

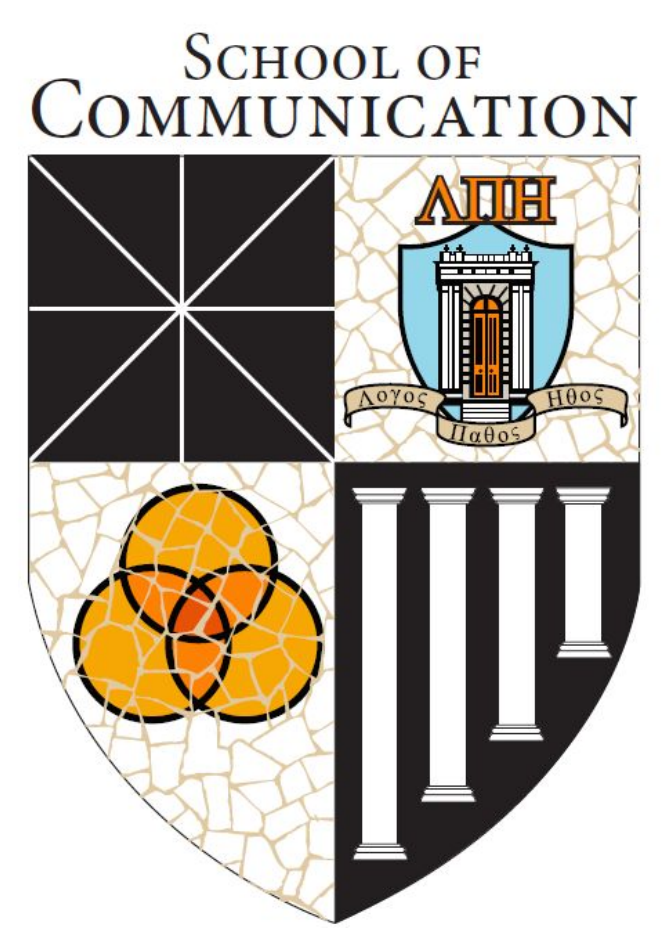


Best Social and Organizational Practices of Successful Science

Gateways and Cyberinfrastructure Projects

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Introduction

Cyberinfrastructure (CI), also referred to as e-science, is a complex system that consists of “computing systems, data storage systems, advanced instruments and data repositories, visualization environments, and people, all linked together by software and high performance networks to improve research productivity and enable breakthroughs not otherwise possible” (Kee et al., 2016, p. 5; Stewart, 2007). Among these technologies are unique computational tools that are designed to analyze big datasets, which includes science gateways. Science gateways reduces the highly specialized skillsets and programming knowledge needed in the CI community, thereby enabling e-science to spread to a wider range of users. Regardless if it’s science gateway or CI projects, the success of these platforms depends on the organizations and teams behind it. The organizational and social factors behind the product play a role in whether or not a new tool would be adopted by potential users. It is for these reasons that we turn to the Theory of Diffusion.

Literature Review

Rogers (2003) defines the diffusion of innovations theory as the process in which an innovation is communicated through certain channels over time among the members of a social system. An innovation can be an idea, practice, or object perceived as new by an individual other unit of adoption, such as an organization or group (Rogers, 2003).

Kee and Shrock (2018) took a different approach with diffusion theory by treating CI as a complex innovation that includes new objects, behaviors, and ideas intertwined for adoption. By integrating the role of organizational capacity in understanding the success and failure of CI’s diffusion, the best practices of successful science gateways and cyberinfrastructure projects were determined in terms of both social and organizational practices (Kee & Shrock, 2018). The final 12 best practices include: seeking multidisciplinary expertise, setting shared goals, using common language, having bridging liaisons, establishing productive routines, meeting face-to-face, demonstrating altruistic leadership, having clear roles, engaging user feedback, raising sustainable funding, growing organizational capacity, and maintaining personnel continuity (Kee & Shrock, 2018).

Based on a new data set, we found that Kee and Shrock’s (2018) findings were not exhaustive and that there are more themes to be emerged.

