the programming of the agents that represent CSOs: they have a higher capacity to join proposals and adopt new capabilities during the projects that they are involved in.

The specific relationship that is tested is between the capacity of CSOs to join proposals and adopt new capabilities and the learning/diffusion of SCI and RRI capabilities by CSOs.

Table 9 illustrates the outcome of the experiment.

	Experiment C. *Hybrid CSOs*
Participants	0 participants-net 0 participants-PUB-net - participants-LDF-net 0 participants-SME-net + participants-CSO-net
Proposals	+ proposals + proposals-with-CSO (*) + proposals-with-CSO-perc
	0 proposals-size-avg - proposals-PUB-avg - proposals-LDF-avg - proposals-SME-avg + proposals-CSO-avg
RRI/SCI	+ proposals-anticipation-avg + proposals-participation-avg 0 proposals-reflexivity-avg + proposals-responsiveness-avg
	0 proposals-capability-match-avg 0 proposals-expertise-level-avg + proposals-orientation-avg
Projects	0 projects + projects-with-CSO + projects-with-CSO-perc
	0 projects-size-avg - projects-PUB-avg - projects-LDF-avg - projects-SME-avg + projects-CSO-avg
Knowledge	+ knowledge-flow + knowledge-flow-CSO (*)
Capabilities	0 capabilities + capabilities-diffusion + capabilities-frequency
Network	0 density 0 size-of-largest-component 0 diameter 0 avg-path-length 0 avg-degree + avg-degree-CSO 0 avg-clustering - avg-clustering-CSO + avg-betweenness-CSO

Table 9: Hybrid CSOs Scenario (*) = intended effect

The outcome of Experiment C shows that the same learning/diffusion patterns have accelerated (capabilities-diffusion in Table 9, with details in Tables 10 and 11).

	Baseline scenario		Experiment C	
PUBs	27	8.2%	38	10.7%
LDFs	4	1.2%	8	2.4%
SMEs	6	2.0%	9	2.6%
CSOs	287	88.5%	296	84.3%

Table 10: Diffusion of special RRI capabilities in the Baseline Scenario and Experiment C

	Baseline scenario		Experiment C	
PUBs	17911	49.7%	17853	47.7%
LDFs	5993	16.6%	5900	15.8%
SMEs	9326	25.9%	9224	24.7%
CSOs	2793	7.8%	4419	11.8%

Table 11: Diffusion of SCI capabilities in the Baseline Scenario and Experiment C

Answer to Evaluative Question 2:

Can we find out more about the effects and limits of the hybridity of CSOs if we "release them" from the – obviously wrong assumption – that they are mainly contributing to research and innovation by and due to their RRI capabilities?

In summary, the diffusion patterns show that special RRI capabilities of CSOs are increasingly adopted and then contributed by the other agents, and via the same learning mechanisms, CSOs increasingly adopt and then contribute SCI capabilities.

6. Conclusions

This Deliverable presented results from a simulation model calibrated by empirical data, which was set up to address and test some evaluative questions and hypotheses on RRI implementation and spread in European research and innovation. As the empirical domain for calibrating the simulation, a particular funding scheme was used: the Competitiveness and Innovation Programme of the European Commission (CIP), and here the projects of the Information and Communication Technologies Policy Support Programme (CIP-ICT/PSP). Quantitative work on the CIP-ICT/PSP as a whole (programme statistics, network analysis, survey results) and qualitative case studies on selected projects had provided insights into the current extent, the role, and the possible determinants of RRI in the CIP-ICT/PSP to inform the simulation model.

Especially with the empirical survey among CIP-ICT/PSP coordinators, a special focus on the current implementation degree of RRI elements on organisational and project level was provided: the RRI elements (anticipate, reflect, deliberate, respond) could be more or less "scored" to provide as profile of a project participant (RRI score of organisations), and could be followed by a research project more or less sequentially in its life time (RRI score of research projects).

Using this empirical data as input, GREAT-SKIN offered the framework to simulate the impacts of RRI in EU-funded research and innovation projects.

In this Deliverable, the model was used for theory testing. In current RRI literature and in EC policy papers, a strong pattern could be detected saying that CSOs are crucial for realising RRI (or a 'societal perspective') in current research and innovation processes, and that, therefore, the participation of CSOs in these processes needs to be fostered. However, we found that our own empirical work on CIP-ICT/PSP strongly questioned the existence of this pattern.

The empirical findings of our survey, supported by similar insights provided by the GREAT case studies, challenged the commonly shared, popular conviction that CSOs act as the main facilitators of RRI among project participants and are mainly responsible for the "spread" of RRI in the research and innovation system (RRI learning among actors, RRI diffusion).

Instead, our empirical findings indicated that other agent types (unis, research organisations, SMEs, MNEs, etc.) were likewise active in promoting RRI in European research and innovation: these other agent types carry RRI capabilities as well, and are major players for RRI diffusion. CSOs, in turn, are involved in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

Our empirical findings indicated this with data and correlations. They did not, however, offer the full causal explanation, because, of course, in empirical reality we cannot observe processes such as “RRI learning” of and between different agent types; we cannot observe and measure knowledge exchange, knowledge flows, knowledge diffusion etc.

This had been the task of the GREAT-SKIN simulation model. It allowed to check for the empirical “un-observables”: here we could observe and measure “RRI capabilities” of agent types and “RRI learning/diffusion“ between them.

For the simulation, we dis-entangled the task into two evaluative questions framing one hypothesis:

Evaluative Question 1:
Are CSOs the main facilitators of RRI among project participants, and they are mainly responsible for the “spread” of RRI in the research and innovation system (RRI learning among actors, RRI diffusion)?

Hypothesis:
CSOs are considered as attractive partners in projects not only as society representatives, but also – and sometimes rather - for their domain and knowledge expertise in specific areas of research.

Evaluative Question 2:
Can we find out more about the effects and limits of the hybridity of CSOs if we “release them” from the – obviously wrong assumption – that they are mainly contributing to research and innovation by and due to their RRI capabilities?

To address these questions, we conducted three simulation experiments that changed the level of CSOs involvement in projects. The “No CSOs Experiment” addressed Evaluative Question 1: In summary, it showed that the number, identity and role of CSOs are *not critical* to the simulation outcomes. The “Attractive CSOs Experiment” tested and confirmed our Hypothesis providing causal insights. Finally, the “Hybrid CSOs Experiment”, which addressed Evaluative Question 2, provided more detail on the diffusion patterns of RRI: it showed that special RRI capabilities of CSOs are increasingly adopted and then contributed by other agent types, and via the same learning mechanisms, CSOs increasingly adopt and then contribute scientific capabilities.

With these results, our study contributed to the analysis of the RRI-led turn to co-creation, transdisciplinarity and tranformative science in European research and innovation. It especially sheds light on the role and involvement of civil society on the organisational level of Civil Society Organisations (CSOs), which are supposed to change the research and innovation system towards RRI functions. Our study had looked into this on the level of project/programme structures, in terms of knowledge production dynamics in research projects, and in terms of research outcomes/impacts.

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Appendices

Appendix 1: Specifics for the model

Creating the starting configuration

The starting configuration of the model is constructed using the CIP projects database:

First, a total of 3,000 agents (research institutes, diversified firms, SMEs and CSOs) are created. This is deliberately set to be larger than the number of organisations listed as participants of the CIP projects in the database (2474 organisations). The information in the database about the organisations does not include the *type* of organisation. Consequently, the survey data – with information about types of project partners – is used to realistically set the percentages of the four types of agents in the population.

A standard feature with INFSO-SKIN is that the starting configuration may include a *starting network*. If used, links are created between all the members of a smaller subset of projects, e.g. all projects from the first call. This option is not used in this study, however, because of the above-mentioned information problem.

Participant *size*, which is a measure for the *capacity* of organisations to interact and exchange knowledge, is based on the configuration in Figure 16. This configuration, standardly used for INFSO-SKIN and extended with CSOs for GREAT, illustrates the differences in size proportional to funding received, including the occurrence of very big participants.

All the agents are endowed with their initial *kenes* (their capabilities, abilities, expertise levels and research orientations) using randomised designs for agent types, based on the model's partitioning (10 themes, sector/common/rare/special capabilities) of the knowledge space.

Instruments and calls are then created to complete the setup procedure.

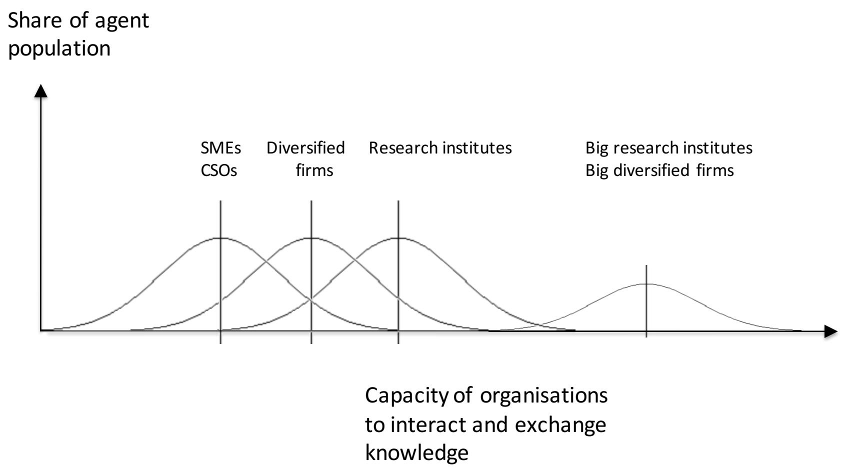


Figure 16: Configuration of initial capacity of organisations

The main processes in the model

The general behaviours of the agents follow the empirical understanding of phases in network formation and evolution of the Framework Programmes:

Definition of policy incentives and rules for R&D collaboration

The EU provides funding for collaborative research. The rules are defined in the Framework Programmes (e.g. rules for project consortia, research topics, time span of the FP etc.). Actors (research institutes, firms etc.) want to apply for funding. The calls of the Commission specify:

- type of instrument (CIP) -> the instrument type specifies minimum number of partners, composition of partners, and the length of the project
- date of call (to determine the deadline for submission)
- a range of capabilities, a sufficient number of which must appear in an eligible proposal (how many is sufficient depends on the scope of the instrument)
- the funding available for this call
- the desired basic or applied orientation

Process of consortium formation / partner choice

The actors form project consortia. Partner choice mechanisms apply. Firstly, the agent looks at the list of its previous partners. Secondly, previous partners, which agreed to join the proposal, can add previous partners from their list. Thirdly, new partners will be searched for. The search process is guided by the requirements outlined in the call. These requirements are a list of capabilities. The proposal is considered to be eligible only, if a sufficient number of these capabilities appears. If no agent from the list of previous partners can contribute such a capability in the first iteration, then in the second iteration previous partners of those agents, which agreed to join the proposal can ask their previous partners. If the required capability is not found, the proposal consortium can search for the knowledge in the population of all actors. This is done on a random basis. In each iteration *n* agents can be asked whether they have the respective capability and whether they want to join the proposal consortium. The possibilities to join a proposal consortium are determined by the same rules we apply for the determination of project initiations (see next step). The length of the agent's kene determines whether the agent has free capacities for new activities. For example, an SME, whose kene is of minimum size (i.e. five quadruples) and which is already in a project or a proposal initiative, has to reject the offer.

Process of proposal selection

The Commission evaluates the proposals according to a template that emphasises: contents (programme match), quality, and architecture of consortium (minimum number of members, industry involvement etc.). The Commission selects projects to fund. The availability of funding limits the number of projects. Proposals need to meet hard criteria to be considered as eligible; otherwise they are rejected. Hard factors are: sufficient partners with the desired capabilities (a sufficient number of capabilities specified in the call must appear in the proposal).

All proposals, which fulfil the eligibility criteria are then ranked according to the following rule: The first ranking order is the average expertise level of the proposals (i.e. the expertise levels of the capabilities are summed up and divided by the number of quadruples in the proposal). If some proposals turn out to have the same average expertise level, the second criteria applied is the number of capabilities specified in the call which are in the proposal (i.e. a proposal is ranked higher in the case more outlined capabilities are used). If after the application of this rule proposals are still ranked equally, it is randomly decided on the ranking. As in the call the number x of projects, which will be supported by the Commission is specified, the Commission chooses the x highest ranked proposals. Proposal consortia, which are not successful are dissolved. Proposal consortia, which are successful become project consortia.

Process of R&D cooperation

The projects start to work on a "project hypothesis", i.e. they are involved in research and cooperative learning activities. At the project's end, deliverables are produced (e.g. a number of publications, patents, reports). The research in the projects follows the ideas of INFSO-SKIN. Agents in project consortia are randomly allocated to sub-projects and combine their kenes. Every three months they produce an output (deliverable), which can be a publication or a patent. A transformation function for the project hypothesis produces (i) a number between 0 and 1, which decides on the type of outcome and (ii) a figure describing the success probability of a project hypothesis. The potential outcome (publication or patent) depends a) on the research orientation of actors (i.e. an applied research orientation increases the probability of a patent whereas a basic research orientation is decreasing this probability); b) the variance in capabilities involved in a project hypothesis is decreasing the probability to end up with a patent. Significant differences in knowledge involved in a project hypothesis make smaller outcomes more likely. During the length of the project they can improve their results. The research undertaken in projects is incremental research (abilities are substituted, expertise levels are increased). The potential of a radical innovation is determined only when the proposal is put together in the sense that new capability combinations can appear in consortia.

SMEs are important candidates for contributing new capabilities and therefore increase the likelihood for radical innovation. SMEs are very important concerning their contribution to radical research. New knowledge is injected into the system most often by new, small and sophisticated companies. Therefore, we design SMEs with this rare knowledge.

CSOs have special capabilities in relation to RRI aspects that other stakeholders may not have. In particular, CSOs can help other agents anticipate changing issues pertinent to society, the economy and technological advance as well as prevent any harmful consequences of research and innovation

The knowledge space is structured: 1000 different capabilities by allocating e.g. 100 capabilities to each of the ten themes. In order to allow the SMEs to play their special role we define 10 capabilities per theme as “rare” capabilities and give these capabilities in the starting distribution exclusively to SMEs. In addition, we defined 10 capabilities per theme as “special” capabilities.

The learning processes and knowledge sharing that happen in the projects follow INFSO-SKIN. The expertise levels of the capabilities that are used for the deliverables are increasing at each iteration. Capabilities of deliverables are exchanged among partners to model knowledge transfer in projects. At the end of the project all results are delivered to the Commission.

Overview of the main processes

The next pages show the flowchart of the model, which pictures this model narrative. The first figure gives a general overview of the model while the second refers to the single rules.

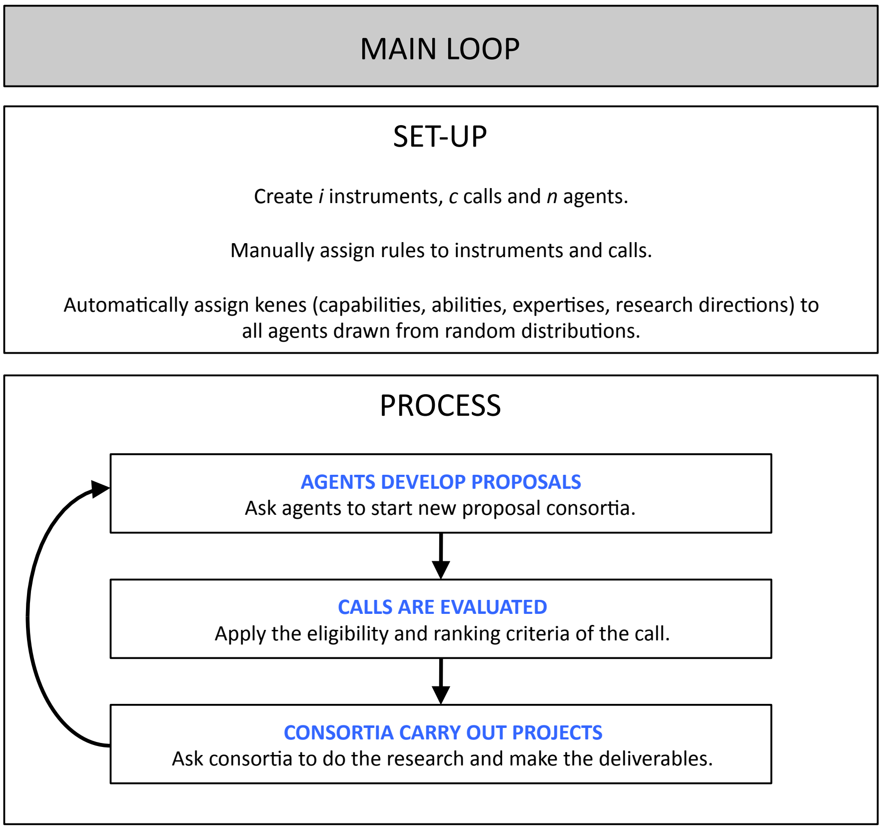


Figure 17: Overview of the simulation model (see Figure 4 in the Main Report)

AGENTS DEVELOP PROPOSALS

INITIATE NEW PROPOSAL

The possibility to initiate a proposal (most often by research institutes) depends on the agent's size (its capacity to develop new capabilities) and its existing projects.

