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Abstract:

Public organizations often turn to the private sector for guidance and best practice examples when faced with technological or organizational change. However, private-sector business practices do not always translate neatly into the government domain. In this study, we analyze data from 82 collaborative projects in the public safety domain to establish whether public-sector IT outsourcing (ITO) practices match practices that researchers have documented in the private sector. In particular, we focus on the ITO decision process components and outcomes that they have identified as challenging for public-sector ITO. Results show that: 1) public organizations adopt ITO due to expertise gaps and cost considerations more than any other factor, 2) capital funding's availability affects ITO decisions, 3) public-sector organizations outsource complex systems more often, 4) multiple successful ITO configurations exist, and 5) like the private sector, knowledge sharing and the vendor's involvement in defining requirements represent important factors for whether ITO projects in public organizations succeed. Our descriptive, exploratory study extends previous ITO research by providing a framing for the fragmented literature on ITO in the public sector and laying a foundation for more systematic and theory-based scholarship. Our observations also guide governmental practitioners in their sourcing decisions.

Keywords: IT Outsourcing, Cross-sectoral Collaboration, Digital Government, Inter-organizational Collaboration in the Public Sector, Public Safety Networks, Government IT, Federal Government Outsourcing.

1 Introduction

Public organizations often turn to the private sector for guidance and best practice examples when faced with technological or organizational change. However, private-sector business practices do not always translate neatly into the government domain. Public organizations often need to adapt these practices to accommodate the public context's unique requirements. Partnerships with private companies and outsourcing to private-sector vendors represent two organizational strategies that public organizations have successfully embraced (i.e., Joha & Jansenn, 2010); however, these cross-sectoral collaborations face many challenges, such as conflicts in ethics and values (Mulgan, 2005), mismatches in behavior expectations (Chen & Perry, 2003), and legal constraints (i.e., Ruzzier, Sohal, Katna & Zyngier, 2008). Nevertheless, these partnerships have gained traction in, among others, the information technology outsourcing (ITO) domain.

Both private and public organizations have used ITO for almost three decades, and the frequency with which public organizations use it has increased significantly in recent years (Luna-Reyes, Gil-Garcia & Romero, 2012). However, in government settings, ITO projects have a high failure rate (Sullivan & Ngwenyama, 2005; Vintar & Stanimirovic, 2011), and effectively managing an outsourced project remains challenging and prone to pitfalls.

In this study, we establish whether public-sector ITO practices match practices that researchers have documented in the private sector. In particular, we focus on the ITO decision process components and outcomes that they have identified as challenging for public-sector ITO.

In their 97-pages long seminal paper, Dibbern, Goles, Hirschheim, and Jayatilaka (2004) proposed an ITO-inspired interpretation of Simon's (1960) classic decision making model. We adopt Dibbern et al.'s (2004) model (which we refer to henceforth as the "stage model") as the guiding structure to explore and as the driver for three overriding research questions that direct this study. We then map our findings from comprehensively reviewing the private sector ITO literature (Wiener, Vogel & Amberg, 2010; Lacity, Khan, Yan, & Willcocks, 2010; Lacity, Yan, & Khan, 2017) and many public-sector ITO studies onto the stage model to further frame our analysis. This paper is descriptive and exploratory in nature, and we do not attempt to provide a theoretical basis for the highly cited stage model. Rather, with this study, we lay the groundwork to stimulate future theory development by drawing attention to empirically validated cross-sectoral differences using well-established framing. In addition, public-sector organizations can use the evidence we present about the model's efficacy to better guide ITO decision making.

We use data from a large set of phone interviews with representatives of collaborative projects in the public safety domain (called "public safety networks" or PSNs) as a source of empirical evidence for the public sector-specific ITO trends. We found that the PSNs commonly used ITO and that cost considerations and staffing gaps instigated ITO adoption (i.e., the "why" component in the stage model). We also note the influence that risk and uncertainty coming from the PSNs' dependence on capital funding had on their ITO decisions. Contrary to parallel findings in the private sector, we found that public-sector organizations had a higher likelihood to outsource highly complex projects. Our findings also reinforce the importance of knowledge- and expertise-acquisition concerns in the public-sector ITO decision.

The PSNs do not uniformly outsource a common set of developmental or operational task types with some outsourcing only technical support and others delegating the whole project to an ITO provider (i.e., the "what" component in the stage model). The most consistently successful outsourcing configurations included, at minimum, the project's systems analysis and design activities and its support function. The PSNs seemed to have less concern for the lack of flexibility and communication difficulties that the literature on public-sector ITO has reported—many recognized the importance of knowledge sharing and were open to involving vendors in various IT activities. Taken together, these characteristics of public-sector IT outsourcing demonstrate the complexity of assessing the bases for why public organizations undertake ITO and the range and uniqueness of factors that influence whether these relationships succeed (i.e., the "outcome" component in the stage model).

The paper proceeds as follows: In Section 2, we introduce and discuss the empirical framework, which provides the set of themes that we address in this study. In Section 3, we describe our methodology and discuss the context for the PSNs from which we drew our data. In Section 4, we analyze the data and present our findings. In Section 5, we discuss identified trends and their implications, present the study's potential contributions and limitations, and discuss directions for future research. Finally, in Section 6, we conclude the paper.

2   Background

ITO scholarship goes back almost as long as the practice itself. ITO research initially focused almost exclusively on the practice's economic aspects but soon expanded into social and organizational perspectives because researchers recognized outsourcing's strategic potential, its possible risks, and, more recently, the critical importance of client-vendor relationship management (e.g., Liang, Wang, Xue, & Cui, 2016).

Researchers published over 800 papers on ITO between 1992 and 2013 that employed various theoretical lenses and prescribed many models and frameworks (Liang et al., 2016). In their review, Dibbern et al. (2004) cover the theories, approaches, and research methods that researchers used in the first decade of ITO research and propose a "stage model" of information systems outsourcing based on Simon's (1960) classic four-stage (i.e., intelligence, design, choice, and implementation) decision-making model. We favor the stage model as it provides a comprehensive framework for managing an IT outsourcing project from the decision-making and implementation phases to the assessment phase.

The first column in Table 1 captures the five stages in Dibbern et al.'s (2004) ITO stage model that gives structure and organization to the extensive existing body of ITO research. Several subsequent comprehensive literature reviews have used the stage model as an organizing vehicle. To guide our exploratory efforts, we include themes from later well-referenced and comprehensive ITO reviews. For example, Westner and Strahringer (2010) and Wiener et al. (2010) applied the stage model to offshore outsourcing. We note that they suggest combining the "which" and the "how" stages based on the argument that one cannot easily draw a clear line between the two. We show the resulting four stages in the second column in Table 1. We adopt these four stages from Wiener et al. (2010) as guides for organizing our study results.

Lacity et al. (2017) coded 257 empirical academic publications, and their work represents the most comprehensive analysis of the outsourcing literature to date. They grouped the factors underlying each study into themes focusing on determinants of sourcing decisions or determinants of outsourcing success. Accordingly, we mapped the themed determinants of ITO decisions and success as Lacity et al. (2017) reported to the phases in the stage model (third and fifth columns of Table 1, respectively) and used Wiener et al.'s (2010) literature review to verify our mapping.

Following the notation that Lacity et al. (2017) used, we coded the effects that various factors have on ITO decisions and success in Table 1. Specifically, we coded factors that at least 80 percent of papers found a positive or negative relationship for as "(++)" and "(--)", respectively and items that 60 to 80 percent of papers found positive or negative relationship for as "(+)" and "(−)", respectively. We also included one item that 14 researchers have studied with mixed results, which we mark with"?".

