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Determinants of data sharing in U.S. city governments

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ABSTRACT

Although the rise of big data, open government, and social media imply greater data sharing, expectations currently do not match reality as many consider data exchange in government to be inadequate. Based on prior research, Additionally, the paper distinguishes technical management capacity and technical engagement capacity effects on agencies' sharing behavior. We test hypotheses predicting sharing behavior of municipal government agencies with other agencies and with non-government organizations using data from a 2012 national survey of U.S. municipal government managers. We find that data sharing with both government and non-government organizations is more strongly determined by persuasive mechanisms and technical engagement capacity, although technical management capacity is also important for sharing with other government agencies. Conclusions provide insights for future research directions and practice.

1. Introduction

This is the era of big data, social media, open source software, and 'open access' as numerous authors in academia and the popular press have noted (Agrawal, Das, & El Abbadi, 2011; Bollier & Firestone, 2010; Lohr, 2012). Government and private organizations are collecting, manipulating, and sharing large quantities of data. Agencies such as the National Security Agency have drawn attention because of data mining activities, science is generating and using quantities of data in physics and genomics the likes of which the world has never seen, healthcare organizations are compiling massive amounts of individual health data, and Facebook has succeeded in centralizing the flow of massive amounts of social and behavioral data. Describing the modern wired world as data rich is certainly appropriate.

Despite the promise of data and data sharing, there is also the reality that data are neither freely available nor typically considered common property (Onsrud & Rushton, 1995). Rather multiple constraints limit access, exchange, and use of data. Ownership exists in the hands of both providers and receivers and access is typically provisional due to a variety of ownership related rationales: privacy, property rights, maintenance of control, and economic or strategic advantage (Campbell & Masser, 1995; Harvey & Tulloch, 2006). Lack of trust and confidence that data will be used appropriately results in a lower likelihood of transfer; differences in technical standards and capacity also create barriers to sharing (Budhathoki & Nedovic-Budic, 2007; Nedovic-Budic & Pinto, 2000; Omran, Bregt, & Crompvoets, 2007). Because the gap between the need for and the provision of data ranks among the modern challenges that societies face, it is increasingly important to better understand the mechanisms that facilitate and hinder data sharing in government.

Government is a major collector and sharer of data; national security, weather forecasting, space exploration, income and taxation, and trade and commerce are just a few areas in which government is a prominent player. Third party government contractors and service providers also collect, store, and use data as part of normal operations. Nevertheless, government is often criticized for not allowing sufficient access to data across agencies, usually after media reports have identified instances in which lack of data sharing has led to negative consequences. This is most obvious in cases of national security or emergency response where various agencies are continuously under pressure to improve coordination to maintain public safety (Schooley & Horan, 2007). However, more mundane examples exist. For example, government services are less effective when data are not effectively shared among child welfare agencies, between police and other public security agencies, or among state or regional planning agencies (Nedovic-Budic & Pinto, 1999; Gil-Garcia, Schneider, Pardo, & Cresswell, 2005; Howell, Kelly, Palmer, & Mangum, 2004; McGuirk, O'Neill, & Mee, 2015).

Technological advances that enable large databases raise the potential for more effective and efficient government, yet the persistence of organizational, contextual, and technical barriers continue to hamper data sharing that often underlies improvements (Gil-Garcia, 2012). For example, limited resources at the local government level result in significant cross-agency interdependencies that depend on shared

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data to improve coordination and collaboration (Fan, Zhang, & Yen, 2014). This paper aims to increase knowledge about the factors that enable and constrain data sharing at the local government level, improving general understanding of the phenomenon and assisting managers and policy makers in ways that might improve data sharing. More research focused on this problem will help develop solutions that improve data sharing and reduce the pernicious effects of information asymmetries (Clarkson, Jacobsen, & Batcheller, 2007). To this end, the paper addresses two primary questions: (1) *To what extent and with whom are municipal governments actually engaged in data sharing?* (2) *What factors enhance or reduce data sharing activity of municipal governments?*

The paper addresses these questions by examining the case of data sharing in U.S. city governments. Using data from a 2012 national survey of lead managers in five city government departments – police, finance, community development, parks and recreation, and mayor's offices – in 500 cities, we first document variation in data sharing behavior across and within departments. Second, we model data sharing behavior. We develop four general hypotheses based on rationales of decision context (coercive and persuasive) and technical capacity (management and engagement). We follow the hypotheses with an explanation of the data and methods used in the study. Fourth, we present the analysis and empirical results. We then present a discussion that explores the significance of the results and a brief concluding section.

