E-Government

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Introduction

Text

Pairing two terms such as “electronic” and “government” to name a phenomenon and create the label of “electronic government” was the signature of the early days of the Internet and web in the 1990s, which also witnessed similar creations such as “electronic business,” “electronic commerce,” and “electronic democracy,” among others. In those early days, labeling something “electronic” was meant to suggest modern, novel, and future-oriented undertakings supported by information and communication technology (ICT). None of these labels emanated from any academic discourse or research, but rather they evolved and were promoted from within ICT vendor and trade press communities. Another and equivalent label for “electronic government” is “digital government,” which was and has remained popular in North America. Both terms have been used interchangeably. Academia blessed the terms “electronic government” (EG) and “digital government” (DG) only later, by providing definitions that attempted to capture the ideas of modernizing government, fostering participation, and improving services by means of novel ICTs. One definition, which in 2006 was also adopted by the Digital Government Society, reads, “Electronic government is the use of information technology to support government operations, engage citizens, and provide government services.” Over the years and since its recognizable beginnings in the late 1990s, the multidisciplinary study domain of e-government has formed around these themes and has produced a sizable and well-respected body of knowledge at the intersection of the public sphere, including public administration, information, and information technology as well as individual, group, and institutional stakeholders’ needs and wants in this particular context. The study domain qua definition spans several traditional disciplines. Consequently, no single discipline has claimed or can claim sole ownership of the domain as its academic “home turf.” Hence, as a multidisciplinary domain of study, EG needed almost a decade to establish its unique outlets of publication, which were then recognized also from the vantage points of contributing disciplines such as Public Administration, Political Science, Management Information Systems Research, Information Science, Computer Science and Human-Computer Interaction Research, and others. One challenge for any multidisciplinary study domain such as EG is that the contributing disciplines may base their work on different standards of inquiry and norms of publication. Hence, what may count as good research in one discipline may not be equally acceptable in another discipline. However, although a niche domain of study to these contributing disciplines, over the years EG has successfully overcome this particular challenge and has established a widely recognized academic footprint and a reputation of high quality in research, which also enjoys high relevance to practice.

Public Management Information Systems as E-government Precursors

Academic interest in information and communication technologies (ICTs) in public administration developed as early as the 1950s. Most contributions from the early era came from scholars in public administration research who had an interest in the effects and impacts of information systems in government; however, initially scholarly contributions were rather rare. Crecine 1967 discusses the use of “computer systems” for the simulation of public-policy decisions. Kraemer 1969 presents a holistic understanding of “information systems” and their interacting parts in a local government context, which in the author’s view included people, hardware, software, dynamic databases, and institutional procedures. The authors of Bozeman and Bretschneider 1986 coined the term “public management information systems” (PMIS), which adapted and extended the term “management information systems” (MIS) used for

ICTs in the private sector since the 1970s. In the 1990s the desire and need for modernizing and rethinking public administration were clearly articulated in Osborne and Gaebler 1992 as well as in Milward 1994. Along these lines, discussing the potential and uses of ICTs for the purposes of modernization, citizen participation, and service improvement in government (such as in Kraemer and King 1978) coincided with the advent of the Internet and the web. However, as demonstrated in Norris and Kraemer 1996, still in the mid-1990s the high potential of mainframe-independent computing facilitated by networked personal computers and small servers in government was basically unacknowledged but instead dismissed. Bannister and Grönlund 2017 assesses and portrays the pre-e-government phase of research.

Bannister, F., and Å. Grönlund. 2017. Information technology and government research: A brief history. Paper presented at the 50th Hawaii International Conference on System Sciences (HICSS-50), held 4–7 January 2017 at Waikoloa, HI.

This conference paper gives a concise and good overview of pre-e-government literature from the early 1950s through the late 1990s.

Bozeman, B., and S. Bretschneider. 1986. Public management information systems: Theory and prescription. In *Special issue: Public management information systems*. Edited by B. Bozeman and S. Bretschneider. *Public Administration Review* 46 (November): 475–487.

While the authors built on the concepts of private sector of MIS, they were also critical of their lack of attention to externalities. As an alternative, for the public sector they presented the concept of PMIS, which was reflective of “distal” and “proximate” factors in PMIS.

Crecine, J. P. 1967. A computer simulation model of municipal budgeting. *Management Science* 13.11: 786–815.

This article presents the logic of a computer program, which helps policymakers create and manage an annual local government budget. It provides empirical evidence of the model’s effectiveness.

Kraemer, K. L. 1969. The evolution of information systems for urban administration. *Public Administration Review* 29.4: 389–402.

The author categorizes the approaches to using ICTs in government and distinguishes housekeeping, databank, model-building, and process control approaches in ICT usage.

Kraemer, K. L., and J. L. King. 1978. Development of urban information systems: Status and international relevance of United States experience. *International Review of Administrative Sciences* 44.2: 221–232.

In the later 1970s, scholars began to look across borders and compare national to international uses of ICTs in government. The study found that over 90 percent of ICT uses were still dedicated to record management in all its variants, rather than process control or analytics.

Milward, H. B. 1994. Nonprofit contracting and the hollow state. *Public Administration Review* 54.1: 73–77.

Like Osborne and Gaebler 1992, Milward’s elaborate advocacy piece in favor of privatizing large portions of the public-service endeavor also fueled the discussion on using ICTs for radically shrinking and modernizing government.

Norris, D. F., and K. L. Kraemer. 1996. Mainframe and PC computing in American cities: Myths and realities. *Public*

***Administration Review* 56.6: 568–576.**

Few studies embody the genuine underappreciation and lack of sincere understanding of the potentially transformational capacities of novel ICTs more than this article, in which the two authors hold that hierarchical mainframe computing was much more in tune with local government needs than networked personal computer–based information management.

Osborne, D., and T. Gaebler. 1992. *Reinventing government: How the entrepreneurial spirit is transforming the public sector*. Reading, MA: Addison-Wesley.

Parallel to discussions in the private sector about reengineering the organization, similar discourses were conducted for the modernization of public administration. This book is the landmark contribution in the discussion over “new public management.”

Evolution of the E-government Study Domain

With the growing interest in increased and more-effective organizational capabilities, once information and communication technology (ICT) enabled and with the assumed potential for transformational change in its wake, the popularity of the concept of “electronic government” (EG) grew, not least because of its ample opportunities for public and private research funding. As a consequence, beyond the disciplinary realms of research in public administration and political science, by the turn of the millennium, scholars from other disciplines developed strong stakes in the area, making EG research effectively a multidisciplinary domain of study, as reported in Bannister and Grönlund 2017 (cited under Public Management Information Systems as E-government Precursors). As Scholl 2009 shows, the fifty-five most prolific scholars in EG research, many of whom were already cross-trained in more than one discipline, represented a total of twenty-four disciplines. The major contributors to the multidisciplinary mix were researchers in public administration, political science, information systems, business administration, computer science, and information science. In a discourse over several years, Grönlund 2005, Norris and Lloyd 2006, Scholl 2006, and Heeks and Bailur 2007 point out that like in other multidisciplinary domains of study, in EG research, methods and standards of inquiry differed among disciplines, which initially led to much debate about what counted as “good” EG research. However, once it had become clear over the years that no single discipline “owned” the study domain of EG, or that no one discipline was able to impose its own standards onto other disciplines, the research community seemed to have settled on the grounds of method and standard pluralism, which ever since has enabled multi- and interdisciplinary collaboration, as Delcambre and Giuliano 2005 and Scholl 2010 independently show. Major topical themes and directions inside EG have been determined in Scholl 2010, Scholl 2014, and Bannister and Grönlund 2017 on the basis of bibliometric analyses, as well as in Scholl 2013 on the basis of survey data. According to these studies, among the top-ten topical clusters in EG, one finds (1) open government, transparency, and participation, (2) transformational government, (3) government services and information, (4) social media in government, (5) policy, governance, ethics, and law, (6) cloud services, interoperability, and institutional architecture in government, (7) big, open, linked data, (8) information technology service management in government, (9) digital divide(s) in the public sector, and (10) smart government, smart governance, and smart cities.

