



# The design and management of multi-stakeholder research networks to maximize knowledge mobilization and innovation opportunities in the forest sector



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## ABSTRACT

Our comparative analysis of forest research networks indicates the emergence and strengthening of a new model of knowledge co-production involving knowledge producers and users, with the goal of fostering innovation and addressing challenges facing the forest sector. However, effective movement towards this model requires attention to design and to management, particularly in relation to the expectations of partners (both university and non-university) who are used to traditional models of knowledge production and linear processes of knowledge extension. Based on our survey and literature review, we argue that in the short-term, the objective of producing applied research requires that forest research networks prioritize diverse and tailored knowledge mobilization strategies, rather than emphasizing knowledge production. With regards to the longer-term objective of facilitating new avenues for innovation in the forest sector this requires a knowledge mobilization strategy that entails a level of engagement with partners that is creative and transformative rather than mainly informative. Building an organizational culture of innovation requires a different approach to producing applied research, although many of the same skills are required. Our analysis suggest that if networks are to be effective in both these short and long term objectives, they should foster openness by establishing transparent and responsive organizational processes. Although such policies may exist and be available to partners, we found relatively little information available on the processes of transparency, accountability and conflict resolution within the websites of the networks we compared. Establishing clear roles and consistent channels of communications is imperative to facilitate the efficient and effective management of the network and manage partners' expectations, regardless of the partnership model.

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## 1. Introduction

Formal research networks that represent multi-sector partnerships are becoming increasingly common in national science policy frameworks (Hickey, 2013; OECD, 2010). Such networks coordinate research on complex problems and involve collaborative teams of researchers and partner organizations dispersed over a number of geographically separate sites. In Canada's forest sector, this approach appears particularly relevant as a means of bringing together universities and other research institutions, forest managers (both public and private), government policy makers, and industrial actors with particular interests in transformation and commercialization of forest products. The capabilities, effectiveness and impacts of such forestry networks has been the subject of several recent studies using various approaches (Ellefson et al., 2007; Raitzer, 2010; Scarascia-Mugnozza et al., 2012; Di Matteo et al., 2015).

Developing ways to strengthen knowledge dissemination and implementation appears to be influenced particularly by the conceptual

approach adopted to understand the relationships between the parties and the epistemological orientation of the research collaboration (Fazey et al., 2014). Van Horne et al. (2006), propose an innovation value chain that situates research in response to a need identified by commercial or other interests and proceeding through a series of steps (including commercialization) to terminate with implementation through industrial production or adoption as a newly standardized process. Examining technology transfer, Ellefson et al. (2007) sought to identify a series of key elements that affected the effectiveness and efficiency of programs that sought to improve the application and commercialization of research and technological development. Interestingly, Ellefson and colleagues also distinguished between four conceptual frameworks for scientific investigation: researcher-dependent diffusion of knowledge; an imprecise demand from users; a facilitated interaction between researchers and users; and a direct user-producer relationship. Where Van Horne et al. (2006) see a chain, Rametsteiner and Weiss (2006: 693) propose a more complex system view of innovation "as a complex non-linear process involving a range of actors and different interactions", emphasizing the social elements of the system. The challenge of identifying the different elements of such a system and of

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evaluating effectiveness and impacts are demonstrated in case studies such as that of Raitzer (2010) who established a dollar value of benefits resulting from policy changes in the Indonesian pulp and paper sector based on research by the international organization CIFOR. Raitzer described how a variety of actors (government, industry and non-government organizations) used research undertaken and diffused by CIFOR helped to modify policy – although the study also noted that the benefits “pale in comparison with the magnitude of the problems that remain” (Raitzer, 2010: 1516)

Public–private research partnerships raise a variety of issues, both for traditional research organizations such as universities and for the private sector (Hessels et al., 2014; Bozeman and Boardman, 2014). Institutional, disciplinary and motivational factors can facilitate or act as barriers to more democratic knowledge co-production (Jasanoff, 2004; Barry and Born, 2013). In the forest sector for example, forest scientists may expect research networks to provide funding and resources for specific academic projects, while the forest industry typically seeks information and technology for commercial application. A central question for public–private research partnerships is how to effectively mobilize knowledge to innovate while satisfying the reward and incentive structures of different organizations (Hessels et al., 2014). Levin (2008) suggests that assessing the effectiveness of knowledge mobilization in this context can be done using as a three-part question:

1. how to create research/evidence/knowledge that is rigorous and useful;
2. what processes can most effectively distribute or make available this research/evidence/knowledge; and
3. how to facilitate feedback and interaction among these elements given that the process does not flow simply in one direction.

