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Editorial

Digital government and wicked problems

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ABSTRACT

This editorial introduces three examples of innovative research from the 16th International Digital Government Research Conference (dg.o 2015). To position the contributions of these examples meaningfully, we first performed a brief bibliographic analysis of research articles in the knowledge domain of digital government. This analysis provided a detailed examination of the evolution of digital government research themes and helped us introduce the examples in this special issue to the research field. Specifically, the research selected contributes to the theme of "digital government and wicked problems" by examining people's online political behavior, extracting citizens' needs from massive quantities of text data, or engaging constituents across geographical boundaries. At the same time, the bibliographic analysis and research examples together led us to ask whether the research field is ready to adopt wicked problems as a central focus, as it appears that the field is only in the very early stages of understanding the importance of the theme. To facilitate the transition from the current research orientation of the field to the next stage, we provide several suggestions for directions in future research.

1. Introduction

Contemporary public policy problems, including crime, environmental degradation, and poverty, often demonstrate the characteristics of "wicked problems," which refers to problems that lack definitive solutions (Churchman, 1967; Rittel & Webber, 1973); there also is no definitive way to describe these problems, as complete descriptions inevitably would indicate an understanding of the anticipated solutions. For example, how do we define the problems of crime and terrorism? Do we know or agree on solutions to these problems? How is one solution preferable to another? Taking crime prevention and control as an example, one may claim that crime is attributable to the ready availability of assault weapons; another may point to the lack of police training, and yet another might attribute it to inner city poverty. Such diagnoses can go on and on, as can the interventions suggested to address the problems. As exemplified by crime prevention and control, incomplete, conflicting, and changing requirements, as well as the complex interdependencies of wicked problems and ways of addressing them, make many public policy problems insoluble or suboptimal. The objectives in addressing wicked problems also can be confusing and controversial, because the public good is often disputable and the definition of equality is subjective (Rittel & Webber, 1973). These problems are wicked because they are difficult or impossible to solve in a "right" or "optimal" manner, or the solution creates another set of challenges that might be harder to solve than the set intended initially. The example of crime illustrates the "wickedness" of public policy problems—for example, the policy of mass incarceration started in the 1990s is not only costly, but also has deepened and perpetuated racial inequality and discrimination in the United States.

The theme of the 16th International Digital Government Research Conference—"Digital Government and Wicked Problems"—represents the Digital Government research community's ambition to deal with the most intractable problems that societies face, including climate change, urbanization, and inequality. This special issue introduces a collection of three outstanding research papers presented on this theme at dg.o 2015. At the same time, it is sensible to examine the landscape of digital government research and ask the question: Has digital government research evolved to the point that addressing these problems has taken center stage?

In this editorial, we first describe the evolution of digital government research based on a bibliographic analysis. We then position these three papers in the field and briefly explain their contributions. This editorial attempts to not only describe the emerging themes of digital government research and introduce this special issue, but also to identify what is missing in this issue, and digital government research in general, in an effort to better understand and approach wicked problems. Therefore, we conclude with some suggestions for future research.

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2. Evolution of digital government research

"How are we using technology to make a real difference in people's lives?"[1] is not a new question. Long before the Obama administration made digital government a high priority, several waves of "technology use and government" research had developed (Janowski, 2015). What has changed over the years are the types of technologies upon which this research has focused; the ways in which technologies enable interactions among various social, economic, political, and other actors, and the implications of the standards to which government is expected to aspire, including legitimacy, efficiency, equity, and transparency. For example, early studies examined the use of the Internet as a focal technology that enables low cost online government communication. This effort was expected to improve citizens' views on governments, especially from the point of view of efficiency or trust (e.g., West, 2004; Tolbert & Mossberger, 2006). Recent research has expanded the interest in the use of emerging information communication technologies (ICTs), such as Twitter and Facebook, to improve interactions among governments, citizens, and other sectors in networked environments, as found in many ICT journals. Others have paid attention to "smart" technologies and "big data" as ways to transform governmental affairs, such as public safety and traffic control. The use of technology in government continues to appeal strongly to all levels as a valuable resource to address public policy problems and, more importantly, as a resource that can be made available to the public to serve as a basis for social and government innovation, and participatory governance (Janssen, Charalabidis, & Zuiderwijk, 2012).

