Evaluating Public Sector Innovation in Networks: Extending the Reach of the National Cancer Institute's Web-based Health Communication Intervention Research Initiative

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Abstract

Network analysis is gaining prominence in public management, as intergovernmental and inter-sectoral networks increasingly become a part of policy and program implementation. Network structures typically involve an identity-type of relation, i.e., interpersonal relationships based on shared values and outlooks. One of the authors (Rogers), a pioneer in the communications and innovation fields, has defined a network as "interconnected individuals who are linked by patterned communication flows," indicating therefore both micro- and macro-cultural dimensions of communications (Rogers & Agarwala-Rogers, 1976, p.10). Consequently, interpersonal and intercultural communications may be seen as prominent variables in network-based efforts at the diffusion of innovation. This study reports on the application of communications audit and evaluation techniques to the assessment and development of a web-based, cancer prevention nutrition-education project of the National Cancer Institute of the U.S. Department of Health and Human Services across seven national demonstration sites, including project sites in northern New Mexico and Southern Colorado. The authors are involved in an early evaluation of the project, the *Health Communication Intervention Research Initiative,* which is in its third year of implementation by a network of research agencies, nonprofit organizations, community and tribal organizations, as well as the National Cancer Institute.

Introduction: Network Theory and the Diffusion of Computer-based Innovation

In network settings, the quality of internal and external network communications may become a salient determinant of the efficacy of interorganizational programs. The quality of network communications depends on bridging activities, as "boundary spanners" (managers, outreach workers, public communications officers, trainers) address organizational challenges—everything from human resource development to public education efforts—and perform essential integrative functions.

Cultural differences among the parties involved in communications, as well as disparities in their value orientations and goal commitments, may thwart the development and integration of information systems (IT) particular, as researcher Rivera has found in a study of the failure of an automated record retrieval system at the U.S. Bureau of Land Management (Rivera & Casias, 2001). The ability of networks and coalitions to effect policy innovation depends on goal congruence, shared values, and sufficient cultural compatibility (Mahajan & Peterson, 1985).

Researchers looking at network-based innovation have thus begun to emphasize the nature of networked organizations as social communities with potentialities and attributes of their own

(Kogut & Zander, 1996). Fichman and Kemerer (1993) have proposed that computer-based program innovations are prone to an *assimilation gap*, owing to a combination of: (1) strongly increasing returns to adoption and (2) substantial knowledge barriers impeding adoption. Increasing returns to adoption may owe to several causes, including network dynamics themselves, scale economies, informational returns, and reductions in transaction costs. Adoption of innovations, and therefore their diffusion, is impeded when knowledge and skill acquisition is made difficult by implementers, however unwittingly.

Communicative Conventions and Innovation Diffusion

As individuals and groups collaborate in networks, they tacitly or explicitly agree on certain communicative conventions. Some conventions are taken for granted, as cultural norms, while others result from negotiation, bargaining, and compromise. Communications and coordination presuppose shared valuation systems (Rogers, 1995). It is in this vein that Cooper and Zmud (1990) view IT-based implementation as a process involving both technological diffusion and social-network creation. They build an implementation model that turns on Rogers' postulate of mutual causation in innovation-diffusion between the *sociocultural organization* of senders and that of adopters.

The concept of implementation has been studied in the network literature in relation to the acceptance of new information technology (Davis 1989). The diffusion of innovation literature, largely initiated by the work of Rogers (Rogers 1995, Rogers & Shoemaker 1971) and developed by others (e.g. Cooper & Zmud 1990, Lai & Mahapatra 1997), has also addressed the relation between implementation and adoption. Rogers regards implementation as one step in the diffusion process: It occurs when an individual (or decisional unit) puts an innovation to use. Rogers' work indicates that diffusion is strongly related to program or policy implementation *over time*, involving timing and sequencing decisions. This thesis is further developed by Kwon and Zmud (1987), who specify six temporal stages: initiation, decision, adaptation, acceptance, routinization, and infusion.

A common failure of network analysis and network management alike is to take network system level interactions for granted, rather than tracing them over time (as do epidemiologists in following the course of disease), therefore missing causal sequences (Salancik, 1995). By their very nature, networks can obscure connections among decisions, actions, implementation steps, and program impacts. Network functioning can also reduce program feedback, particularly from target communities, thereby impeding communications.

Increasingly, therefore, there is recognition that networks can create both positive outcomes (such as flexibility and adaptability) and liabilities (exclusion, loss of feedback; Brown & Duguid 1996). Linkages among organizations can prompt the generation and adoption of innovations, but the likelihood of systemic dysfunction is also high. It has been observed, for instance, that networks can become excessively inward-looking, or insular (Cohen & Levinthal, 1990). Insularity is often a function of cultural gaps and communications failures between network members across organizations and their stakeholders, client groups, or constituencies.

