Managing trans-national distributed infrastructures/facilities and research teams: a sort of internet of things and brains.

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INDEX	
1. **The governance of complex initiatives in a nutshell**	2
1.1. Research levels and trans-national distributed research infrastructures	2
1.2 The approach to the governance of E-RIHS	3
1.3 The main aspects of the implementation as a guide for the design of the executive governance	5
1.4 References	6

1. The governance of complex initiatives in a nutshell

1.1 RESEARCH LEVELS AND TRANS-NATIONAL DISTRIBUTED RESEARCH INFRASTRUCTURES

Governance of complex initiatives is a difficult task and has not a general recipe. It has to be designed to fit the purpose, requires a clear definition of objectives and, preferably, a detailed planning of the flow of the activities. In this regard, European Research Infrastructures adopted different governance models.

It is well known that research is developed and performed by people. The cooperation between people investigating the same topic results in a sort of social network that eventually evolves into a "research field" (Nedeva 2013, Lepori 2011). A research field can be described as an ensemble where ideas and experiments build a community linking people and infrastructures through remote or physical exchange/access to knowledge and data or equipment. In the case of e-RIHS, the "general" research field is heritage science.

In any event, for a research field to remain vital requires money to support the people and the necessary infrastructure, e.g., buildings, equipment, administrative support, etc. This dependence of the activity on the availability of money or agreements, typically leads to the research fields being organized into spaces, where the essential relationships between the research organizations (paying the salaries of the researchers) and the owners of the infrastructures are linked to the utility of knowledge (Nedeva 2013). In practice, nationally bound research organizations or owners of facilities are requested to interact through exchange/access of resources (personnel, data, infrastructures, funds for specific projects, services, competencies, techniques, patents etc.) at different "levels" (see figure 1): policy makers and funders, performing organizations and owners of facilities, research teams or individuals).

These resources can be "controlled and oriented" mainly as institutional funds, non-oriented research funds, and oriented research funds (Cave et al., 1999).

In the case of e-RIHS, a) policy makers and funders, b) performing organizations and owners of facilities, c) research teams or individuals, are all strictly involved in many ways. Their roles can vary (Moretti, 2015a) and a careful analysis of the appropriateness of the governance for the implementation of the actions has to be evaluated in order to avoid undesired impacts (Moretti, 2015b).

Two main levels of governance can be distinguished:
- a policy level, with the involvement of high representatives of governments, addressing agreements and decisions on vision, commitments, amendments, guidelines for ethical or relevant aspects, monitoring and evaluation of the process,
- an executive level, with many different stakeholders, addressing the day-by-day management and reporting, including financial, administrative and implementation aspects.
The two levels should not work in isolation, in order to guarantee coherence between the goals and the action, as well as the monitoring and the prompt intervention in case of necessity.
While the policy level clearly adopts a top-down approach, the executive one should be structured to fulfill some desirable characteristics, such as efficiency, effectiveness, sustainability, transparency, resiliency.

Figure 1: a graphic pyramidal representation of the concept of research levels in three hypothetic countries (in red, yellow and green), where policy makers orient investments through research funders organizations (RFOs) to research performing organizations and owners of infrastructures, which in turn manage and sustain the final cost for personnel, equipment and facilities.

1.2 STRUCTURING THE COOPERATION OF TRANS-NATIONAL FACILITIES FOR COMMON SERVICES

When dealing with actions aiming at tackling societal challenges, despite the complexity of the activities and their respective outputs are difficult to attribute to specific solutions, it is often desirable to focus (or make more visible) the services and deliverables which are "end-users driven".
JPI Oceans has launched different joint actions aiming at providing measurable steps towards solutions, adopting a fit-to-purpose approach in order to be effective and efficient.
*The actions named "Multi-use of infrastructures for monitoring", "Ecological aspects of Deep Sea mining", "Intercalibration of the EU WFD", "Munitions in the Sea", "Ecological Aspects of Microplastics", are only few of the JPIO actions where deliverables are depending on a very diverse and interconnected number of stakeholders with different responsibilities. A preliminary evaluation of these actions, suggests to reflect on a possible common approach when dealing with multi-role and multi-stakeholder participation. This can help in the **design of the executive governance for the implementation of some actions. In particular, this document focuses on the management of nationally spatially distributed facilitities, personnel and instrumentation which can be coordinated to provide access and services.***

In general, as described in the previous paragraph, the trans-national research cooperation consists of spatially distributed facilities and personnel, to be managed at national and European levels, in order to deliver access and services with a clear European added value. Funds are a component of this process.
"Client satisfaction" (meant as providing a societal impact) within such a complex initiative implies a very flexible governance, which in turn needs to be simplified to guarantee many of the characteristics usually required (i.e. efficiency, effectiveness, sustainability, transparency, resiliency).
It has to be clarified from the beginning that the efficiency of the process in terms of costs/investments is linked to the effectiveness in terms of the respect of the timescales, implying a strong link between the end-users and the providers of facilities/services.