In his analysis of the articles published between 1992 and 2014 in *Government Information Quarterly* (*GIQ*), Janowski (2015) showed that digital government initiatives have evolved in four stages, from digitization (Technology in Government), transformation (Electronic Government), and engagement (Electronic Governance), to contextualization (Policy-Driven Electronic Governance). Another way to understand the evolution of the digital government field is to examine the way in which the themes in digital government research in the larger set of journals have evolved. In this editorial, we performed a bibliographic analysis of articles identified in all journals that publish research on ICTs and government in the Web of Science. In our bibliographic analysis, we identified the underlying themes in the digital government research domain and changes in those themes over time, as informed by accumulated trails of co-citations in the literature. Therefore, this analysis complemented the findings of Janowski's analysis (2015), and extended our understanding of the evolution of digital government research themes.

This bibliographic analysis provided three useful pieces of information for this editorial. First, it identified the intellectual bases and research trends in the digital government field by searching and generating clusters of co-citation networks among articles (Chen, 2015). Each cluster can be represented by a noun phrase that was extracted from the text of bibliographic records and illustrates the underlying theme of each cluster (Chen, Ibekwe-SanJuan, & Hou, 2010). Second, it provided a view on the evolution of the field by presenting these research clusters within a temporal framework. In the figures, the color indicates the time when the connection between citations was made first. Cold colors, such as blue and green, show that the first connection between citations was made early, while warm colors, such as orange and red, show that the first connection was made more recently. Therefore, the evolution of each cluster, as well as of the field as a whole, can be seen visually. Third, our analysis illustrated the critical paths or pivot points during the evolution of the field by identifying key references that bridged different clusters (i.e., those with a high value of betweenness centrality). These references are landmark papers in the field (Chen, 2015). Later, we discuss the ways in which papers with high betweenness centrality can inform future work.

2.1. Co-citation analysis

To retrieve relevant articles for this analysis, we first searched five terms in the Web of Science: "information communication technologies" OR "e-government" OR "e-governance" OR "digital government," OR "open government." The selection of search terms ultimately involves a decision about the boundary of a knowledge domain. The combination of the search terms "information communication technologies" and "government" using an AND operator generated only a few articles (less than 30 as of August 2016), while the combination of "information communication technologies" and "government" using an OR operator generated a large number of articles that might not necessarily fit the knowledge domain of our interest. On the other hand, terms such as e-government or e-governance alone do not necessarily encompass the breadth and development of research in the field. Therefore, we used primarily the findings of the four stages in Janowski (2015), as well as our observation of papers presented at the dg.o 2015 conference to specify those five search terms. More importantly, because the analysis used bibliographic records that include information on authors, titles, abstracts, keywords, and references cited, if articles include one of these terms in their titles, abstracts, and/or keywords, they are likely to concern various substantive topics on ICTs and government. Thus, these terms together are broad, yet sufficiently specific, to identify articles in the knowledge domain of ICTs and government.

A total of 2552 records was identified on the Web of Science as of April 25, 2016. We then narrowed the search results by applying the following criteria: 1) research articles only; 2) English only, and 3) publications in selected applied research areas. The applied research areas represented included information science; computer science; business economics; public administration; engineering; communication; telecommunications; operation research and management science; environmental science; healthcare science; public environmental and occupational health; urban studies; social work, and transportation. This resulted in a final set of 1399 articles. Articles from "information science" and "public administration" together comprised 59.4% of the total. Note that the dataset also included publications from other research areas to which theories, ideas, and tools associated with the search terms can be applied, such as environmental and healthcare science, and so forth. We hoped that by extending the applied research areas, we could cover the cross-disciplinary nature of digital government research. Therefore, the selection includes not only those articles that focus more narrowly on ICTs' uses within the public sector, but also those with a broader focus on using ICTs for policy-making and governance in various sectors. We then downloaded the full record and cited references for all 1399 articles.

After retrieving the citation data, we constructed a matrix of co-cited references using the analytical tool CiteSpace.[2] CiteSpace is "a freely available computer program written in Java for visualizing and analyzing the literature of a scientific domain, or a knowledge domain" (Chen, 2015, p. 1) that is designed to identify the structure and dynamics of a knowledge domain. The co-citation matrix was then transformed into a node-and-link graph or a multidimensional scaling configuration using computer algorithms (Chen, 2015). In the node-and-link graph (co-citation networks) presented in the figures, the nodes are the references cited and the links represent co-citations among them. Below we elaborate on the key results of our bibliographic analysis using CiteSpace.

[1] https://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government.html.

[2] http://cluster.cis.drexel.edu/~cchen/citespace/.

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