Table 1. Empirical Framework for the Study based on the Stage Model and Literature Reviews

Dibbern et al. (2004)	Wiener et al. (2010)	Lacity et al. (2017)				Public-sector ITO literature examples
		Determinants of ITO decisions	Effect	Determinants of ITO success	Effect	
"Why" Determinants / advantages / disadvantages	"Why" Benefits and risks	Cost reduction	(++)			Cost minimization as a legal requirement (Burnes & Anastasiadis, 2003; Alaranta & Jarvenpaa, 2010)
		Access to expertise	(++)			Access to expertise (Owusu-Nyamekye, 2016), Rigid hiring policies (Khalfan & Gough, 2002; Willcocks & Currie, 1997).
		Business risk	(-)	Uncertainty	(-)	Risk/uncertainty created by short-term budgets (Burnes & Anastasiadis, 2003; Swar, Moon, Oh, & Rhee, 2012; Willcocks & Currie, 1997)
		External / internal influence and mimetic influences	(++)			Lack of vision and strategic objectives beyond the period of government mandate (Vintar & Stanimirovic, 2011), institutional pressures (Ya Ni & Bretschneider, 2007; De Looff, 1996)

		Service complexity, interdependence	(--)	Service complexity	(--)	Inter-organizational and public safety systems are highly complex and high-risk systems (Tomasino, 2013; Tomasino, Fedorowicz, Williams, Gentner, & Hughes, 2014)
"What" Degree of outsourcing	"What" Degree and ownership	Fear of losing control, security concerns	(-)			Lack of trust in vendor (Rusu & Jensen, 2015; Swar et al., 2012), fear of loss of control (Lin, Pervan, & McDermid, 2007; Willcocks & Currie, 1997; Peled, 2001, Cox, Roberts, & Walton, 2012)
		Client's technical and methodological capability	(++)	Client's outsourcing readiness	(++)	Excessive and indiscriminate outsourcing, lack of outsourcing strategy (Cordella & Willcocks, 2010; Vintar & Stanimirovic, 2011; Willcocks & Currie, 1997)
"Which" Decision-making guidelines, procedures and stakeholders	"How" Relationship governance, project management			Management commitment	(++)	Lack of management commitment (Chen & Perry, 2003; Tomasino et al., 2014; Owusu-Nyamekye, 2016)
"How" Vendor selection, Relationship building, and management				Evaluation process, management capabilities	(++)	Public managers stick with the guidance and do not try to develop better control mechanisms (De Looff, 1996; Lin et al., 2007; Sullivan & Ngwenyama, 2005)
"Outcome" Experiences, types. and determinants	"Outcome" Best practices, determinants of success			Degree of outsourcing	?	Excessive outsourcing may lead to project failure (Willcocks & Currie, 1997), loss of control and over-dependence on the vendor (Vintar & Stanimirovic, 2011)
				Knowledge sharing, communication	(++)	Flexibility (Owusu-Nyamekye, 2016; Rusu & Jensen, 2015; Swar et al., 2012), lack of flexibility and informal communication (Guah & Currie, 2007; Hancox & Hackney, 1999; Swar et al., 2012)
				Relational Governance	(++)	Risk aversion and sticking to the contract (Cox et al., 2012); Strategic decision-making, leadership, change management capability (Owusu-Nyamekye, 2016)
				Trust, commitment	(++)	Cooperation, trust, mutual understanding affect outsourcing success (Rusu & Jensen, 2015; Swar et al., 2012)

Unlike general ITO scholarship, which includes hundreds of publications and many systematic reviews, the scholarship on outsourcing in the public sector remains scarce and highly geographically and disciplinarily scattered (Gantman, 2017). Organizations in both sectors readily apply some general ITO-related findings. However, differences in organizational values, priorities, and culture (e.g., Boyne, 2002; Van Der Wal, Huberts, Van Den Heuvel, & Kolthoff, 2006); information-management approaches (Bozeman & Bretschneider, 1986); and attitudes toward cross-sectional collaborations (Ya Ni & Bretschneider, 2007; Swar et al., 2012) suggest that one cannot blindly apply private sector research to the public sector. In the rightmost column in Table 1, we provide example findings on public-sector ITO related to each research theme. In particular, we emphasize studies that illustrate sector-specific differentiators.

Researchers conducted almost all the studies that Lacity et al. (2017) and Wiener et al. (2010) reviewed in private-sector companies. In their review, Wiener et al. also focused on offshoring, an uncommon practice in the public sector. As a result, we focused on variables that pertain most to the public sector and left out others, such as vendor capabilities and offshore countries' characteristics.

In our analysis, we focus on the impact of the determinants in the third and fifth columns in Table 1 on 1) ITO decisions ("why" and "what") and 2) an ITO initiative's success ("outcome") in the public sector. The "how" stage requires a more nuanced analysis than our data can accommodate, and we exclude it from this study. We grey the themes that represent this stage in Table 1. Thus, in this paper, we address the following research questions:

> **RQ1: Why**: why do public organizations choose to outsource IT?
>
> **RQ2: What**: what IT outsourcing arrangements do public organizations typically use?
>
> **RQ3: Outcome**: what factors determine success for ITO in public organizations?

We study select themes that Lacity et al. (2010, 2017) identified as important for ITO decisions or ITO success in each stage. In the "why" stage, we focus on uncertainty and service complexity. In the "what" stage, we focus on client organizations' readiness and the project parts that they chose to outsource. In the "outcome" stage, we link the degree of outsourcing in projects to their success. In Sections 2.1 to 2.3, we briefly review literature about these stages and themes.

2.1   The "Why" Stage: Why Do Public Organizations Choose to Outsource IT?

Many researchers have studied ITO decision-making determinants, particularly in the private sector (Dibbern, Chin & Heinzl, 2012). Earlier research commonly focused on the motivation to pursue outsourcing arrangements (i.e., 63 percent (164 of 259) of all relations that Lacity et al. (2017) examined, which we reflect in this study with our "why" question).

2.1.1   Why: Costs, IT Expertise Gap, and Mandates Drive Outsourcing Decisions

The original motivation behind private-sector outsourcing decisions tended to concern economic factors (i.e., cost efficiency); however, strategic factors (i.e., focusing on the core business, gaining access to expertise) soon grew to become central decision factors in the private sector (e.g., Lacity, Khan & Willcocks, 2009; Liang et al., 2016).

Research has found mixed results on the transition from economic to strategic factors as the main motivation for ITO in the public sector. Several studies report on requirements for governmental agencies to outsource everything that an outside contractor can do at a lower cost (Burnes & Anastasiadis, 2003) and cite regulations to hire the lowest bidder on a tender (Alaranta & Jarvenpaa, 2010). These elective or regulated cost-cutting requirements suggest an economic motivation for the decision to outsource. Other authors found that rigid employment processes and a widespread inability to match compensation levels that privately owned companies offer create serious difficulties in recruiting and retaining IT professionals in the public sector, which leaves ITO as the only real opportunity for them to attain high-level technical knowledge (e.g. Khalfan & Gough, 2002; Willcocks & Currie, 1997). Regulations, policies, or other mandate from higher authorities often prevail over an agency's internal sourcing strategy preferences (Gantman, 2017).

Since some of these drivers are similar and others differ between the two sectors, we include Lacity et al.'s (2017) cost reduction and access to expertise themes to examine whether the public sector has indeed followed the private sector in pursuing economic and strategic motivations.

2.1.2   Why: Risks Created by Funding Uncertainty

Budget planning cycles drive one key difference between the private and public sectors. While private companies have full control over their assets, governmental organizations depend on funding allocations that external bodies determine. Public-sector agencies fund new projects through two distinct budgets: 1) capital funding for expenditures that they incur when developing and implementing projects and 2) the operational budget they have for their ongoing operations.