A special case of decentralized governance is the one usually adopted to coordinate distributed national research infrastructures. This means mainly that we deal with a central hub connecting nodes of spatially distributed components (see figure 2). The relevant aspects of the governance are indeed the links between the different nodes and components (usually referred as the terms of reference).

For this reason, the flow chart for the actions is identified: who does what and when, consequently addressing roles and functions, including the time planning for actions. In the following, the definitions and the description of the implementation as shown in figure 3.
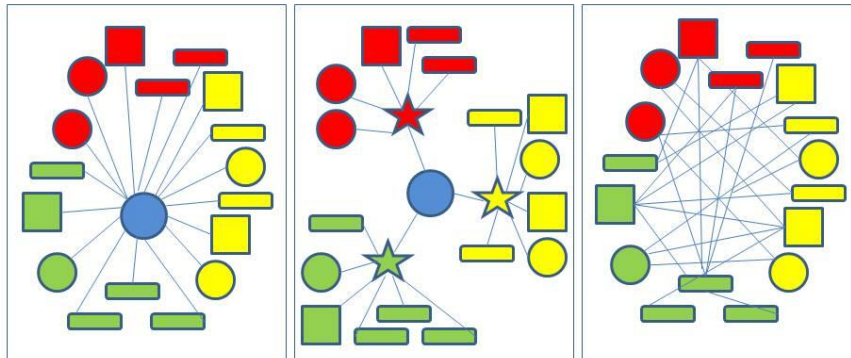

Figure 2: a graphic representation of the concepts of centralized (left), decentralized (center) and distributed (right) networks. Colors represent different countries and stars national coordinators. The blue circle represents the central hub.
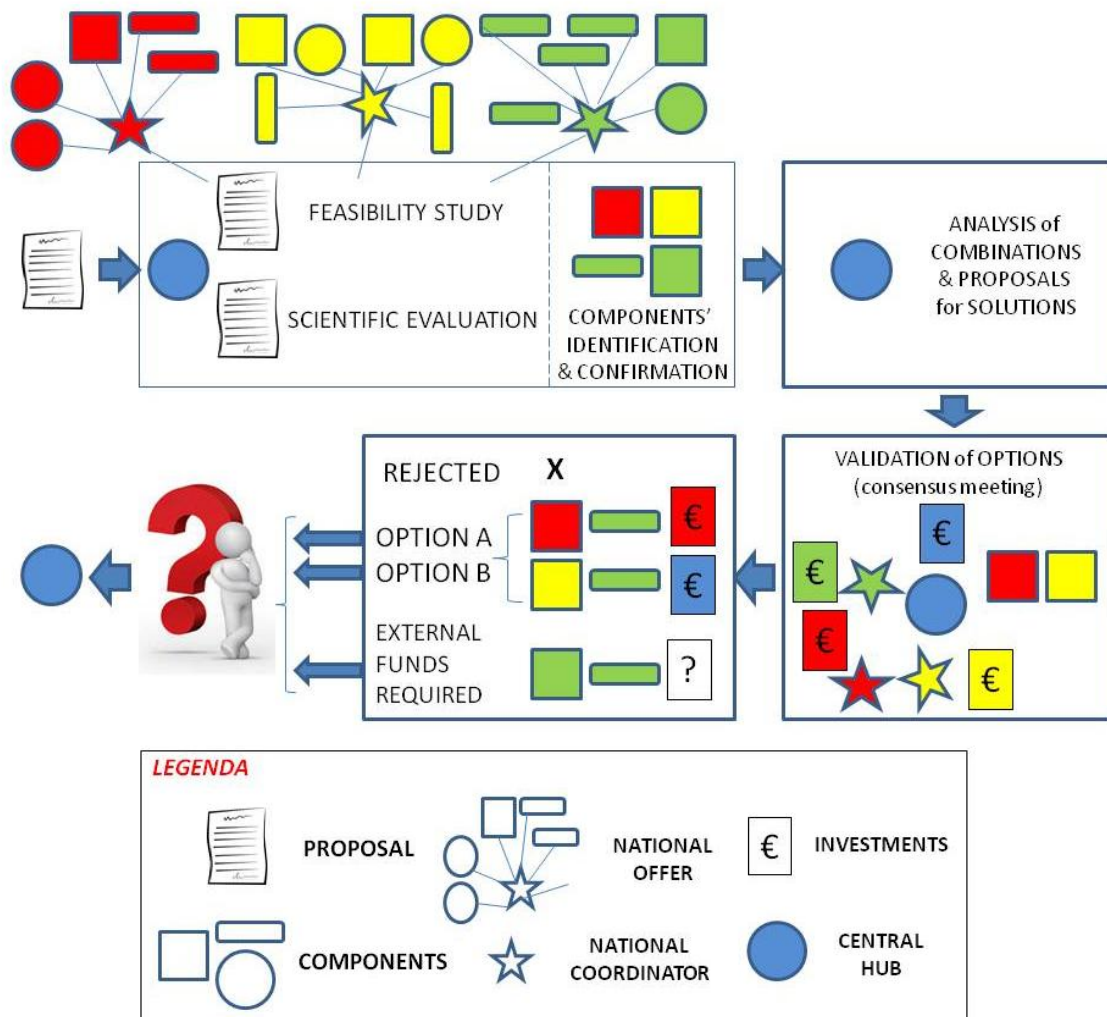