Program Analyses—the National Library of Medicine and the National Cancer Institute

In a 1997 study of network innovation involving computer information systems, "The Diffusion of Innovations Model and Outreach from the National Network of Libraries of Medicine to Native American Communities," Everett Rogers and Karyn Scott evaluated National Library of Medicine (NLM) outreach activities intended to convey scientific findings to health professionals and thus, indirectly, to the public. The program fell short of expectations for lack of sufficient attention to communication strategies affecting adoption rates. These included the elements of *compatibility* (whether an innovation is perceived as being consistent with the existing cultural values, expectations, and needs of potential adopters) and *complexity* (whether an innovation is perceived as difficult to understand and use, often for cultural reasons).

The NLM program's target audiences ranged from participants in Continuing Medical Education courses, to health professionals concerned with the AIDS epidemic, to others working in poverty areas in the South or serving Native Americans in the Pacific Northwest, to Historically Black Colleges and Universities. The communication channels used to reach these intended audiences included one-on-one training in practitioners' offices and training sessions and demonstrations for small groups of health professionals in hospitals, clinics, and medical libraries.

Rogers and Scott concluded that the program did not sufficiently capitalize on outreach to early adopters and opinion leaders, at least to the extent needed to attain critical mass and a selfsustaining diffusion process. Outreach activities were aimed primarily at the "least advantaged" segment (the "information poor") of health care professionals, who also happened to serve least advantaged populations. However, the diffusion strategy of targeting early adopters (so as to achieve critical mass in diffusion) was not used, nor were cultural differences among intended audiences sufficiently taken into account. Thus the potential for the innovation-diffusion process to multiply existing resources was not realized.

The lesson learned from this evaluation study is that policy or program implementation involving computer-based learning requires close attention to cultural differences in communications, along with outreach strategies targeting early adopters and opinion leaders. The failure to acknowledge the importance of cultural affinities in innovation diffusion—i.e., of *homophily*, or the tendency to selectively interact with and learn from individuals seen as similar to self—was a crucial implementation variable in this context.

The authors' current research aims to develop, implement, and report an evaluation of a web-based national program intended to close the so-called "digital divide" in the diffusion of public health information. The program has been carried out in low-income and minority communities across the nation by the National Cancer Institute (NCI) and the National Institutes of Health (NIH) of the United States Department of Health and Human Services, with additional sponsorship from the National Technical Information Administration, the National Library of Medicine, eRate, and others.

The NCI program, the *Health Communication Intervention Research Initiative*, in whose design and deployment author Rogers has been involved, is an NCI-funded cancer-prevention nutrition education effort using the Internet and web. It is being implemented nationally in seven study sites by a network of research and social service institutions, for the purpose of (1) effectively reaching cultural or linguistic minority, low-income communities, and otherwise addressing

disparities of care, with special concern for women's preventive health education; and (2) ascertaining which approaches work best, and why, in different settings. Preliminary evaluations have been reported in the practitioner literature (Kreps & Viswanath, 2001; Buller et al., 2001).

One project location under review covers forty sites in the rural Upper Rio Grande Valley of northern New Mexico and southern Colorado. Program implementation and review are being conducted by a far-reaching implementation network, one that includes the University of New Mexico, Colorado State University, the Cancer Research Center in Denver, and the La Plaza Telecommunity and San Luis Valley Community Interconnections nonprofit organizations.

Process innovations in these sites are providing an alternative approach within the NCI national program. These innovations entail (1) the use of change agents ("Community Outreach Trainers") drawn from target communities and therefore equipped to operate in them with maximum impact and (2) the use of tribal languages and Spanish in both program outreach and web-based training. Author Rogers is evaluating both of these project elements against the backdrop of the national program. Author Rivera's interest is in evaluating the role of provider networks in determining program success, as well as in assessing the interrelation of technical and cultural systems in these networks.

Using communications audit and cross-case evaluation techniques, data have been gathered through pretests, cross-sectional surveys, focus group studies, and structured interviews, to gauge successful and less-than-successful patterns of innovation in this program across all seven sites. Of particular interest has been the very process of implementation through a large-scale network of governmental, nonprofit, and community organizations.

Preliminary findings suggest that communications and coordination among providers—from webpage design to the timing of program deployment across participant agencies and contractors—are critical for programmatic success. Equally important are cultural communication factors, indicating the appropriateness of pretest and focus group research as means of determining the self-identified priorities and needs of client communities.

Factors related to cultural communications, sequencing, and the extent of involvement by early adopters and opinion leaders have been found to be key to the evaluation research underway. Specifically, the *homophily* construct has been found to be an essential element in the construction and conduct of research in this project. The researchers have attended, at the same time, to indicators of network functioning, for instance to indices of goal congruence among providers and clients, as well as to the formative role of computer and web technologies themselves, consistent with the opening discussion of the diffusion literature.

Lastly, the role of community leaders (such as tribal governors) and community advocates in expanding the scope, base, and reach of the program—by virtue of their increasing involvement in it—is being examined. Because of their involvement, and their insistence on cultural sensitivity and fit, they have helped redefine key program elements, including the delineation of performance criteria The program's ultimate success may depend on the extent of its responsiveness to these efforts–in other words, on the extent that the network grows to fully accommodate its culturally diverse constituencies.

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