



Evaluating the outcomes associated with an innovative change in a state-level transportation project prioritization process: A case study of Vermont



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ARTICLE INFO

Article history:

Received 25 June 2014

Received in revised form

13 May 2015

Accepted 24 May 2015

Available online 14 June 2015

Keywords:

Innovation

Transportation funding

Project prioritization

Equity

Gini coefficient

Multi-criteria analysis

ABSTRACT

In this paper we examine the outcomes associated with an innovative change in a state-level transportation project prioritization process within the United States (U.S.). A foundational component of the innovation is the development and implementation of a novel multi-criteria analysis (MCA) tool to aid decision-makers. The pre and post-MCA project prioritization processes are described in detail for the state of Vermont, and we use a mixed methodological approach to empirically evaluate the outcomes associated with the innovative change with respect to three objectives: (1) to make the project prioritization process more transparent, (2) to improve the project prioritization process by incorporating well-defined, objective evaluation criteria into the decision-making process, and (3) to reduce inequality in the allocation of transportation project funds between the local jurisdictions. We demonstrate that the innovative change in the project prioritization process was clearly successful in accomplishing objectives 1 and 2, but does not appear to be successful with respect to accomplishing objective 3. The findings are discussed in the context of the state of Vermont, and we offer suggestions for how funding inequality might be addressed in the future.

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1. Introduction

In the United States (U.S.), the process of vetting, prioritizing, and funding transportation infrastructure projects can be extremely complex. Various agencies at the national, state, and local levels are responsible for planning, building and maintaining different components of a very large, interconnected, and open access transportation network. Although a specific agency may bear the primary responsibility for building and maintaining a particular infrastructure component, most transportation infrastructure projects are financed through a mixture of public funding sources and are explicitly designed to serve “the public”, not just the local constituency within the geographical boundaries of the project. Because transportation infrastructure projects have the potential to affect mobility, accessibility, and economic competitiveness both within and outside of the jurisdictional boundaries where the project occurs; the impacts associated with project financing decisions extend well beyond the immediate vicinity of the individual projects being considered

(Novak et al., 2012; Cohen, 2010; Scott et al., 2006). Decisions regarding which transportation projects are ultimately funded are not only important at the local and regional levels, but to the state as a whole.

We define the term *innovation* according to the 3rd edition of the *Oslo Manual* as “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (OECD, 2010, p. 1). The innovation discussed in this paper centers on the development and implementation of multi-criteria analysis (MCA) decision-support tool that significantly changed the entire transportation project prioritization process within the state of Vermont. While the use of MCA by public sector agencies is not necessarily innovative in and of itself, the development and use of an MCA tool in the context of transportation project prioritization by a state-level transportation planning agency within the U.S. appears to be quite innovative. This particular innovation was championed and implemented by the Vermont Agency of Transportation (VAOT), Vermont’s state-level transportation agency, and was motivated by collaborative interactions between a wide range of actors within a large intergovernmental network. We frame the study in the context of empirically evaluating the outcomes associated

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with a specific public sector innovation. In this case, the innovation is not a product, but a process-based improvement.

Within the innovation literature, various sources have examined how public sector innovation may be viewed differently from private sector innovation (Mazzucato, 2014; Lee et al. 2012), how characteristics typically associated with private sector innovation may be applicable to the public sector (Mulgan and Albury, 2003), how innovation is implemented and disseminated throughout different types of intergovernmental networks (Edquist and Zabala-Iturriaga-goitia, 2012; Aschhoff and Sofka, 2009; Walker, 2006), and how the collaborative processes through which innovation is developed are formed (Hoppe and Schmitz, 2013). However, there is a large gap in the literature related to empirically evaluating the outcomes associated with public sector innovation (Bloch and Bugge, 2013). While there are studies that propose a theoretical framework for analyzing innovation with respect to public transportation (Ongkittikul and Geerlings, 2006), that address the need for more innovative thinking when considering transportation policy issues (Weber et al. 2014), and that provide some empirical assessment of operational level technological improvements in the transportation sector such as smart cards, in-vehicle GPS, weigh-in-motion, etc., (Duncan and Graham 2013; Naphade et al., 2011; Wagner, 2008); there are few, if any, studies that attempt to evaluate the impact that a particular innovation has on public decision-making processes and service outcomes in the transportation sector. The scientific contribution of this paper focuses on the outcomes resulting from the implementation of an innovative decision-making process within the transportation sector.