Delcambre, L., and G. Giuliano. 2005. Digital government research in academia. *Computer* 38.12: 33–39.

Delcambre and Giuliano recapped the results of seven years of National Science Foundation–funded research on EG and found the foundations established for novel cross-disciplinary work in EG.

Grönlund, Å. 2005. What’s in a field—Exploring the egovernment domain. In *Proceedings of the 38th annual Hawaii International Conference on System Sciences: Abstracts and CD-ROM of full papers; 3–6 January 2004, Big Island, Hawaii*. Edited by R. H. Sprague Jr., 125a. Los Alamitos, CA: IEEE Computer Society Press.

Grönlund analyzes the early contributions in the domain, finding them mostly exploratory and thinly guided by theory.

Heeks, R., and S. Bailur. 2007. Analyzing e-government research: Perspectives, philosophies, theories, methods, and practice. *Government Information Quarterly* 24.2: 243–265.

Similar to in Norris and Lloyd 2006, the authors analyze a small sample of eighty-four EG publications from three different sources, published between 2001 and 2005. However, despite the very small and nonrepresentative sample, the paper claims that EG research is an "intellectual weakling" (p. 261).

Norris, D. F., and B. A. Lloyd. 2006. The scholarly literature on e-government: Characterizing a nascent field. *International Journal of Electronic Government Research* 2.4: 40–56.

The authors identify and analyze fifty-seven articles on EG published between 1999 and 2004, the earliest phase of EG research. They conclude that the domain was still "getting its legs" (p. 51); contributions were relatively "weak" and were not published in what the authors suggest are "top" journals of the field.

Scholl, H. J. 2006. Is e-government research a flash in the pan or here for the long shot? In *Electronic government: 5th international conference, EGOV 2006, Kraków, Poland, September 4–8, 2006; Proceedings*. Edited by M. A. Wimmer, H. J. Scholl, Å. Grönlund, and K. V. Andersen, 13–24. Lecture Notes in Computer Science 4084. Berlin: Springer-Verlag.

The paper made the case for the longevity of EG research as a multi- and even transdisciplinary domain of study, which would be stronger and scientifically more effective if ridded from single-discipline constraints.

Scholl, H. J. 2009. Profiling the EG research community and its core. In *Electronic government: 8th international conference, EGOV 2009, Linz, Austria, August 31–September 3, 2009; Proceedings*. Edited by M. A. Wimmer, H. J. Scholl, M. Janssen, and R. Traunmüller, 1–12. Lecture Notes in Computer Science 5693. Berlin: Springer.

This contribution was one of the first providing a detailed account of leading scholars in the study domain, their disciplinary backgrounds, and the topical directions of the domain.

Scholl, H. J. 2010. Electronic government: A study domain past its infancy. In *E-government: Information, technology, and transformation*. Edited by H. J. Scholl, 11–32. Advances in Management Information Systems 17. Armonk, NY: M. E. Sharpe.

This study presents a first comprehensive assessment of the state of the study domain, on the basis of a bibliometric analysis of several thousand references of peer-reviewed EG literature collected in the E-government Reference Library, cited under Core Resources and Affiliations. Also see Scholl 2013.

Scholl, H. J. 2013. Electronic government research: Topical directions and preferences. In *Electronic government: 12th IFIP WG 8.5 International Conference, EGOV 2013, Koblenz, Germany, September 16–19, 2013; Proceedings*. Edited by M. A. Wimmer, M. Janssen, and H. J. Scholl, 1–13. Lecture Notes in Computer Science 8074. Berlin: Springer.

This follow-up study provides additional bibliometric evidence of the main topical directions of the EG research domain.

Scholl, H. J. 2014. The EGOV research community: An update on where we stand. In *Electronic government: 13th IFIP WG 8.5 International Conference, EGOV 2014, Dublin, Ireland, September 1–3, 2014; Proceedings*. Edited by M. Janssen, H. J. Scholl, M. A. Wimmer, and F. Bannister, 1–16. Lecture Notes in Computer Science 8653. Berlin: Springer.

In this study, the publication metrics including Google Scholar indices for the leading EG scholars are presented for the first time.

Core Resources and Affiliations

In part due to necessity, and in part due to foresightful vision, in the first decade of the 21st century, leading scholars in the then-young electronic government (EG) study domain jointly engaged in generating structural elements that would provide the heterogeneous and multidisciplinary community with orientation, identity, and reputation. In 2002 in Europe, the editors of Traunmüller and Lenk 2006 revitalized an existing working group (8.5) within the International Federation for Information Processing (IFIP) to become an initial and reputable organizational frame for the fast-growing scholarly community, through which a series of key conferences were to be coordinated for many years to come. In 2001 in the United States, the National Science Foundation (NSF) under the lead of Digital Government program director Lawrence Brandt and his congenial deputy, Valerie Gregg, began sponsoring the annual dg.o(nline) research conferences, in which NSF-funded research was to be presented, as Marchionini, et al. 2003 and Dawes, et al. 2004 (the latter cited under Study Methods) describe. Under the auspices of NSF, the annual dg.online conference series (cited under Conferences) helped create a platform for diverse and multidisciplinary research on the subject of digital government, which was then a popular term equivalent to electronic government, as presented in Delcambre and Giuliano 2005 (cited under Evolution of the E-government Study Domain), which finally led to the forming of the Digital Government Society in North America in 2005. Beyond professional associations, other formative resources included the E-government Reference Library (EGRL), in which, semiannually, beginning with its inaugural edition in 2005, bibliographic references in the vast majority of peer-reviewed academic contributions worldwide in the English language were documented. In early 2017, the EGRL contained 8,805 references, grown from an initial number of 922 in 2005. The EGRL has served as the source for a number of studies on the domain and is also widely used in peer reviewing and topical research on a daily basis. Finally, and somewhat late (2011), the EG community created and has since been using an electronic list service, the eGov-List, for its ongoing communications.

eGov-List.

This listserv provides a platform for exchanges between and among scholars and practitioners interested in e-government-related topics. The list has approximately 1,500 subscribers. The eGov-List archives can also be found online.

E-government Reference Library.

EGRL has been characterized as the authoritative collection of references to the academic literature in the English language on e-government.

Marchionini, G., H. Samet, and L. Brandt. 2003. Digital government. In *Special issue: Digital government*. Edited by D. Crawford. *Communications of the ACM* 46.1: 25–27.

In this editorial to the special issue on digital government, the three authors provide an overview in the direction of the US NSF's research program on the subject.

Traunmüller, R., and K. Lenk, eds. 2006. *Electronic government: First international conference, EGOV 2002, Aix-en-Provence, France, September 2–6, 2002; Proceedings*. Lecture Notes in Computer Science 2456. Berlin: Springer.

The two editors prepared the proceedings of the first EGOV conference, which would later become an influential and reputed Europe-based conference with a worldwide reach.

