



Design observations for interagency collaboration



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ABSTRACT

We present 14 design observations for public safety networks (PSNs) and describe how they may apply more broadly to a wider range of inter-organizational systems within the public sector. A PSN is an interagency collaboration focused on developing and using information systems in support of information sharing and functional interoperability among public safety organizations engaged in law enforcement, criminal justice, and emergency response. We base our design observations upon an analysis of an extensive survey of 80 PSNs plus 6 in-depth case studies. The design observations identify commonalities that can guide agencies participating in interagency collaborations in addressing the interlocking issues they face. Our goal in presenting this set of design observations is to: (1) encourage improved PSN systems design and (2) draw attention to the importance of jointly addressing governance and technological considerations when designing PSNs.

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1. Introduction

Through this paper, we advance a set of 14 design observations about public safety networks (PSNs). PSNs are interagency collaborations focused on the development and use of information and communication technologies (ICT) to support the information sharing and functional interoperability needs of public safety organizations engaged in law enforcement, criminal justice, and emergency response (Sawyer, Fedorowicz, Tyworth, Markus, & Williams, 2007). As such, a PSN is a specific form of an inter-organizational system (IOS) created to support information sharing among distinct organizations through a collective technology infrastructure. However, public safety networks also represent a collaborative phenomenon exhibiting characteristics in common with a wide range of government agency information-sharing initiatives. Looked at through this lens, these PSN design observations also should provide guidance to a broader set of interagency collaboration domains (Fedorowicz & Dias, 2010; Markus, Majchrzak, & Gasser, 2002).

As government agencies strive to increase their ability to share information and communicate across organizational boundaries, they must

address many new technological and organizational challenges. Although interagency collaborations have unique needs, features and goals, agency decisions made before and during the implementation process also share many commonalities. In response to this, we have derived a set of design observations from these commonalities to guide those agencies participating in interagency collaborations through the range of interlocking issues they face.

We pursue two goals in presenting this set of PSN design observations. First, we seek to promote these design observations as guidance for IOS developers. We achieve this goal by synthesizing our empirical findings into a set of design observations, which constitute an inventory of the many alternative configurations that currently exist. Second, we seek to increase the attention paid to the co-design of organizational governance structures and operations structures that PSNs, and all IOS, require. The design observations accomplish this goal by showcasing the interdependence among governance structures and PSN technology development (Denyers, Tranfield, & van Aken, 2008).

We focus on design observations because they provide a means to summarize and synthesize the empirical data gathered from our study of PSNs. Beyond this descriptive contribution, design observations become the basis for developing design principles (Germonprez, Hovorka, & Gal, 2011; Hevner, March, Park, & Ram, 2004). While design observations provide guidance, design principles provide a fundamental idea which directs designers (Markus et al., 2002). Fig. 1 depicts this process. The dotted lines surround the portion of the process developed in this paper.

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The next two sections respectively describe the research perspective and theoretical basis for developing our design observations. We then summarize the empirical context and describe our study of PSNs. We next present our set of 14 design observations and in the final section discuss how these design observations will lead to the construction of design principles and outline research and practice implications.

2. A design perspective: literature review

In developing the observations that follow, we seek to provide PSN design guidance that advances both scholarship and professional practice.

2.1. Purpose and scope

The underlying premise of design is interventionism (Nelson & Stolterman, 2003). Intervention enactment is via the introduction of new technologies or by altering the structure of organizational and institutional arrangements and practices. The design perspective adopts a constructivist epistemology (Vincenti, 1990), viewing design as purposeful and goal-oriented. The intention is to create an intervention in the world, such as the late Steve Job's intent to use the iPod as the means to change how people consume music. The design perspective may have a broad lens, but it has a distinct purpose: to induce improvement through change.

The need to ensure this guidance is grounded in the specific needs of the situation (scope) tempers the broad-scale need for greater guidance on how to support cross-boundary information sharing. This suggests that while there may be some set of common-to-all-situations guidance regarding how best to design and implement cross-boundary information sharing systems, these will need framing by the particulars of an initiative. Still, there are clear similarities (such as the need for flexibility and a call for meeting the needs of a broad base of users) in the kinds of advice prescribed in these other domains.