Public agencies work under short-term (i.e., annual) operational budgets, which may change abruptly following events such as elections or a natural disaster. An annual budget that a governing body sets, usage fees from private- or public-sector users, or transfers from other government entities support a public agency's operations. Public agencies can obtain capital funding through earmarks, grants, and other one-time allocations in government appropriations. Capital budgets are initially set years in advance but sometimes subject to whimsical changes due to the political climate, which poses a serious obstacle for long-term planning and managing a complex technology project (Burnes & Anastasiadis, 2003; Willcocks & Currie, 1997).

Typically, ITO projects require an initial investment from both the client and the vendor. The uncertainty of a project's future increases viability risk and may discourage vendors from bidding on a project (Gordon & Walsh, 1997; Willcocks & Currie, 1997). Sometimes, government entities even commence a large-scale initiative without the assurance of long-term financial viability (Fedorowicz et al., 2014). Currie (1996) quoted a public manager who describes his job as "managing in the dark". Survey respondents in her study repeatedly complained that budget uncertainty does not allow for planning more than a year ahead. Some government agencies undertake projects as soon as they receive initial funding to reduce the likelihood that the funding will disappear before the funding body determines the remaining budget . These financial challenges occur only in the public sector and may have a significant impact on public agencies' propensity to outsource IT projects.

While public agencies widely face risk associated with financial uncertainty, private companies do so to a lesser degree (or not at all). The sizeable difference between private- and public-sector funding patterns lead to business risk and uncertainty challenges for these PSNs, which we reflect in this study with our "why" question.

2.1.3   Why: Service Complexity

Lacity, Khan, and Yan (2016) defined service complexity as "the degree to which a service or project requires compound steps, the control of many variables, and/or where cause and effect are subtle and dynamic". Lacity et al. (2016) found and coded only six studies on service complexity, and five reported a negative relationship between service complexity and outsourcing (e.g., Poston, Simon & Jain, 2010; Aubert, Haude, Patry, & Rivard, 2012). The challenge of managing the complex relationships among a project's stakeholders reduces the likelihood that an organization will decide to outsource (Jain & Thietart, 2014).

Governmental IT projects regularly feature both high organizational (in the number and variety of project stakeholders (e.g., Lin et al., 2007)) and technical (in the characteristics of the system itself (Bozeman & Bretschneider, 1986)) complexity. Although previous public sector-related ITO literature has not addressed the influence that project complexity has on ITO decisions or outcomes, given the potential implications of widespread complexity, we include this item in the framework. We expect to observe a relationship similar to what prior research has reported on both technical and organizational complexity (Gantman & Fedorowicz, 2016; Bosch-Rekveldt, Jongkind, Mooi, Bakker, & Verbraeck, 2011). Given these findings, we expect service complexity to negatively impact the decision to outsource.

2.2   The "What" Stage

In discussing the "what" stage, Dibbern et al. (2004) focus on alternative outsourcing strategies pertaining to the degree of IT asset ownership and the degree (or functional coverage) of outsourcing. Thus, we also address what IT outsourcing arrangements public organizations typically use (RQ2).

Several large-scale ITO projects turned out to be wholesale failures in the mid-1990s, which triggered widespread discourse on total versus selective ITO as the best strategy (Willcocks & Currie, 1997). Outsourcing a company's IT staff, processes, and systems bears high risks, and, therefore, researchers do not recommend that organizations (especially public agencies) do it (Cordella & Willcocks, 2010).

In addition, the public-sector ITO literature suggests that governmental agencies experience difficulties in building relationships with vendors and lack trust, flexibility, and the ability to communicate informally (Rusu & Jensen, 2015; Swar et al., 2012; Guah & Currie, 2007; Hancox & Hackney, 2000). Indeed, public-sector scholars warn that overreliance on an external provider might indicate the organization's inability to embrace the complexity of its IT function and lead to the organization to subsequently lose control over its IT function (Burnes & Anastasiadis, 2003; Vintar & Stanimirovic, 2011; Lin et al., 2007; Peled, 2001).

Several studies have found a positive relationship between client organizations' technical and methodological capability and outsourcing decisions (Jain & Thietart, 2014; Lacity et al., 2016, 2017). Given the public-sector findings to date, we predict that public-sector agencies will outsource only some of their IT functions (likely those for which they lack expertise).

2.3   The Outcome Stage

The last stage in the stage model, "outcome", reflects various determinants and measures of success. Research has identified factors such as knowledge sharing, communication, relationship quality, trust, and relational governance as important determinants of ITO success (Lacity et al., 2016). Researchers have also noted that the complexity of the outsourcing relationship itself whether due to a project's size or type can affect its success (Aubert et al., 2012; Tomasino et al., 2014; Poston et al., 2010).

2.3.1   Outcome: Service Complexity

An IT project's complexity constitutes a central threat to its success (e.g., Tomasino et al., 2014). Lacity et al. (2017) coded five publications that studied service complexity, and four found a negative relationship between service complexity and the outcomes of the ITO project. In one of the few studies on project complexity that researchers have conducted in the public sector, Tomasino (2013) found that organizations' difficulties with IT projects stem from a failure to acknowledge and embrace its complexity. Therefore, we expect to find a reverse relationship between project complexity and its outcomes, which reflects Lacity et al. (2017)'s service complexity theme.

2.3.2   Outcome: Degree of Outsourcing

Lacity et al. (2016) discussed 14 studies that look at the relationship between the degree or extent of ITO (i.e., the range of tasks that an ITO engagement includes) and ITO success. Interestingly, four of these studies found a positive relationship, five found a negative relationship, and five concluded that the extent of ITO has no effect on success. At the same time, studies in the public sector suggest that "excessive outsourcing" may stem from public agencies' inability to manage a complex IT function and lead to project failure and loss of control (Lin et al., 2007; Peled, 2001; Willcocks & Currie, 1997; Vintar & Stanimirovic, 2011). These inconsistent findings suggest they require more testing. Following the predictions that public-sector focused studies have made, we expect to see a negative relationship between degree of outsourcing and success of ITO projects.

2.3.3   Outcome: Knowledge Sharing and the Client-Vendor Relationships

In determining ITO success, much research has also focused on the characteristics of the relationships between client and outsourcing team members. ITO studies in the public sector have confirmed the findings in ITO research that knowledge sharing, communication, trust, and relational governance represent important factors for ITO success. One can best observe many typical measures of these factors longitudinally and at the individual level of analysis; therefore, they fall outside our scope in this study. Instead, we present findings on factors that one can obtain at the agency level in line with the other measures in this study.

Private-sector organizations seek vendors' involvement in developing project requirements and IT strategy to enable knowledge sharing and innovation. In contrast, public-sector clients who use private vendors often doubt the latter's profit motives, which leads to lack of trust and the former to fear that they will lose control over their projects (Guah & Currie, 2007; Hancox & Hackney, 1999; Lin et al., 2007; Willcocks & Currie, 1997; Peled, 2001; Rusu & Jensen, 2015). Communication problems in public-private outsourcing relationships also arise from public agencies' excessive adherence to formal rules (Cox et al., 2012) and a failure to appreciate the value of relationship building (i.e., the "procurement paradigm"; Chen & Perry, 2003; Swar et al., 2012). Organizations can offset some of these risks by implementing practices to

embrace complexity (Tomasino et al., 2014), such as gap analysis and requirements definition, interactive project governance, and flexibility.

We expect to see that public agencies that more openly embrace knowledge sharing with their ITO vendors to be more successful in their ITO arrangements.