Core Texts

As pointed out in the Introduction, unlike traditional disciplines—for example, economics—electronic government (EG) is not an academic discipline or sharply delineated field but rather a multidisciplinary domain of study, and the objects of study are phenomena situated at the intersection of public sector and uses of modern information and communication technologies (ICTs). As such, EG can be characterized as an applied scientific undertaking in which theories developed by and rigorous methodological approaches used in contributing disciplines informs the understanding in this particular environment of EG research and practice. Consequently and, again, unlike traditional disciplines or fields, the study domain is no candidate for developing a "grand theory" of EG—such as, for example, price theory in economics. However, on the basis of theories in other disciplines, EG research has witnessed the development of a number of theoretical frameworks and models (including stage models) geared at guiding research endeavors in the various topical areas of the domain. Although some may view citation numbers as rough indicators in EG, it has remained difficult to identify core texts in terms of influencing the direction of overall discourse. Nevertheless, a few contributions stand out since they represent the state of discussion in the domain at the time of their publication, as well as giving voice to major contributors to the domain. With strong sponsorship from the US National Science Foundation (NSF), Hsinchun Chen and colleagues prepared a thirty-two-chapter edited book (Chen, et al. 2008) that has been used as a textbook and orientation into the domain in many institutions of higher education around the world. Scholl 2010 is a volume within the Advances in Management Information Systems series, which in many ways complements and updates Chen, et al. 2008. It presents sixteen chapters in four parts. While it emphasizes the multidisciplinary orientation of the EG study domain, it also highlights disciplinary contributions from information systems research. Gil-Garcia 2013a and Gil-Garcia 2013b complements and in part updates the two previously presented textbooks.

Chen, H., L. Brandt, V. Gregg, et al., eds. 2008. *Digital government: E-government research, case studies, and implementation*. Integrated Series in Information Systems 17. New York: Springer.

The chapters are grouped into three "units," with chapters 1 to 10 focusing on foundations of digital government and public policy, chapters 11 to 22 centering on government-related information technology research, and chapters 24 through 32 presenting studies of various cases of e-government implementation. Many of the most prolific EG scholars contributed to this volume, and it marks a milestone in the structural shaping of EG as a multidisciplinary undertaking.

Gil-Garcia, J. R., ed. 2013a. *E-government success factors and measures: Theories, concepts, and methodologies*. Advances in Electronic Government, Digital Divide, and Regional Development. Hershey, PA: Information Science Reference.

This volume contains three sections, the first of which highlights some theories used in the study of EG, whereas the second section discusses a number of concepts that may measure and contribute to EG success. The third section portrays methodologies used in planning for and securing EG success.

Gil-Garcia, J. R., ed. 2013b. *E-government success around the world: Cases, empirical studies, and practical recommendations*. Advances in Electronic Government, Digital Divide, and Regional Development. Hershey, PA: Information Science Reference.

This second volume edited by Gil-Garcia reports on practical cases and successful implementations of EG in three major world regions: the Americas, Asia and Australia, and Europe.

Scholl, H. J., ed. 2010. *E-government: Information, technology, and transformation*. Advances in Management Information Systems 17. Armonk, NY: M. E. Sharpe.

The four parts discuss the foundations of the domain (Part 1); the impact of EG on organization, management, and transformation in government (Part 2); important aspects of policy, participation, and governance (Part 3); and the infrastructure, interoperability, and

services sides of EG (Part 4). The volume illustrates that the study domain by 2010 had been developed past its stage of infancy.

Journals

Beginning shortly after the turn of the millennium and in the course of more than a decade thereafter, several journals have established leading roles in the publication of academic work in electronic government (EG). Two journals, *Government Information Quarterly* and *Information Polity*, had been launched prior to the formation of the EG study domain. Both journals extended their respective foci to include and explicitly invite EG-related topics around 2002. All other journals dedicated to EG topics were launched later. Evinced, for example, by impact factors or Google Scholar Metrics, but also through a dedicated study, the relative weight and reputation of the respective journals in EG was determined. Five journals ranked highest: *Government Information Quarterly* (with a commanding lead) and *Information Polity* topped the ranking in the "Forums" study, followed by *Transforming Government: People, Process and Policy*, the *International Journal of Electronic Government Research*, and the *Journal of Information Technology & Politics*. Whereas *Government Information Quarterly* and *Information Polity* are similar in their focus on information, organization, and policy, while also regarding the technology side of the equation, *Transforming Government: People, Process and Policy* and *International Journal of Electronic Government Research* put a higher emphasis on the research on information systems in the context of government. *Journal of Information Technology & Politics*, in turn, addresses technology topics from a political-science perspective. Other journals, such as *Electronic Government, an International Journal*, the *Electronic Journal of e-Government*, the *International Journal of Public Administration in the Digital Age* (launched in 2015), and the *eJournal of eDemocracy and Open Government* had no rankings in Scholl and Dwivedi 2014, had no metrics from Google Scholar Metrics or Journal Scholar Metrics, or neither. However, that does not necessarily suggest that these journals are of minor quality. In the case of *International Journal of Public Administration in the Digital Age*, for example, it would be too early to make any assessment, whereas other journals cover certain subareas (e.g., e-democracy, as in *eJournal of eDemocracy and Open Government*) or research that was generated from a Europe-based conference (e.g., *Electronic Journal of e-Government*). EG scholars also publish their work in journals that are leading in their respective disciplines, as Scholl 2009 (cited under Evolution of the E-government Study Domain) and Scholl and Dwivedi 2014 show. Among the top-five journals not dedicated to EG, according to Scholl and Dwivedi 2014, three journals (*Public Administration Review*, *Journal of Public Administration Research & Theory*, and *International Journal of Public Administration*) in public administration and two (*European Journal of Information Systems* and *MIS Quarterly*) in information systems research are relatively highly regarded by EG scholars, although the overall numbers of EG research published in these journals are relatively moderate, as found in Scholl 2009.

***eJournal of eDemocracy and Open Government*.**

Founded in 2009 and published by Danube University (Austria), this is an open-access journal closely linked to the Conference for e-Democracy and Open Government (CeDEM) and oriented toward citizen participation and open government.

***Electronic Government, an International Journal*.**

Published by Inderscience since 2004, the journal has presented research from multiple disciplines.

***Electronic Journal of e-Government*.**

An Academic Conferences and Publishing International publication closely connected to the European Conference of e-Government (ECEG); mostly republishes extended work presented previously at the conference.

***Government Information Quarterly*. 1984–.**

Published by Elsevier, this is the premier and most highly ranked journal outlet of the study domain. The journal embraces multidisciplinary research at the intersection of public administration, political science, and information science.

***Information Polity*. 1993–.**

Established in 1993 under the name of *Information Infrastructure and Policy* and published by IOS Press, this is in the group of the next highly rated journal outlets. Its editorial orientation is similar to the one of *Government Information Quarterly*.

***International Journal of Electronic Government Research*.**

Established in 2005 and published by IGI Global, this journal is very similar in its editorial orientation to *Transforming Government: People, Process and Policy*.

***International Journal of Public Administration in the Digital Age*.**

The most recent arrival among the EG journals (2015), this is published by IGI Global with a technology-sensitive orientation on public administration.

***Journal of Information Technology & Politics*.**

Founded in 2004 under a different name (*Journal of E-Government*, until 2007) and published by Taylor & Francis. The journal emphasizes a political-science orientation.

Scholl, H. J., and Y. K. Dwivedi. 2014. Forums for electronic government scholars: Insights from a 2012/2013 study. *Government Information Quarterly* 31.2: 229–242.

The two authors gave the first comprehensive survey-based account of leading EG scholars' preferences of publishing outlets for the study domain. The study established the equal ranking of top journal (*Government Information Quarterly*) and top conference (Hawaii International Conference on System Sciences E-government [HICSS EGOV] Track) outlets.

