

**RUI: VOSS: COMPUTATIONAL TOOLS, VIRTUAL ORGANIZING,
AND DYNAMIC INNOVATION DIFFUSION**

PRELIMINARY FINDINGS FOR MEMBERS CHECK

Research Question #1

RQ1: In e-science, what communication activities constitute the iterative and co-occurring development and use of computational tools in virtual organizations?

Communication Activities at the Team Level:

- Creating a Common Project Understanding
 - Developers understand the scientific needs of the users
 - Users understand the technical capability/possibility of the developers
 - Users and developers maintain the same set of priorities (are ‘on the same page’)
 - Systematically documenting tool development and use

- Facilitating Constant Communication Cycles
 - Provide internal iterative feedback (from users to developers)
 - Update tool and instructions (from developers to users)
 - Agile software development (sprinting)

- Promoting Synergistic Collaborations
 - Coordinating division of labor/specializations
 - Synergizing multi-disciplinary expertise
 - Constant (virtual) communication
 - Inducing trust and minimizing conflicts

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Research Question #2

RQ2: What interactions (linking people-people, object-object, & people-object) mutually constitute the co-occurrence of tool implementation and virtual organizing in e-science?

- People-People Interactions
 - Establish leadership and credibility
 - Foster effective collaboration with existing (or new) contributors
 - Share/negotiate needs/motivations for the project
 - Communicate, coordinate, and collaborate in an established routine structure
 - Check progress regularly
 - Socialize to establish rapport and trust

- People-Object Interactions
 - Bring together dispersed users, developers, and tools through collaboratories
 - Prototype and test computational tools through visualizations, simulation, and modeling of big data using XSEDE resources
 - Augmented/Virtual Reality
 - Promote participation on a user feedback platform

- Object-Object Interactions
 - Connecting local computers, national supercomputers, software tools, visualization technologies, data repositories, through high-speed networks
 - Maintaining a tool repository (e.g., Galaxy Tool Shed, NanoHub, etc.).
 - Safeguard data through security systems/technologies
 - Employing middleware to link hardware and software
 - Coordinating jobs in queue through scheduling tools

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Research Question #3

RQ3: What macro conditions affect the attributes of a computational tool and the attributes of the inception virtual organization (VO), which, in turn, influence whether a tool successfully gets adopted and/or diffuses from one VO to another?

- Tool Attributes
 - Open source
 - Available for free
 - Community driven/Active user community
 - Well-documented
 - User-friendly interface
 - Easy to adopt
 - Problem-driven, Useful for meeting the original needs
 - Easily adapted across domains and/or meets other needs not originally thought of
- Virtual Organization's Attributes
 - Led by key players with credibility
 - Has a multidisciplinary team of experts
 - Develops a new common language
 - Maintains a collaborative environment (across locations, generations, etc.)
 - Focuses on a common goal
 - Generates strategic plans and establish routines
 - Create efficient and productive organizational structures & systems
 - Develop sufficient organizational capacity & resources
 - Maintains sustainable funding
 - Minimizes personnel turnover
- Macro Conditions
 - Economic: Funding Environment
 - Institutional/University Policies
 - Cultural Norms