FIND PARTNERS

The search process is guided by the requirements outlined in the call, which include a list of capabilities sought for proposal consortia.
• First, the agent looks on the list of his previous partners.
• Second, previous partners, who agreed to join the proposal, can add previous partners from their list.
• Third, new partners will be searched for.
These iterations are finite (a maximum search depth is set).

JOIN PROPOSAL

The possibility to join a proposal depends on the agent's size and its existing projects.

SUBMIT PROPOSAL

A proposal will be submitted when it fulfils the eligibility criteria. Otherwise the process is stopped and the agents of the consortium may start a new initiative.

CALLS ARE EVALUATED

APPLY ELIGIBILITY CRITERIA

Proposal consortia should fulfil all the eligibility criteria outlined in the call:
• The required composition of different types of agents;
• The desired research orientation, across the spectrum of basic and applied research;
• The minimum set of desired capabilities.
Consortia that do not fulfil these criteria are dissolved.

APPLY RANKING CRITERIA

All proposals that fulfil the eligibility criteria are ranked according to the rules:
1. The average expertise level of the proposal consortia;
2. The number of desired capabilities.
The Commission will support the *x* highest ranked proposals.
Consortia for lower ranked proposals are dissolved.

CONSORTIA CARRY OUT PROJECTS

INCREMENTAL RESEARCH

The research undertaken in projects is incremental research (abilities are substituted, expertise levels are increased).

MAKE DELIVERABLE

Consortium members are grouped in *s* sub-projects. Every *m* months the sub-projects produce a deliverable. This can be journal article or a patent.

LEARN FROM PARTNERS

Members obtain capabilities from partners in sub-projects. The capabilities that are learned are those contributed by the partners to the deliverable of the sub-project.

Figure 18: Overview of the rules used in model’s main processes

a. Funding decisions in the model

The funding dimensions of the framework, instruments, calls, proposals and projects are fully implemented.

- for the framework, a value for total funding is set
- for the instrument, a multiplier is defined that relates to the average funding per partner per month
- for calls, the available funding is set as percentage of total framework funding
- for proposals and projects, the required EC contribution is calculated using the multiplier: *contribution = multiplier × size × duration*
- in the evaluation of proposals, the number of projects that will be funded depends on the sum of required contributions of the highest ranked eligible proposals and the available funding for the call

b. Model inputs

Model inputs are grouped into pre-configured settings (*presets*) for participants, instruments, calls, capabilities and other (Table 12 below).

Participants settings	
nParticipants	number of participants
Percent-RES	percentage of type x participants
Percent-LDF	
Percent-SME	
Percent-CSO	
Size-RES	size (kene length) of type x participants
Size-LDF	
Size-SME	
Size-CSO	
Cutoff-point	number of calls used to create the starting network (0 if no starting network)
Instruments settings	
Size-min-CIP	smallest size of projects (0 if no limit)
Size-max-CIP	largest size of projects (999 if no limit)
PUB-min-CIP	lowest number of type x partners in projects (0 if no limit)
DFI-min-CIP	
SME-min-CIP	
CSO-min-CIP	
PUB-max-CIP	highest number of type x partners in projects (999 if no limit)
DFI-max-CIP	
SME-max-CIP	
CSO-max-CIP	
Duration-avg-CIP	duration (number of months) of projects

Duration-stdev-CIP	
Contribution-CIP	EC contribution (per month and per partner) for projects
Expertise-CIP	average expertise level required
Match-CIP	number of capabilities in the call's range which must appear in an eligible proposal
Orientation-CIP	average research orientation required
RRI-min	total (weighted) RRI score required
SCI-min	total (weighted) SCI score required
RRI-balance	the balance of RRI/SCI scores (e.g. 50/50)
Calls settings	
Type-Call1 … 6	types of projects accepted for the call
Deadline-Call1 … 6	deadline (month) of the call
Funding-Call1 … 6	funding available (percentage of total funding) for the call
Themes-Call1 … 6	thematic orientation (number of themes) of the call
Range-Call1 … 6	number of capabilities (range) which are desired for the call's proposals
Orientation-Call1 … 6	research orientation (0 basic … 9 applied) of the call
Repeat-last-call?	repeat the last call 6 times (optional)
Capabilities settings	
nCapabilities	number of capabilities possible
nThemes	number of themes possible
Sector-capabilities-per-theme	number of special/common/rare/special capabilities (per theme)
Common-capabilities-per-theme	
Rare-capabilities-per-theme	
Special-capabilities-per-theme	
Other settings	
Funding	total funding for all the calls
Project-cap-ratio	room (number of capabilities) needed for adding a project or proposal
Search-depth	search depth for finding partners
Invite-previous-partners-first?	search partners first in previous partners network
Time-before-call-deadline	months between a call's publication date and deadline
Time-before-project-start	months between a call's deadline and start of the projects
Time-between-deliverables	months between a sub-project's output of deliverables
Max-deliverable-length	maximum number of capabilities used for making a deliverable

Adjust-expertise-rate	likelihood of adjusting expertise levels
Sub-nr-max	highest amount of sub-projects (999 if no limit)
Sub-size-min	smallest size of sub-projects (0 if no limit)

Table 12: Overview of model inputs

Model outputs

The model outputs are groups of indicators for participants, proposals, projects, knowledge, capabilities and network (Table 13 below).

Participants indicators	
participants-net	number of participants with a history of 1 or more projects; total is equal to the number of nodes and size-of-largest-component if number-of-components is 1
participants-RES-net	as above, for type x participants
participants-LDF-net	
participants-SME-net	
participants-CSO-net	
participants-partners-avg	average number of (current and previous) partners for participants, i.e. participants that have a history of 1 or more projects in which they both participated; participants with 0 projects are excluded from these statistics; partners-avg is equal to avg-degree
participants-proposals-avg	average number of (submitted) proposals for participants; when a submitted proposal is dissolved (successful and unsuccessful) all consortium members get 1 added to their proposals count; participants with 0 proposals are excluded from these statistics
participants-projects-avg	average number of (finished) projects for participants; when a finished project is dissolved all consortium members get 1 added to their projects count; participants with 0 projects are excluded from these statistics
Proposals indicators	
proposals-submitted	total number of (submitted) proposals; all these statistics are based on the list of submitted proposals, successful and unsuccessful; stopped proposals (not submitted) are excluded from these statistics
proposals-with-SME	as above, for proposals with at least 1 SME/CSO in the consortium
proposals-with-CSO	
proposals-size-avg	average number of participants in the proposal consortia
proposals-RES-avg	as above, for type x consortia members
proposals-LDF-avg	
proposals-SME-avg	
proposals-CSO-avg	
RRI/SCI indicators	
proposals-anticipation-avg	RRI score; average match between the capabilities in the proposals and the special capabilities outlined in the calls
proposals-participation-avg	RRI score; share of consortium members with special capabilities
proposals-reflexivity-avg	RRI score; average match between the diversity of the non-special capabilities in the proposals and of the non-special capabilities outlined in the calls
proposals-responsiveness-avg	RRI score; average match between proposals and RRI requirements

proposals-capability-match-avg	SCI score; average match between the capabilities in the proposals and the non-special capabilities outlined in the calls
proposals-expertise-level-avg	SCI score; average expertise level of the proposals
proposals-orientation-avg	SCI score; average research orientation of the proposals
Projects indicators	
projects-completed	total number of (finished) proposals; all these statistics are based on the list of finished projects
projects-with-SME	as above, for projects with at least 1 SME/CSO in the consortium
projects-with-CSO	
projects-size-avg	average number of participants in the project consortia
projects-RES-avg	as above, for type x consortia members
projects-LDF-avg	
projects-SME-avg	
projects-CSO-avg	
projects-duration-avg	average duration (number of months) of the projects
projects-contribution-avg	average funding for the projects contributed by the European Commission
Knowledge indicators	
knowledge	total knowledge of participants, which is same as the sum of their kene lengths
knowledge-flow	total knowledge flow between participants; the flows occur in active (sub-)projects and are the result of learning from partners; kene lengths are measured before and after learning occurs
knowledge-RES-to-RES	as above, between type x/y partners
knowledge-RES-to-LDF	
knowledge-RES-to-SME	
knowledge-RES-to-CSO	
knowledge-LDF-to-RES	
knowledge-LDF-to-LDF	
knowledge-LDF-to-SME	
knowledge-LDF-to-CSO	
knowledge-SME-to-RES	
knowledge-SME-to-LDF	
knowledge-SME-to-SME	
knowledge-SME-to-CSO	
knowledge-CSO-to-RES	
knowledge-CSO-to-LDF	
knowledge-CSO-to-SME	
knowledge-CSO-to-CSO	
knowledge-kenes-length-avg	average kene lengths for participants
Capabilities indicators	
capabilities	overall number of capabilities that are present in the population of participants; all these statistics are based on the total population (i.e. not just the network)
capabilities-diffusion-Theme1	share of participants that have 1 or more capabilities from this theme
capabilities-diffusion-Theme2	
capabilities-diffusion-Theme3	
capabilities-diffusion-Theme4	
capabilities-diffusion-Theme5	
capabilities-diffusion-Theme6	
capabilities-diffusion-Theme7	
capabilities-diffusion-Theme8	

capabilities-diffusion-Theme9	
capabilities-diffusion-Theme10	
capabilities-frequency-avg	average frequency for capabilities, i.e. the average number of participants that have a certain capability
Network indicators	
density	density of the graph of (previous) partners, i.e. participants that have a history of 1 or more projects in which they both participated; all these statistics are based on this graph
number-of-components	the number of components (i.e. portions of the network in which all agents are connected, directly or indirectly, by at least one link)
size-of-largest-component	the size of the largest ('giant') component
modularity	measures the strength of division of a network into modules (also called groups, clusters or communities)
diameter	the maximal distance between any two nodes in the network
avg-path-length	the average number of steps along the shortest paths for all possible pairs of network nodes
avg-degree	the average number of connections a node has to other nodes
avg-degree-RES	
avg-degree-DF	
avg-degree-SME	
avg-degree-CSO	
avg-clustering	the degree to which nodes in the network tend to cluster together ('cliquishness')
avg-clustering-RES	
avg-clustering-LDF	
avg-clustering-SME	
avg-clustering-CSO	
avg-betweenness-centrality	three measures of centrality that are widely used in network analysis: betweenness centrality, closeness, and eccentricity centrality
avg-betweenness-centrality-RES	
avg-betweenness-centrality-LDF	
avg-betweenness-centrality-SME	
avg-betweenness-centrality-CSO	
avg-closeness-centrality	
avg-closeness-centrality-RES	
avg-closeness-centrality-LDF	
avg-closeness-centrality-SME	
avg-closeness-centrality-CSO	
avg-eccentricity-centrality	
avg-eccentricity-centrality-RES	
avg-eccentricity-centrality-LDF	
avg-eccentricity-centrality-SME	
avg-eccentricity-centrality-CSO	

Table 13: Overview of model outputs

Appendix 2: Specifics for the experiments

a) Data and software

The next pages show more of the databases and software used for this study, which are integrated to support the study's workflow (Figure 19).

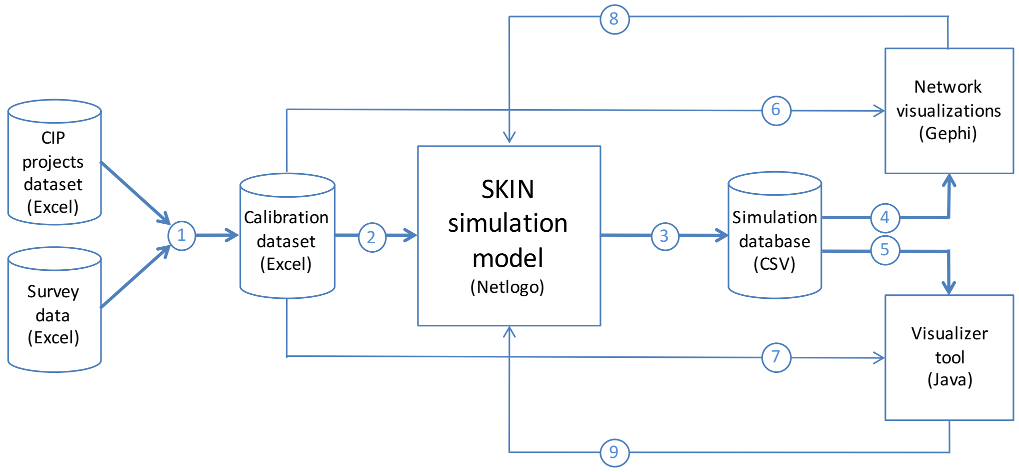


Figure 19: Workflow of the study's methodological framework

The **CIP projects dataset** is connected to the model using results from statistical analysis and network analysis. The statistical analysis includes distributions to be replicated by the model, concerning participants (number and participation rate) and projects (number, type, size, duration, cost and EU contribution). The network analysis captures structural features (density, distance, clustering, centrality) of the network of actors collaborating in CIP projects.

The **survey data** is connected to the model using results from statistical analysis, for example the participation rate of types of actors for the project consortia in the survey. These statistics use more detailed information on projects and are not available for the CIP project dataset. In addition, certain correlations identified in the survey results are used as stylised facts to be replicated by the model. They include relations that were identified after assigning estimates of RRI scores to projects in the survey.

Calibration dataset	**Description**
CIP projects dataset	Results from the statistical analysis of the CIP projects dataset
	Results from the network analysis of the CIP projects dataset
Survey data	Results from the statistical analysis of the survey results
	Correlations identified in the survey results (stylised facts)

Table 14: Data used for calibration

The **simulation model** is coded in NetLogo (version 5.2), a free software for agent-based modelling[6]. The version used for the experiments has over 5000 lines of code. This code can be accessed using NetLogo or any text-based editor. A document with the full NetLogo code is included on the CD that comes with this report.

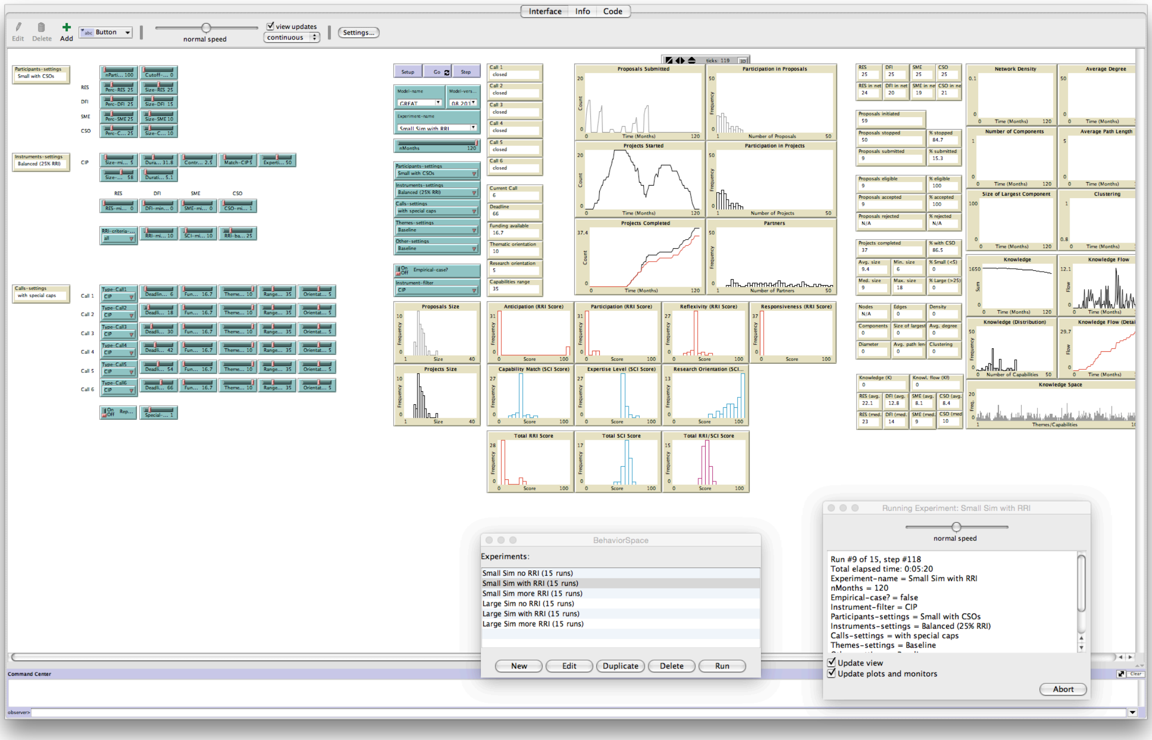


Figure 20: Screen shot of the NetLogo model

The experiments are designed and run using a feature in NetLogo called 'BehaviorSpace'. Running one experiment of 15 runs, repeating the same setup, takes about 24 hours on a standard PC.

All results of experiments are automatically stored in the **simulation database**, taking 4 GB storage space (the equivalent of one DVD) per experiment. Visualization and evaluation of results stored in the simulation database is helped by the **Visualizer tool**, which was programmed in Java for this project (20000 lines of code).

