



Research article

Let sleeping bats lie: Analyzing institutional adaptation to environmental regulatory change through Adaptive Management theory

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ARTICLE INFO

Keywords:

Adaptive Management
 Collaboration
 Outsourcing
 Regulatory shocks
 Transportation agency

ABSTRACT

Employing a case of a state transportation agency, we examine how complex institutions which integrate outsourcing within a bureaucratic process adapt to environmental regulatory changes. In 2012, two endangered species of bats were located outside of their established ranges in northern Georgia. These discoveries required the Georgia Department of Transportation (GDOT) to comply with a new set of federal regulations relating to those species when developing its projects. This article examines how GDOT adapted to new and unforeseen regulations in the face of environmental uncertainty. Using archival and interview data, we describe how GDOT engaged in Adaptive Management (AM) to internalize environmental changes (i.e. sufficiently stabilize the situation so that the project can get back on track). We also examine the role of outsourcing in bureaucratic agencies as an avenue for AM and suggest extending the AM model to describe mediating actors in the adaptive process. Furthermore, we investigate the impact adaptation had on project outcomes by analyzing 81 bridge projects, which are most susceptible to these environmental shocks, from a sample of 429 transportation projects using multivariate regression. We show that GDOT engaged in initial decision-making, iterative learning, and collaboration through a multi-tiered communication structure. We then present evidence supporting the narrative that these strategies helped it mitigate the impact of subsequent environmental shocks and improve project outcomes over time through adaptation.

1. Introduction

State transportation agencies frequently encounter unexpected changes in the environmental and regulatory conditions surrounding their projects' environmental assessments (Amekudzi and Meyer, 2005; Landres et al., 1999). How they adapt to these shocks can be a key factor in determining how environmental concerns are addressed in infrastructure projects (such as roads, bridges, and ports) as well as how long those projects take to complete. Adaptive Management (AM) is a strategy that uses collaboration and experimentation to generate learning. AM provides a theoretical foundation for understanding agency behavior and performance under conditions of high uncertainty such as those created by environmental shocks (Norton, 2003, 2005). However, current formulations of AM do not fully address increasingly popular New Public Management (NPM) practices which emphasize greater reliance upon market forces and business strategies drawn from the private sector (Barzelay, 2001). We present a case study of the Georgia Department of Transportation (GDOT) as it responded to a series of environmental shocks stemming from discoveries of

endangered bats within its jurisdiction. When endangered species were detected in the local environment, normal operations at GDOT were disrupted and mediation was required in order to determine how they should be dealt with on ongoing projects. We focus on how GDOT uses other mediating actors, primarily environmental consultants, to assist in the development of compliance procedures.

AM is often presented as an alternative, and better, approach of environmental management than the structured procedures associated with traditional command and control bureaucracy (Norton, 2015; Holling and Meffe, 1996; Gunderson, 2001a). By observing the use of two common NPM practices, outsourcing (contracting out environmental analyses to private consultants) and performance measurement (monitoring the time taken to get projects approved), we explore the robustness of AM theory in explaining bureaucratic behavioral outcomes.

AM prescribes that policy-makers and their agents should test ambiguities and conflicts which arise due to environmental uncertainty through an iterative decision-making process coupled with rigorous monitoring of environmental performance (Williams, 2011a). AM often

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includes processes for greater democratic engagement with stakeholders as a means of better articulating the competing values associated with an environmental shock (Norton, 2005). It is commonly integrated in collaborative governance, a system of organization focused on incorporating agents and stakeholders from diverse perspectives in the decision-making process (Ansell and Gash, 2008; Innes and Booher, 2004; McGuire, 2006). NPM and more recent movements in administration, such as New Public Service (NPS) (Denhardt and Denhardt, 2007) are also based on prescriptive theories about how management should be conducted. NPM argues for the incorporation of private sector, incentives-based management into the public sector (Hood, 1991). NPS builds off of this, emphasizing attention to elements of collaborative governance such as democratic values (Bryson et al., 2014). Though they prioritize different goals, these strategies can be commensurable with one another. NPM's emphasis on outsourcing can facilitate elements of collaboration promoted by NPS and collaborative governance. Furthermore, its recommendations for rigorous performance review and feedback from stakeholders (or clients in NPM language) are similar to the monitoring and feedback systems in AM.