3   Methodology

3.1   The Study Domain

As we describe in Section 2, we investigate three research questions that reflect the decision-making stages in the stage model. These questions cover a wide range of factors that researchers have established to possibly affect the scope of and motivation for governmental ITO. To address these questions, we employed a rich descriptive dataset that contained detailed data on a well-defined category of public-sector ICT-based initiatives. To collect the data, the National Science Foundation (NSF) conducted a large-scale study that investigated inter-organizational ICT-enabled collaborations that supported the police's and associated public safety organizations' information-sharing and interoperability needs (Fedorowicz et al., 2014; Sawyer et al., 2013). As we state in Section 1, the term public safety networks (PSNs) refers to these initiatives.

PSNs link police and other responder agencies to shared data and a common communications infrastructure across functional or geographic borders and usually include agencies from multiple governmental levels. Because they always involve multiple governmental bodies, PSNs set up a cooperative governing structure and obtain capital funding outside agencies' normal operational channels. Further, as new entities, PSN ICT projects provide a unique opportunity to study the role that ITO plays in many well-defined ICT initiatives throughout their full development lifecycle.

3.2   Data Collection

The PSN dataset contained responses from interviews with public officials who participated in managing data and technology from these federal, state, metropolitan, and local initiatives. Table 2 shows the range of job titles that the interviewees held. The interviewees underwent pre-screening to establish that they had suitable knowledge about their PSN. Trained interviewers from the Pennsylvania State University Survey Research Center (SRC) conducted structured telephone interviews with the participants. Each interview took 45 to 60 minutes to administer.

Table 2. Survey Respondents

Job title categories	N	%
Emergency services officers (with responsibilities ranging from fire and medical to homeland security)	17	20.7%
IT Project/program manager	17	20.7%
IT Director/system manager	11	13.4%
Law enforcement officers (police, courts, criminal investigations)	9	11%
PSN manager	6	7.3%
Analyst/consultant	5	6.1%
Information manager	5	6.1%
Operations manager	5	6.1%
Information/data manager	4	4.9%
Telecommunications administrator	2	2.4%
Academic working in a PSN	1	1.2%
Total	**82**	**100%**

The final clean data set includes 82 full interviews that represent 39 U.S. states and the District of Columbia. Over 400 variables, predominantly categorical, comprehensively depict the PSNs' characteristics, such as their history, organizational structure, governance, IT architecture, and ITO

experience (Fedorowicz et al., 2014; Fedorowicz, Sawyer, & Tomasino, 2018). The structured interview also covers other themes such as the PSN's overall mission; IT outsourcing's role, characteristics, and success; the PSN's organizational structure and governance; funding sources; ICT used; types of data the PSNs stored and shared; communication practices among the PSN's members; performance metrics; satisfaction with its operation; and experienced problems. In this study, we use a subset of the survey results, which we describe in Section 3.3.

3.3 Data

The survey that we base our study on included over 100 questions about PSNs' initiation and operation, which included their outsourcing experience. Given the data's richness, we could include variables in our analysis that reflect important aspects of a PSN's functioning to more deeply understand the circumstances surrounding PSNs' sourcing experience.

We depict the PSNs' geographic distribution in Figure 1. One can see that the PSNs resided across the US but that they had more prominence in heavily populated areas. Further, 47 of the 82 PSNs (57.3%) had outsourced some or all of their IT functions. This distribution provides a good mix of project ITO experience on which to base our analysis. Most outsourcing PSNs perceived that they had achieved their outsourcing goals in full or in part (Table 3). Due to this success rate, in our outcome analysis, we focused on identifying behavior patterns that led to successful goal attainment.
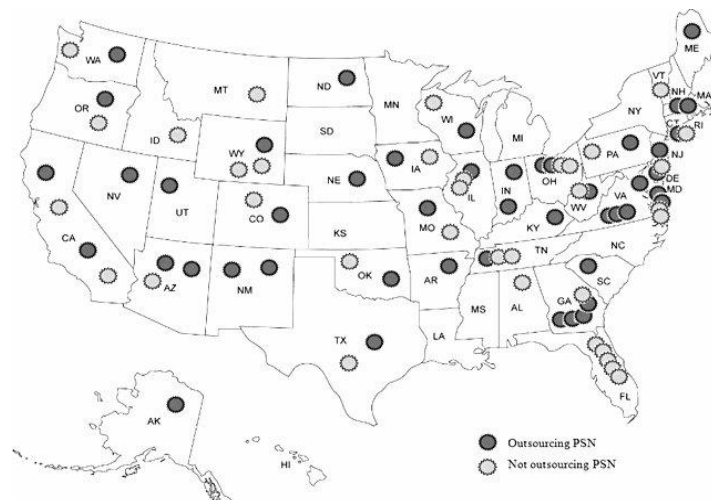

Figure 1. Geographic Distribution of Outsourcing and Non-outsourcing PSNs

Table 3. Success in Achieving Outsourcing Goals

Goal achievement levels	N	%
Outsourcing goals have been achieved	33	70.2%
Outsourcing goals have been achieved in part	10	21.3%
Outsourcing goals have not been achieved	3	6.4%
"Too early to tell"	1	2.1%
Total	**47**	**100%**

3.4 Data Analysis

We cleaned and coded the raw data set that mostly included categorical variables for analysis; we created indices when appropriate for assessing constructs such as project complexity.

To analyze the data, we mostly compared means using independent samples t-tests and cross-tabulations with Pearson's chi-square tests.

In all tables that include results from independent samples t-tests, the reported test significance is two-sided. We performed Levene's (1960) test of equality of variances prior to each t-test and then made appropriate adjustments to the value and significance of t. We mark statistically significant results at the 0.05 level with an asterisk (*) and statistically significant results at the 0.01 level with two asterisks (**).

In all tables that report results from Pearson's chi-square tests, the reported test significance is asymptotic and two-sided. We mark statistically significant results at the 0.05 level an asterisk (*) and statistically significant results at the 0.01 level with two asterisks (**).

We also used the Boolean algebra-based qualitative comparative analysis (QCA) method (Rihoux & Ragin, 2009) to identify patterns in the PSNs' outsourcing behavior and, in particular, to understand the possible connection between a PSN's decision to outsource specific IT functions or specific parts of the system development lifecycle and the ITO project's outcomes. We analyzed which functions and tasks are outsourced together and then considered the rate of success in each group. QCA determines all possible configurations of data factors that lead to an indicated outcome; these configurations are the multiple pathways identified to reach a common objective. One evaluates QCA solutions based on two criteria: 1) solution coverage, which relates to the proportion of cases that exhibit the condition; and 2) solution consistency, which measures the proportion of cases where the condition produces the outcome. High consistency values indicate the condition is sufficient for the output (Ragin, 2008).

When looking for a parsimonious definition for successful outsourcing strategies, we applied truth table analysis using the Quine-McCluskey algorithm with 90 percent as the threshold for solution consistency. We present the resulting configurations of outsourcing components that most consistently led to ITO success in Table 17.

4   Findings

In Section 2, we match the findings from the general ITO literature that Lacity et al. (2010, 2017) and Wiener et al. (2010) surveyed with the stage model and with the literature on ITO in the public sector and propose three questions referencing the three stages of the stage model: what and why, which describe factors that lead to the decision to outsource and the decision of what to outsource, and outcome, which describes the determinants of ITO success. We structure our findings from analyzing the PSN dataset in a similar way.

4.1   The "Why" Stage

The first stage in the Stage Model, "why", explores the role that various organizational and environmental characteristics play in an organization's decision to hire an external provider for its IT needs. We address this stage with RQ1 (i.e., "why do public organizations choose to outsource IT?").