A mixed methodological approach is employed to evaluate the overall “success” of the innovation with respect three specific objectives: (1) to make the transportation infrastructure project prioritization process more transparent to the critical actors within the intergovernmental network, (2) to improve the project prioritization process by incorporating well-defined, objective evaluation criteria that can be used to compare and contrast projects from different infrastructure asset classifications in the decision-making process, and (3) to reduce inequality in the allocation of transportation project funds to localities throughout the state. The mixed methods approach includes qualitative input from stakeholder workshops as well as an examination of the pre and post-MCA project prioritization process documentation. The feedback from the workshops offered insight into the expectations and opinions of the various actors involved in the project prioritization process with respect to all three objectives. We also examined the post-innovation project prioritization decision-making framework and the MCA tool itself to further evaluate all three objectives. A Gini-coefficient analysis was then used to explicitly evaluate objective 3. The Gini analysis provides a quantifiable means for evaluating how the innovative change impacted funding allocation patterns over time. We also consider the use of Gini coefficient analysis to quantitatively measure inequality with respect to the distribution of federal transportation funds and revenues as a novel contribution to the literature (Altshuler, 2013; Hierro et al. 2007). Detailed transportation project data and the associated funding obligations between 1998 and 2010 (inclusive) along with demographic data are employed in the study.

1.1. Project background

This research relates directly to work originally discussed in Zia (2010).¹ As part of the ‘Navigating Trade-offs in Complex Systems’

¹ This report summarizes research activities performed under a 2010 sponsored grant award, ‘Navigating Trade-offs in Complex Systems’, Zia (2010), awarded by the University of Vermont’s Transportation Research Center.

project, several workshops were organized by the Chittenden County Metropolitan Planning Organization (CCMPO), which is the only MPO in the state of Vermont. The primary purpose of these workshops was to evaluate a number of long-term state-level transportation development scenarios, and then to select one of those scenarios for implementation. Prior to these workshops, the research team contacted the VAOT and the CCMPO to see if they would be interested in a research project focused on how the adoption of the MCA tool and new project prioritization process had impacted different localities within Chittenden County. Both organizations expressed interest in the idea, and included discussions on project prioritization, scoring criteria, and weighting in the agenda. Authors A. Zia and C. Koliba were key participants in the workshops, where they were introduced to Vermont’s transportation project prioritization process and were able to listen to the opinions of the various actors. This was the first time that the VAOT had gathered various stakeholders and solicited formal feedback from them regarding their perceptions of the innovative MCA tool and the new project prioritization process. During the workshops, concerns over funding allocation “inequity” were mentioned by several stakeholders. After the research team shared their informal results with the VAOT, the VAOT expressed interest in investigating how “successful” the MCA tool had been, and more specifically, if and how the MCA tool and the new project prioritization process had affected the allocation of project funds throughout the state. The Gini coefficient analyses evolved from these discussions. While the focus of this paper is on empirically evaluating the outcomes associated with an innovation in a state-level transportation project prioritization process (centered on the development and implementation of the MCA tool), the project described in Zia (2010), also led to separate publications addressing, governance informatics (Koliba et al. 2011) and the development of agent-based models for intergovernmental decision making (Zia and Koliba, 2013).

The remainder of the paper is structured as follows. In Section 2, we provide an overview of innovation within public governance networks and briefly discuss the evolution of public sector decision-making models. In Section 3, we describe how transportation infrastructure projects are typically prioritized and funded at the state level in the U.S. We note a number of challenges faced by state, regional, and local transportation planning agencies and discuss how the federal transportation asset management (TAM) programs can influence state-level project prioritization planning. An overview of MCA is presented in Section 4, and the pre and post-innovation project prioritization processes within the state of Vermont are discussed in Sections 4.1 and 4.2 respectively. The data and methods used in the study are presented in Section 5, along with a brief discussion of different views on the concept of equity with respect to transportation policy in Section 5.1. In Section 6, we present the results from the Gini analyses and discuss the effectiveness of the innovative change in the transportation infrastructure project prioritization and funding allocation process with respect to the three objectives identified previously. Section 7 provides a concluding discussion where we consider the implications of this study in the state of Vermont and offer suggestions for future research.

2. Evaluating the impact of innovation within public governance networks

The introduction and proliferation of new practices and ideas within intergovernmental networks is of critical importance with respect to public policy and administration, as government agencies are increasingly being called upon to institute more “innovative” approaches and procedures concerning policy formulation and

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