Figure 3: a graphic representation of the implementation flow from the submission of a proposal to the preparation of the grant for accessing a facility or a service of e-RIHS (see text). Colors (green, yellow and red) refer to national identity. Blue color to trans-national organizations.

Definitions:

Client: identified in the coordinator of the proposal submitted to the central management office.

Component: a facility or an equipment or a research team, or a combination of them, which can be accessed or consists in a service.

National coordinator: the representative of the national node and contact point for national funders, coordinating the national components.

Central hub: a set of different boards which address the management of the proposals, the evaluation of the proposals, the exchange with national coordinators and components, the interaction with the clients, the financial distribution of the common budget.

National offer: a set of available components coordinated at national level and communicated periodically to the central hub.

National budget: the funds available for the national components and travel for users.

Common budget: the funds at the central hub to be allocated to top-up the national budget for eventual filling the gaps (it is not including administrative costs).

This general approach can easily be transferred to the JPI Oceans case, traducing the central hub as the AISBL or JPIO secretariat, national coordinators as the Management board representatives and so on.

Description of the implementation flow:

Step 0: the national coordinators review and transmit to the central hub a list of components and the estimated budget to cover the costs for access and services (consisting the national offer). All the components are grouped by the central hub to be disseminated for preparing the proposals of the clients.

Step 1: the client submit its proposal, consisting of scientific and implementation parts.

Step 2: the central hub starts the evaluation process for the scientific aspects. In parallel, it contacts the appropriate components for confirmation of the availability and evaluate the feasibility of the single proposal. In case the scientific evaluation suggests other components to be used, these are contacted as well. The central hub prepares an analysis of different combinations of the "all-together" feasibility for the proposals which passed the scientific evaluation.

Step 3: the central hub asks the national coordinators to validate different options of feasibility and in case of lack of funds, evaluates the distribution of additional funds from the common budget.

Step 4: the central hub communicates the client if the proposal has been rejected, if there are different options to fulfill its request, if a revision of the proposal is needed in terms of additional funds.

Step 5: the client communicates its choice to the central hub, which interact with the components and national coordinators for the final arrangements and signature of the contract.

1.3 THE MAIN ASPECTS OF THE IMPLEMENTATION AS GUIDE FOR THE DESIGN OF THE EXECUTIVE GOERNANCE

The process described in 1.2 mainly consists of two phases, including a first adaptation/negotiation internal to the infrastructure for selecting different options and an eventual additional adaptation/negotiation with the client for a revision of the proposal when external funds are needed.

The simplification resides in the identification of the "minimal cell" of the system, that is the component (a facility, an equipment, a research team) offered through the national coordinators.

The different governing boards are interfaces with different roles, functions and responsibilities which link the components and, indirectly, the users.

This scheme is effective, including a negotiation between the users, the providers and funders, which allows to find solutions for eventual bottlenecks. In addition, with the proposal of different possible options, it involves the user in the decision, as a sort of citizen participation to the process.

This scheme implies redundancy in some components (indeed avoiding unnecessary duplications) and the coordination of national coordinators. It is a mixed mode of governance, where bottom-up response (the facilities and personnel) are interconnected with top-down decision (funders and coordinators).
This allows cross-monitoring and structuring of the trans-national and multi-level cooperation, transforming a crystalline approach to governance to an adaptive distributed one, building trust and guarantying stability.

The central hub has the crucial function of intelligence interface, as a sort of problem solver, between requests and offers (users and producers), as well as a catalyzing factor for structuring the cooperation between the different components, national coordinators and funders. No board in the executive governance has the role of final decision maker, since the aim of the process is to deliver the client with more efficient choice options.

1.4 REFERENCES

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