Adopting open source software in public administration: The importance of boundary spanners and political commitment

Alexander van Loon *, Dimiter Toshkov

Leiden University, The Netherlands

ARTICLE INFO

ABSTRACT

Open source software (OSS) adoption in public administrations around the world has been uneven. Despite the substantive economic and efficiency-related implications of OSS adoption, there is surprisingly little research into the determinants of the diffusion of OSS across public sector jurisdictions. In this article we explore the variation in OSS adoption among Dutch local administrations. The Dutch central government adopted a policy to stimulate the use of OSS in the public sector, but the non-mandatory character of the policy resulted in great differences in the degree of adoption of OSS at the local level. Using data from a new survey of municipalities in the Netherlands and proportional odds statistical models to analyze the data, we show that the degree of OSS adoption crucially depends on the presence of boundary spanners and political commitment within the local government. On the other hand, oft-suspected factors like financial stress and jurisdiction size have no discernible effects. Our findings have implications for understanding the spread of OSS in the public sector and for public policies designed to encourage OSS diffusion.

© 2015 Elsevier Inc. All rights reserved.

What are the factors that determine the spread of institutional and technological innovations in the public sector? How can we explain why certain public organizations are more likely to be at the forefront of innovation while others lag behind? These questions have a central place in the study of public administration, but we still have only imperfect understanding of how individual-, organization-, and system-level variables interact to produce the patterns of diffusion we observe in the world. In this article we analyze the diffusion of open-source software (OSS) in Dutch municipalities: a process that can shed new light on the diffusion of innovations in the public sector since there was a great degree of variation in the extent to which these organizations progressed towards OSS adoption. The variety of outcomes in a set of similar organizations provides us with a window of opportunity to isolate potential causal factors that can account for the differences: an opportunity that we pursue in this study.

OSS provides many potential benefits for public and private organizations. For example, it is often available for no license costs, it is not the exclusive property of a single software vendor, and users have the freedom to study, change and redistribute OSS. Not surprisingly, OSS is making gains in market share rapidly. A study from 2009 estimated that worldwide revenue from OSS would grow at an annual rate of 22.4% to reach US $8.1 billion by 2013. The economic crisis is an extra stimulus for that growth (International Data Group, 2009).

The advantages of using OSS have not gone unnoticed in the public sector. Perhaps one of the most well-known users of OSS in the public sector is the municipality of Munich. It started a plan to migrate to OSS in 2003 with the aim to finish the migration of all of its 12,000 workstations by the end of 2012. The municipality calculated that the current cost of its migration project is € 11.7 million, while an upgrade to a comparable environment based on Microsoft Windows and Office would have required € 15.52 million, excluding costs of € 2.8 million for license fees for upgrades recurring every 3 to 4 years for a Microsoft infrastructure (von Eitzen, 2012).

Even larger migrations have been undertaken elsewhere in Europe. The Spanish autonomous region of Extremadura decided in 2002 to migrate to Linux as well. With 40,000 workstations (Hillenius, 2012c) it expected to save € 30 million annually (Hillenius, 2012b). The French national police force decided to migrate to OSS in 2004. This enabled the organization, which had 90,000 workstations in 2004, to save over € 50 million on software licenses, hardware and maintenance since the migration was started (Hillenius, 2009).

Globally, there have been 354 initiatives for OSS policies from 2000 to 2009, of which 245 have been approved. 235 of those are national policies but only 54 are mandatory. 163 of these initiatives originate from Europe, with the Netherlands having implemented a preferential OSS policy in 2002 (Lewis, 2010). In that year the Dutch House of Representatives accepted a motion which requested the government to ensure that all software used in the public sector would work with open standards by the year 2006 and to stimulate the use of OSS in the public sector. The arguments given for the motion were the lack of competition

---

* Corresponding author.
E-mail address: a.vanloon@alexandervanloon.nl (A. van Loon).

in the software market and the high switching costs for choosing a different software vendor (Dutch House of Representatives, 2002).

This resulted in several policy programs started by the national government since then. The last program 'The Netherlands in Open Connection' (*Nederland Open in Verbinding*, abbreviated as NOiV) was launched in 2007. For open standards it enacted a 'comply-or-explain and commit' regime. The regime requires that public sector organizations use select open standards for IT projects and demanded an explanation and plan for future implementation if that requirement was not met. It explicitly required that governmental organizations would support the OpenDocument Format, an open standard for documents. Compared to the open standards policy, the OSS policy was less demanding. It asked public organizations to formulate an implementation strategy for OSS. The government announced research on the release of its own software as OSS and on the economic benefits of OSS. The program bureau would provide support and advice to further the adoption of open standards and OSS and measure progress with a ranking and periodic reports (Ministry of Economic Affairs, 2007).

Especially the OSS policy was a stimulus policy which lacked instruments for enforcing adherence. As such, adherence to the policy was highly dependent on the discretion of the governmental organizations. When the NOiV program was ended in December 2011 the program's final progress report judged the policy to have been effective (NOiV, 2011a). Yet, the program's benchmarks revealed that there still existed large variation in the adoption of OSS (NOiV, 2011b).