Function	**Description**
"Show network"	Visualize the network for the currently viewed experiment and run
"Network measures"	Compute all network measures for the currently viewed experiment and run
"Save charts"	Save all charts for the currently viewed experiment and run

[6] https://ccl.northwestern.edu/netlogo/download.shtml

“Summary table”	Show the summary table of all runs in the currently viewed experiment
“XY plot”	Show an XY plot for all runs in the currently viewed experiment
“Compare networks”	Compare all network measures for two experiments
“Compare cases”	Compare all non-network measures for two experiments

Table 15: Functions provided by the Visualizer tool

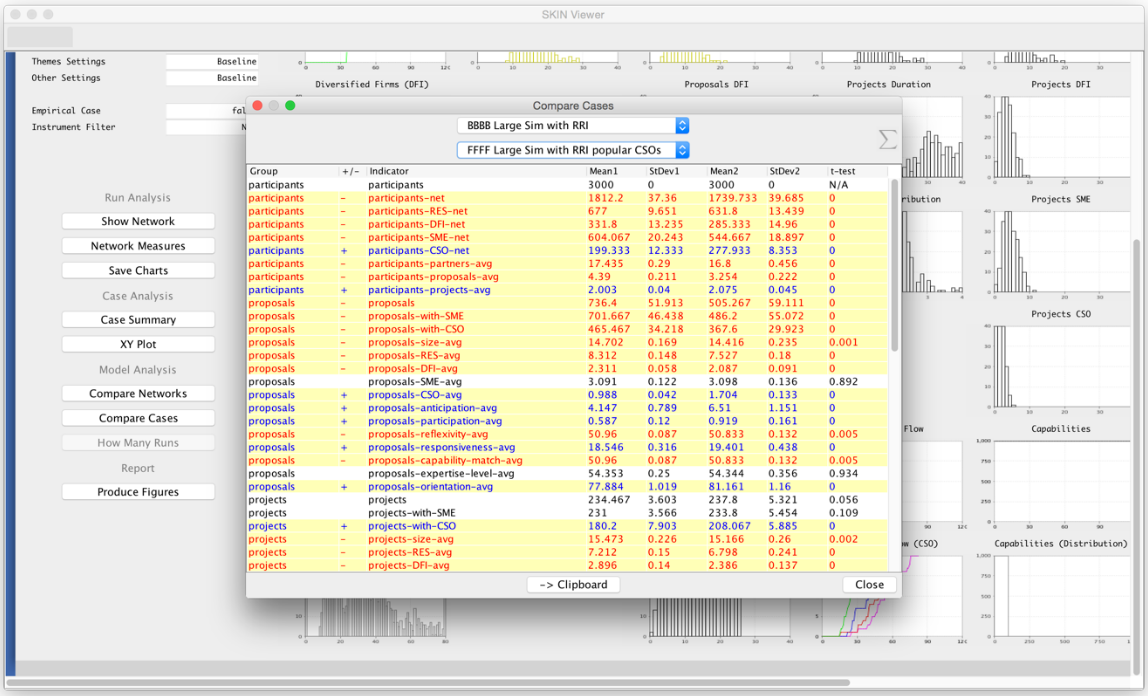
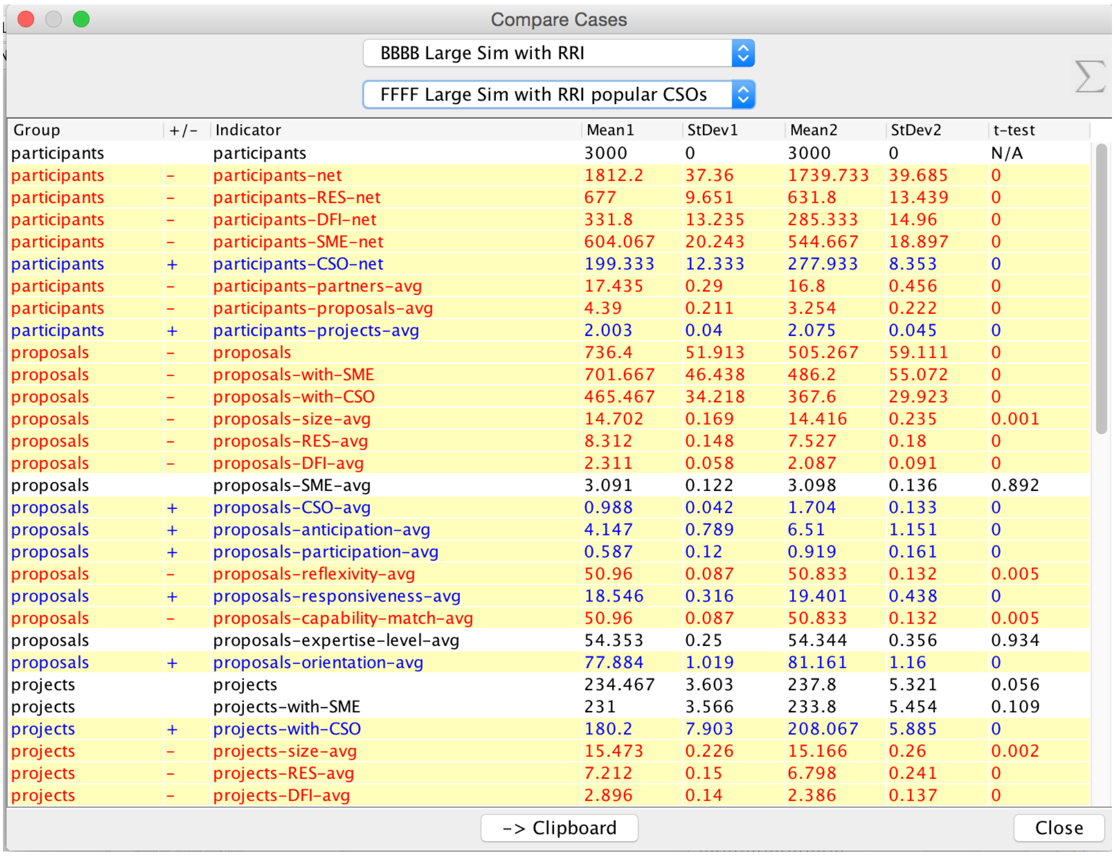


Figure 21: Screen shot of the Visualizer tool (showing a summary table with t-test results)

The “Compare networks” and “Compare cases” functions feature a t-test for finding the significant differences between two cases. These findings, highlighted in yellow (see Figure 21), underpin the scorecards used in this study to evaluate the experiments.


Compare Cases

BBBB Large Sim with RRI

FFFF Large Sim with RRI popular CSOs

Group	+/-	Indicator	Mean1	StDev1	Mean2	StDev2	t-test
participants		participants	3000	0	3000	0	N/A
participants	-	participants-net	1812.2	37.36	1739.733	39.685	0
participants	-	participants-RES-net	677	9.651	631.8	13.439	0
participants	-	participants-DFI-net	331.8	13.235	285.333	14.96	0
participants	-	participants-SME-net	604.067	20.243	544.667	18.897	0
participants	+	participants-CSO-net	199.333	12.333	277.933	8.353	0
participants	-	participants-partners-avg	17.435	0.29	16.8	0.456	0
participants	-	participants-proposals-avg	4.39	0.211	3.254	0.222	0
participants	+	participants-projects-avg	2.003	0.04	2.075	0.045	0
proposals	-	proposals	736.4	51.913	505.267	59.111	0
proposals	-	proposals-with-SME	701.667	46.438	486.2	55.072	0
proposals	-	proposals-with-CSO	465.467	34.218	367.6	29.923	0
proposals	-	proposals-size-avg	14.702	0.169	14.416	0.235	0.001
proposals	-	proposals-RES-avg	8.312	0.148	7.527	0.18	0
proposals	-	proposals-DFI-avg	2.311	0.058	2.087	0.091	0
proposals		proposals-SME-avg	3.091	0.122	3.098	0.136	0.892
proposals	+	proposals-CSO-avg	0.988	0.042	1.704	0.133	0
proposals	+	proposals-anticipation-avg	4.147	0.789	6.51	1.151	0
proposals	+	proposals-participation-avg	0.587	0.12	0.919	0.161	0
proposals	-	proposals-reflexivity-avg	50.96	0.087	50.833	0.132	0.005
proposals	+	proposals-responsiveness-avg	18.546	0.316	19.401	0.438	0
proposals	-	proposals-capability-match-avg	50.96	0.087	50.833	0.132	0.005
proposals		proposals-expertise-level-avg	54.353	0.25	54.344	0.356	0.934
proposals	+	proposals-orientation-avg	77.884	1.019	81.161	1.16	0
projects		projects	234.467	3.603	237.8	5.321	0.056
projects		projects-with-SME	231	3.566	233.8	5.454	0.109
projects	+	projects-with-CSO	180.2	7.903	208.067	5.885	0
projects	-	projects-size-avg	15.473	0.226	15.166	0.26	0.002
projects	-	projects-RES-avg	7.212	0.15	6.798	0.241	0
projects	-	projects-DFI-avg	2.896	0.14	2.386	0.137	0

-> Clipboard

Close

Figure 22: Screen shot of the visualizer tool (zooming in on a summary table with t-test results)

b) Parameters for the experiments

For easy reference, the parameter settings used in the experiments are displayed in Table 16 below.

Experiments	Baseline	A	B	C
		No CSOs	Attractive CSOs	Hybrid CSOs
Participants settings				
nParticipants	3000			
Percent-RES	30			
Percent-LDF	16.7			
Percent-SME	40	53.3		
Percent-CSO	13.3	0		
Size-RES	25			
Size-LDF	15			
Size-SME	10			
Size-CSO	10			15
Cutoff-point	0			
Instruments settings				
Contribution	4500			
Duration-avg	32			
Duration-stdev	5			
Expertise-min	50			

Match-min	50			
Orientation-min	50			
Size-min	5			
Size-max	60			
RRI-min	10			
SCI-min	10			
RRI-balance	25			
Calls settings				
Type-Call 1-6	CIP			
Deadlines-Call 1-6	6, 18, 30 …			
Funding-Call 1-6	16.7			
Themes-Call 1-6	10			
Orientation-Call 1-6	5			
Range-Call 1-6	30			
Special-capabilities-Call 1-6	2			
Capabilities settings				
nCapabilities	1000			
nThemes	10			
Sector-capabilities-per-theme	40			
Common-capabilities-per-theme	40			
Rare-capabilities-per-theme	10			
Special-capabilities-per-theme	10			
Other settings				
Funding	530			
Attractiveness-CSOs	0		25	

Table 16: Overview of parameter settings used for the experiments

c) Number of replications

For each of the experiments, the number of replications is 15. It is a sufficient number of runs in order to achieve convergence and a small enough confidence interval for the entire set of indicators[7].

[7] The issue of the number of simulation replications is covered in chapter 9 of Robinson, Stewart (2004) *Simulation: The Practice of Model Development and Use*. Wiley.

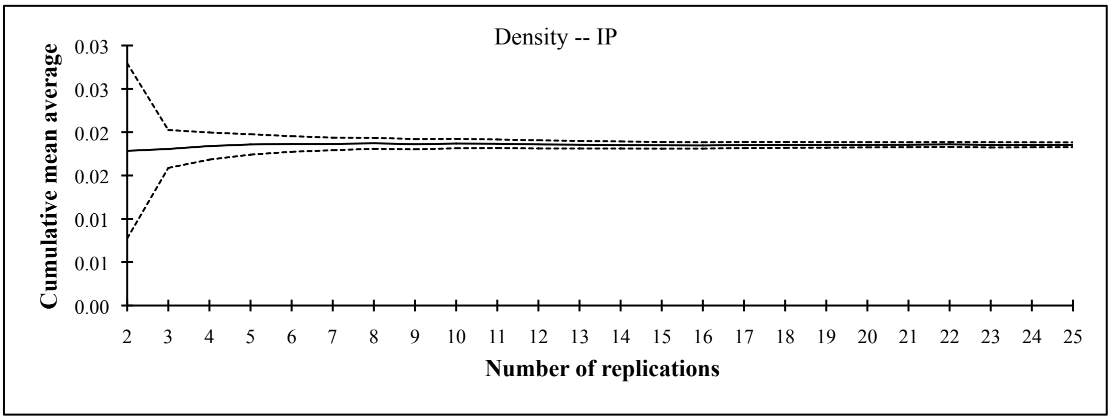


Figure 23: Convergence and confidence intervals (shown for density)

d) Construction of confidence corridors

The simulation data for each scenario are summarized using corridors around the mean (Figure 24). Plots for each of the 15 replication runs will, for the most part, lie within this corridor. Due to the small number of replications, the corridors were constructed using t-based confidence intervals (95%). Note that the summarizing tables in this study only present the end value (after 112 months) and the standard deviation.

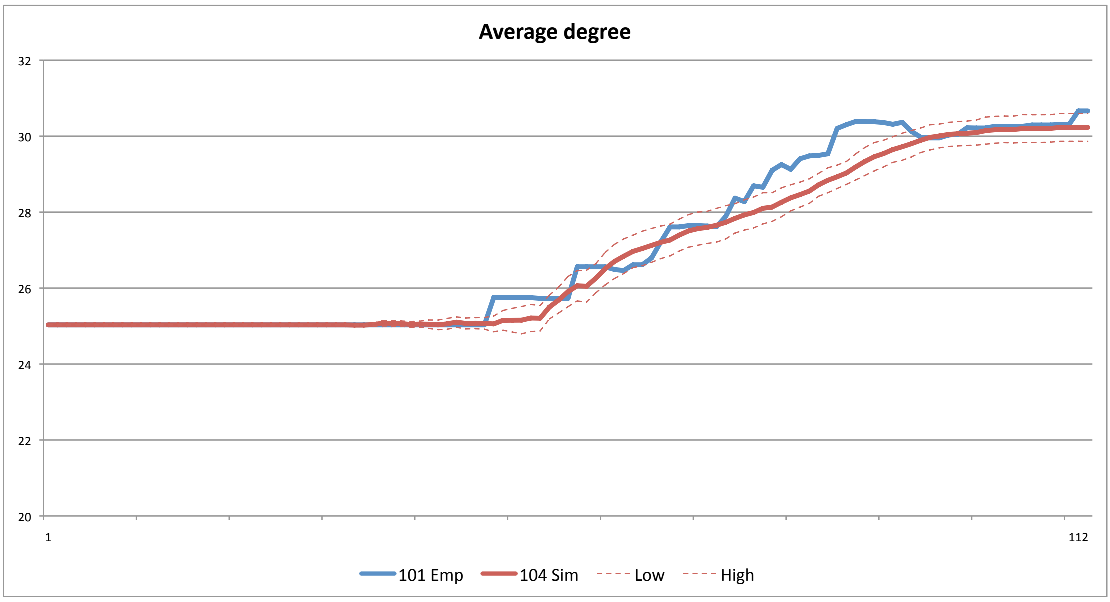


Figure 24: Corridor for simulated data (shown for average degree)

Annex 3: Design of experiments

Design of Experiments (DOE)

Baseline Scenario	RRI Scenario
Stylised facts from theory, previous studies, policy documents:	Stylised facts from? deductions from?
Stylised fact 1: The **involvement of civil society represented by CSOs changes the research and innovation system towards RRI functions** (anticipation, reflexivity, deliberation, and responsiveness).	Stylised fact 1: **More CSO participation** in research consortia leads to **more RRI** in terms of anticipation, reflexivity, deliberation, and responsiveness **during the research process**.
Stylised fact 2: **EU policies**, regulations and incentives **have managed the inclusion of CSOs in EU-funded research and innovation** by providing CSOs with broad access to EU funding.	Stylised fact 2: The **more related requests in the EU funding Calls**, the **more CSOs in the proposal and project consortia** (maybe even: CSOs manage to participate over-proportionally).
Stylised fact 3: The **participation of CSOs as R&D partners in projects has proved to be central for representing the RRI functions** and **for ensuring that scientific knowledge production includes the "societal perspective" on the process and on the output level**.	Stylised fact 3: The **more CSOs** in the consortia, the **more of their specific capabilities survive and play a considerable role in knowledge exchange/diffusion during the project and in knowledge outputs** such as project deliverables.
Stylised fact 4: **CSOs are complementing the existing partner-sets in project consortia** where all partner types represent certain competences and strengths and are needed for scientific knowledge production in terms of scientific excellence and innovation potential.	Stylised fact 4: **More CSO** participation and influence **does not weaken/strenghten the participation and influence of other partners** in the consortia.
Stylised fact 5: There is a **causal link between EU policy interventions and European research and innovation performance with CSO participation**:	Stylised fact 5: There are **effective and less-effective EU policy interventions to further help CSOs in participating** more frequently, more actively and more prominently in EU-funded research and innovation.
Observations from GREAT survey, case studies and database:	**Expectations that are explored with experiments:**
Key observation 1: **CSOs can have a big**	*(Hypothesis: Probably the CSO influence is big,*

overall influence in project consortia if they contribute their unique perspective/capabilities, which is not present with the other partners.	*if they are specialists in a field where no other consortium partner is, e.g. a special interest group on local food security has unique and specific knowledge about local conditions and local history of food security)* **Experiment 1 tests** whether the more CSOs provide other scarce knowledge than RRI capabilities, the bigger the difference is they make
Key observation 2: **The participation of CSOs is much less central than expected for representing the RRI functions**: The CSOs were almost never mentioned as being among the top 3 active for any dimension.	*(Hypothesis: Probably, one of the reasons for the equality among consortium partners concerning the capacity to bring societal perspectives into research and innovation are the long-time policy incentive structures (e.g. rules for evaluating proposals and for rewarding researchers) to include societal perspectives in the research and innovation cycle. There has been considerable learning and socialisation of R&D actors (universities, research organisations, R&D departments of big firms, research-intensive SMEs etc.) to make the move and include these perspectives)* **Experiment 2 tests** whether it is the bringing-in of CSOs or the RRI competence/learning of the other actors, which has the biggest and quickest effect.
Key observation 3: **Other consortia partners, especially SMEs, are more active / at least as active in representing RRI functions:** CSOs were almost never mentioned as being among the top 3 active for any dimension.	*(Hypothesis: Probably, one of the reasons for the equality among consortium partners concerning the capacity to bring societal perspectives into research and innovation are the long-time policy incentive structures (e.g. rules for evaluating proposals and for rewarding researchers) to include societal perspectives in the research and innovation cycle. There has been considerable learning and socialisation of R&D actors (universities, research organisations, R&D departments of big firms, research-intensive SMEs etc.) to make the move and include these perspectives)* **Experiment 3 tests** whether consortium partners with high RRI values are more sought after at proposal stage and end up more often in funded projects.