4.1.1   Cost Considerations, Access to Expertise, and Mandate to Outsource

Respondents could select up to three reasons for outsourcing: 1) cost cutting; 2) gaining access to technical expertise (two themes that both the general and public sector-specific ITO literature have often mentioned); and 3) policies, regulations, or mandates (a recurring theme in the public-sector ITO literature). They could also add their own answer. We examined and reclassified interviewee-supplied responses when appropriate into one of the three main choices. We summarize the answers that the study participants provided about sourcing decisions in Table 4 and visualize them in Figure 2.

Obtaining access to technical expertise turned out to be a primary motivation for most (63%) respondents, and all but three (93.5%) PSNs considered it. Only 14 of 46 respondents selected cost as a main driver for their decision to outsource, and none reported it as their sole motivation. This finding concurs with the general ITO literature that has observed a shift in the main motivation for ITO from reducing costs to gaining access to technical expertise. This shift took much longer to arrive in the public sector compared to the private sector (Gantman, 2017). Our findings suggest that the public sector has "caught up" with the private sector, and access to technical expertise has begun to dominate PSNs' decision to outsource as is the case for private companies.

Finally, seven PSNs (15.2%) indicated policies and regulations guided their decision to outsource alongside both cost-cutting and staff-expertise shortages. Notably, the only three PSNs in the sample who did not report a staffing shortage all claimed that they only outsourced because higher authorities required them to do so.

Table 4. The Main Reasons to Outsource

Outsourcing reasons	Number	Percent
Availability or expertise of staff alone	29	63.1%
Policies, regulations, or mandate alone	3	6.5%
Cost cutting alone	0	0.0%
Availability or expertise of staff and cost cutting	10	21.7%
All three reasons (availability of expertise or staff, policies and regulations and cost cutting)	4	8.7%
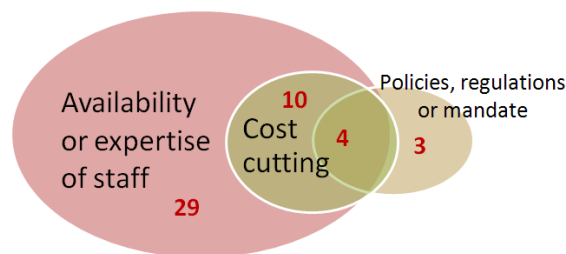
Figure 2. Diagram of "Why" PSNs Outsource

4.1.2   Risk and Uncertainty Related to Availability of Funding

Table 5 examines the proposition that having funding available (i.e., as seed funds or capital funding appropriations) as a stimulus for PSN creation affects a PSN's ITO decision and that the presence or absence of funds and financial stability affects the ITO's role in a PSN. The PSNs created due to available funds had a significantly higher outsourcing rate compared to the PSNs that did not list accessible funding among their formation's triggers.

Table 5. PSNs Listing Availability of External Funding as one of the Triggers for PSN Formation

	Outsourcers	Non-outsourcers	Total	Pearson's Chi^2	
				Chi^2	Sig.
PSNs triggered by funding availability	39 (66.1%)	20 (33.9%)	59		
Other PSNs	8 (34.8%)	15 (65.2%)	23	6.635	0.01**
Total	47 (57.3%)	35 (42.7%)	82		

As Table 6 shows, PSNs were more likely to outsource when they could rely on externally provided capital funds (typically grants and appropriations). PSNs that supported themselves through service charges, membership fees, and subscriptions were less likely to outsource their IT.

Table 6. Funding Composition

Funding sources	Mean %		St. Dev.	t-test	
	Non-out-sourcers (31)	Outsourcers (45)		t	Sig.
Grants, bonds, appropriations, earmarks, other capital funding	68.7%	86.5%	38.5	2.132	.037*
Charges, subscriptions, other fees	31.3%	13.5%			

4.1.3 Service Complexity

Multiple studies in different disciplines have addressed how to measure complexity in IT projects and offered dozens of variables that one can use to assess and compare projects' complexity. We present three views of complexity that fit well with these shared systems' interorganizational public setting. The first two examine the reported variety of user types and project objectives, and the third examines the project's technological architecture.

Organizational complexity (users): the PSNs in our sample were created for assorted public safety purposes, such as to provide services or support users. Because each user type (e.g., state or local police, fire, EMT) has differing needs and priorities for the shared PSN resources, the more user types a PSN needs to support, the greater its complexity. Thus, the number of intended user types represents one way to measure the complexity of a PSN's information service.

The survey asked participants to identify primary and secondary users of their services, and they could choose from among four options: federal agencies, state agencies, local agencies, and private companies. They could also name additional intended users. Eighteen PSNs identified additional users; the most frequently mentioned included the public, non-profit organizations, tribes, and health services.

Table 7 shows how many user types on average the outsourcing and non-outsourcing PSNs supported. Outsourcing PSNs had a greater variety of intended user types compared to non-outsourcers, and we found similar results when we considered only primary users.

Table 7. Average Number of Primary and Secondary User Types

Number of user types	Non-outsourcers (35)		Outsourcers (47)		t-test	
	Mean	St. dev	Mean	St. dev	t	Sig.
Primary users only	1.74	0.817	2.13	0.850	-2.061	0.043*
Secondary users only	1.25	1.094	1.34	1.028	-.350	0.727
Primary and secondary users	3.00	1.030	3.47	0.856	-2.246	0.027*

Organizational complexity (objectives): the range of technology-related objectives that a PSN pursued represents another way to measure system complexity. PSNs deal with various (including many outdated) systems. We focus here on IT objectives related to integrating these systems and standardizing data and provided services to indicate technological service complexity.

Table 8 summarizes the prevalence of different IT goals in the outsourcing and non-outsourcing PSNs. Outsourcing PSNs focused on leveraging existing investments in IT and on increasing how frequently they used data standards, such as Global Justice XML. Interestingly, in their review in which they analyzed IT and business process outsourcing studies together, Lacity et al. (2016) mentioned knowledge formalization and service standardization as factors for organizations' ITO decisions, but these factors do not appear in Lacity et al. (2010) and Lacity et al. (2017): two reviews that focused on IT outsourcing alone.

Table 8. IT Objectives in Outsourcing vs. Non-outsourcing PSNs

IT objectives	Non-outsourcers (35)		Outsourcers (47)		Total (with this objective)	% of total who are outsourcers	Pearson Chi^2	
	N	%	N	%			Chi^2	Sig.
Increasing the number of users who can get access to data	25	71%	41	87%	66	62.1%	3.191	.074
Increasing data security	28	80%	40	85%	68	58.8%	.369	.543
Increasing the number of data sources available to users and/or consolidating systems	25	71%	40	85%	65	61.5%	2.284	.131
Leveraging existing investments in IT	27	77%	44	94%	71	62%	4.687	.030*

Upgrading or replacing aging IT infrastructure, improving IT infrastructure reliability	28	80%	41	87%	69	59.4%	.787	.375
Increasing use of data standards (e.g., Global Justice XML or National Information Exchange Model)	25	71%	42	89%	67	62.7%	4.316	.038*

Technical complexity: we assessed the technical complexity of PSN systems as the variety of their architectural elements (see Table 9). Data-oriented PSNs, especially those that centralized data storage and those that focused on standardizing the data and making it available to more PSNs, showed notably higher rates of outsourcing and built more architecturally complex systems in terms of data storage and use (see Table 10).