***Transforming Government: People, Process and Policy*.**

Set up in 2007 by Emerald, this journal has taken an editorial orientation combining administrative and information systems perspectives.

Conferences

Research on electronic government (EG) initially developed out of academic workshops and conferences on the subject; that is, absent any journals dedicated to the domain, conferences were at first the most-important venues for presenting EG-related research. However, also due to the multidisciplinary nature of the study domain, in which some participating disciplines (e.g., computer science, human-computer interaction) value conferences much more than journals, as opposed to other disciplines (e.g., public administration, management information systems, political science), publications at the top-three conferences and at the top-five journals have been considered of equal value by 80 percent of the tenured faculty in the domain, according to the 2014 Forums study, as Scholl and Dwivedi 2014 (cited under Journals) finds. The top-three EG conferences are the Hawaii International Conference on System Sciences

(HICSS) E-government (EGOV) Track (Electronic Government), the combined EGOV-EPART conference, and dg.online. Three other conferences are regional ones in Europe (European Conference on Information Systems [ECIS] EGOV Track and European Conference on Digital Government) and the ICEGOV conference, which has attracted completed research, ongoing research, posters, and practice reports predominantly from developing countries. The Electronic Government page on the HICSS website provides details on the most highly ranked e-government conference worldwide, specifically the HICSS EGOV Track. HICSS itself is one of the longest-running (since 1969) conferences in the domain of systems sciences. The HICSS EGOV Track hosted the first so-called minitrack on EG in 2001, which rapidly developed into a fully fledged track with seven minitracks within only five years.

dg.online.

Shortened as dg.o, this is the third-ranked conference and is conducted by the Digital Government Society. For many years, dg.o was based in North America; however, more recently it has also been conducted in other parts of the world.

EGOV-EPART.

This combined conference, first held in 2002 and based in Europe, is second in line and also has a global reach. The conference program combines completed research, ongoing research, and poster presentations along with workshops and a doctoral colloquium. The EGOV-EPART (e-government–e-participation) conference is chartered to join forces with the Conference on Electronic Democracy and Open Government (CeDEM) in 2018.

Electronic Government. Hawaii International Conference on System Sciences EGOV Track.

In 2017, the HICSS EGOV Track hosted thirteen minitracks and presented over fifty accepted and completed research papers from all around the world. The track has developed the reputation of the worldwide leading and most rigorous venue for presenting EG research. The acceptance rate of EG papers at HICSS is among the lowest of all tracks. The “short history” site on the HICSS EGOV Track, available online, presents a comprehensive account (including images) of the evolution of the track, listing all minitracks, cochairs, and best papers.

European Conference on Digital Government.

The European Conference on Digital Government (ECDG) was renamed from the European Conference of e-Government (ECEG) in 2018. The conference presents work mainly from European researchers.

European Conference on Information Systems.

ECIS is a regional annual conference with over thirty tracks, of which three or four tracks with changing foci have traditionally been dedicated to e-government-related topics.

ICEGOV.

ICEGOV is unique in that it also appeals to government practitioners, particularly from developing countries. The conference has been conducted on all continents.

Identifying Main Areas of Focus

When identifying a study domain's topical foci, a number of approaches can be employed; for example, bibliometric analyses, survey data on the subject, and other sources of evidence such as research papers or conference calls, among others. In this section, a synthesis of the various approaches is presented. Following the aforementioned formal definitions, Scholl 2007 defines the electronic government (EG) study domain along the lines of six high-level variables and their relationships and interactions: (1) government operations, (2) government services, (3) citizen engagement, (4) public policy in context, (5) information use, and (6) technology use. Research questions (and with them topical foci) are the more central to EG the more they involve and relate to these high-level variables and their relationships and interactions. Bibliometric analyses of the EG literature quite strongly confirm these theoretical considerations. Using the frequency of keywords in references collected in the E-government Reference Library (cited under Core Resources and Affiliations) for the period 2009 through 2014, government operations (also, transformational government, e-government) and citizen engagement (also, e-democracy and participation) were found to be the most-prominent topical areas, followed by information use (public-sector information, access to information, and digital divide[s]) and government services (web services and service delivery) and technology use (adoption, diffusion, and technology acceptance), as discussed in Scholl 2014 (cited under Evolution of the E-government Study Domain). A later bibliometric study based on the two top journals confirmed these findings and also found public policy (in the EG context) well covered, according to Bannister and Grönlund 2017 (cited under Public Management Information Systems as E-government Precursors). Scholl 2013 (cited under Evolution of the E-government Study Domain) presents a survey-based study and provides an even more detailed breakdown of topical foci; however, the various topics mapped without exception into the six areas defined by the high-level variables.

Scholl, H. J. 2007. Central research questions in e-government, or which trajectory should the study domain take? *Transforming Government: People, Process and Policy* 1.1: 67–88

This 2007 article was one of the first, if not the first, to define the domain by means of its main focal areas of study. It provided a definition for the centrality of research in the subject area by identifying, presenting, and discussing research questions central to e-government.

Government Operations

In early e-government practice, the potential for process and operational improvements via information and communication technologies (ICTs) had been already recognized, as Pardo and Scholl 2002 documents. Agency-internal improvements along with interagency enhancements of transactional and informational operations were in the focus of practitioners. The internal relationships and exchanges between government agencies were labeled g2g (for government-to-government) both in the trade press and the early academic literature. Many projects, however, were reaching only for so-called low-hanging fruits and were not providing any transformational change, as Norris and Reddick 2013 observes. In an interesting response to Donald Norris and Christopher Reddick, Cordella and Tempini 2015 argues that transformational change was not even the object of improving government operations, but it was instead about making an already functioning and well-designed bureaucracy more efficient.

Cordella, A., and N. Tempini. 2015. E-government and organizational change: Reappraising the role of ICT and bureaucracy in public service delivery. *Government Information Quarterly* 32.3: 279–286.

Cordella and Tempini present an approach to organizational change through e-government, which does not aim at slashing bureaucracy but rather to maintain it by functionally simplifying and increasing the overall bureaucratic effectiveness and efficiency.

Norris, D. F., and C. G. Reddick. 2013. Local e-government in the United States: Transformation or incremental change? *Public Administration Review* 73.1: 165–175.

While advocates in the early days of EG promoted and expected a rather fast and transformational change in government operations and service provisions, the reality from a more than ten-year hindsight perspective shows that operations and service changes through

EG were rather incremental, at least at local government levels.

Pardo, T. A., and H. J. Scholl. 2002. Walking atop the cliffs—avoiding failure and reducing risk in large-scale e-government projects. In *Proceedings of the 35th annual Hawaii International Conference on System Sciences: 7–10 January 2002, Big Island, Hawaii; Abstracts and CD-ROM of full papers*. Edited by R. H. Sprague Jr., 1656–1665. Los Alamitos, CA: IEEE Computer Society.

Large-scale organizational process-change projects such as the overhaul of a state's central accounting system bear a high risk of failure. This contribution discusses how failure-prone shortcuts in such projects can be identified and avoided and projects of large size can be successfully concluded in a government context with a high number of diverse stakeholders.

Government Services

From the outset, both politicians and public administration officials viewed e-government as an opportunity to improve public services both to citizens and businesses. These relationships were then termed g2c (government-to-citizens) and g2b (government-to-business) services. Carter and Bélanger 2005 describes the requirements for successful government services. Also, Venkatesh, et al. 2012 analyzes the prerequisites and success factors for public service provision. In the course of discussing public services, the notion of coproduction of services (i.e., governments, businesses, and citizens jointly providing services) became more prevalent, leading to improved services according to Bell and Nusir 2017.

