Understanding virtual scientific organizations using the Transdisciplinary Index.

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WHY THIS STUDY IS IMPORTANT: Scientific grand challenges confronting society are being investigated by multiple domains of science. For example, the increase in human population and its impact on land-based ecosystems, oceans, ice sheets, etc., is an interdisciplinary problem. Data is scattered and not integrated.

* Empowering integrative data intensive science unlocks the potential for a more complete picture of threats and solutions but requires coordination between domains and disciplines in widely distributed locations. Complex virtual scientific research organizations (CVSROs) are emerging to address these challenges but they must be supported and nurtured in order to fulfill their goals. An exemplary CSRO is DataONE, an NSF funded multidomain, multi-institutional distributed scientific collaboration focused on data about life on earth and the environment that sustains it.

* Improving the “vision” of researchers and policy makers who often operate without seeing the big picture— which impedes effective policy making and resource allocation.

* Providing momentum to facilitate interdisciplinary science through CVSROs like DataONE which can provide the cyberinfrastructure for data science and become an attractor for coordinated.

ABOUT THIS STUDY

DataONE was identified as an examplar CVSRO. A case study was conducted and the transdisciplinary index was used as a framework to better understand how DataONE supports interdisciplinary science.

Data for this study was generated through:

• 15 semi-structured interviews with DataONE leadership (6 face-to-face, 7 Skype, and 2 phone interviews)
• 51 responses from early members to an online survey (51% response rate)
• Participatory observation over 2 years (researchers are involved in the project).

The Transdisciplinary Index’s seven elements were used to analyze the data:

Adaptability

The basic unit the DataONE operates is a working group. However, membership in the working groups are not strict. People could be involved in more than one working group; interaction across working groups are highly encouraged; and even sometimes workshop model is used for some specific problems.

Context

*DataONE's emergence is a direct result of the needs identified by the data intensive scientific community and the igniting energy of its members. The resulting "organizational biography" is firmly rooted in the societal and scientific context.

Result: Developed a structure to address the need to bring together researchers, educators, representatives from non-governmental organizations, and civil servants.

Leadership/governance

*Participatory governance. Leadership team & members value the balance between tight and loose. Leadership includes leaders of each working group. Every goal, concern and perspective represented.

Result: Creative problem solution, strong commitment to project goals, and maximization of limited resources.

Balance between responsibilities to the funding agency and research interests of the members. If goals are met on time, members choose their own way of achieving them.

Result: Ideas and actions are generated from the bottom up creating high level of motivation and long term sustainability of effort.

Adaptability

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Result: Demonstrated ability to adapt to external (funding environment, advances in technology) and internal (personnel and organizational) changes.

Integration

*Team members from different disciplines (earth sciences, computer science, library and information science, etc.) and different sectors (federal agency, university, national lab, library etc.) and roles are integrated for the success of the project.

Result: The DataONE system has many countering forces in it, but Leadership model facilitates integration to allow alignment with the goals of the project.

CONCLUSIONS: Science is getting more complex and self-organizing into CVSRO. These new organizations meld different cultures of science and observations at different levels. Using the TI index as a framework we can analyze actions and results. This helps assess success of organizations and possibly help design new ones.

DataONE success comes from the leadership which allows bottom-up participation including goal setting and problem solving. Individual goals are integrated to fit the project goals. The context provides opportunities and threats. The adaptability of DataONE utilizes the opportunities while avoiding the threats. The situation is a complex adaptive system and more can be learned through a complex adaptive system analysis.