Table 17: Design of experiments

Appendix 4: The Survey questions and findings

Q.1.1 General - As the coordinator of the project, what type of organisation were/are you working for during the project?

Actor Type	Number of respondents	%
University (including e.g. Hautes Écoles, Grandes Écoles, Fachhochschulen)	8	14
Research organisation or network (e.g. CNRS France, Fraunhofer Germany, CSIC Spain)	5	9
Large enterprise (250 or more employees)	9	16
Small and medium enterprise (less than 250 employees)	11	19
Governmental organisation (e.g. ministry, regional or local government)	12	21
Public/semipublic corporate body (e.g. hospitals, museums, regional or communal health organisations)	6	11
Civil society organisation (e.g. Special interest groups, NGOs, regional interest groups)	3	5
Other	3	5

Table 18: Q.1.1 survey results: organisation types

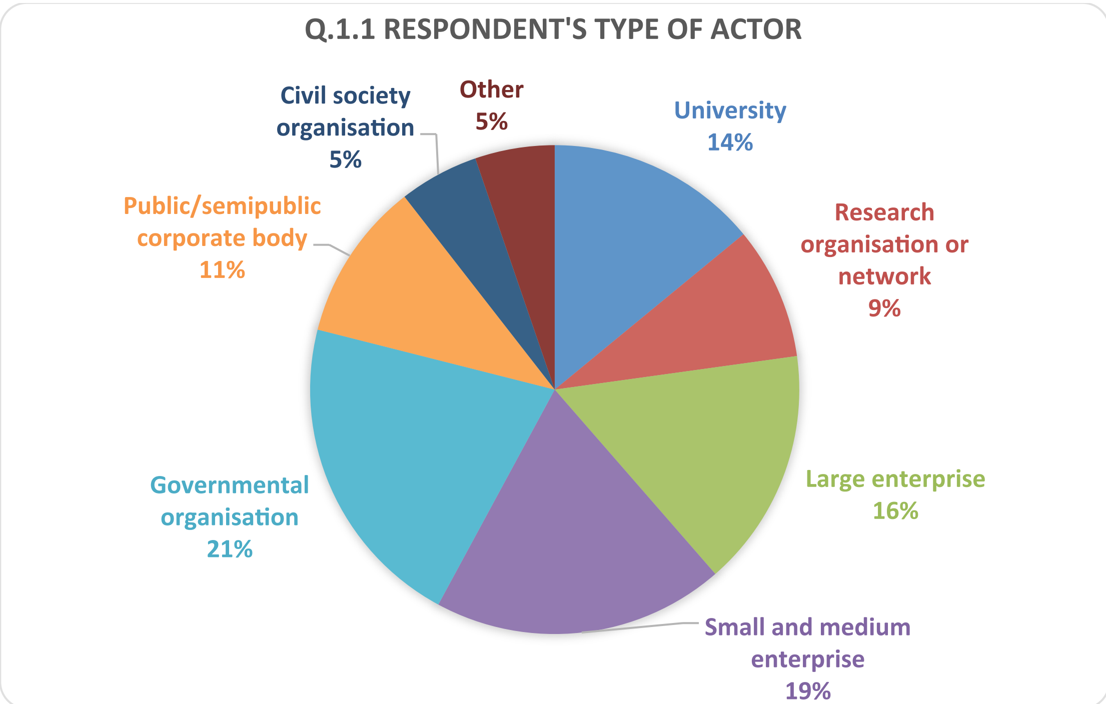


Figure 25: Q.1.1. survey results: respondent's type of actor

<u>Example how to read the table:</u> Eight coordinators were at a university while they were coordinating the project. Eight out of 57 responses corresponds to 14%.

Q.1.2 General - How many contractual partners of which type participated in your project?

Number of CSOs	Number of Projects	%
None	27	48
One	0	0
Two	11	19
Three or more	19	33

Table 19: Q.2.2 survey results: number of contractual partners

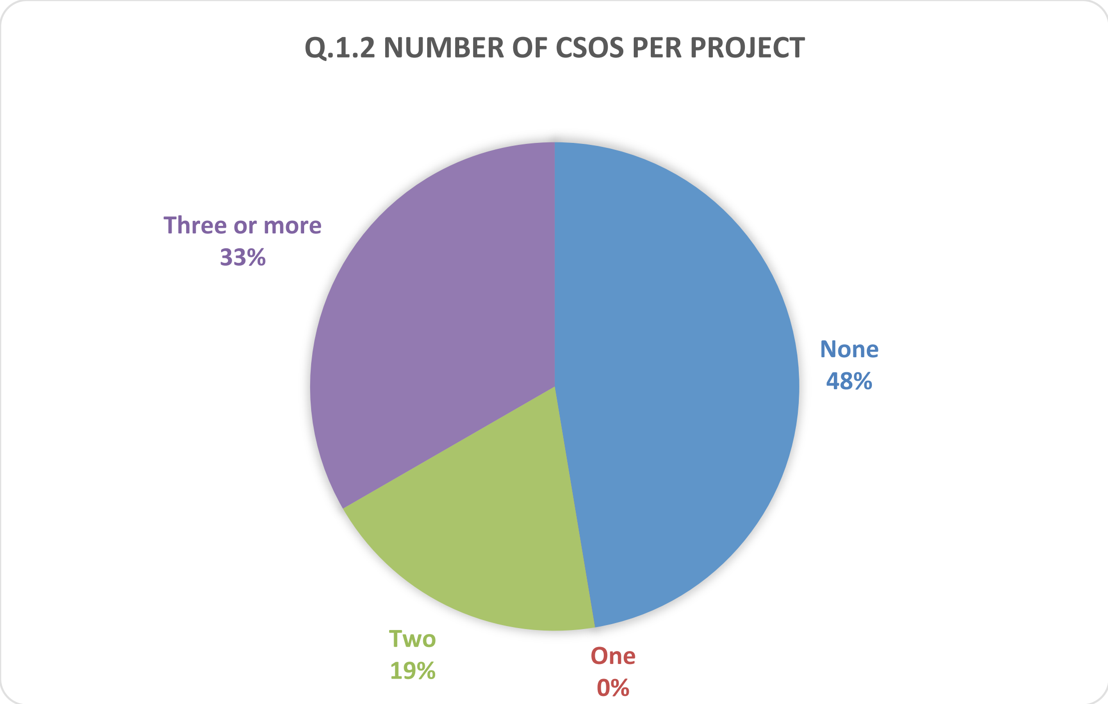


Figure 26: Q.1.2 survey results: number of CSOs per project

<u>Example how to read the table:</u> In 27 projects, or 47%, CSO were not involved.

Q.2.1 Before the project started - Prior to your project, was there systematic anticipation of possible positive or negative societal or environmental outcomes?

Instrument	Number of Projects	%
Yes, we did foresight analysis - an intelligence-gathering, vision-building process aimed at enabling present-day decisions.	13	23
Yes, we did technology assessment - an interactive process that aims to form opinion on societal aspects of science and technology.	19	33
Yes, we did scenario analysis - a process of analysing possible future events by considering alternative possible outcomes.	18	32
Yes, we conducted a Participatory Impact Pathways Analysis (PIPA)	0	0
Yes, we used Social Impact Assessment Methods through the study of Productive Interactions between science and society (SIAMPI)	1	2
Yes, we were using the following methodology for assessing societal aspects of the project's outcomes	2	4
No, we did not analyse any societal outcomes before doing the project	21	37

Table 20: Q.2.1 survey results: anticipation of societal or environmental outcome

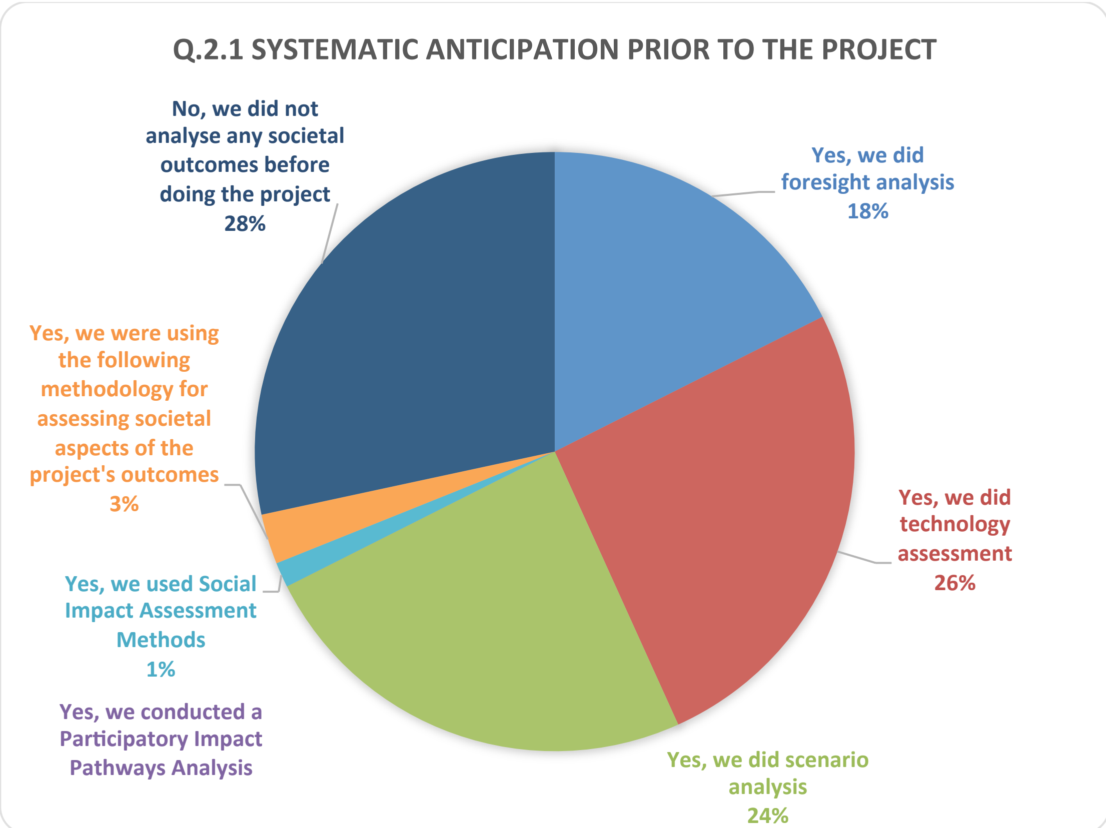


Figure 27: Q.2.1 survey result: systematic anticipation prior to the project

<u>Example how to read the table:</u> In one project systematic social impact assessment (SIAMPI) was used for systematically anticipate societal or environmental project outcomes.

Q.2.2 Before the project started - Prior to the project, who did you approach for advice in order to assess the possible positive or negative societal or environmental project outcomes? (Figures may add up to more than 100% since multiple boxes could be checked)

Actor	Number of Projects	%
Government (in any form)	18	32
Customers or end-users	23	40
Experts	31	54
Civil Society Organisations	23	40
Other stakeholders	11	19
Others	6	11
I did not consult with anybody	12	21

Table 21: Q.2.2 survey results: advisory organisations re: social or environmental outcome

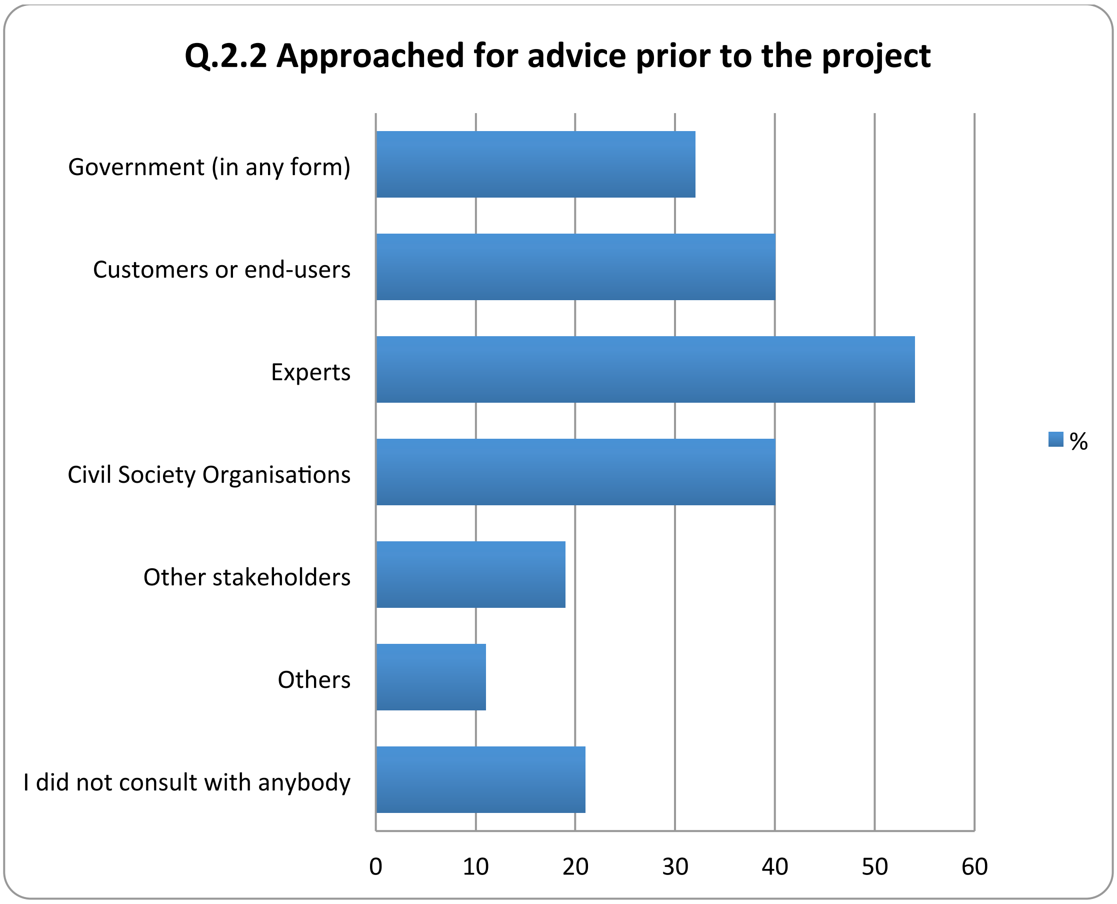


Figure 28: Q 2.2 survey results: approached for advice prior to the project

<u>Example how to read the table:</u> In eight projects CSOs were approached for advice prior to the project, which corresponds to 14% of the 57 projects. Since multiple boxes could be ticked, other actors might have been approached as well.

Q.2.3 Before the project started - Who were the three-most-active contractual partners when anticipating the outcomes of the project?