Bell, D., and M. Nusir. 2017. Co-design for government service stakeholders. Paper presented at the 50th Hawaii International Conference on System Sciences (HICSS-50), held 4–7 January 2017 at Waikoloa, HI.

Over the years, the idea of citizens and governments codesigning services has become more prevalent, in order to make sure that citizens' needs were met and that government resources were used toward successful ends. Bell and Nusir's contribution describes the process of government-stakeholder service codesign in detail.

Carter, L., and F. Bélanger. 2005. The utilization of e-government services: Citizen trust, innovation and acceptance factors. *Information Systems Journal* 15.1: 5–25.

Carter and Bélanger explain from an information systems perspective how and when citizens use and prefer to use EG services. The authors combine the technology acceptance model with innovation diffusion theory and trust models. The study finds ease of use, trustworthiness, and compatibility to be important factors in the acceptance of e-government service delivery.

Venkatesh, V., F. K. Y. Chan, and J. Y. L. Thong. 2012. Designing e-government services: Key service attributes and citizens' preference structures. *Journal of Operations Management* 30.1–2: 116–133.

Venkatesh and colleagues discovered that the design of e-government services should be reflective of citizens' preferences. Key attributes that represent these preferences, such as usability, resource requirements, technical support, and security, played important roles in determining and predicting the acceptance and use of electronic services.

Citizen Engagement

Besides the interest in improving government operations and government services, another great hope was that engaging and involving

citizens in the business of democratic government and governance would improve and be better facilitated by means of novel ICTs. Thomas and Streib 2003 depicts a new two-way street in the interactions between government and citizens. Initiatives fostering electronic ways of participation and voting are described in Tambouris, et al. 2013, and Parycek, et al. 2015 discusses the prerequisites for increasing the levels of citizen engagement.

Parycek, P., J. Schossböck, and B. Rinnerbauer. 2015. Identification in e-participation: Between quality of identification data and participation threshold. In *Electronic participation: 7th IFIP 8.5 International Conference, ePart 2015, Thessaloniki, Greece, August 30–September 2, 2015; Proceedings*. Edited by E. Tambouris, P. Panagiotopoulos, Ø. Sæbø, et al., 108–119. Lecture Notes in Computer Science 9249. Cham, Switzerland: Springer.

Parycek and colleagues emphasize that providing a low threshold for citizens to engage with government is of premier importance. However, at the same time, data quality standards and security measures need to be maintained at a high level, which provides a challenge. The authors found that quality and security standards could be adjusted to the respective levels of engagement.

Tambouris, E., A. Macintosh, E. Dalakiouridou, et al. 2013. eParticipation in Europe: Current state and practical recommendations. In *E-government success around the world: Cases, empirical studies, and practical recommendations*. Edited by J. R. Gil-Garcia, 341–357. Advances in Electronic Government, Digital Divide, and Regional Development. Hershey, PA: Information Science Reference.

In Europe, e-participation, e-democracy, and e-voting appear to have found much attention and support, as well as in the form of funding numerous initiatives pursuing those ends. The authors summarize these initiatives and the lessons learned.

Thomas, J. C., and G. Streib. 2003. The new face of government: Citizen-initiated contacts in the era of e-government. *Journal of Public Administration Research and Theory* 13.1: 83–102.

In an early report, Thomas and Streib found that seeking information from government still prevailed over citizens interacting with governments. “Expressing opinions” still represented a fairly small portion of citizens’ interactions with governments. However, those interactions were on the rise despite obstacles in the form of several digital divides.

Public Policy

With the establishment of, for example, online government services (as opposed to “in-line” front office services), numerous policy issues needed to be addressed, including but not limited to identification, authentication, transactional and informational nonrepudiability, data protection, privacy, and the right to know. In this context, Hardy and Williams 2008 investigates the policy implications of electronic procurement by government. The authors of Tolbert, et al. 2008 were also among the early scholars who shed light on the various policy implications of transactions and interactions on the basis of novel ICTs between government and citizens as well as businesses. Dawes 2010 extends earlier work on the subject and discusses policy changes in the context of intergovernmental information sharing in e-government environments.

Dawes, S. S. 2010. Information policy meta-principles: Stewardship and usefulness. In *Proceedings of the 43rd annual Hawaii International Conference on System Sciences: 5–8 January 2010, Koloa, Kauai, Hawaii; Abstracts and CD-ROM of full papers*. Edited by R. H. Sprague Jr., 1–10. Los Alamitos, CA: IEEE Computer Society Press.

Building on earlier work with regard to information-related policy, Dawes illustrates the importance of principles of information stewardship and usefulness in the context of open and transparent government.

Hardy, C. A., and S. P. Williams. 2008. E-government policy and practice: A theoretical and empirical exploration of public e-procurement. *Government Information Quarterly* 25.2: 155–180.

Initially, e-procurement was considered an important and somewhat distinct subarea in the study domain of EG, and policy-related questions were discussed to some extent right from the beginning. Hardy and Williams provide an account of cases that illustrate how public procurement policies were adopted in the context of online bidding and procuring.

Tolbert, C. J., K. Mossberger, and R. McNeal. 2008. Institutions, policy innovation, and e-government in the American states. *Public Administration Review* 68.3: 549–563.

Tolbert and colleagues present study results showing that US states that were among the early adopters of novel information technologies (e-government) were also those that understood and addressed related policy implications early.

Information Use

Per mandate and by their very mission, governments collect and hold enormous amounts of comprehensive and authoritative information, and when taking all levels of government into account, a country's public administration is probably the holder of the largest amount of official high-quality data and information, on a tremendous scale and scope and in great detail. The value of free and open access to this unique pool of public information has increasingly been recognized, and many countries have enacted legislation such as the Freedom of Information Act in the United States. Dawes 1996 finds government information not only of highest value and interest to the general public but also very important with regard to interagency information sharing. Yang and Maxwell 2011, a literature review, elaborates on the intricacies of information sharing, and Dawes, et al. 2009 emphasizes the value of knowledge networks in the public sector, which are built on the basis of established information-sharing infrastructures.

Dawes, S. S. 1996. Interagency information sharing: Expected benefits, manageable risks. *Journal of Policy Analysis and Management* 15.3: 377–394.

In the earliest days of EG research, Dawes's article on information sharing established the foundation for explaining the connection between the use of shared information on the basis of its usefulness, on the one hand, and the unfailing information stewardship it takes to produce and maintain the usefulness of information to make it shareable and trusted in an interagency context, on the other hand.

Dawes, S. S., A. M. Cresswell, and T. A. Pardo. 2009. From "need to know" to "need to share": Tangled problems, information boundaries, and the building of public sector knowledge networks. *Public Administration Review* 69.3: 392–402.

In their thoughtful essay on public-sector knowledge networks (PSKN), the authors present thirteen lessons about knowledge generation and information sharing in the public sector. They conclude that challenges exist with regard to the governance and the administration of PSKN.

Yang, T.-M., and T. A. Maxwell. 2011. Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors. *Government Information Quarterly* 28.2: 164–175.

Yang and Maxwell provide a comprehensive literature review on information sharing in government, in which they distinguish between interpersonal, intraorganizational, and interorganizational levels of information sharing, which they find to be highly interrelated. Among the factors influencing the sharing of information, legal and policy factors played a role, as well as trust, resourcefulness, and

operational differences, among others.