Table 9. Architecture Elements in Outsourced vs. Non-outsourced PSN Projects

					Total (with this element)	% of total who were outsourcers	Chi-square test	
	N	%	N	%			Chi^2	Sig.
Central data storage (of 82)	20	58.8%	38	80.9%	58	65.5%	4.708	0.030*
Access to data not available before (of 82)	24	70.6%	44	93.6%	68	64.7%	7.765	0.005**
Data standardization (Global Justice XML) (of 70)	17	58.6%	34	82.9%	51	66.7%	5.074	0.024*
Legacy systems (of 60)	6	23.1%	9	26.5%	15	60%	.090	0.764
Mobile access (of 82)	23	65.7%	35	74.5%	58	60.3%	.743	0.389
Business process standardization (of 74)	22	73.3%	35	79.5%	57	61.4%	.389	0.533

Table 10. Average Number of Different IT Objectives and Architectural Elements in Outsourced vs. Non-outsourced PSN Projects

	Non-outsourcing (35)		Outsourcing (47)		t-test	
	Mean	St. dev.	Mean	St. dev.	t	Sig.
Total IT objectives (0 to 6)	4.51	1.915	5.28	1.057	-2.126	.039*
Data-related architectural elements (0-3)	1.74	1.17	2.47	0.75	-3.21	0.002**
Non-data-related architectural elements (0-3)	1.37	.77	1.68	.78	-1.782	.079

The number of IT objectives and the complexity of a system's architecture were predictably correlated with a Pearson correlation of .629 (significant at .001). However, we found no correlation between the variety of intended user types and the number of IT objectives, and a low correlation between user types and total architectural elements ($r = .219$, significance .048). This observation confirms the independence of findings that we report in Table 7 (the variety of PSN's users) and Table 8 (the number of PSN's IT objectives). Each complexity measure affected ITO decisions in a distinctive way.

4.2   The "What" Stage

The second stage in the IT outsourcing model, "what", explores the outsourced projects' technical and organizational configuration. This stage focuses on the degree, or extent, of outsourcing. As not all ITO contracts govern the client's IT organization to the same extent, we need to document how ITO arrangements apportion activities. Some studies have warned against outsourcing IT in its entirety and

suggested that it may subsequently result in an organization's losing control over its IT (Cordella & Willcocks, 2010; Vintar & Stanimirovic, 2011, Lacity & Hirschheim, 1993; Willcocks & Currie, 1997).

4.2.1 Extent of Outsourcing Arrangements

The degree of outsourcing depends on the client's needs and, therefore, often reflects the reasoning behind an outsourcing decision ("why"). In particular, since PSNs reported inadequate internal technical expertise, the ITO arrangements likely reflected the skill sets they lacked. The PSNs in our data set reported that they outsourced IT project parts in many combinations (see Tables 11 and 12). (We also present further analysis in Table 17.)

Table 11. Percentage of PSNs Outsourcing Different Parts of IT Projects

	N	% of 47 cases
System analysis	24	51.1%
System design	31	66%
Project management	28	59.6%
Programming	18	38.3%
Support functions	44	93.6%

Table 12. Percentage of PSNs Outsourcing Multiple Parts of IT Projects

	N	% of all cases
All five	11	23.4%
Four	7	14.9%
Three	9	19.15%
Two	15	31.9%
One	5	10.6%
Total	**47**	**100%**

4.2.2 Vendor Involvement

We look at the ITO vendors' involvement in project-related decision making as a proxy for the PSNs' openness to share knowledge and build a relationship with them. If prior research findings on the lack of trust in a vendor's motives and strict adherence to formal rules in communication hold for the ITO relationships between public organizations and vendors, we expect that most PSNs will limit vendors' involvement in project-related decision making and knowledge sharing.

Table 13 summarizes the PSNs' responses regarding their vendors' involvement in sharing technical expertise, defining requirements, and making IT strategy suggestions and advice. PSNs did take advantage of their outsourcing vendors' expertise in all three categories. These results disprove the proposition that PSNs are reluctant to let their vendors participate in decision making and knowledge sharing.

Table 13. Vendor's Involvement in IT-related Activities in the PSN

Vendor activity	Not involved	%	Involved	%
Sharing technical expertise	7	14.9%	40	85.1%
Definition of requirements	11	23.4%	36	76.6%
IT strategy suggestions and advice	9	19.1%	38	80.9%
Other activities[1]	N/A	N/A	7	14.9%

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[1] Seven PSNs reported other activities as an open response: policy development, assistance with regional coordination and regional network architecture, business processes mapping, Web and database design. We omit these responses from the analysis because the survey did not ask all respondents.

However, the extent of vendor involvement was correlated with the extent of outsourcing (r = .374, significance .010). The PSNs that outsourced all five project parts reported significantly higher level of vendor involvement compared to all others (t = -3.393, significance 0.001).

4.3   Outcomes

The final stage in the IT outsourcing model, "outcome", explores the factors that determine a project's success. Overall, the PSNs' ITO initiatives had an impressively high success rate (see Table 14). Only three PSNs reported that their ITO efforts failed (the same three PSNs that claimed that higher authorities forced them to outsource). Of the remaining 44 outsourcers, only 10 (22.7%) reported that they had not achieved their outsourcing goals in full.

Table 14. Success in Achieving Outsourcing Goals

Goal-achievement levels	N	%
Outsourcing goals have been achieved	33	70.2%
Outsourcing goals have been achieved in part	10	21.3%
Outsourcing goals have not been achieved	3	6.4%
"Too early to tell"	1	2.1%
Total	**47**	**100%**

4.3.1   Project Complexity and ITO Outcomes

As Table 1 shows, we found service complexity as one of the few factors to influence both the decision to outsource and a project's propensity to succeed (according to Lacity et al., 2017). In Table 15, we compare the complexity measurements that we discuss in Section 4.1.4 for successful and less-successful outsourcing PSNs. In contrast with the findings that the literature has found in the private sector where service complexity negatively affects a project's success (Lacity et al., 2017), we found an outsourced PSN project's complexity did not affect its chance to succeed.

Table 15. Measures of Project Complexity and Outsourcing Success

	Successful outsourcing (33)		Partially or unsuccessful outsourcing (13)		t-test	
	Mean	St. dev.	Mean	St. dev.	T	Sig. (2-tailed)
Organizational complexity: number of user types	3.42	0.867	3.62	0.870	-0.673	0.505
Organizational complexity: number of IT objectives	5.30	1.075	5.15	1.068	0.425	0.673
Technical complexity: number of architectural elements	4.15	1.278	4.00	1.354	0.356	0.723
Data related	2.52	0.712	2.31	0.855	0.840	0.405
Not data related	1.64	0.783	1.69	0.751	-0.221	0.826

4.3.2   Degree of Outsourcing

As we report in Section 4.2.1, the PSNs used various outsourcing configurations, and several IT project parts participated in multiple configurations. This finding suggests that multiple paths to a successful project outcome exist, which drove our decision to choose the qualitative comparative analysis (QCA) method to examine this topic (Rihoux & Ragin, 2009).

In Table 16, we summarize success rates of different outsourcing configurations that the PSNs reported. Notably, all but one PSN that chose to outsource all parts of the IT project reported achieving their outsourcing goals.

Table 16. Success Rates of Different Outsourcing Configurations

Outsourced IT project parts					N	% of all cases	Success	Success rate
System analysis	System design	Coding	PM	Technology support				
x	x	x	x	x	11	24.4%	10	91%
			x	x	9	20%	6	67%
x	x			x	6	13.3%	6	100%
	x			x	3	6.7%	2	67%
	x	x	x	x	3	6.7%	1	33%
x	x	x		x	2	4.4%	2	100%
x	x		x	x	2	4.4%	2	100%
				x	2	4.4%	2	100%
	x		x	x	2	4.4%	0	0%
x					1	2.2%	0	0%
	x				1	2.2%	0	0%
	x	x		x	1	2.2%	0	0%
			x		1	2.2%	1	100%
					46	**100%**	**33**	**71.1%**

In Table 17, we parsimoniously define successful outsourcing strategies that we produced using the Quine-McCluskey algorithm with a 90 percent threshold for solution consistency. Two resulting configurations included cases with limited outsourcing arrangements.