	Most active		Second most active		Third most active	
Actor Type	**Count**	**%**	**Count**	**%**	**Count**	**%**
University	11	21	8	16	9	19
Research organisation	6	12	8	16	5	11
Large enterprise	6	12	7	14	6	13
Small and medium enterprise	13	25	9	18	13	28
Govermental organisation	6	12	7	14	6	13
Public/semipublic corporate body	6	12	9	18	1	2
CSO	3	6	1	2	6	15
Other	1	2	1	2	1	2
Responses	n=46		n=44		n=41	

Table 22: Q.2.3. survey results: most active contractual partners in anticipation

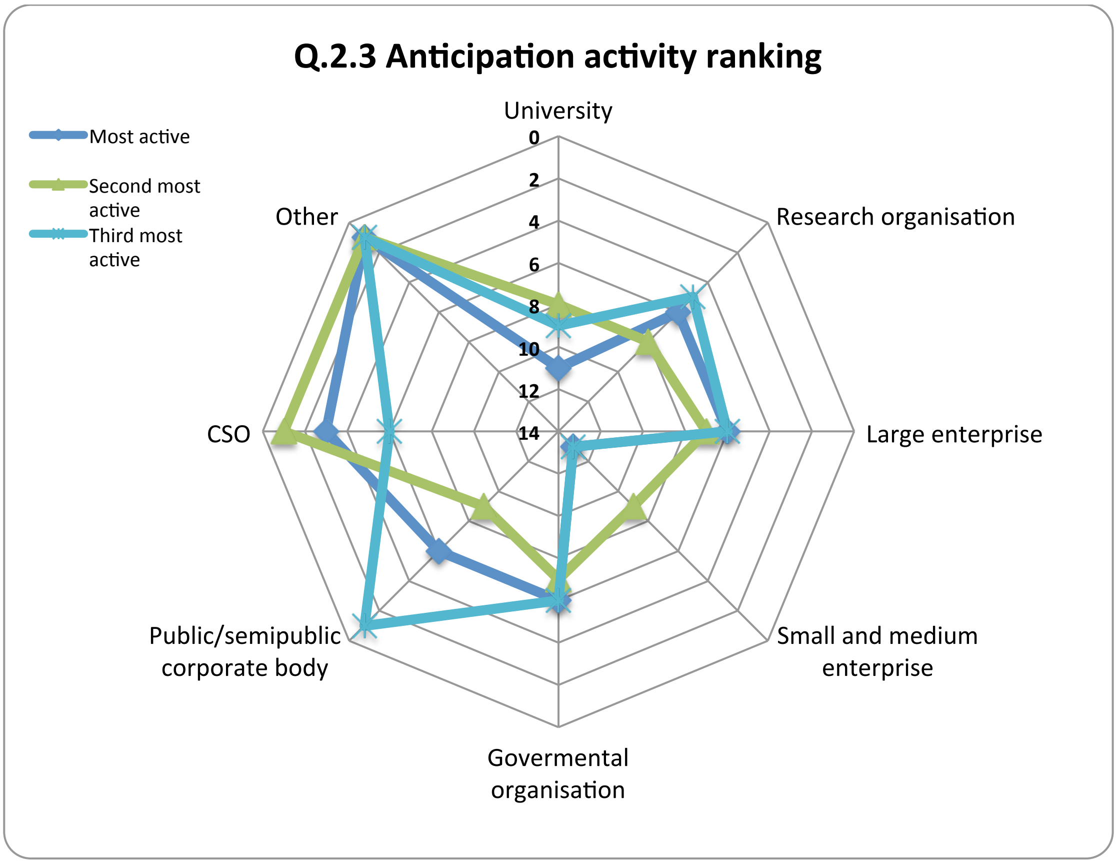


Figure 29: Q.2.3. survey results: anticipation activity ranking

<u>Example how to read the table:</u> In three of the projects CSOs were the most active partner when anticipating the project outcomes.

Q.3.1 During the project - Were there boards, individual experts, work packages, external stakeholders, committees or dedicated groups in place helping you to reflect on? (Figures may add up to more than 100% since multiple boxes could be checked)

Issues reflected upon	Count	% of projects
Ethical issues	12	21
Political issues	17	30
Societal issues	25	44
Environmental issues	14	25
There were no boards, committees or dedicated groups in place considering ethical, political or societal issues.	19	33

Table 23: Q.3.1. survey results: issues reflected upon

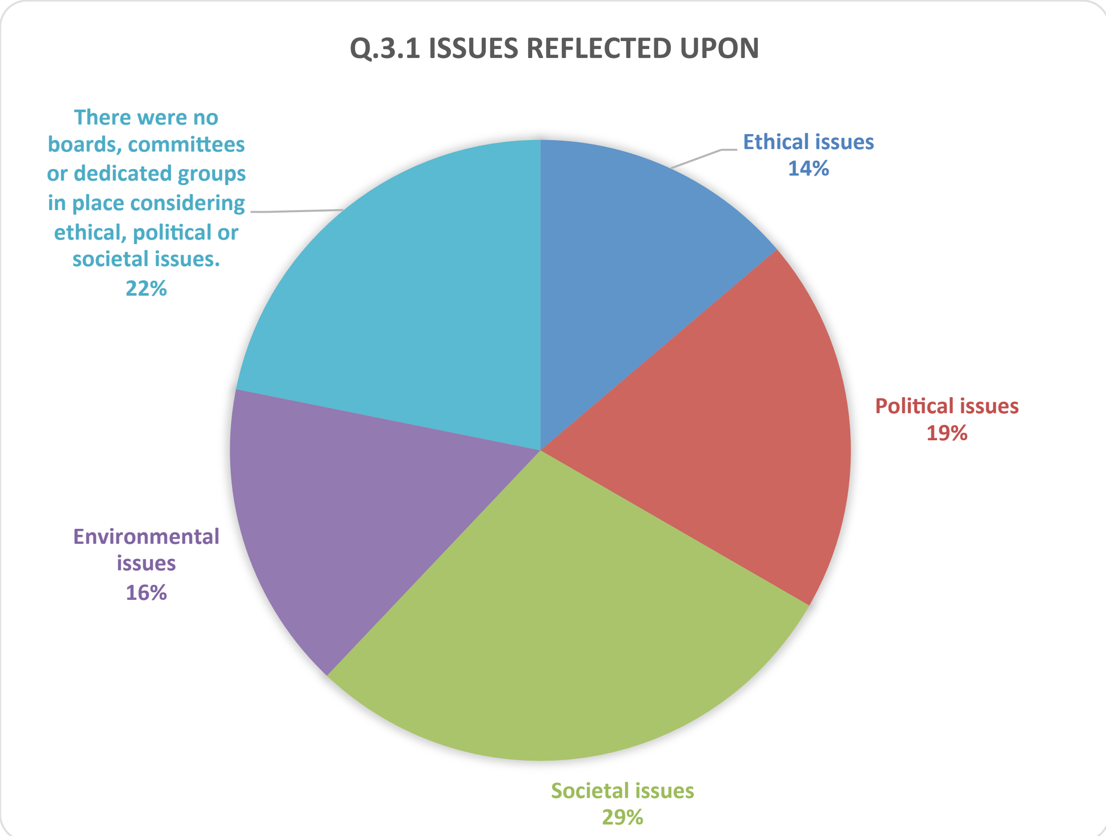


Figure 30: Q.3.1. survey results: issues reflected upon

Example how to read the table: In 12 projects (21% of the 57 projects) project members reflected on ethical issues. Since multiple boxes could be ticked, project members may have reflected on other issues as well.

Q.3.2 During the project - Based on your previous response, when did the issue arise? (Figures may add up to more than 100% since multiple boxes could be checked)

	Ethical Issues		Political Issues		Societal Issuel		Environmental Issues	
Project phase	**Count**	**% of projects**	**Count**	**% of projects**	**Count**	**% of projects**	**Count**	**% of projects**
Proposal preparation	8	67%	12	71%	15	60%	10	71%
Before or at mid-term review	7	58%	9	53%	18	72%	8	57%
Before or at final review	5	42%	8	47%	9	36%	2	14%

Table 24: Q.3.2. survey results: phase of issue consideration

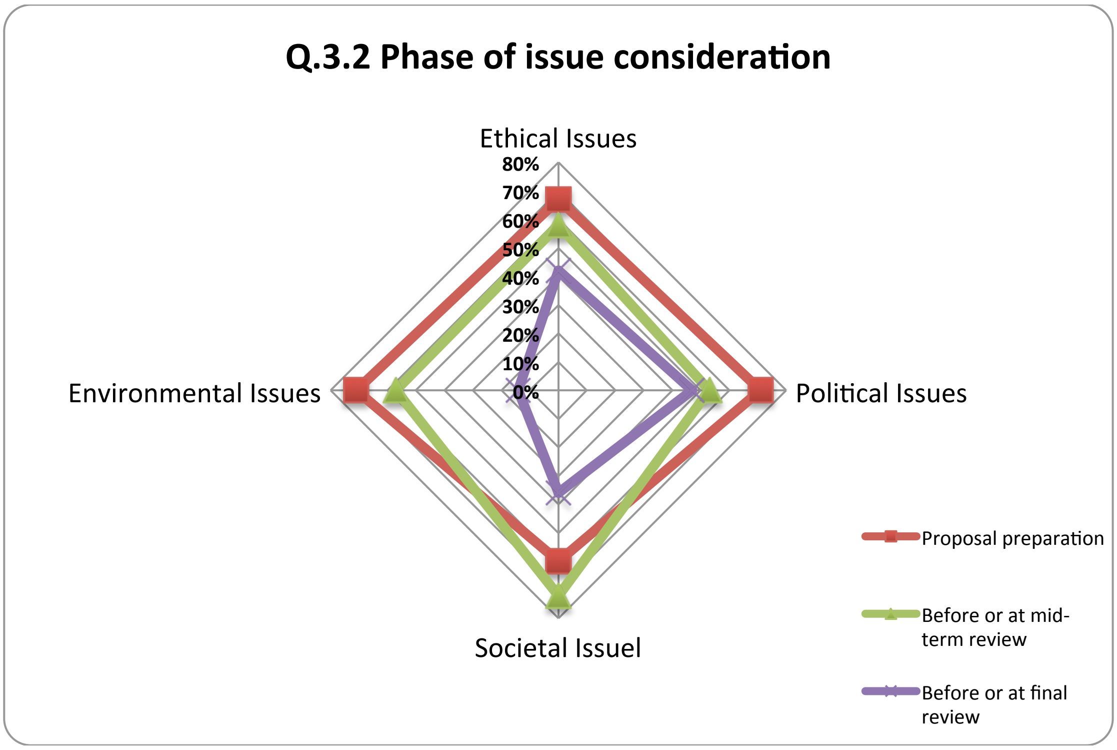


Figure 31: Q.3.2 survey results: phase of issue consideration

<u>Example how to read the table:</u> 12 respondents said they had ethical issues in their projects. Eight of them had ethical issues during proposal preparation, 7 before or at mid-term review, which means some project members experienced ethical issues at two or more stages.

Q.3.3 During the project - Did these components in your project or at your institution help you to reflect upon ethical, social, environmental or political aspects of your project?

	Ethical committee		Project management committee		Work packages		External stakeholders		Individual experts		Advisory board		Other	
How did it help?	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Was in place and helped	7	12	45	79	45	79	33	58	27	47	21	37	2	13
Was in place but did not help	3	5	9	16	10	18	10	18	5	9	7	12	0	0
Was not in place	47	82	3	5	2	4	14	25	25	44	29	51	12	87

Table 25: Q.3.3. survey results: components for reflection

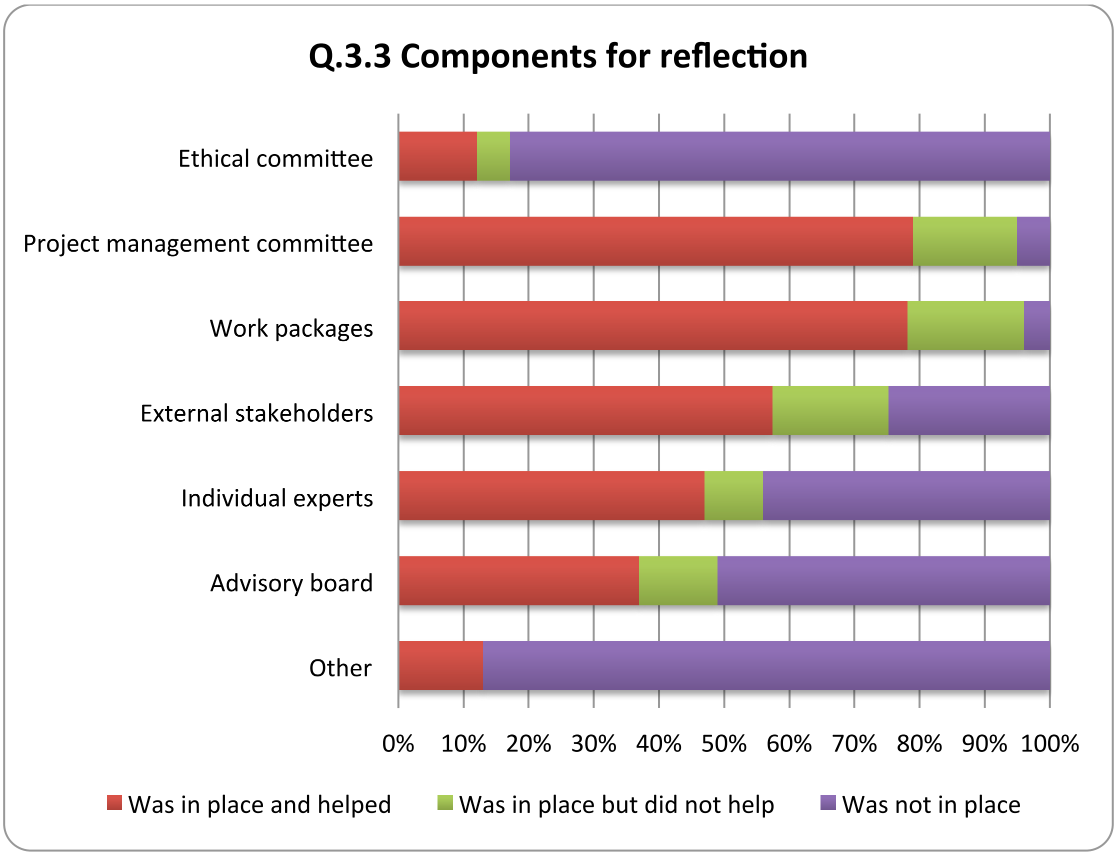


Figure 32: Q.3.3. survey results: components for reflection

<u>Example how to read the table:</u> Ethical committees were in place in only 10 projects (7+3), and they helped in only 7 (out of a total of 57), which corresponds to 12%.

Q.3.4 During the project - Who were the three-most-active contractual partners when considering ethical, environmental, political or societal issues in the project?

	Most active		Second most active		Third most active	
Actor Type	Count	Percent	Count2	Percent3	Count4	Percent5
University	9	19	6	13	5	12
Research organisation	3	6	9	20	7	17
Large enterprise	3	6	5	11	7	17
Small and medium enterprise	12	25	9	20	12	29
Governmental organisation	12	25	6	13	5	12
Public/semipublic corporate body	5	10	7	16	2	5
CSO	2	4	1	2	2	5
Other	2	4	2	4	1	2
Responses	n=48		n=45		n=41	

Table 26: Q.3.4 survey results: reflexivity activity ranking

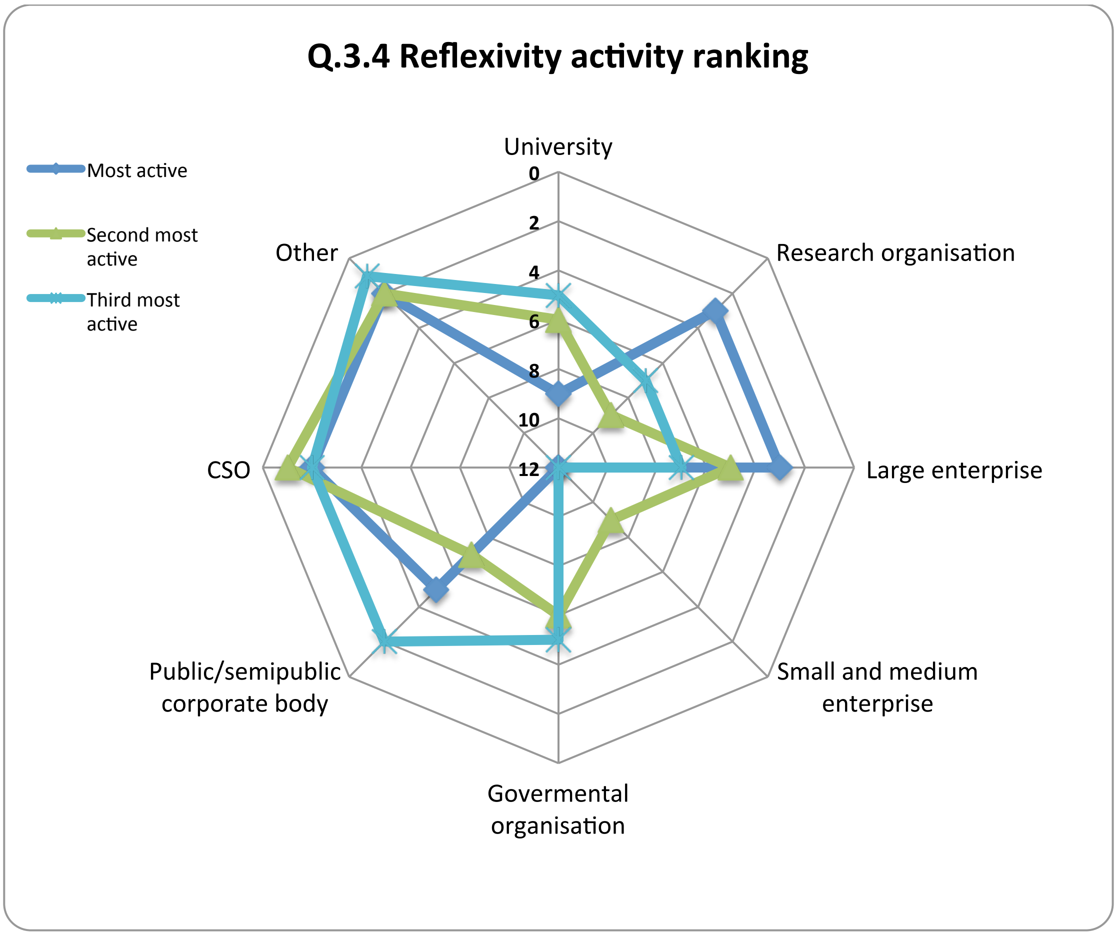


Figure 33: Q.3.4 survey results: reflexivity activity ranking

Example how to read the table: During two of the projects, a CSO was the most active partner when considering ethical, environmental, political or societal actors.