2.2. Constructs

The sociotechnical basis of designing a PSN means that these entities involve organizational elements as much as the construction of a technological infrastructure (Bostrom & Heinen, 1977). Prior research on design in the public sector often has taken one or the other perspective rather than the amalgamation espoused here. Design research in the Information Systems (IS) literature places analytical emphasis on the design of technological artifacts, paying scarce attention to institutional structures and organizational processes. This noted, there is widespread agreement within the IS community that particular design artifacts are both driven by organizational needs and reside in organizational contexts (March & Storey, 2008). The IS literature, however, is relatively silent on the characteristics and needs of such organizations when it comes to their design (Pries-Heje & Baskerville, 2008).

Over the past decade, work that contributes directly to providing design guidance in the public sector has begun to make its way into the literature on public administration and e-government. As with the IS literature, the focus of e-government design scholarship often reflects an interest in the artifact's constructs. Fedorowicz and Dias (2010) identified 53 papers (published in the first ten years of the annual Digital Government Conference) that focused on the design of an ICT-based artifact. Most of these papers merely described specific design science artifacts. Indeed only four of the papers analyzed presented a full design science analysis of their ICT-based systems. Likewise, Kwon, Pardo, and Burke (2008) stress the need for the development of organizational structures and processes when considering new ICT-based networks.

In contrast, both the public administration and political science literatures more often focus on the development of institutions, organizational structures, decision rights regarding resources, and the procedures and processes to enact or review laws and regulations, political

participation, and embed beliefs about collective action (Ostrom, 1990). There is a growing body of work within this literature focused specifically on designing institutions and organizations to enhance or enable inter-organizational collaborations (Mullin & Daley, 2009). The public administration and political science literatures, however, have been mostly silent regarding design principles for the technological entities on which most governments now rely.

2.3. Principles of form and function

A design perspective emphasizes describing an artifact in terms of its form and function (Norman, 2002). That is, the goals of design include esthetic as well as functional elements (Gregor & Jones, 2007). In the broad space of computing, there is resurgent interest (popularized in part by Apple) to merge form and function into a common design approach (Moggridge, 2007). For the work reported here, however, and consistent with many scholars of organizations and technology, we focus analytic attention less on esthetics and more on functionality (Hevner et al., 2004). In addition to tangible artifacts, design research also can examine work processes or abstract or intangible artifacts like information design models (Agrawala, Li, & Berthouzoz, 2011; Hevner et al., 2004).

Design scholars may draw on others' work by theorizing on the nature of needed changes, the mechanism by which the intervention will bring about change, and drawing parallels to the results of similar efforts in other domains (Denyers et al., 2008). Examples from the public sector address the challenges of crossing boundaries, the flexibility needed to meet varying and changing goals, and how to work within the restrictions of evolving standards in domains such as government–industry hazard identification collaboration in aviation (Mills, 2010) and international efforts to work on dynamic environmental issues (Friedman & Foster, 2011). What we learn from these and other published sets of design principles is that there are many facets of accommodation, integration, and flexibility that affect both the technical and organizational solutions within each domain (Fedorowicz & Sawyer, 2012).

Within the design literature, implementation principles represent prescriptive assertions based upon the mechanisms elucidated in relevant kernel theories (Denyers et al., 2008; Gregor & Jones, 2007; Hevner et al., 2004). Practitioners execute implementation plans for an intervention in the context of current conditions. While design principles prescribe interventions, design observations describe current conditions. Design observations provide insight into existing architectural and social patterns, but do not provide specific diagnoses for future action. For example, a design observation might state that policing communication technologies support observed information sharing practices. A design principle that arises from the observation would assert that to enhance police response performance, policing agencies should design their information-sharing systems with the ability to access needed information across multiple mobile devices.

In addition, by employing a theoretical rationale for explaining the various constructs and their relationships, design principles provide performance-oriented implementation prescriptions that are contingent upon situation-specific observation. To extend the previous example, detecting a pattern of information sharing practices among neighboring police agencies, each using in-vehicle radios, mobile-data terminals, and tablet computers does not lead to guidance about the value of adopting the same technologies elsewhere under different environmental conditions. Design research typically reflects a usage orientation and guidance contributes to developing criteria for assessing the intervention's success. So, in the public safety space, the design of police radio systems guides their use (Manning, 1996).

For this paper, we focus on design observations within a single public sector domain, and present technological and organizational considerations for each. They result from analysis of the extensive data collected on the PSNs in our study (as depicted earlier by the boxed in area of Fig. 1). The functionalist approach we take to developing design observations reflects our first goal of providing a synthesis to advance

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