In this article we explore the variation in adoption of the NOiV program to reveal the factors that explain the differential success in the diffusion of OSS. We employ data from a new survey of the Dutch municipalities to test the possible impact of a number of variables related to the organizational, political and economic contexts. Using proportional odds statistical models to analyze the data, we show that the degree of OSS adoption crucially depends on the presence of boundary spanners and political commitment within the local government. On the other hand, oft-suspected factors like financial stress and jurisdiction size have no discernible effects. Our findings have implications for understanding the spread of OSS in the public sector and for public policies designed to encourage OSS diffusion.

The remainder of the article proceeds as follows. The next section presents an overview of the existing literature on OSS diffusion from which we derive our theory and the hypotheses we test. Next, we outline our research design, and the operationalization and measurement of our variables. Next, we present the results from the empirical statistical analyses. Finally, the concluding section summarizes our inferences and draws their implications.

Towards an explanation of the diffusion of open source software in public administrations

The literature on organizational learning and the diffusion of policy, institutional and technological innovations is immense and spans public administration, organization studies, sociology and other related disciplines. In this review we will focus only on the most-directly relevant part of this scholarship that deals with the spread of innovations related to e-government in the public sector. Since OSS is part of the information technologies (IT) infrastructure of organizations, it is natural to expect that the findings from studying the diffusion of e-government in general would suggest potential explanations for the adoption of OSS as well. Few studies deal with the adoption of OSS in the public sector in specific and the theoretical insights they offer while valuable remain limited. For example, Cassell (2008) performed an exploratory qualitative study of the motivations of four German municipalities to adopt OSS. Ven and Verelst (2008b) have been the only ones so far to execute a quantitative study. They investigated factors in the adoption decisions of OSS on a sample of both public and private Belgian organizations. The study of e-government has identified the novel use of IT in government as an important element for increasing public trust in

government (Welch, Hinnant, & Moon, 2005), curbing corruption (Shim & Eom, 2009), enhancing political control of the bureaucracy (Ahn, 2011), and reducing red tape (Welch, 2007). Although the enthusiasm for the transformative potential of e-government has been somewhat cooled lately (Baldwin, Gauld, & Goldfinch, 2012; Norris & Reddick, 2013), the e-government agenda remains one of the most important innovation drives facing the public administrations of the XXI century. Since the progress towards the adoption of e-government practices has been highly uneven both between and within countries, much academic attention has been focused on the topic.

The resulting literature has identified a plethora of possible explanatory factors that operate at three distinct levels: systemic, organizational, and individual. Important factors in the organizational adoption of innovations can be categorized as the characteristics of the innovation itself, the characteristics of the adopting organization and environmental influences (Frambach & Schillewaert, 2002). The interactions between individual organizations and their environment (e.g. fiscal or political pressures), the institutional characteristics of organizations (e.g. bureaucratic structures or form of government) and personal cognitive biases and predisposition have all been implicated in explaining the patterns of innovation diffusion.

In a big cross-national study of e-government adoption, Lee and Chang find evidence for the impact of policy learning, political norms, competition, and citizen pressure. Analyzing digital innovativeness of the American states over time, Tolbert and Mossberger (2011) conclude that institutional capacity, and the modernization of state institutions, are important for continued innovation. Ganapati (2011) also emphasizes institutional barriers for the utilization of new technologies in the public sector. In a study of the diffusion of six e-government practices among American municipalities, Ahn (2011) finds that the interaction of the preferences of the elected mayors and the perceptions of nonelected officials shape the chances of an innovation being adopted. More generally, the political environment and the bureaucratic structure seem to matter (see also Ahn (2011)). Focusing on one particular institutional characteristic, Nelson and Svara (2012) argue that the form of municipal government (council-manager or not) has the greatest leverage for explaining the adoption of e-government innovative practices in the US. In a study of e-government in Italy conducted at the municipal level, Nasi, Frosini, and Cristofoli (2011) find that organizational factors are more important than the environmental ones in explaining the pattern of adoptions. In sum, there is a broad consensus that institutional characteristics matter, although different authors have quite different understanding of which the relevant institutions are. But there is more to explaining diffusion than institutions.

Jun and Weare (2011) emphasize the search for efficiency and the need for legitimacy in the eyes of the peer organizations. In a longitudinal study of the Italian e-government policy, Mele (2008) argues that a 'substantial osmosis between the policy and the political community' was needed to put the policy in place and to sustain the e-government program in the country. Studying the spread of geo-information technologies, Vonk, Geertman, and Schot (2007) conclude that individuals knowledgeable of the technology, like geo-information specialists and planners, should participate in the design of organizational diffusion policies and formal strategies to enhance the process. Bhatti, Olsen, and Pedersen (2011) single out the presence of administrative professionals acting as drivers of innovation in their analysis of the spread of integrated citizen service centers among Dutch municipalities. Looking more into the individual-level decision making process of the people responsible for authorizing technological innovations (e-voting machines in particular), Moynihan & Lavertu (2012) find the effect of cognitive biases and predispositions, like general trust in technologies. So it appears that the presence of individuals with the right set of knowledge and preferences can have a big impact on the chance of successful adoption of innovations. We focus on this insight and incorporate it the design of our empirical study. In addition, we attempt to address factors operating at the environmental level (fiscal pressures),