In this article, we seek to generate a better understanding on how to design and manage public–private research networks to enable knowledge co-production for innovation in the forest sector. Our analysis responds in part to a recent call for “developing a better conceptual framework for explaining technology transfer and for guiding the subsequent design and implementation of technology transfer programs” in the forest sector (Ellefson et al., 2011). We also respond to Hickey’s (2013) observation that studies showed the need for improvements in interactions between scientists and government and in communication with broader society. Accordingly, we choose to focus upon factors that appear to contribute to stronger relationships between public and private actors engaged in the production, diffusion and application of knowledge, with a focus on spurring innovation in the private sector. This appears to be equally applicable whether one adopts a value chain view of innovation (eg. Van Horne et al., 2006) or a systems view (eg. Rametsteiner and Weiss, 2006). Finally, we also seek to compare some of the conclusions from earlier work on the Canadian Sustainable Forest Management Network<sup>1</sup> (Klenk and Hickey, 2009, 2010, 2011, 2012; Klenk et al., 2010a, 2010b) with the experiences of other research networks operating elsewhere in Canada and internationally.

Our review first introduces a range of theories that offer insights on how research or created knowledge is mobilized into policy, industrial or commercial situations, resulting in applied knowledge. We then present an analytical framework, with seven key structures and processes based upon studies of the SFMN (Klenk and Hickey, 2012). Using this framework, we analyze the structure and processes of 22 research networks in the forest sector, both within and outside Canada. Finally, we make practical recommendations using our analytical framework to help practitioners with the design, management and assessment of knowledge mobilization and innovation in research networks in the forest sector.

<sup>1</sup> The Sustainable Forest Management Network (SFMN) operated from 1995 to 2009 and is still the most well-known example of a public–private forest research network in Canada.

## 2. Literature review

### 2.1. Research utilization and knowledge management in policy and practice

Over the last decade, there have been a large number of studies conducted to improve our understanding of the use of scientific information in forest policy (Konijnendijk, 2004; Mayer and Rametsteiner, 2004; Spilisbury and Nasi, 2006; Janse, 2006, 2008; Klenk and Hickey, 2012; Stevanov et al., 2013; Böcher and Krott, 2014). Many studies have developed an “ideal type” model of forest policy development as a framework to study research utilization. Typically, the policy process model is conceived as a series of activities that overlap, but may have different information requirements: setting the policy agenda, policy formulation, policy selection and legitimization, policy implementation, policy evaluation, and policy revision (Janse, 2006, 2008). Scientific evidence may be used throughout this policy process to focus attention on critical uncertainties, broaden the range of policy options, clarify the relationship between means and ends within particular policy options, simulate policy outcomes, engage in problem-solving activities and provide expert opinion on potential risks of implementing particular policy options. According to the ‘Research, Integration, and Utilization’ (RIU) model, knowledge integration plays a critical boundary-spanning role in enabling science utilization in forest policy (Stevanov et al., 2013; Böcher and Krott, 2014). Other studies have decomposed the science policy interface according to institutional, social, cultural and individual factors. Below we describe how these factors can affect how science is implemented in practice. While the literature we draw upon in this section mostly focuses on the science–policy interface, rather than on private–public research networks, it helps us understand the complex pathways through which science makes it way (or not) into applications.

Explanatory models of research utilization posit four major categories of explanations that have different implications for knowledge management with public–private research networks: engineering, organizational, cultural and interactionist (Landry et al., 2003; Amara et al., 2004; Ellefson et al., 2011). The engineering model suggests that research uptake depends on the characteristics of the research findings according to traditional scientific metrics of quality and type (e.g., applied versus fundamental research). From this perspective, strategic choices in terms of publication outputs must consider how best to communicate the complexity, validity, applicability and relevance of research results for the intended knowledge users. The likelihood of uptake is therefore directly influenced by the compatibility of research findings with an application context (Landry et al., 2003).

The organizational explanation on the other hand, focuses on the capacity of knowledge users to obtain relevant and applicable knowledge. Here the focus is on the positions of the knowledge users (e.g., managers, professionals, implementers) and the routines through which they acquire information. Strategic decisions in this perspective have to do with targeting research outputs that correspond to the information gathering practices of knowledge users (Ellefson et al., 2011). Greater research uptake is expected if knowledge users consider the research pertinent, if it corresponds to their needs and if they can rely on its credibility and legitimacy and if it is timely (Landry et al., 2003; Amara et al., 2004).

From a different perspective, the cultural explanation refers to differences in organizational cultures and information needs as potential obstacles to knowledge mobilization. Organizational structures that seek to bridge the gap between science and application include efforts to support knowledge extension and receptor capacity. Capacity-building workshops would seem germane to bridge the gap between organizations cultures in multi-stakeholder research networks (Landry et al., 2003; Amara et al., 2004). Van Horne et al. (2012) documented the ways in which research partnerships created different types of value for the various stakeholders.

Finally, the interactionist explanation emphasizes the social ties between the producers and the users of knowledge, especially trust and

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