Strategic Opinion Leadership for the Adoption and Diffusion of Cyberinfrastructure

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Introduction

For over a decade, the National Science Foundation has been funding the development of cyberinfrastructure (CI) to accelerate and promote breakthrough research. CI can be considered a complex system, involving a diverse network of interdependent technologies, remote instruments, big datasets, dispersed experts, diverse institutions, etc. (Kee, 2016). Implementation of CI allows for researchers to keep up with computing demands of modern sciences and big data; however, in order to advance CI, organizations must strategically drive influence within their organization.

Literature Review

The Diffusion of Innovations theory by Everett Rogers (2003; here after referred to simply as diffusion theory) is the most cited communication theory, and the second most cited social science theory to date (Kee, 2016; Rice, 2009). Diffusion theory sets out to predict adoption and diffusion through a complex model based on innovation attributes, adopter categories, diffusion networks, and opinion leadership. Specifically, this investigation focuses on opinion leadership as it relates to the diffusion of cyberinfrastructure.

Opinion leaders influence the attitudes, beliefs, motivations, and behaviors of others (Valente & Pumpuang, 2007). Individuals who are perceived as credible, likeable, and trustworthy play key roles in promoting behavior change (Rogers, 2003). Opinion leaders who embody these characteristics have the power to informally influence for or against a new innovation. Opinion leaders remove barriers to change and increase the rate of diffusion of innovations among peers (Valente & Davis, 2007). It is important to note that opinion leaders represent the norms and beliefs of their community (Kee, in press) and therefore can be considered "linkages" and "pipes" through which influence flows within a social network. It is evident that opinion leaders play a crucial role in informally influencing adoption and diffusion within communities.

Past research has demonstrated the benefits of utilizing opinion leadership as compared to other interventions (Flodgren et al., 2011). Although the literature has defined opinion leaders as individuals who spread the ideas of new innovations, there is limited research on *how* to use opinion leadership as a strategy to promote desired social change (Valente & Davis, 1999). Current research on opinion leadership tends to suggest interventions at the stage of initial recruitment. In order to extend this body of literature, this poster focuses specifically on strategic approaches for maximizing influence that will likely lead to actual adoption. Therefore, we ask the research question, *"What are the different strategies that opinion leaders can employ to promote CI adoption and diffusion?"*

Methodology

This poster employed the grounded theory approach (Corbin & Strauss, 1990) and analyzed 15 interviews conducted with members in the e-science community, such as directors, domain scientists, and PIs. Participants were from a diverse range of institutions and states across the U.S. Following a semi-structured protocol, interviews were conducted by telephone. Guided by the stated research question, the co-authors performed multiple iterations of data analysis and literature integration, yielding preliminary findings presented in this poster.

Findings

Storytelling

Narrative Engagement theory uses narratives to target and shape cognition and decision-making (Miller-Day & Hecht, 2013). Furthermore, Browning and Morris (2012) emphasizes how stories affect the structure of organizations. Through conversational messages, opinion leaders then influence attitudes and behavioral changes (Kelly, 2004).

- "Letting people know what they can take advantage of and tailoring the message to their particular use cases so that they can understand the benefits of actually taking advantage of the CI or ACI [Division of Advanced Cyberinfrastructure]. I think that is the first step— bringing the message home to their subject matter that they can understand the impact CI can have on their work, their role, their teaching and education." (Administrator, MA, 3/31/16)
- "We have evolved our presentation from the beginning to spending a lot of work in the last eighteen methods to getting a lot of good examples that we can pick up if we know the audience we're talking to…so you got to be really careful in tailoring a pitch to them and picking the examples." (Administrator, Washington D.C., 4/13/16)

Teach-to-Fish

The Teach-to-fish strategy highlights how opinion leaders facilitate and train others to adopt an innovation. Opinion leaders may also operate as facilitators, as facilitators may also be opinion leaders (Kitson et al., 1998). These advocates have experience with the use of the innovations and can help spread influence about the innovations as well (ACI-REF, 2016).

- "The ones that tend to do best are the ones that also invest in human resources to a company in CI. So if you have a great cluster but you have nobody in person that can help when people get stuck... it's going to be much harder. You may not have a great resource but at least you have someone to get them through the hoop" (Facilitator, SC, 4/06/16)
- "Outreach is the recruitment end--- that means we go out to conferences; we do campus visits and give them that initial first presentation and discussion about what XSEDE offers and national resources. Maybe we can tell them about local resources or regional sources. But that's the initial--here is CI and this is what it can do for you kind of talk. That is the recruitment where you get their attention, and they say "Maybe that's applies to my research" (Administrator, Washington D.C., 4/13/16)

One-to-Many

The one-to-many strategy offers recognized opinion leaders to connect to community members in order to accelerate diffusion of innovation (Valente & Davis, 1999). Also these influential leaders are positioned within their community and use interpersonal communication to link the flow of information (Flodgren et al., 2011). This strategy enables an opinion leader to spread information to many members in their community.

- "A few years ago we decided that it would be better to have a single point person to deal with new users as well as become more proactive in reaching to new users or potential users of our systems." (Administrator, UT, 4/06/16)
- "Identify the key individuals in labs that are the ones that are the early adopters but the lab itself is a laggard, and scale that early that adopter so that they can help their community. By doing that you help broader group of people and by that our project is able to reach more meaningfully to a bigger community. But If you don't have that one individual or a handful of individuals in that lab the energy to bring everyone up to that level of understanding and adoption is much much higher." (Technologist, AZ, 4/29/16)

Conclusion

This investigation offers three strategic approaches that opinion leaders can utilize to accelerate adoption and diffusion of new innovations: narrative theory, teach-to-fish, and one-to-many. Collectively, these three approaches are interrelated and can be employed to navigate the channels of influence within any given community. Adapted from Miller-Day and Hecht (2013), these channels of influence are: *from peers, to peers, and through peers*. Opinion leaders are members within their community and therefore considered peers (Dearing, 2009; Valente & Pumpuang, 2007). Through the channels of influence, information starts *from peers*, in that opinion leaders construct a personal narrative about their experience using a new innovation. Consequently , these opinion leaders spread this message *to peers*, recruit opinion leaders, and teach them how to use the innovation. Through recruitment, the original opinion leaders utilize the teach-to-fish approach in that this new group will continue to influence other peers. Ultimately, the innovation spreads *through peers*, as one opinion leader influences many other peers in their circles; strategically, opinion leaders should employ the one-to-many strategy in this phase of diffusion. Through the approach of *from peers, to peers, and through peers*, opinion leaders have the potential to influence fellow community members. Opinion leaders of the e-science community can utilize the strategies of narrative theory, teach-to-fish, and one-to-many in influencing their peers to adopt CI. If these strategies are implemented successfully, CI will gain increasing momentum in the research community.

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