Q.3.5 During the project - The following are some of the issues that might have arisen during the project. Which of these required you to make changes and of which dimension were these changes?

	Ethical issues		Legal framework		Government policy		Social values	
Dimension of change	Count	%	Count	%	Count	%	Count	%
Large change (amendment to contract, change of partner)	2	4%	4	7%	2	4%	0	0%
Medium change (e.g. change of timeline, work packages)	1	2%	7	12%	7	12%	2	4%
Small change (e.g. change of wording)	2	4%	4	7%	1	2%	1	2%
Change of outcome (e.g deliverable, prototype)	2	4%	12	21%	5	9%	3	5%
Changes regarding this issue were needed, but not possible any more	1	2%	1	2%	1	2%	0	0%
No, changes were not necessary due to this	49	86%	29	51%	41	72%	51	89%

Table 27: Q.3.5. survey results: changes made due to issues

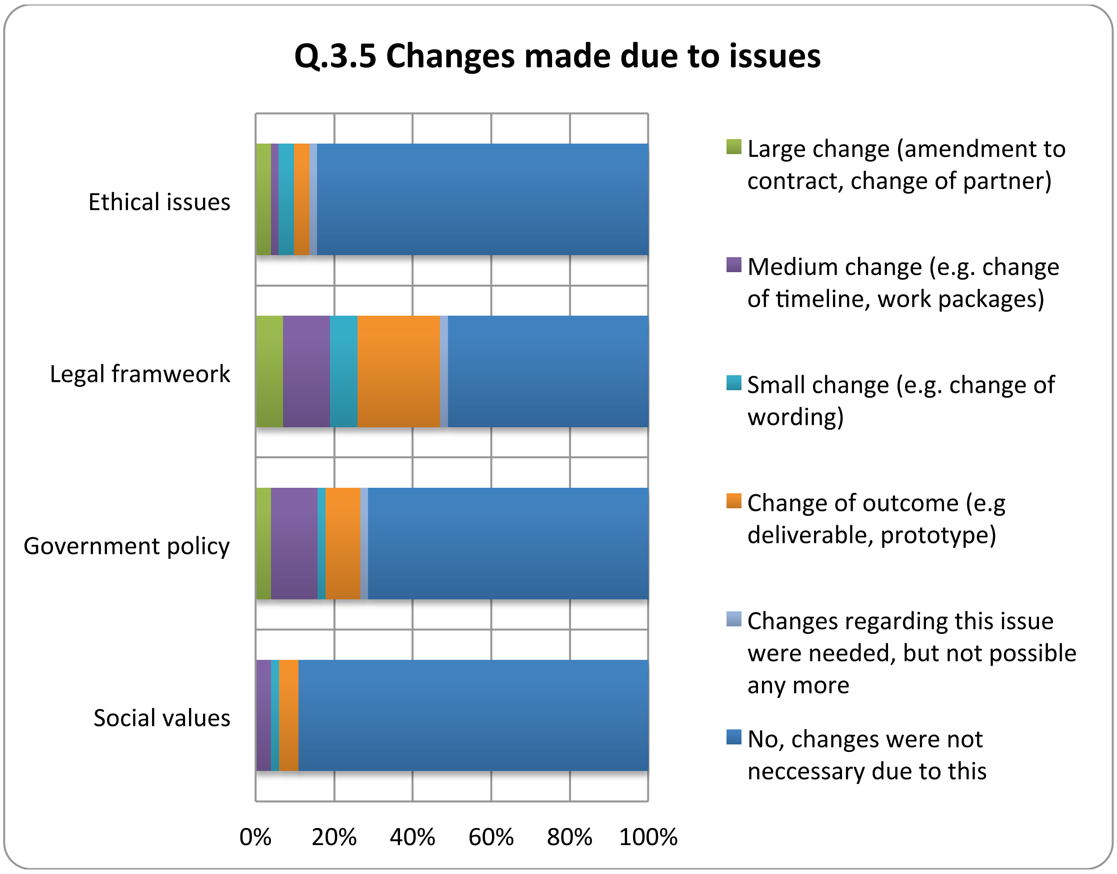


Figure 34: Q.3.5. survey results: changes made due to issues

Example how to read the table: In 49 projects (86% of 57) no changes were made in the face of ethical issues.

Q.3.6 During the project - Who were the three-most-active contractual partners when you were making changes on the project?

	Most active		Second most active		Third most active	
Actor Type	Count	Percent	Count2	Percent3	Count4	Percent5
University	4	8	9	22	3	9
Research organisation	5	10	5	12	7	20
Large enterprise	8	16	2	5	3	9
Small and medium enterprise	16	33	6	15	7	20
Governmental organisation	7	14	4	10	7	20
Public/semipublic corporate body	3	6	9	22	3	9
CSO	2	4	3	7	2	6
Other	4	8	3	7	3	9
Responses	n=49		n=41		n=35	

Table 28: Q.3.6 survey results: responsiveness activity ranking

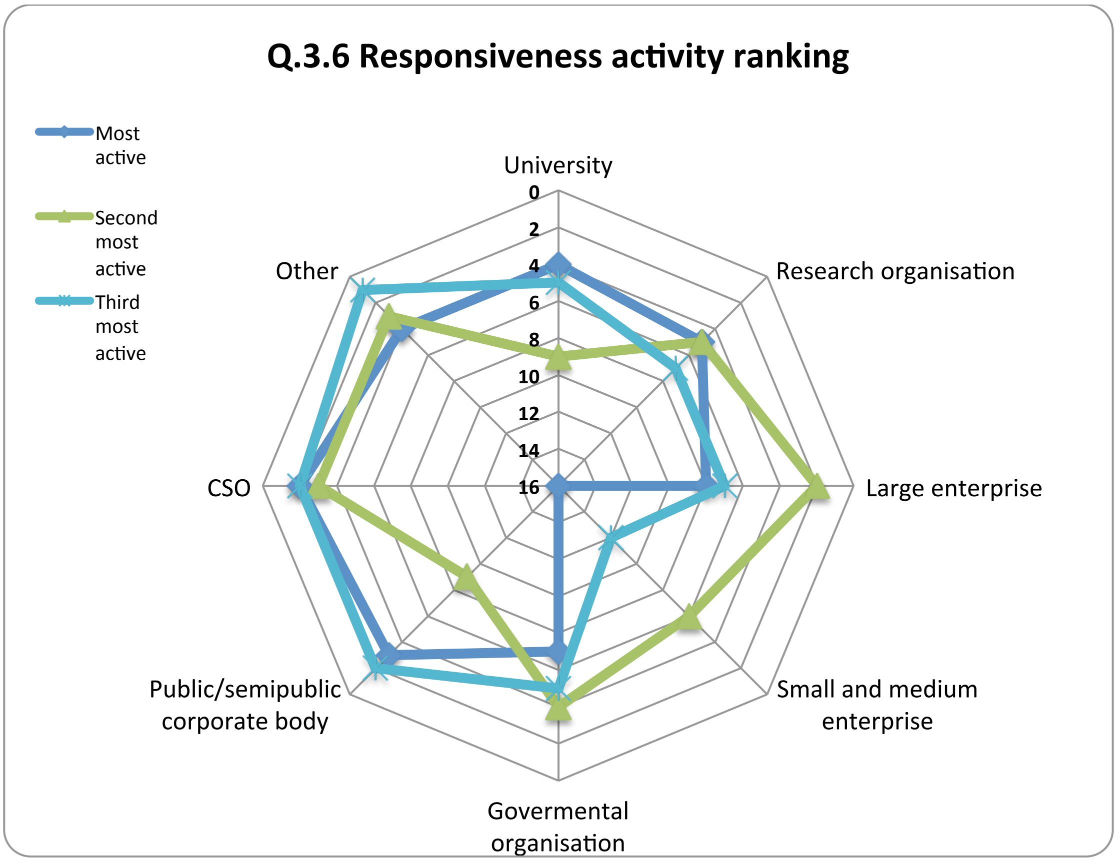


Figure 35: Q.3.6 survey results: responsiveness activity ranking

Example how to read the table: In two of the projects, a CSO was the most active partner when changes were made to the project.

Q.4.1 During the project - Which of the following stakeholders or groups were interested in the results of the project? (Figures may add up to more than 100% since multiple boxes could be checked)

Label	Count	% of projects
Government (in any form)	34	60
Customers / end-users	39	68
Experts	35	61
CSOs (see below for definition)	16	28
Industry	36	63
Other stakeholders or interested groups	4	7

Table 29: Q.4.1. survey results: interested groups during the project

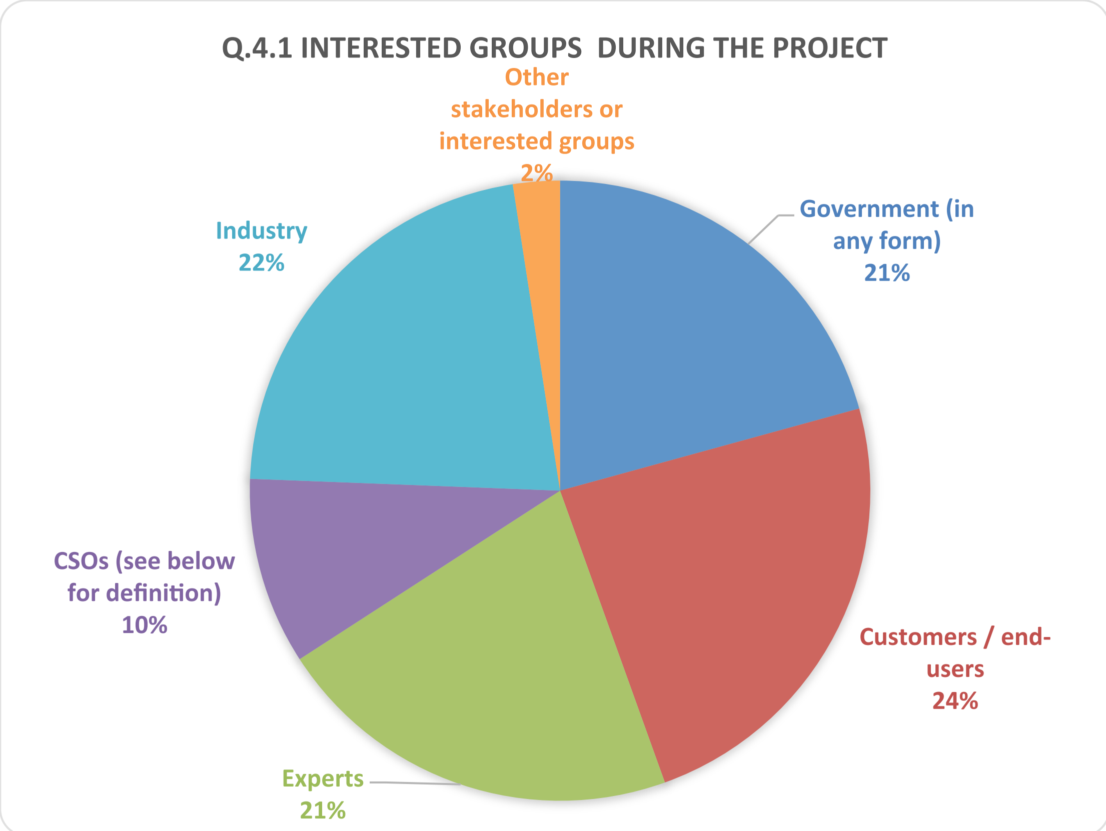


Figure 36: Q.4.1. survey results: interested groups during the project

<u>Example how to read the table:</u> In 34 projects (60% of the 57 projects surveyed), governmental organisations (broadly construed) were interested in the project results before the project started. Since multiple boxes could be ticked, several groups could have been interested in the results.

Q.4.2 - During the project - For the groups that were interested in the project's results during the project, what role had the following groups in your project? (Figures may add up to more than 100% since multiple boxes could be checked)

	Government (in any form)		Customers / end-users		Experts		CSOs		Industry		Other stakeholders or interested groups	
Role in project	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
As partners/beneficiaries	25	74%	18	46%	14	40%	8	50%	24	67%	2	50%
As members of an advisory board/committee	1	3%	5	13%	12	34%	2	12%	3	8%	0	0%
As associated partners	1	3%	1	3%	1	3%	2	12%	4	11%	0	0%
As sub-contractors	0	0%	0	0%	2	6%	1	6%	0	0%	0	0%
Other	7	21%	15	38%	6	17%	3	19%	5	14%	2	50%

Table 30: Q.4.2. survey results: role of various groups in the project

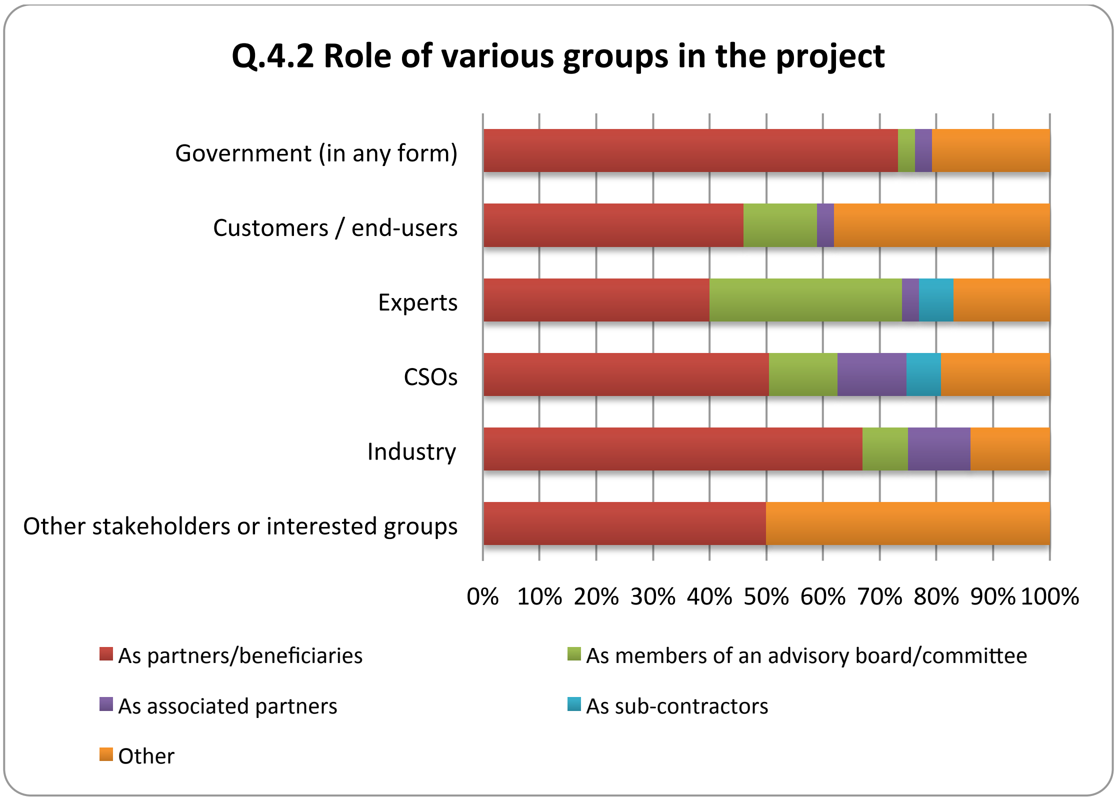


Figure 37: Q.4.2. survey results: role of various groups in the project

<u>Example how to read the table:</u> In 25 projects, governmental organisations acted as beneficiaries. In seven projects they acted in other ways. In one project they acted as members of an advisory board. Lastly, in one project they acted as an associated partner. In total, 23 of the 57 projects included no involvement of government organisations.