Table 17. QCA Results for Outsourcing Project Configurations

Intermediate Solution (cut off 95%)	Raw coverage	Unique coverage	Condition consistency	Number of PSNs in this condition	Number of successful PSNs in this condition
System Analysis, Design and Tech Support	0.63	0.63	0.95	21	20
Project Management only	0.03	0.03	1	1	1
Technical Support functions only	0.06	0.06	1	2	2
Total solution coverage: 0.697; Solution consistency: 0.96					

We found that 21 PSNs in our sample outsourced system analysis, system design, and technical support; all but one considered the outsourcing arrangement successful. Half of this group (i.e., 10 PSNs) outsourced the entire project, while the other ten retained project management and programming in house (see Table 16). The single unsuccessful case was one of the three PSNs that reported that policies, regulations, or mandates forced it to outsource (see Table 4).

Other outsourcing tactics, such as hiring a consultant for system analysis or system design alone, outsourcing project management and support but not project implementation, and delegating system development to an external provider while keeping technical support in house, showed mixed results as to whether PSNs achieved their outsourcing goals, and these tactics did not meet the QCA algorithm's conditional cutoff. Thus, the most common path for PSNs to achieve success lies in outsourcing (at least) system analysis, design, and support functions.

4.3.3   Trust, Communication, and Effective Knowledge Sharing

Prior research suggests that PSNs' readiness to embrace knowledge sharing and involve vendors in strategy development will affect ITO success. In Table 18, we contrast the frequencies of three vendor-involvement activities in successful and less-successful PSNs. A vendor's involvement in sharing technical expertise and definition of requirements was associated with more successful ITO projects. ITO projects that involved vendors more extensively were also more likely to achieve their goals.

Table 18. Vendor's Involvement in IT-related Activities

	Successful outsourcers (33)		Partially or unsuccessful outsourcers (13)		Total outsourcing PSNs (46)		Pearson's Chi^2 or t-test	
	N	%	N	%	N	%	Chi^2	Sig.
Sharing technical expertise	31	93.9%	8	61.5%	39	84.8%	7.589	.006**
Definition of requirements	30	90.9%	5	38.5%	35	76.1%	14.10	.000**
IT strategy suggestions and advice	28	84.8%	9	69.2%	37	80.4%	1.45	.229
Other activities (open response)	6	18%	1	7.7%	7	14.9%	.988	.610
	Mean	St. dev	Mean	St. dev.	Mean	St. dev.	t	Sig.
Total number of reported activities (range is 0 to 3)	2.70	.684	1.69	1.182	2.33	1.049	-2.88	.011*

5   Discussion

While ITO does not represent a new research area, only a relatively small and highly fragmented subset academic work on the topic has documented the ITO challenges that governmental agencies face. Many papers on public-sector ITO rely on single case studies that one can generalize only with caution (Gantman, 2017). In this paper, we use seminal reviews of the general ITO literature (Dibbern et al., 2004; Lacity et al., 2010, 2017; Wiener et al., 2010) to map known private-sector ITO research themes into the public sector to provide a more comprehensive lens through which to view ITO in the public sector. Short-term budgets, government mandates, funding often linked to political events or disasters, and lack of trust in public-private partnerships illustrate the kinds of unique issues that differentiate the public sector from the private sector. By contextualizing these issues as public-sector decision-making or success factors in this organizing framework, we assist both practitioners and researchers in understanding how best to evaluate the complex arrangements surrounding these important decisions.

We analyzed a rich set of data that covered a single government domain (i.e., public safety). By studying a large number of public safety networks, we could contrast similar entities that outsourced IT to those that did not. We tested several characteristics of public-sector ITO behaviors that researchers have noted to lag or diverge from trends in the private sector. In Table 19, we organize our findings according to the stages in the stage model.

Table 19. Summary of Results

Stages in the stage model (Dibbern et al., 2004)	Findings	Implications for future research (R) or practice (P)
"Why" Determinants Advantages Disadvantages	**Motivation**	
	Similar to the private sector, the need for technical expertise most prevalently drove the PSNs to outsource. **Unlike private companies,** some PSNs reported that government mandates forced them to outsource. PSNs mandated to outsource failed to achieve project objectives.	(P) Regulatory bodies may consider loosening regulations to allow public agencies to broaden ITO decision criteria beyond legal or regulatory compliance. (R) More deeply analyzing the relationship between coerced outsourcing and project failure may lead to better regulatory guidance for government agencies.

Table 19. Summary of Results

	Risk and uncertainty (funding):	
	Unlike private companies, PSNs depended highly on external funding. PSNs created due to accessible initial funding outsourced twice as often as others. Outsourcing PSNs were less likely to obtain finance via charges and fees.	(P) Government agencies should strive to attain capital funds whether or not projects will entail significant outsourcing components. (R) The relationship between funding availability and sources deserves more attention to determine why sourcing matters in ITO decision making.
	Complexity	
	Contrary to private sector findings, PSNs outsourced organizationally and technically complex projects more often.	(R) A more nuanced insight into the different types of and reasons for project complexity and their effect on the decision to outsource would benefit ITO research in both the public and the private sectors.
"What" **Degree of outsourcing**	**Extent**	(P) By design, PSNs are dynamic and collaborative initiatives that join disparate public agencies. This organizational design may contribute to increased trust in an ITO arrangement. (R) Research that compares single and multi-agency ITO arrangements may detect differences in vendor arrangements due to established organizational relationships. See also below in "outcomes".
	Contrary to earlier research about the public sector, many PSNs delegated all their IT project parts to an outsourcing vendor.	
	Vendor involvement	
	Contrary to earlier research about the public sector, most PSNs' vendors participated in sharing knowledge, defining requirements, and developing IT strategic goals.	
"Outcome" **Experiences Types Determinants**	**Complexity**	
	Contrary to private sector findings, a project's complexity had no adverse effect on ITO success.	(R) (P) Although one can expect complex systems to fail more than simpler ones, it may be that ITO vendor expertise offsets in-house understanding of complex arrangements in PSNs. Or it may be that PSNs could recognize and embrace the complexity of their ITO projects and, therefore, mitigate the risks inherent in IT project complexity. More case studies (such as Tomasino, 2013) will help researchers identify recommendations for practitioners and advance the theoretical base for understanding complexity of IT projects.
	Configuration	
	Contrary to earlier research about the public sector, PSNs that voluntarily outsourced all their IT project parts achieved their outsourcing goals. The most successful ITO configuration included system analysis, system design, and technical support. Some successful PSNs also outsourced coding and project management.	(P) Public agencies should adopt a holistic approach to IT projects, analyze the interdependencies between their different parts, and develop an outsourcing configuration that allows for vendors' involvement in project work that draws heavily on their expertise. Agencies should also consider ITO for the whole project lifecycle (from system analysis to technical support).
	Vendor Involvement	
	Similar to the private sector, PSNs promoting knowledge sharing and vendor involvement were more likely to succeed in IT outsourcing.	(R) (P) To succeed, ITO in both sectors requires vendor involvement and knowledge sharing. However, public agencies can find both vendor involvement and knowledge sharing especially challenging. Studies that examine the relationship between funding availability and the types and timing of vendor involvement will have important implications for practitioners and will help researchers gain better insight into factors under an agency's control that can affect ITO success.