2. Literature and hypotheses

Data sharing refers to the transfer of data between two or more organizations or individuals (Calkins & Weatherbe, 1995; Harvey & Tulloch, 2006). Prior research has identified several broad determinants of data sharing including: relational, organizational, institutional, and technical (Budhathoki & Nedovic-Budic, 2007; Harvey & Tulloch, 2006; McDougall, 2006; Nedovic-Budic, Pinto, & Warnecke, 2004; Onsrud & Rushton, 1995; Tulloch & Harvey, 2007; Wehn de Montalvo, 2003b). Azad and Wiggins (1995), based on work by Oliver (1990), developed six rationales for inter-organizational data sharing: necessity, asymmetry, reciprocity, efficiency, stability, and legitimacy. Necessity refers to authority-based demands and mandates for data sharing, typically set out in legislation and regulation. Asymmetry refers to the power or influence that one organization has over another to demand data, while reciprocity addresses a resource exchange perspective. Efficiency, stability, and legitimacy are constructs that predict the development of data sharing relationships for cost savings, uncertainty reduction, and reputational reasons, respectively (Azad & Wiggins, 1995; Oliver, 1990). Others have found empirical support for distinguishing types of inter-organizational interdependencies, intensity of relationships, and locus of data sharing (internal or external) to explain data sharing (Nedovic-Budic et al., 2004; Nedovic-Budic & Pinto, 1999, 2000, 2001). For example, Omran et al. (2007), using theory of planned behavior and culture theory, showed that trust, uncertainty, incentives, resource scarcity, autonomy, and rules determine sharing behavior. Wehn de Montalvo (2003a, 2003b) found that attitudes toward data sharing, social pressure, perceived control, and willingness to share data as predictors of sharing.

While this paper builds on these prior studies, it takes an organization decision-making approach in which institutional mechanisms, inter-organizational context, and organizational technical capacities are the focal determinants of data sharing. In general, we posit that organization decisions to share data are affected by the institutions that act upon them (Ostrom, 1991; Williams and Fedorowicz, 2011), the inter-organizational context within which they operate (Hart and Saunders, 1997), and the internal capacities that enable them to act (Bozeman & Bretschneider, 1986; Kraemer & King, 1986). Organizations share when it is required, beneficial and feasible to do so. *Coercion* as an institutional mechanism and *persuasion* as an inter-organizational mechanism apply power and create incentives that influence data sharing decisions in local governments. Additionally, two types of organizational technical capacity – *technical management capacity* and *technical engagement capacity* – enable data sharing.

Coercive institutional mechanisms are applied through regulations, laws, or ordinances that mandate data sharing or when accountability structures require entities to share data (Peled, 2014). Coercive mechanisms are typically built upon power asymmetries and entail some form of punishment or hierarchically imposed sanction for noncompliance (Hart and Saunders, 1997). Government agencies are often required by regulations, legislative mandates, or formal policies to share or not share data (Dawes, 1996; Zhang, Dawes, & Sarkis, 2005; Nedovic-Budic & Pinto, 1999). While there are legal consequences to noncompliance that may encourage sharing, coercion has its limitations; coercion can reduce trust between two parties, potentially reducing interest and incentives for sharing (Hart and Saunders, 1997). For example, mandates for data sharing can expose problems with data quality or technical capacity that result in negative reputational effects or other negative consequences for organizations. Under such conditions, the application of coercive power can be ineffective, particularly in an administrative setting where bureaucracies may be able to resist coercion (Hart and Saunders, 1997; Luna-Reyes, 2006).

Similar to coercive mechanisms, *persuasive* inter-organizational mechanisms take advantage of power asymmetries, but the consequences are often considered to be less punitive and more incentive oriented (Hart and Saunders, 1997; Akbulut-Bailey, 2011). Organizations are persuaded to share data when they become convinced that doing so is for some reason in their best interests; when sharing data carries greater benefit than detriment for the agency (Gil-Garcia, 2012). Persuasion is a complex process that depends significantly on the power and exchange relationships that form the foundation of the inter-organizational environment; organizations are more likely to share data when they are embedded in long term exchange relationships or when resource dependencies encourage it (Constant, Kiesler, & Sproull, 1994; Hart and Saunders, 1997; Guo & Acar, 2005). For example, when agencies seek support from external stakeholders in participative decision making processes, they are more willing to share data as a means of demonstrating commitment, facilitating communication, encouraging trust, and enabling problem solving (Welch, 2012).

In addition to these external mechanisms, two types of organization level technical capacity factors encourage data sharing: *technical management capacity* and *technical engagement capacity*. *Technical management capacity* concerns the technical competence, absorptive capacity, and understanding of employees and management, and captures the extent of organizational readiness to employ technology to enable agency work including data sharing. The literature includes both the broader research on absorptive capacity and specific studies on technical capacity determinants of data exchange (Azad & Wiggins, 1995; Gil-Garcia, Chengalur-Smith, & Duchessi, 2007; Harvey & Tulloch, 2006; Kamal, Singh, & Ahmad, 2012). *Technical engagement capacity* captures the ability of the organization to digitally interface with external groups and organizations. In part, technical engagement requires common technical standards, platforms, software, and applications that enable effective interface (Douglass, Allard, Tenopir, Wu, & Frame, 2014; Kamal et al., 2012; Otjacques, Hitzelberger, & Feltz, 2007). But technical engagement capacity also comprises the application of technology that facilitates participation, engagement, transparency, and other communication-dependent activities undertaken with external stakeholders. Here we can include much of the literature that considers communication technology, including social media and visualization technology, as important components (Chun, Shulman, Sandoval, & Hovy, 2010; Graves & Hendler, 2013; Morton, Balazinska, Grossman, & Mackinlay, 2014).

In sum, we expect four primary constructs – *coercion*, *persuasion*, *technical management capacity*, and *technical engagement capacity* – to predict government data sharing. The next sections articulate specific hypotheses for each.

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