Q.4.3 - During the project - Based on your previous response, what was the main motivation for you as a coordinator to include the following groups in your project? (Figures may add up to more than 100% since multiple boxes could be checked)

	Government (in any form)		Customers / end-users		Experts		CSOs		Industry		Other stakeholders or interested groups	
Motivation	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Professional/Scientific excellence	7	21	7	18	27	77	9	56	23	64	1	25
Provision of data	17	50	22	56	7	20	5	31	9	25	2	50
Access to infrastructure	15	44	5	13	1	3	1	6	8	22	0	0
Formal requirement	4	12	6	15	2	6	1	6	4	11	0	0
To help the project reflecting upon societal needs and ethical issues	21	62	15	38	7	20	3	19	5	14	1	25
Other	6	18	8	21	2	6	3	19	8	22	2	50

Table 31: Q.4.3. survey results: motivation for participation

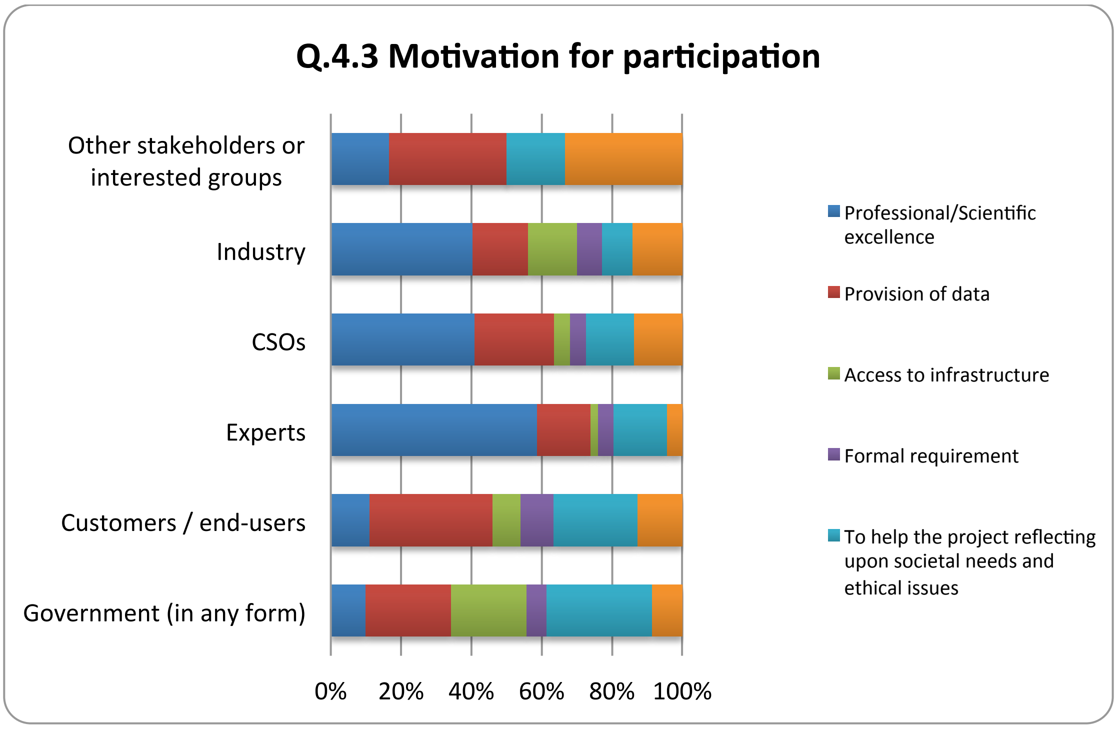


Figure 38: Q.4.3. survey results: motivation for participation

Example how to read the table: From the previous response it is clear that 16 projects had CSOs in their project. Of these 16 projects, 9 coordinators took CSOs in for their professional/scientific excellence. This makes 56% of all projects with CSOs interested in the results.

Q.4.4 After the project - Which of these groups have shown or still are still showing interest in the project's results after it had ended?

Group	Count	%
Government (in any form)	31	54
Customers / end-users	38	67
Experts	29	51
CSOs	11	19
Industry	30	53
Other stakeholders or interested groups	4	7

Table 32: Q.4.4. survey results: interested groups after the project

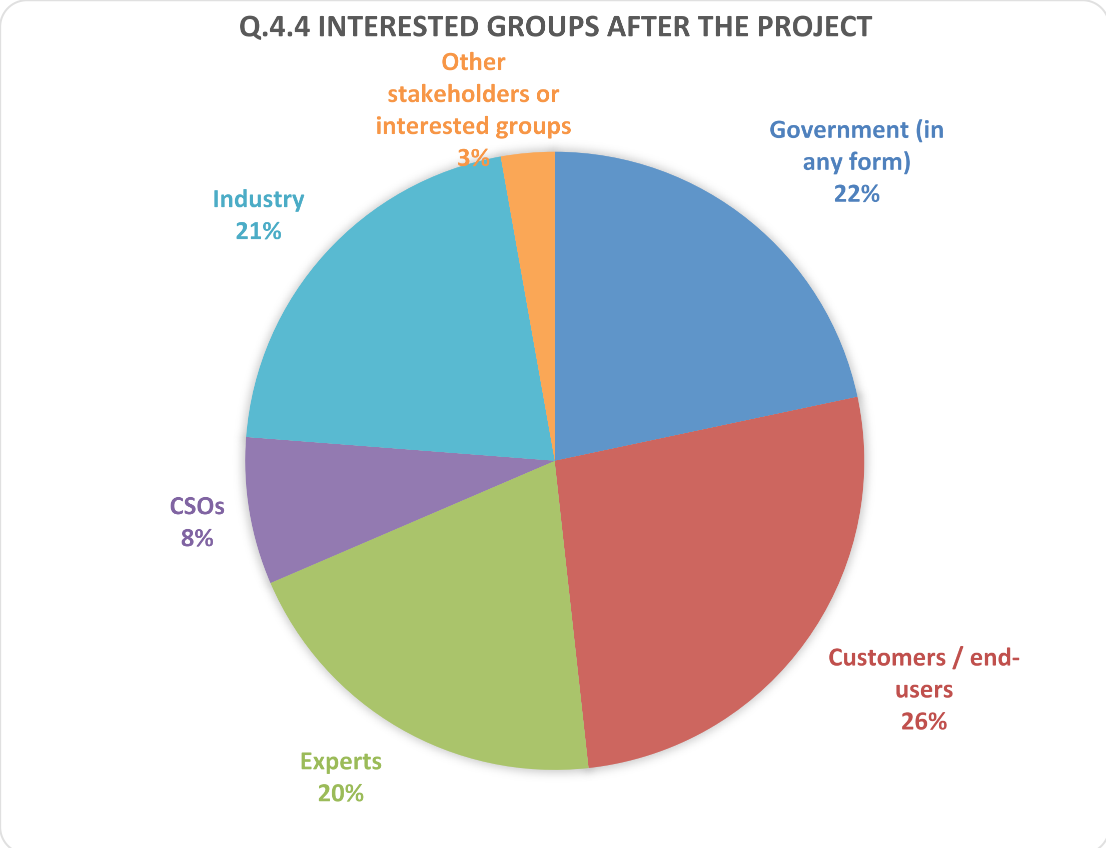


Figure 39: Q.4.4. survey results: interested groups after the project

Example how to read the table: 11 CSOs were interested in the results of the projects, which corresponds to 19% of the 57 surveyed projects. Since multiple boxes could be ticked, several groups may have been interested in the results of the respective projects.

Q.4.5 During and after the project - Based on your previous response, how strong was the overall influence of the following groups on your project?

	Government (in any form)		Customers / end-users		Experts		CSOs		Industry		Other stakeholders or interested groups	
Overall influence	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
None	2	6%	2	5%	0	0%	1	6%	1	3%	0	0%
Small	9	26%	11	28%	17	49%	4	25%	13	36%	1	25%
Large	23	68%	26	67%	18	51%	11	69%	22	61%	3	75%

Table 33: Q.4.5. survey results: influence of various groups

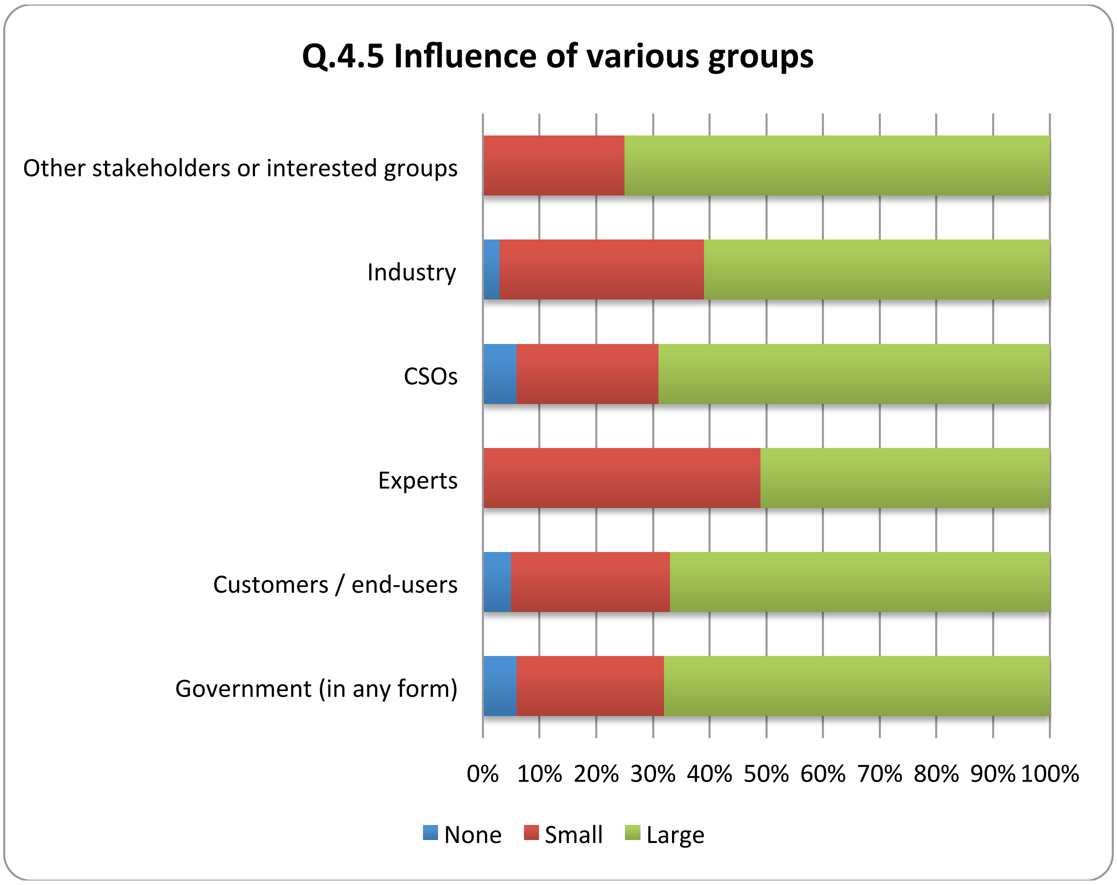


Figure 40: Q.4.5. survey results: influence of various groups

<u>Example how to read the table:</u> Still, we know from Q.4.1 that in 16 projects CSOs were interested in the results of the project. In 11 of these projects, their influence was large (69%).

Q. 4.6. During and after the project - Based on your previous response, in which phase of the project were the following groups mainly involved?

	Government (in any form)		Customers / end-users		Experts		CSOs		Industry		Other stakeholders or interested groups	
Overall influence	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Prior to the project	3	9	1	3	2	6	2	12	3	8	0	0
More at the beginning of the project	1	3	7	18	9	26	1	6	1	3	0	0
More at the end of the project	8	24	18	46	7	20	3	19	10	28	2	50
After the project	2	6	3	8	1	3	2	12	4	11	0	0
The involvement was about the same in all phases	23	68	17	44	19	54	9	56	22	61	2	50

Table 34: Q.4.6. survey results: phases of involvement

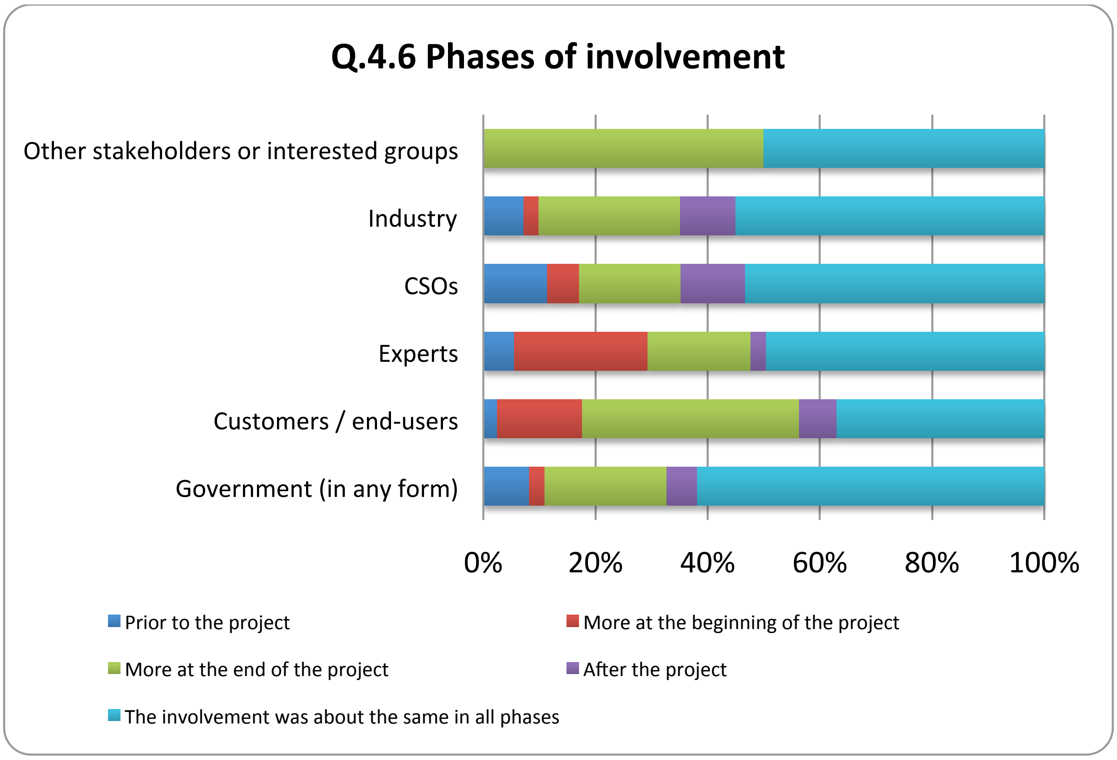


Figure 41: Q.4.6. survey results: phases of involvement

<u>Example how to read the table:</u> Still, we know from Q.4.1 that in 16 projects CSOs were interested in the results of the project. In two cases, CSOs were involved prior to the project and, since multiple answers are possible, they may have become interested at a later stage.

Q.4.7 During and after the project – Please state whether you would agree with the following statements:

	CSOs had a big overall influence on the project		CSOs contributed unique expertise to the project	
Agreement	**Count**	**%**	**Count**	**%**
Strongly agree	9	16	6	11
Somewhat agree	11	19	16	28
Somewhat disagree	17	30	13	23
Strongly disagree	20	35	22	39

Table 35: Q.4.7. survey results: influence and contribution

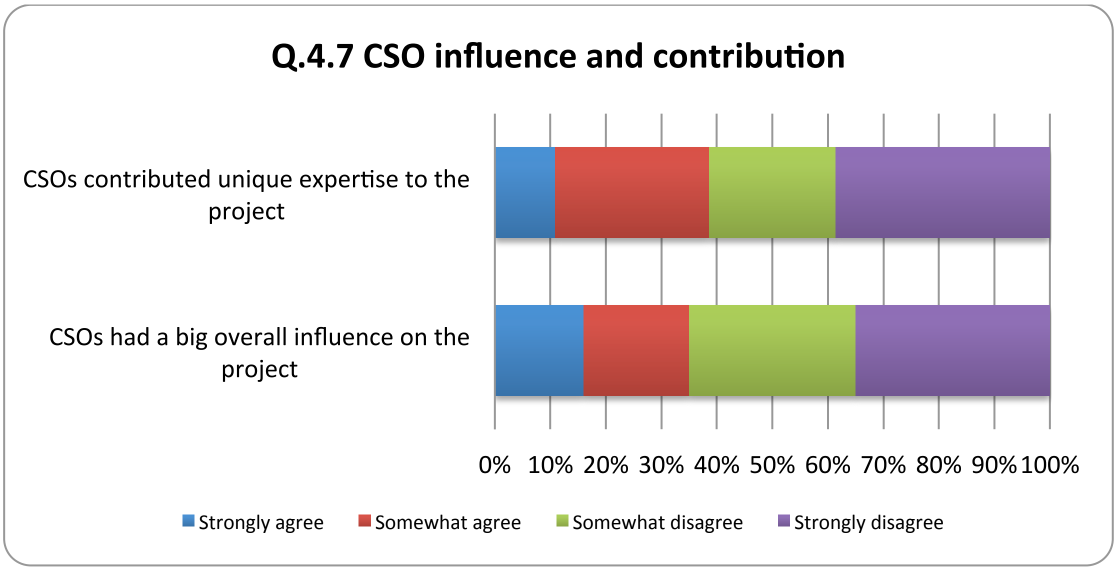


Figure 42: Q.4.7. survey results: influence and contribution

Example how to read the table: Nine coordinators strongly agree that CSOs had a large overall influence on their project.