5.1   Why do Public Organizations Choose to Outsource IT (RQ1)?

5.1.1   Motivation

The first set of analyses correspond to the "why" stage in which an entity bases its decision to outsource on specified criteria. As we expected, many PSNs identified cost cutting as an outsourcing driver, an unsurprising observation because legal requirements often force public agencies to minimize costs (Gantman, 2017). Less surprisingly, no PSNs reported cost cutting as the sole reason to outsource. Rather, a lack of technical expertise most prevalently drove PSNs to outsource—a trend consistent with previous findings in both sectors (Leimeister & Krcmar, 2009; Gonzalez, Gasco, & Llopes, 2010). All voluntarily outsourcing PSNs sought external technical expertise (often as their only outsourcing driver).

Some study participants reported that regulations or mandates forced them to outsource or to switch ITO providers. In line with extant findings that political factors may motivate ITO decisions (Gantman, 2017), the few PSNs who had to outsource due to mandates also failed to achieve their outsourcing goals. This finding suggests a problem with regulatory efforts to govern outsourcing in that public agencies need freedom to broaden their decision criteria to factors beyond legal compliance. In other words, coercion does not positively motivate ITO.

5.1.2   Risk/Uncertainty (Funding)

PSNs, like all government agencies, depend highly on external capital funds from grants, appropriations, and other governmental sources. PSNs created due to this accessible initial funding tended to outsource twice as often as others. However, PSNs' fund source differentiated PSNs that outsourced from PSNs that did not: outsourcing PSNs were less likely to obtain finance from charges, subscriptions, and fees. Future research should investigate the reason for this curious difference.

5.1.3   Service Complexity and Interdependency

Lacity et al. (2017) coded six studies that looked into the relationship between project complexity and outsourcing decision, and five found a negative effect of service complexity on outsourcing (e.g., Jain & Thietart, 2014). In contrast, we found that PSNs with (both technically and organizationally) more complex systems tended to outsource more often. Incongruously, outsourcing itself adds an additional layer of organizational complexity to a project at the same time that it offloads some responsibility for the technical complexity. This finding may have arisen due to public sector's longstanding shortage of technical expertise as their primary reason for outsourcing; the more complex the requested service, the stronger their reliance on external IT expertise. Unlike most packaged business software, PSN systems have few if any generic components and often must conform to shared standards with which vendors would have experience. Future research that investigates the factors behind an outsourcing decision should examine the specific system requirements, technical skills, and competencies that agencies themselves cannot provide.

Outsourcing PSNs identified more goals for their outsourcing projects and, thus, recognized that they needed to embrace an IT project's complexity for it to succeed (Tomasino, 2013). They also place more emphasis on data-oriented elements of system architecture, such as centralized data storage and compliance with data standards. These findings align with the observation that access to technical expertise is the strongest driver of public-sector ITO.

5.2   What IT Outsourcing Arrangements do Public Organizations Typically Use (RQ2)?

The "what" stage focuses on the extent of a project's activity that an agency outsources. ITO strategies evolved to cover multiple project activities in most projects we examined. Most PSNs also involved vendors in sharing technical expertise, defining requirements, and developing IT strategy, which signifies that the public sector has overcome lack of trust in and fear of losing control to private sector vendors as earlier studies have reported (Willcocks & Currie, 1997).

5.3 Outcome: What Factors Determine Success for ITO in Public Organizations (RQ3)?

The "outcome" stage focuses on the factors that determine a project's success. Lacity et al. (2017) coded five studies that looked into the connection between service complexity and ITO success in the private sector, and four found that more complex outsourced projects are less likely to achieve success. However, this finding did not apply to the PSNs we studied. None of the three aspects of complexity that we analyzed had any effect (negative or positive) on ITO success. As both the decision making and success findings on complexity in our study counter what Lacity et al. (2017) found, we recommend that researchers conduct further studies to determine if these differences result from sectoral incongruences, an evolution of thinking over time, or a methodological disparity.

Finally, we identified specific activity configurations that were associated with more successful projects. Successful projects consistently outsourced system analysis, system design, and technical support; some successful outsourcing also included coding and project management tasks. Projects where clients asked vendors to share their technical expertise and participate in requirements definitions were more successful than those that did not. Future research might investigate whether vendors' early involvement helps a project formulate the right requirements in its request for proposal (particularly important in the public sector given public agencies cannot easily change the content in a request for proposal once a project has begun) or whether it indicates that projects with secure funding for the whole project lifecycle end up being more successful than those who stop due to stopped funding[2]. Further research into the decision to outsource each of these activity types would provide strong guidance to public-sector managers as to the benefits that lead to these more productive relationships.

In sum, we demonstrate how the themes that Lacity et al. (2017) identified according to the stages in the stage model (Dibbern et al., 2004) fit in the public sector and explain when our findings replicate or differ from what researchers have found in the private sector. We encourage government agencies to view their ITO decisions in the purview of the findings and themes that we present in this study as a means to reduce the high rate of failure in public-sector outsourcing. As with much research, we could not thoroughly test the model in this domain; we need further research to fully understand how the public sector might best apply the model.

5.4 Limitations

Since we build our model on prior research, it inherits that research's limitations. While Weiner et al. (2010) and Lacity et al. (2017) successfully employed the Dibbern et al. (2004) model as an organizing mechanism, the scarcity, interdisciplinarity, and geographical fragmentation of public-sector ITO research preclude the model's applicability in this sector pending additional study. In summarizing prior public-sector research and analyzing our sample of public-sector ITO projects, we obtained the ability to examine differences in ITO decision making and outcomes in many of the themed areas. However, alternative explanations for differences between the sectors due to research design considerations such as differing measures, methods, timing of data collection, or other factors may exist.

Since public organizations rely on governmental guidance and prevailing political environment, one should exercise caution when generalizing findings from different countries in one framework. We note, however, most public ITO literature published in the English language describes English-speaking countries with relatively similar political systems. The few international comparisons in the academic literature on public ITO suggest that, despite some differences, these countries have many similarities.

We used a rich dataset on PSNs to test the propositions related to various aspects of an ITO project that we include in Table 1. The PSNs varied substantially in size, age, maturity level, organizational goals, and applied governance mechanisms. However, the variety in the PSNs' structures and governance schemes has one salient drawback: the interviewed informants had different job titles and somewhat different formal responsibilities. While the survey organizers made a significant effort to identify the most knowledgeable person in each PSN, the depth of each interviewee's knowledge and the quality of answers could have varied from participant to participant.

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[2] We thank an anonymous reviewer for this question.

As our sample examined only interorganizational public safety projects from a single country, we cannot generalize our findings to all public-sector domains globally. While we believe that many of our findings generalize to many other types of public service organizations, PSNs' ITO behavior may differ from other types of public service (e.g., tax assessment). Applying the same set of propositions to data on other types of governmental agencies and in other countries would help further verify our findings' reliability and generalizability.

6   Conclusion

This work comprises an important addition to the literature on ITO in the public sector—a relatively understudied phenomenon that deserves closer attention from researchers. We extend previous IT outsourcing research by systematically mapping unique traits and perils that outsourcing public agencies face onto an outsourcing model from a seminal, widely cited ITO study (Dibbern et al., 2004) alongside two extensive meta-analyses of empirical ITO research (Wiener et al., 2010; Lacity et al., 2010, 2016). We also analyze a unique and robust survey of 82 public safety networks to empirically test significant portions of the model and, thus, demonstrate its value to both research and practice.

This study also makes an important contribution to practice. It helps outsourcing vendors understand the unique challenges that governmental agencies face. It will benefit public officials who can use our observations to support their risk-analysis and sourcing decisions.

The study is confirmatory in nature as it relies on an empirically derived model. In the future, the findings we present would benefit from more systematic and theory-based scholarship to broaden our contribution to a more diverse set of public safety domains.

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