Technology Use

Over the years, modern ICTs have been presented and celebrated both in the trade press and in the literature on information systems as effective enablers for organizational change and institutional improvement. This did not change with the advent of EG. In fact, early academic contributions such as Fountain 2001 reiterate the optimistic speculations presented by vendors and the press. Layne and Lee 2001 introduces a model of four stages through which the authors expect e-government to evolve, which in its essence is not much different from the consultants' stage model in Baum and Di Maio 2000, presented a year earlier. Coursey and Norris 2008 criticizes the purely speculative and uncritically technology-optimistic nature of these early contributions. More recently, however, the use of technology in government has been discussed in a far more reflective and empirical study-based fashion. Notably, the effects that ICTs demonstrably have on public administration, and how such ICTs can be improved, are analyzed in detail in Bertot, et al. 2010.

Baum, C. H., and A. Di Maio. 2000. Gartner's four phases of e-government model. *Gartner Group* (21 November): G0094235.

Although published a year ahead of Karen Layne and Jungwoo Lee's model, the Gartner stage model basically repeats earlier stage models and speculates about the developmental phases of the e-government evolution.

Bertot, J. C., P. T. Jaeger, and J. M. Grimes. 2010. Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government Information Quarterly* 27.3: 264–271.

The use of technology is revisited on grounds of real data at a later stage by Bertot, Jaeger, and Grimes. When looking at the use of social media in the context of e-government for fostering a culture of transparency and accountability, the authors conclude that lack of access to, lack of usability and functionality of, and the lack of literacy with regard to technology on the part of users might be the true barriers rather than the lack of technology itself.

Coursey, D., and D. F. Norris. 2008. Models of e-government: Are they correct? An empirical assessment. *Public Administration Review* 68.3: 523–536.

Two stage models cited here (Baum and Di Maio 2000, Layne and Lee 2001) and others are characterized (and criticized) as "purely speculative, having been developed without linkage to the literature about information technology and government" (p. 523).

Fountain, J. E. 2001. *Building the virtual state: Information technology and institutional change*. Washington, DC: Brookings Institution.

In an early contribution, the prospects of what Fountain calls the "virtual state" (i.e., public administration in the age of the Internet) are explored. She points out that information technology (IT) by itself would not be "revolutionary"; however, over time and not immediately visible on the surface, through the use of IT, processes would change, ultimately leading to a more virtual than a brick-and-mortar state.

Layne, K., and J. Lee. 2001. Developing fully functional e-government: A four stage model. *Government Information Quarterly* 18.2: 122–136.

Layne and Lee publish their hypothetical four-stage model of the projected development of EG, which distinguishes four stages: (1) cataloguing, (2) transaction, (3) vertical integration, and (4) horizontal integration. Interestingly, despite its questionable analytical and explanatory merit, this contribution has remained the most highly cited academic publication in e-government.

Main Contributors and Contributions

The contours of the electronic government (EG) study domain can also be effectively represented by its main academic contributors, who regularly and in some cases prolifically publish on EG topics. While the core of the EG scholarly community numbers in the three hundreds to four hundreds, it is only a smaller group of scholars who consistently and influentially contribute to the domain, according to Scholl 2016. The main contributors can be distinguished as the most highly cited or most-prolific EG scholars, which then fall into two groups of Highest-Impact Contributors and Other Important Contributors. Furthermore, highly cited contributions from other scholars also help shape the study domain, which are discussed in the respective third subsection, Other Highly Cited Work.

Scholl, H. J. 2016. Making sense of indices and impact numbers: Establishing leading EGOV scholars' "signatures." In *Electronic government: 15th IFIP WG 8.5 International Conference, EGOV 2016, Guimarães, Portugal, September 5–8, 2016; Proceedings*. Edited by H. J. Scholl, O. Glassey, M. Janssen, et al., 3–18. Lecture Notes in Computer Science 9820. Cham, Switzerland: Springer International.

This paper continues a series of other contributions on the evolution of e-government. It distinguishes between an EG scholar's "signature" in research as opposed to plain citation or index numbers.

Highest-Impact Contributors

In this subsection the highest-impact EG scholars are briefly introduced with regard to one of their most influential contributions. These scholars were identified on the basis of (1) the number of EG contributions as of 2016, (2) the respective Google Scholar citation number as of March 2017, (3) the *h* index as of March 2017, and (4) the i10 index as of March 2017. In these criteria, first the reference for the section introduction is given, and then the twelve leading scholars are introduced by also showing their respective scores from (1) to (4) behind their names. One influential publication is presented per scholar. Over many years, John Carlo Bertot (34, 6524, 40, 111) has been the most influential and most highly cited EG scholar. This past long-term editor-in-chief of *Government Information Quarterly* has also served as a president for the Digital Government Society (DGS) and as a minitrack cochair at the Hawaii International Conference on System Sciences E-government (HICSS EGOV) Track. Besides other topics, he has investigated the effectiveness of e-government policies and policy frameworks, such as in Bertot, et al. 2012. The most prolific EG scholar undoubtedly is Marijn Janssen (122, 6409, 41, 145), who is the coeditor-in-chief of *Government Information Quarterly*. He also serves as a co-organizer of the EGOV-EPART conference, as well as a minitrack cochair at the HICSS EGOV Track. As seen in Janssen, et al. 2012, open government / open data are major areas of his research. Jose Ramon Gil-Garcia (97, 5397, 35, 82), the research director of the Center for Technology in Government and the second-most-prolific EG scholar, has published on a number of subareas in the EG domain, including the evolution of the domain, as in Gil-Garcia and Martinez-Moyano 2007. Gil-Garcia also serves as a minitrack cochair at the HICSS EGOV Track. Theresa A. Pardo (86, 6143, 35, 91) is the director of the influential Center for Technology in Government (CTG). She also is a former president of DGS and serves as a minitrack cochair at the HICSS EGOV Track, as well as a track chair at the EGOV-EPART conference. Pardo and Tayi 2007 exemplifies her interest in interorganizational information integration. Sharon S. Dawes (42, 3977, 28, 54) is the founder and former director of CTG. She also served as founding president of DGS and as cochair of minitracks at the HICSS EGOV Track. Governance topics have been a major focus of her work, as seen in Dawes 2008. Hans Jochen Scholl (75, 3547, 29, 60) also is a former president and founding member of DGS and has served as a chair and cochair of the HICSS EGOV Track from its inception. In addition, he has been a co-organizer of the EGOV-EPART conference. Shaping the e-government research agenda has been a special concern, as evidenced in Scholl and Klischewski 2007.

Bertot, J. C., P. T. Jaeger, and D. Hansen. 2012. The impact of polices on government social media usage: Issues, challenges, and recommendations. *Government Information Quarterly* 29.1: 30–40.

Bertot and colleagues investigate and discuss policies and policy frameworks to guide social media use in public administration.

Dawes, S. S. 2008. The evolution and continuing challenges of e-governance. *Public Administration Review* 68.S1: S86–S102.

This paper on e-governance provides a historical overview and discusses governance challenges in the digital age.

Gil-Garcia, J. R., and I. J. Martinez-Moyano. 2007. Understanding the evolution of e-government: The influence of systems of rules on public sector dynamics. *Government Information Quarterly* 24.2: 266–290.

An important contribution by Gil-Garcia as a lead coauthor is this paper on the evolution of e-government.

Janssen, M., Y. Charalabidis, and A. Zuiderwijk. 2012. Benefits, adoption barriers and myths of open data and open government. In *Special issue: European research on electronic citizen participation and engagement in public policy making*. Edited by J. C. Sipior. *Information Systems Management* 29.4: 258–268.

