

# Machine Learning Algorithms for Big Data Applications With Policy Implementation

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## ABSTRACT

This article examines the policy implementation literature using a text mining technique known as a structural topic model (STM) to conduct a comprehensive analysis of 547 articles published by 11 major journals between 2000 and 2019. The subject analyzed was the policy implementation literature, and the search included titles, keywords, and abstracts. The application of the STM not only allowed the authors to provide snapshots of different research topics and variation across covariates but also let them track the evolution and influence of topics over time. Examining the policy implementation literature has contributed to the understanding of public policy areas; the authors also provided recommendations for future studies in policy implementation.

## KEYWORDS

Policy Implementation, Structural Topic Model, Text Mining, Topic Diversity

## INTRODUCTION

Policy implementation is a critical part of public policy, referred to as the process of carrying out an underlying policy decision, typically made in a statute (Sabatier & Mazmanian, 1980). Researchers have always paid much more attention to policy design and policy evaluation and less on how to implement these policies (Schofield, 2001). The first studies of implementation theory occurred in Oakland, California (Pressman & Wildavsky, 1984). Since then, there has been a rapid rise in the study of policy implementation. Previous work has focused on critical analysis or synthesis of different approaches (Sabatier, 1986). However, policy implementation research remains a niche area of interest.

Given that many studies of policy implementation provide evidence of the importance of implementation, the aim of this study was to further current knowledge of their rigidities. Based on selected published research, this research combines the application of the text mining technique with a structural topic model (STM) to provide a snapshot of policy implementation studies from January 2000 to July 2019 as well as incorporating information about the documents (Roberts et al., 2013). Within the literature analysis, we have tried to highlight the manifestation of the rigidities in policy implementation study development to facilitate future research (Moro et al., 2019). Furthermore, the STM could allow the researcher to discover topics from textual data without predicting them.

Text mining and topic modeling have been successfully used as a valuable tools in research on ethnic marketing (Moro et al., 2019) and cause-related marketing (Guerreiro et al., 2016). The generally accepted use of advanced text mining methodology could provide a comprehensive data-driven analysis of research (Liu et al., 2018). We chose unsupervised algorithms because we had no a priori expectations for categories of scholarly study, especially on topics some researchers might not have considered (Reich et al., 2014). The unsupervised learning model could help researchers

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analyze textual data without human intervention. Until now, this methodology has not been applied to the policy implementation literature. In this paper, we demonstrate policy implementation research using topic models instead of focusing on the technical details of the STM.

The main contributions of this study are as follows. First, we uncovered the prevalence and content of topics regarding policy implementation, based on text mining and the STM. Second, we explored the changing trends regarding the proportion of scholarly attention to different topics. Third, we evaluated the levels of scholarly impact by each topic. The rest of this paper is broken into four sections. The next section gives a brief overview of policy implementation, after which we outline text mining and an STM that includes covariates. We then present our results before, finally, drawing our conclusions for policy implementation research.

## **POLICY IMPLEMENTATION LITERATURE AND SYNTHESIS**

### **Generational Study**

In recent years, interest has been growing in summarizing the policy implementation field or parts of it by a variety of methods. Some preliminary work in policy implementation has focused primarily on case studies that address the obstacles between the definition and execution of policy (DeLeon & DeLeon, 2002). The first generation of implementation research did not examine the policy implementation process and focused less on generic implementation theory (Van Meter & Van Horn, 1975). Furthermore, the conclusions of case-based analysis cannot change the analysis of other policies and/or their forecasts of the effects of policy. However, the first-generation literature contributions to scholars' understanding of these specific study streams, even collectively, could help bring the attention of the public to policy failure.

The second generation of implementation studies was much more multivariate and comparative after analysis (Goggin, 1986), as with the top-down perspective and bottom-up perspective. Scholars have drawn our attention to the variety of variables that influence policy implementation and have tried to find the best policy proposal for its successful implementation (DeLeon & DeLeon, 2002). The main limitation of this generation is the definition of policy implementation and the implementation framework. Representative scholars have espoused specific opinions, and therefore there is no common ground for policy implementation. For example, those with a top-down perspective believe that implementation starts with a government's policy decision, which is then implemented, whereas those with a bottom-up perspective focus on the interests of the local area (Sabatier, 1986).

The third generation of implementation studies attempted to synthesize the two perspectives using multiple measures and methods (O'Toole, 1986). The aim of the study of implementation for third-generation research is much more scientific than it might have been for the previous two generations (Goggin, 1990). These researchers were concerned with the variety of policies, time, and governmental units, and then they attempted to predict future implementation behavior. A researcher who conducted a recent review of the literature on policy implementation tried overcoming the problems created by a shortage of cases and an excess of variables in research (Goggin, 1986). Unfortunately, there has been no sustained interest in research from a third-generation perspective (O'Toole Jr, 2000).

### **Theories of Implementation**

It is worth pointing out the three perspectives of policy implementation research: top-down, bottom-up, and synthesis. Sabatier and Mazmanian (1980) and Van Meter and Van Horn (1975) are the representative scholars for the top-down perspective. They have stressed the process of policy implementation and the critical role of the central government. The Sabatier and Mazmanian (1980) framework presents three categories of variables that influence policy implementation. The three stages include 17 variables linked to the tractability of the problem, the ability of the statute to structure implementation and non-statutory variables. We should note that each of the stages can

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