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Meeting the needs of people and forests around the globe



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Science and Community Change: Technology Transfer, Urban Forestry, and Local Government Policy

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Recent research has significantly expanded our knowledge base regarding the environmental, social, and economic benefits and functions of urban forests. This knowledge has been translated into an abundance of technology transfer products, distributed across many U.S. cities.

Certain products are intended to inform, and then convince local decisionmakers about the need to commit resources to urban forest management and green infrastructure. Anecdotal feedback from across the United States is that adoption of urban forestry programs in cities is at point “B” on the adoption curve (Figure 1). We know little about the actual influence of technology transfer products on local elected leaders or the professional staff of municipal government (such as planners or public works directors). We also have little knowledge about technology transfer impact on urban forest policy and actions at the local government level.

This presentation will report results from an ongoing research program. As the research proceeds, three

domains of theory are proving relevant: innovation diffusion and adoption (from both organizational and policy perspectives), communities of practice, and open source materials.

Adoption of Innovation

Innovation adoption at the individual level is well understood but organizational innovation adoption, particularly in the public sector, involves additional layers of social interactions. Some general principles apply. Rogers’ model of innovation diffusion (2003) reported five variables that influence the rate at which new ideas or products are adopted by individuals or organizations: (1) the perceived attributes of innovations, (2) the type of innovation decision (i.e., optional, collective or authoritative), (3) the communication channels used, (4) the nature of the social system that is adopting the innovation, and (5) the extent of the change agents’ promotion efforts.

The perceived attributes of innovations are the most researched variable and are thought to account for half of the variability in rate of adoption. Five distinct traits are thought to contribute to the favourable perception of an innovation (Rogers 2003), and may be particularly important in organizational innovation adoption: (1) relative advantage, (2) compatibility, (3) low complexity, (4) trialability, and (5) observability.

Rogers (2003) also identified five sequential stages that organizations move through to adopt new innovations: (1) agenda-setting, (2) need matching, (3) redefining/restructuring, (4) clarifying, and (5) routinizing.

It is likely that social dynamics play out significantly with regard to both innovation trait perception and the stages of organizational innovation adoption. In both instances organizational behaviour is based on the cumulative perceptions and actions of many individuals across a particular organization, such as a municipal government.

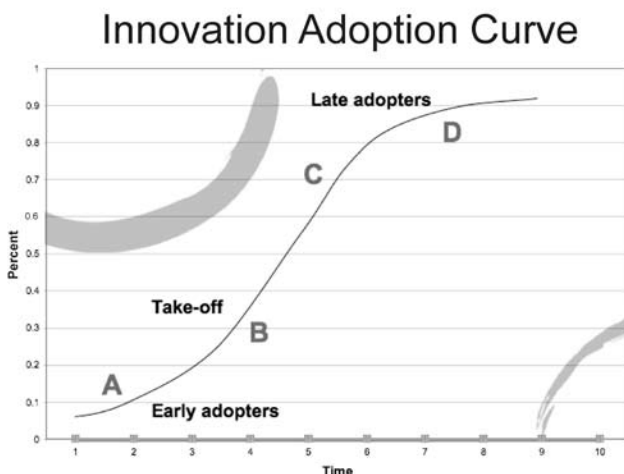


Figure 1. Innovation adoption curve (from Rogers 2003).

Communities of Practice

Communities of practice (CoP) theory offers insight on how distinct subgroups within a larger organization operate, and the potential dynamics of innovation within and between such subgroups. Communities of practice are social structures that lead to social learning, and are formed by people who engage in a process of collective learning in a shared domain of human endeavour (Wenger 1998). They are groups of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly. Three characteristics are crucial: commitment to a shared domain of interest, community relationships built through the pursuit of their interest in the domain, and development of a shared practice or set of resources.

Two important aspects of social learning are reification and participation (Wenger 1998). Reification is the process of giving form to experience and creating something that reflects learning. Active participation is also necessary to the group learning process: it requires both action and connection to others in the group.

Brokers enable knowledge movement (Wenger 1998), being people who belong to more than one community of practice, and act as agents of transfer between communities. Successful brokering involves translation, coordination, and alignment between the perspectives of two or more communities. Boundary encounters also facilitate knowledge transfer, and are bridging events that provide connection between two communities. The success of these encounters, in terms of the transfer and adoption of knowledge, depends on the relationships of the people involved in the encounter (Wenger 1998).

Open Source Authoring

Finally, the transmission of scientific information appears to be an *Open Source* dynamic, in that stakeholders and champions customize the format and relevance of evidence-based sources. Open source software has taken hold in the technology industry over the past decade. It was originally developed as a means to address a “software crisis” – namely that software systems were taking too long to develop, cost too much, and did not work well.

The open source model has been applied to fields other than software (such as a high-performance windsurfing community). The transfer of urban forestry research may be viewed as another

application of the open source model. Urban forestry knowledge tools are often developed by teams or individuals with the same goals in minds as the developers of open source software: to create products that are free, redistributable, modifiable, and non-discriminatory (Feller and Fitzgerald 2000). Many urban forestry tools are freely distributed and are meant to be modified by communities to fit their unique needs and uses, in much the same way that open source software is modifiable. The final version of such products is not determined by their originator; they are adapted for use in an organizational context in order to be more meaningful to a target audience. In the case of urban forestry, target audiences are often professional staff or local policymakers.

Theory Connections

Rogers described the linkages between technology transfer and the diffusion of innovations. Both “deal with causes of *social change*, the process through which the structure and functioning of systems are altered” (Rogers 2002, p 328). Key differences that Rogers noted between the diffusion of innovations and technology transfer are:

- Diffusion is user oriented; technology transfer is producer oriented.
- Diffusion emphasizes individuals and social networks; technology transfer emphasizes organizations.
- Diffusion is spontaneous in nature; technology transfer is planned.
- Diffusion focuses on how innovations, once available in a system, spread among system members and become adopted. Technology transfer focuses on how research results become applied or commercialized.

All three theory sets – diffusion of innovations, communities of practice, and open source – offer insights concerning more effective technology transfer to local government decision makers.

The adoption of urban forestry in response to scientific information is dependent on perceptions of an urban forestry program as a “product,” and appears to proceed along the stages of organizational innovation adoption. Technology transfer may be better served if the social processes of organizations are given as much attention as the natural resource-oriented goals and objectives proposed by urban forestry research.

For instance, communities of practice could play an important role in urban forestry technology transfer. Engaging members of professional communities within cities (beyond natural resources) expands the diffusion and adoption potential. Reification and participation may be processes through which technology tools are developed in an open source fashion. The social learning that occurs through these processes may lead to the adoption of new technologies. Brokers and boundary encounters may promote the transfer of ideas and tools from one internal municipal community to another.

The open source model suggests that urban forestry technology transfer tools can be developed within the context of a community setting, with individuals and organizations taking a basic idea and adapting it to their local needs. Similar to successful open source software projects, urban forestry technology tools that are developed in this manner are more likely to be successful if professional staff are involved, an effective project leader is overseeing the effort, and a strong hierarchy is in place.

A technology transfer assessment is underway to evaluate the effectiveness of urban forestry outreach, in order to provide practical guidelines for adapting existing technology transfer products, and developing and distributing future products. In addition, a community trace analysis will track how science moves within local government and comes to bear on policy decisionmaking. While the research focus is urban forestry, this presentation will translate key theories and findings to a broader set of forestry policy situations.

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