This highly cited paper studies and compares the benefits of open data in government and the barriers to open-data usage.

Pardo, T. A., and G. K. Tayi. 2007. Interorganizational information integration: A key enabler for digital government. *Government Information Quarterly* 24.4: 691–715.

This paper on information integration sheds light on the complexities of interorganizational and intergovernmental information sharing.

Scholl, H. J., and R. Klischewski. 2007. E-government integration and interoperability: Framing the research agenda. In *Special issue: Microinsurance: Working to solve healthcare disparities in developing countries. International Journal of Public Administration* 30.8–9: 889–920.

This article on integration and interoperability helped frame the research agenda in this particular subarea.

Other Important Contributors

For the second-tier group of important contributors, who were identified by means of the same methodology as described in Highest-Impact Contributors, also one influential publication per scholar is presented. Vishanth Weerakkody (61, 3570, 35, 79) is the editor-in-chief of the *International Journal of Electronic Government Research*, who successfully managed to reinvigorate and reorient the journal after a phase of stagnation. As seen in Weerakkody and Dhillon 2009, the transformative nature of e-government is a major interest in his research. Eric W. Welch (26, 3321, 27, 43) served for a number of years as a minitrack cochair at the HICSS EGOV Track. Many of his contributions have a public-policy orientation, as in Welch, et al. 2005. After serving for many years as a minitrack cochair, Lemuria Carter (31, 4455, 23, 30) became cochair of the HICSS EGOV Track in 2017. She has also served as track cochair for e-government at the Americas Conference on Information Systems. Carter and Weerakkody 2008 represents her interest in e-government adoption and the cultural factors, which play a role in that process. Christopher G. Reddick (56, 2661, 24, 51) is the editor-in-chief of the *International Journal of Public Administration in the Digital Age*. He is the author with the most single-authored articles (five) within his ten most highly cited contributions. Reddick 2005 demonstrates his interest in citizen interaction with government. Åke Grönlund (45, 3116, 29, 62) is a former co-organizer of the EGOV-EPART conference and one of the pioneers of EG in Europe. He was a major contributor in the early discussions regarding the course that the then-young EG study was to take, as in Grönlund and Horan 2005. Finally, Maria A. Wimmer (61, 2696, 26, 64) is another former long-term co-organizer of the EGOV-EPART conference and a pioneer of EG in Europe, as seen in Wimmer 2002.

Carter, L., and V. Weerakkody. 2008. E-government adoption: A cultural comparison. *Information Systems Frontiers* 10.4: 473–482.

This article on e-government adoption has been highly cited. When comparing the adoption of e-government in the United States and the United Kingdom, several cultural differences were found.

Grönlund, Å., and T. A. Horan. 2005. Introducing e-gov: History, definitions, and issues. *Communications of the Association for Information Systems* 15 (June): 713–729.

This article introduces the concepts of EG and also charts out the prospects of the domain.

Reddick, C. G. 2005. Citizen interaction with e-government: From the streets to servers? *Government Information Quarterly* 22.1: 38–57.

In an early study of e-government adoption, Reddick shows that citizens were willing to switch to electronic service and information delivery.

Weerakkody, V., and G. Dhillon. 2009. Moving from e-government to t-government: A study of process reengineering challenges in a UK local authority context. In *Handbook of research on strategies for local e-government adoption and implementation: Comparative studies*. Vol. 1. Edited by C. G. Reddick, 1–16. Hershey, PA: Information Science Reference.

Weerakkody's coauthored chapter on transformational government sheds light on the challenges of transformation on the levels of local government in the United Kingdom.

Welch, E. W., C. C. Hinnant, and M. J. Moon. 2005. Linking citizen satisfaction with e-government and trust in government. *Journal of Public Administration Research and Theory* 15.3: 371–391.

In a highly cited paper, Welch and colleagues study and link Internet use and citizens' satisfaction with e-government services to trust in government and government operations. More-satisfying services were found to be boosters of trust in government.

Wimmer, M. A. 2002. A European perspective towards online one-stop government: The eGOV project. *Electronic Commerce Research and Applications* 1.1: 92–103.

This article documents the early expectations and hopes of the impacts of EG in Europe.

Other Highly Cited Work

A number of highly cited articles in EG do not fall into any of the other categories. However, they deserve mentioning since they either were influential at the time or have maintained a lasting effect on the domain. In early studies, the notions of government overhaul and EG intersected, and several authors were inspired to explore this intersection, as in Ho 2002. At around the same time, M. Jae Moon (Moon 2002) studied the evolution of e-government at the municipal level on the basis of third-party survey data. For unknown reasons, Moon almost never used the EG domain's major outlets for publishing his works. Interestingly, he appears to have shifted his attention from EG to other topics in around 2010, when EG-related publications vanished from his publication record. Also, in another highly cited article on the subject, West 2004 studies the effects of the growing EG implementations in local governments. As documented in other sections of this article, scholars from different disciplines first struggled with working together and accepting standards of inquiry used in

disciplines other than their own. In the domain's early years a discussion over the rigor and grounding in theory also ensued, which led to various exchanges, some of which had hardly any favorable summary claims or observations regarding the soundness of EG research, as in Grönlund 2005 and even more so in Norris and Lloyd 2006. Interestingly, these contributions and others such as Heeks and Bailur 2007 (cited under Study Methods) made their own claims on the basis of very small samples—which were in most cases convenience samples—of the EG literature, which would not stand any test of representativeness. Yildiz 2007 provides a thoughtful but also highly selective review of the early EG literature. Over the years and with the growing number of peer-reviewed EG publications, these concerns seemingly evaporated or were no longer seen as important. In the early 21st century, topics such as service delivery, open government along with open data, and smart government have gained prominence in the scholarly discussion; Chourabi, et al. 2012 is a highly cited example of the last topic.

Chourabi, H., T. Nam, S. Walker, et al. 2012. Understanding smart cities: An integrative framework. In *2012 45th Hawaii International Conference on System Sciences (HICSS-45): Maui, Hawaii, USA, 4–7 January 2012*. Edited by R. H. Sprague Jr., 2289–2297. Piscataway, NJ: IEEE Computer Society Press.

The eight-dimensional smart-city / smart-government framework presented in this conference paper has since become highly influential in smart-city and smart-government research.

Grönlund, Å. 2005. What's in a field—exploring the egovernment domain. In *Proceedings of the 38th annual Hawaii International Conference on System Sciences: Abstracts and CD-ROM of full papers; 3–6 January 2004, Big Island, Hawaii*. Edited by R. H. Sprague Jr., 125a. Los Alamitos, CA: IEEE Computer Society Press.

In this contribution, Grönlund attempts to capture and characterize the various strands and threads of EG contributions.

Ho, A. T.-K. 2002. Reinventing local governments and the e-government initiative. *Public Administration Review* 62.4: 434–444.

Like other early contributions, this article attempts to conceptualize the "paradigm shift" from "bureaucratic service delivery" toward "e-government service delivery." It is speculated that such shift of paradigms would lead to reinventing local government services.

Moon, M. J. 2002. The evolution of e-government among municipalities: Rhetoric or reality? *Public Administration Review* 62.4: 424–433.

This study shows that e-government was in the process of adoption by numerous municipalities, though at a very early stage.

Norris, D. F., and B. A. Lloyd. 2006. The scholarly literature on e-government: Characterizing a nascent field. *International Journal of Electronic Government Research* 2.4: 40–56.

This article is an example of the highly critical, if not dismissive, early assessments regarding the quality and soundness of the then-evolving EG domain.

West, D. M. 2004. E-government and the transformation of service delivery and citizen attitudes. *Public Administration Review* 64.1: 15–27.