Similar to many other public agencies in the US, state departments of transportation (SDOTs) rely heavily on performance review (Poister, 1997), and have increasingly expanded their use of consultants (Warne, 2003). Environmental analysts at these agencies organize environmental processes and facilitate project management at the state and federal levels with these external consultants. The consultants themselves might be viewed as having several different roles. First, they might be viewed as agents of the department, providing labor to complete the information needs of bureaucracy. In this context, consultants may be responsible for performing the technical studies and National Environmental Policy Act (NEPA) documentation necessary for environmental approval. Second, they might be considered scientific and technical specialists who apply their expertise to provide a detailed understanding of local conditions, which agency analysts may be too removed to observe. Third, consultants might mediate collaboration between various stakeholders in the decision-making process. These consultants function as mediating actors by brokering collaboration between bureaucratic agents at GDOT, local governments, regulators, research communities, and local stakeholders. We study these three roles that environmental consultants play over a series of transportation projects, examining the relationship between iterative learning processes and the development of bureaucratic compliance procedures. Current formulations of AM do not model collaboration and adaptation as commensurable with bureaucratic organization or account for the role outsourcing plays in the adaptive process. However, when we account for NPM and collaborative practices in our case study, we observe a more complicated relationship between adaptive and bureaucratic processes. After the regulatory landscape changed, GDOT maintained the hierarchical structure typical of a bureaucratic organization. However, it engaged in structural adaptation with the consulting community, shifting its relationships to provide consultants with input into how to respond to the new regulations. Furthermore, members of the consulting community adapted to the market, deciding whether to specialize in bats themselves and act as mediating agents for GDOT in dealing with the issue, or defer to other firms, subcontracting bat-related work out to their peers. This altered individual firms' relationships with GDOT and each other. The complexity of these relationships, and the mediating role consultants had the flexibility to maintain, allowed adaptation to occur within the overall bureaucratic architecture at GDOT.

Section 2 reviews the existing literature concerning AM, then describes the specific context for AM at GDOT. Section 3 describes the case context, our data, and research methodology. Section 4 investigates our results, first describing AM engagement by GDOT and detailing the ways in which it deviates from the AM model, and then quantitatively evaluating the impact that this management strategy had on project outcomes. Section 5 suggests improvements to the AM

model, and discusses the policy implications of our research. Section 6 reviews our conclusions.

2. Adaptive Management Models

Traditional command and control approaches to management have been criticized as ineffective for environmental subjects (Holling and Meffe, 1996). Top-down methods often result in unexpected drawbacks for both human and natural resources due to inflexibility of the bureaucratic structure. For SDOTs, the importance of maintaining project schedules and budgets can drive management behavior. However, management strategies that focus on understanding the complex environment in which their operations are embedded are better suited for adapting to uncertain conditions because they account for the entire system rather than a single variable which may not be well defined (Gunderson, 2001b; Norton, 2015).

AM was developed as a process for resource supervision which facilitates learning and is particularly useful for problems that can be described as “wicked” (Rittel and Webber, 1973; Walters and Hilborn, 1978). This strategy is an effective method of management for natural resources (Freeman, 2010; Norton, 2005). It provides a method for managing subjects under uncertainty by treating them as natural experiments in order to sort through rival theories of ecosystem variation (Gunderson, 2001b). Situations which exist under uncertainty, have spatial or temporal variation, require cost-benefit analyses, or are constrained to institutional or stakeholder requirements, all justify the use of AM (Gregory et al., 2006). It can be employed in any situation where management could realistically be improved by reducing uncertainty (Williams, 2011b).

When managers determine their initial goals and then iteratively alter their decisions in order to learn how to improve management outcomes within the context of their specific environment, their behavior is consistent with AM. This marks a departure from most public management theories where agencies negotiate organizational goals that then set the parameters for acceptable decision-making and performance at the project level (Rainey, 2014).

Early conceptualizations of AM divide the process into two phases of behavior (Nichols et al., 2007), which we incorporate into our study. Managers first focus on *goal determination* (the process of making decisions about how a subject should be managed) using multi-partner collaboration. This creates an arena for discourse involving potentially conflicting values and methodological ideas. *Goal determination* is characterized by collaboration between public officials, scientific and technical specialists, and other stakeholders. For state transportation projects, the goal determination group consists of representatives from federal and state regulatory agencies, local governments, SDOT staff, and consultants working for the SDOT.

In cases of environmental shock, an AM process may begin at the project level and build over time toward a larger organizational goal setting process as knowledge from different projects accrues in an iterative fashion. The collaborative, and in some cases democratic, aspect of goal setting draws in knowledge across a range of disciplines and ideologies to form management goals and objectives (Norton, 2015). *Iterative management* can then take place as managers evaluate how close each project comes to meeting their objectives and integrating what they learned from that success (or failure) into the next round of goal setting. By not stating firm organizational goals up front, agencies can prioritize between management alternatives by weighing their success against each other (Burgman, 2005).

Fig. 1 provides a depiction of the relationship between *goal determination* and *iterative management*, as adapted from Williams (2011a). AM is marked by the presence of multi-partner collaboration and the formation of measurable objectives, decision-making in the face of uncertainty, monitoring and assessment to reduce that uncertainty, learning, and iterative decision-making over time.

For an agency dealing with an environmental shock, the portfolio of

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