Research Question

1. What are the best social and organizational practices of science gateways and cyberinfrastructure projects?

Methodology

This study took a qualitative social science approach with the data collection and analysis following the principles and strategies of grounded theory (Corbin & Strauss, 1990; Glaser & Strauss, 1967). The data for this poster is a subset of a larger data set collected for a larger project, which included 123 semi-structured interviews with 124 individuals in the e-science community (one interview involved two participants) between March 2016 and July 2018. Participants are represented by a diverse range of stakeholders, including administrators, technologists, developers, users, facilitators, liaisons, and outreach educators. Interviews were conducted either in-person or by telephone. The co-authors performed multiple iterations of data analysis and literature integration, yielding the preliminary findings presented in this poster.

Results

Theme	Description	Example
Raising Awareness	Successful inception teams reached out to potential users to let them know about and understand their tools and services. There are two components to raising awareness in e-Science: message dissemination (marketing, advertising, public relations) and educational outreach (training and workshops).	“I guess you might call it advertising – how do you reach out to your potential customers and make sure they know you exist...Finding some way to make sure the potential users of a piece of cyberinfrastructure really know it’s there.” (Administrator and technologist, California, 5/2016) “I think it’s critical for the providers to also, beyond just providing the cyberinfrastructure and being there to answer questions, the CI providers need to proactively do educational outreach...” (Liaison and educator, Wyoming, 7/2017)
Establishing Trust	Informants noted that a key part of cyberinfrastructure adoption includes relationship building among teams and between change agents and potential adopters.	“...similar to like how your friends in the dorm give you recommendations about classes, there’s also user communities that develop, either within particular research groups or even across particular disciplines that give folks ideas on how to use system most effectively, kind of tricks of the trade in terms of configuring a simulation to a particular system.” (Administrator, Texas, 5/2016)
Networking with the CI Community	Developers pointed out the benefits of networking and sharing knowledge with the CI community at conferences.	“So [at] the conferences, the all-hand meetings that they would have to bring everybody together, you got to meet and understand everybody that was participating in this and have a common vision.” (Technologist, Massachusetts, 4/2017).
Keeping a Track Record of Reliability	Inception teams have found that having documentation of the quality and user-friendliness of their technologies increased the likelihood of adoption.	“...having complete documentation that [is] written hopefully with the input of someone who’s a user and not just the maintainer [and] the developer of the package, is super important...poor documentation is a barrier to entry [in cyberinfrastructure] for sure.” (Co-producing user, California, 7/2017)
Having the Freedom to Explore	Innovators felt that having creative freedom and flexible work arrangements gave them the ability to explore new ideas and other uses of cyberinfrastructure.	“[My company is] very good at providing the tools – whatever tools we need to do our job, or adapting the environment to be conducive to doing work, you know? They give us tools to collaborate remotely.” (Liaison/educator and technologist, Idaho, 7/2016)
Staying on Top of the Trends	Inception teams expressed the value of keeping informed on the latest emerging tools and technologies in the field of cyberinfrastructure.	“...keeping knowledgeable with what’s going on in the cyberinfrastructure arena, keeping in touch with the vendors, learning what’s coming down their pipeline and having knowledge of that, and then looking at ways that we can leverage and make use of these new – the new hardware or whatever it is – technologies as they come along.” (Administrator, facilitator/educator and user, Utah, 4/2016)
Encouraging Diversity in Team Composition	Developers indicated the importance of having team members of various backgrounds, demographics, and disciplines.	“One of the things that is on the rise is multidisciplinary science where it takes specialists in different disciplines working together to adequately represent a problem.” (Administrator and technologist, Wyoming, 4/2016)

Conclusion

The 7 best social and organizational practices of successful science gateway and CI projects that resulted from the study can serve as a guideline for teams to organize their projects and success. These findings are important because the social and organizational practices behind a product can increase teams’ abilities to optimize their potential to produce innovative work. This information not only serves the CI community, but it is also valuable for central and higher administration of a university. In addition, this study adds to the literature of organizational communication and diffusion research as it highlights the organization behind organizations and the role that they play in promoting diffusion and adoption.

References

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