Q.4.8 During and after the project – Could you please briefly describe the dynamics of your project regarding the involvement of participants, esp. CSOs (approx. 5-10 sentences)?

CSOs were not really involved and were not really relevant, but we focused on government and public units, on industry partners and research partners
No CSO in the projects
They were involved through workshops. In the workshops they where presented the project ideas and developments and their feedback was captured by the consortium.
The project was led by a municipality to develop a new service for carers. 4 pilot partners were directly involved in service delivery either as CSO, university, local authority and SME delivering for municipalities. All partners had to work closely together across all work packages following iterative design of the eLearning platform with intense user testing. Involving end users and stakeholders throughout the project helped us develop a new service/website that will be used. Many of the stakeholders and future users or customers of the service are CSOs. We had to consider carefully how we design the service to deliver to the end user - carers can be a vulnerable group.
Partners were fully involved in the decision making aspects of the project
External participants, such as partner experts, CSOs and other key stakeholders were involved during the whole lifetime of the project thanks to the organisation of several panels of experts for the validation of the deliverables produced. They were in addition constantly informed about the events and the final conference of the project so they could participate as well.
CSO were involved in the project as leaders for dissemination. As this was a pre deployment project for a mandated deployment of technology across Europe the dynamics featured the MS gov, followed by the stakeholder industries with SME providing the point solutions required.
There was no involvement with CSOs
We had no such organisation in the project
SMART CAMPUS used a Living Lab (user-centric open innovation) methodology for the involvement of stakeholders. This included workshops (M6) for the local community (pilot building and interested parties), an Advisory Board (including the World Bank, Eureka, a former Minister of Energy, representatives from potential markets (Brazil, China)) and we hosted a second round of workshops at the pilots in M18, also several webinars were held with the Advisory Board. At the end, a major conference was held, and a policy paper presented at the European Parliament. No CSOs were involved in the project.
The project was closely followed by the Open Data movement across Europe. There was quite some interaction with them during their and our "public" events. (conferences, workshops..)
It was an end-user driven approach for delivering new services based on new available technologies - therefore governments, end-users and the industry have been in the driving seat - CSOs were not linked at all.

Tight collaboration between end user organisations or organisations with a special interest in education. Especially during the user requirements and piloting phases. The contribution of organisations involved in education is also be important when considering the sustainability of the project after its official end.
CSO were involved as Associate Partners and also as active participants in the three annual conferences of the project.
R&D, new processes for digital preservation, prototype developments
We try to have a Consortium where forces are balanced. CSO are but a type of partner we sought after when acting as Coordinators but not the unique one. As they may have the expertise but not the resources, they have to be surrounded by other partners that help to accomplish what they alone cannot. They should be view as strategic partners with the power to influence end-users belonging to their community, but not enough by themselves to carry out a project needs.
Citizens were involved using web2.0 Government and citizens were involved in special participatory events.
Regional university associations took an interest in the Bologna project which had an impact on dissemination by raising awareness about the project. We created automated translation systems to translate study programmes from a number of source languages into English - one of the many requirements for a university to obtain an ETCS label is having an English versions of the study programmes displayed in their website.
The project succeeded in adapting its results to the various technical context situations, making infrastructure available in different countries. To reach this results, participants were involved and strongly collaborate to solve technical problems. Despite this, in the end of the project only CSO was interested in continue using the project products.
No involvement at all
Customers were involved in the requirement analysis and after for testing the application. Industry representatives were partner of the project and were involved for ethical and legal issues. CSOs were not involved
One of the CSOs provided insight about specific scientific details for some pilots and the other leaded the dissemination pilot during most part of the project.
Our project did not have any CSO as beneficiary
Consulting on design issues, testing alternatives, participation in using the deliverables.
At the very beggining of the project they tend to be pro-active and quite engaged to the activities. Then, the overall engagement tend to decrease and a big effort of the coordinator is necessary to keep them in the loop.
The participants were einvolved in the work packages and tasks in the project according to the work plan
The participants were involved in the work packages and tasks in the project according to the work plan, and the dynamics were good.

There has been interested in the results of the project and in building, through the project an innovation ecosystem based on different mechanism of Open Innovation in the public sector domain
We were interested in cooperating with all stakeholders relevant for the scope of the project. The project received a lot of attention from all types of partners which were interested in contributing. During the project lifetime and after project's end, we held "summits" where all stakeholders were invited, also CSOs. they could respond to our results and give input.
there were no involvement of CSO
CSO´s were involved to address their members, which are cities in Europe, and within the project we launched an open call addressing these members. But overall external cities were equally eager to participate that the members, therefore the impact on positive decisions was not as high as expected.
The project has been thought to respond to a specific aim: making hospitals able to save Energy by avoiding big investments in their infrastructures. Considering this aspect, hospitals and institutions had a crucial role during the whole development of the project, while writing the proposal, during the development of the initiative, in the dissemination phases and now, after the end of the experience. It was curious to realize that the interest on the issues raised by the project is shared by very heterogeneous groups and organisations that not only where pushed by the partners of the project but also found by themselves information about the initiative. We aimed at addressing the largest number of stakeholders in order to provide feedbacks and we managed to do so by pushing most of all the network creation, using also links to different other projects supported by the Commission. More, we included in the project specific tools to help our tasks, such as the website, workshops and seminars, videos, etc.
In order to fully evaluate Puzzled by Policy, it was piloted in real-world settings across Greece, Hungary, Italy and Spain, as well as some trials at an EU level, in Slovenia and in Ireland. This resulted in significant engagement, and The Puzzled by Policy platform proved very successful with 212,700 page views and 17,000 unique visitors. Over 6,800 people actively participated on the pilots and more than 100 NGOs were involved. Over ten policy-makers at a local, regional and national level were also directly involved in the pilots.
universities and research institutions were always strongly involved with targeted contribution standardization bodies interested but just like to be kept informed EIP-AHA and the involved EC units support the project

SMEs contribute with interest and commitment, but are not necessarily the driving forces
the project was a network, therefore implied a constant dialogue and exchange of information and experience between partners. The coordinator kept the consistency while partners were encouraged to share knowledge and experience and be proactive in proposing activities.
CEOs of SMEs participating in the project were interested in the outcomes of the project
There haven`t been CSOs taking part in the project. All members have been companies, administration, public/semi-public bodies and research centres.
The project includes as beneficiaries a broad variety of interests, government, SMEs, industry, customers/end-users (they will become customers/end-users of the main results of the project), universities, and associations - thus the dynamics with these participants is an inherent part of the project. The project does not directly focus CSOs. No special contacts with CSOs have been conducted. Some CSOs could benefit from the project results.
Although the project has not ended yet, there have been no CSO's involved in the execution of the project so far.
CSOs had a quite important role for validating different project´s phases, and also for providing important contacts that were key for achieving different project´s results.
Participants were responsible for some specific tasks. They had to develop their own pilot and were involved in the whole project.
Not sure I understand the definition. Prime motor where large non-for-profit national institution as FHI they conceived, defined, drove and realised the project are they CSO? if not, this whole thing does not make any sense
We got data from Europeana and the results of the project were tested based on evaluation data provided by Europeana
In the project we have involved 7 pilots representing our potential customers (e.g. hospitals, governmental agencies and rehabilitation centres). They played a relevant role along all the project providing requirements, working on the ethical aspects and assessing the solution. Unfortunately during the project we did not have the opportunity to have CSOs among the partners but they have been contacted for surveys and further requirements. In particular they have been contacted for the definition of the market analysis.
None
CSOs have not significantly been involved. The major groups in the project are public archives (semi-public) and they were the dominant stakeholders and experts in the projects.
CSOs Did not participate
no CSO was involved, sorry. The structure of the project participants and assignment of work packages leads to a fixed value contribution into the project. Some of the questions before (e.g. influence of CSOs) maybe misleading if no CSO is involved.

We all made from an RTD project a product and then an EEIG located in Italy for project commercialization... and new business....This says ALL
Workshop speakers, revision of deliverables, support in programme definition
CSO involvement did not play a role in the dynamics of the project
There were few CSOs involvement in the project. Other participants mainly research centres actively participated in the project while governmental organisations were more in the position of end-users, being somewhat passive in key phases of the project. This brought some uncertainty in the uptake of the results since it was not clear whether what was developed in the project was pertinent.
The Consortium’s other key collaboration is the one established with Wikimedia Italia. EAGLE features the development of the first Wikibase platform outside of Wikidata. The extension installed in the EAGLE Mediawiki allows for major corpora of online inscriptions to be imported with their corresponding translations. It also allows for connections with Wikimedia Commons. This approach meets the high quality data modelling while retaining the capacity to meet user engagement and dissemination needs. All the EAGLE content providers have released the metadata under a Creative Commons Zero Public Domain Dedication (CC0). This means that all the metadata in EAGLE can be re-used by anyone in any way, even for commercial use in (for example) external websites and apps.
No
Limited involvement in support activities
The civil society and mainly building occupants were actively involved in the project right from the beginning: they were involved in training courses; their feed-back was considered (web based surveys); their behaviour was considered (data evaluation and adaptation of respective control functions to improve comfort). A few challenges had to be overcome: occupants of the buildings changed in the course of the project (different reference group); framework conditions were not constant (building refurbishment in parallel to retrofit with ICT); often structures are missing to continuously evaluate and "take serious" the feed-back of the occupants (no dedicated energy managers at buildings available; long decision taking processes).
There have been no CSOs involved in the project so far.

Table 36: Q.4.8. survey results: qualitative responses on the dynamic of participants involvement

Q.4.9 During the project - Considering the entire project, who were the overall three-most-active contractual partners participating in the project?

	Most active		Second most active		Third most active	
Actor Type	Count	%	Count	%	Count	%
University	4	8	9	22	3	9
Research organisation	5	10	5	12	7	20
Large enterprise	8	16	2	5	3	9
Small and medium enterprise	16	33	6	15	7	20
Govermental organisation	7	14	4	10	7	20
Public/semipublic corporate body	3	6	9	22	3	9
CSO	2	4	3	7	2	6
Other	4	8	3	7	3	9
Responses	n=49		n=41		n=35	

Table 37: Q.4.9. survey results: participation activity ranking

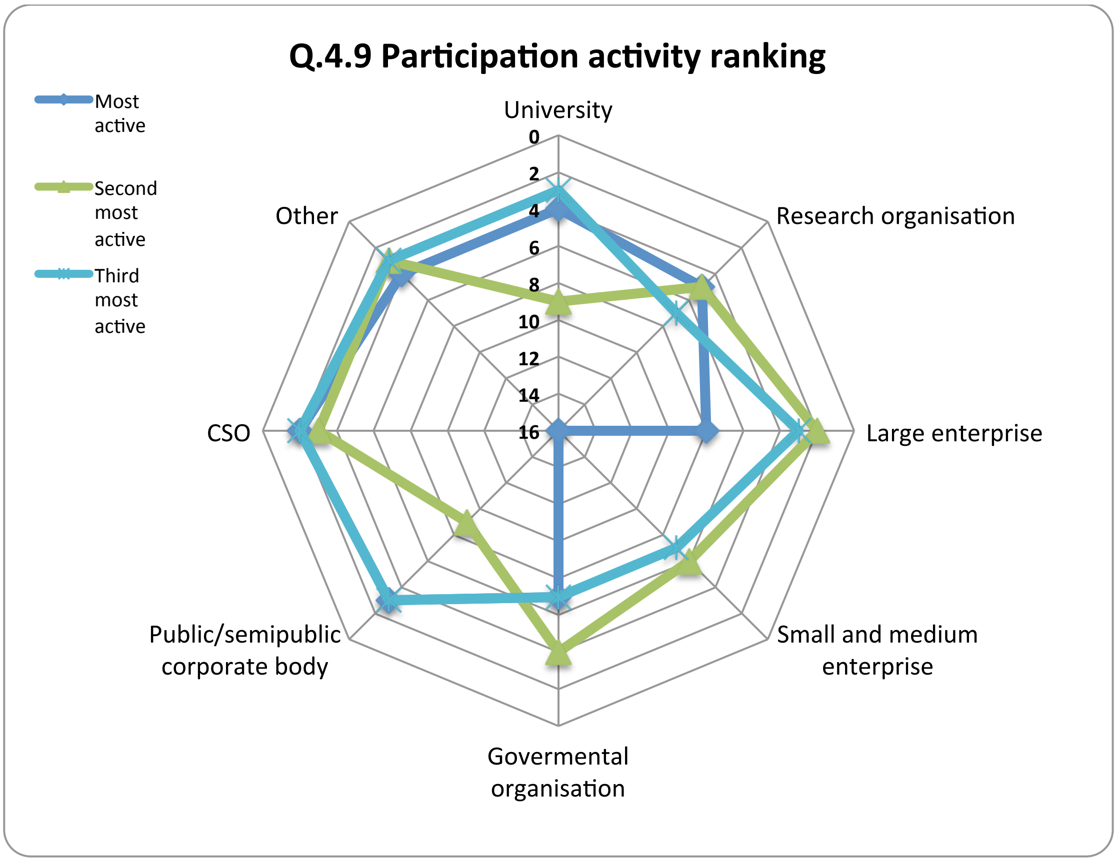


Figure 43: Q.4.9. survey results: participation activity ranking

Example how to read the table: In two of the projects, a CSO was the most active participating partner.

Q.5 Thank you for finishing this survey
As stated in our email you may now choose one of the following options:

Thank-you gift tyoe	Count	%
Please send an Amazon voucher to the following email address:	33	70
Please send an ego network analysis of my organisation to (please leave the name of your organisation and your email address):	14	30

Table 38: Q.5. survey results: thank you gift

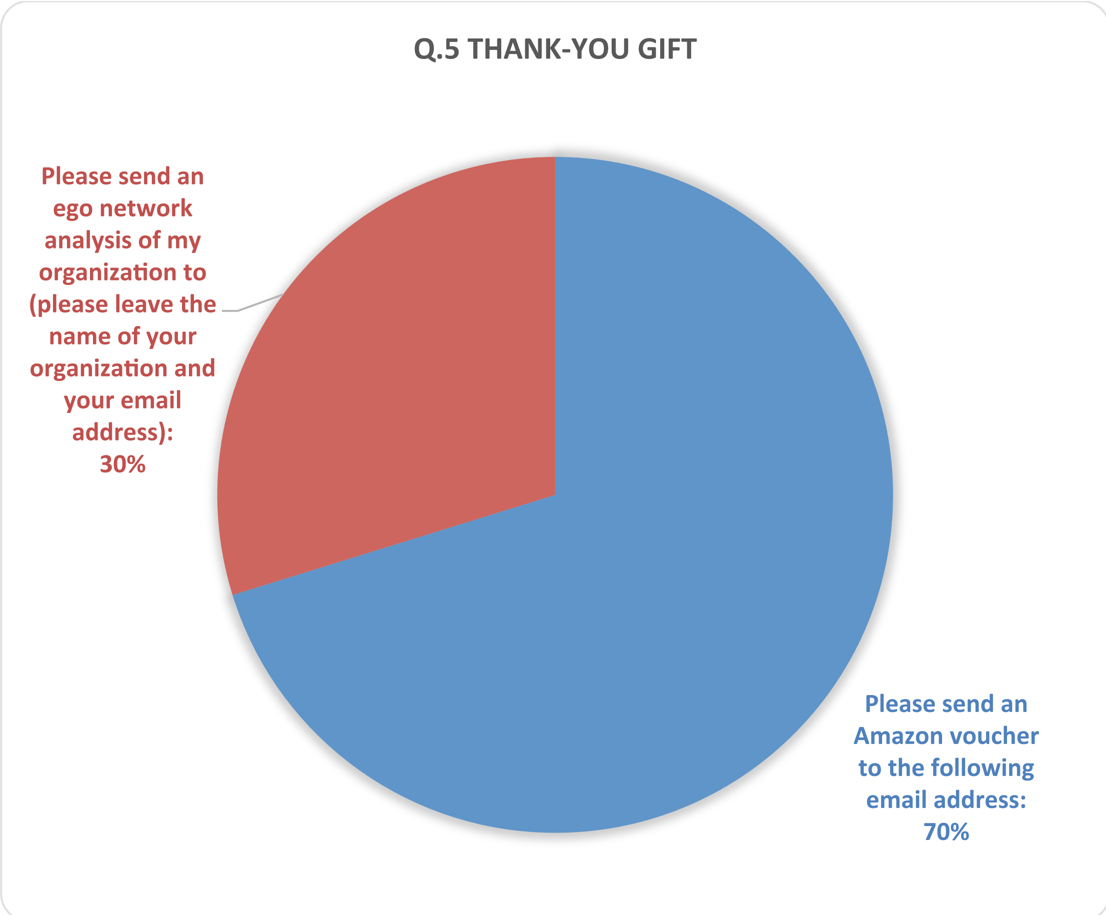


Figure 44: Q.5. survey results: thank you gift