Like others' results, West's study shows that EG most likely did not and would not produce transformational change; rather, the change through EG adoption would be incremental and gradual.

Yildiz, M. 2007. E-government research: Reviewing the literature, limitations, and ways forward. *Government Information Quarterly* 24.3: 646–665.

This review of the EG literature, although not comprehensive, identifies and represents major themes in the study domain.

Related Fields

In the section on the Evolution of the E-government Study Domain it is outlined that six formal disciplines share interests in certain areas of the electronic government (EG) study domain: Public Administration, Management Information Systems Research, Political Science, Information Science, and Computer Science and Human-Computer Interaction Research. While such interest in EG-related topics has significantly risen over the years in some of these disciplines (e.g., in research on public administration), in others (e.g., in research on management information systems) it has been fairly moderate, which might indicate a relative proximity to (or distance from) the center of any given discipline that is involved. Whenever EG-related topics are investigated from within one of the aforementioned disciplines, it appears that disciplinary foci and primary interests of this particular field are emphasized over a more holistic or cross-disciplinary perspective, which would be expected in a publication targeted at an EG readership. In the five subsections of this section, for each discipline, an example is given for an EG-related disciplinary contribution in the leading outlet of the respective discipline.

Public Administration

Before the age of EG, information systems–related topics have been showcased only sporadically in journals such as *Public Administration* and *Public Administration Review*, as mentioned in the introduction. More recently, and with the growing impact of information technologies in and on the public sector, the number of contributions has increased. However, many of these contributions (e.g., Norris and Kraemer 1996) seem to dispute or significantly downplay the impact of the use of information systems in government, which has had a tradition in a field that during the mid-1990s, in all seriousness, still embraced the case made for legacy mainframe computing as more suited to the needs of local governments than administrative support based on personal computers (PCs). A more recent (and short) contribution, Norris 2010, comes across as equally technology skeptical and maintains that administratively, nothing much changes through the use of modern information technology.

Norris, D. F. 2010. E-government 2020: Plus ça change, plus c'est la meme chose. In *Special issue on the future of public administration in 2020*. Edited by R. O'Leary and D. M. Van Slyke. *Public Administration Review* 70.S1: S180–S181.

Along similar lines as Norris and Kraemer 1996, almost a decade and a half later the same lead author maintained that the impact of modern information technology remained basically indiscriminate.

Norris, D. F., and K. L. Kraemer. 1996. Mainframe and PC computing in American cities: Myths and realities. *Public Administration Review* 56.6: 568–576.

This contribution exemplifies the relative reticence and slight discomfort with technology-related topics. At a time when the Internet and the web were visibly making headway, this study still maintained that mainframe computing was superior to networked PCs in local government.

Management Information Systems Research

In the field's top journal, *MIS Quarterly*, the focus lies on information systems (IS) in the context of private-sector businesses, which

explains why it has never been overly interested in public-sector management problems, including IS-related problems. So, the lack of EG-related publications cannot be considered a surprise at all. However, every so often public-sector-related articles have appeared, such as Mohan, et al. 1990. More recently, Tan, et al. 2013 looks at the improvement of service quality through web-based offerings in government.

Mohan, L., W. K. Holstein, and R. B. Adams. 1990. EIS: It *can* work in the public sector. *MIS Quarterly* 14.4: 435–448.

In this article, the authors coin the term “executive information systems,” or EIS, for the context of public administration and study their use in the context of public administration.

Tan, C.-W., I. Benbasat, and R. T. Cenfetelli. 2013. IT-mediated customer service content and delivery in electronic governments: An empirical investigation of the antecedents of service quality. *MIS Quarterly* 37.1: 77–109.

The authors find that both quality content and convenient delivery modes are important factors of satisfactory service-quality perceptions on the part of users (citizens).

Political Science

Although political scientists had always displayed a great interest in EG, only few, if any, publications on EG have appeared in premier political-science outlets. However, in the early 21st century, policy studies regarding the Internet have focused on themes such as quality of service (QoS) as well as on Internet network neutrality. Besides technical and business challenges, regulatory challenges were also discussed. For example, Claffy and Clark 2016 examines the regulatory implications of failed interdomain QoS projects.

Claffy, K. C., and D. D. Clark. 2016. Adding enhanced services to the Internet: Lessons from history. *Journal of Information Policy* 6:206–251.

The authors show that “the coevolution of regulatory, legal, business, and technological capabilities, all at different paces, is tightly coupled in the case of enhanced services—a quintessential interdisciplinary challenge” (p. 248).

Information Science

When taking the top journal in IS—that is, the *Journal of the American Society for Information Science and Technology*, since 2014 titled *Journal of the Association for Information Science and Technology*—as a reference, EG and e-democracy-related topics are far more frequent in this journal than in *MIS Quarterly* or political-science outlets. Peled 2011 investigates and discusses policy and informational challenges in open-data initiatives.

Peled, A. 2011. When transparency and collaboration collide: The USA Open Data program. *Journal of the American Society for Information Science and Technology* 62.11: 2085–2094.

On the basis of empirical evidence from a case, Peled strongly argues in favor of a public “information market place” “in which self-interested actors [can] exchange real-time data [and] ensure that information will be sent to the right people at the right place at the right time” (p. 2092).

Computer Science and Human-Computer Interaction Research

In the early 21st century, and particularly after public and private funding for geographic information science (GIS) and other technology-heavy projects in the public sector dried out, the originally strong interest of computer science (CS) and human-computer interaction (HCI) researchers in public-sector problems has vanished. Since then it has become more difficult to find and identify any CS and HCI project reports genuinely interested in public-sector problems. Vlachokyriakos, et al. 2016 appears to be a rare exception in terms of genuine interest in research at the intersection of citizen empowerment and service provision in the areas of CS/HCI.

Vlachokyriakos, V., C. Crivellaro, C. A. Le Dantec, E. Gordon, P. Wright, and P. Olivier. 2016. Digital civics: Citizen empowerment with and through technology. In *CHI 2016: Extended abstracts; The 34th annual CHI Conference on Human Factors in Computing Systems, San Jose Convention Center, San Jose, CA, May 7–12*. 1096–1099. New York: Association for Computing Machinery.

The authors showcase how digital technologies can help move from transactional to relational interaction.

Study Methods

As discussed in Scholl 2009 (cited under Evolution of the E-government Study Domain) and in Heeks and Bailur 2007, the methods of inquiry in electronic government (EG) range from all kinds of qualitative and quantitative studies to advanced mixed-method study design. In this regard, EG is one of the most exciting scientific domains of study since it lacks preventive lateral blinders in terms of methods of inquiry, as presented in Dawes, et al. 2004.

Dawes, S. S., V. Gregg, and P. Agouris. 2004. Digital government research: Investigations at the crossroads of social and information science. *Social Science Computer Review* 22.1: 5–10.

Showcasing the multidisciplinarity and large range of methodological approaches in the EG domain, the authors were particularly instrumental in expanding the National Science Foundation's digital-government research agenda to include, for example, social-science fields of study as well.

Heeks, R., and S. Bailur. 2007. Analyzing e-government research: Perspectives, philosophies, theories, methods, and practice. *Government Information Quarterly* 24.2: 243–265.

On the basis of an extremely small sample of the then-extant EG literature, the authors present the range of methods used in the EG domain and make generalizations regarding the academic quality, along with recommendations for the future direction of the EG domain.

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Central research questions in e-government, or which trajectory should the study domain take?

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Abstract

Purpose – To develop the notion of centrality in e-government (EG) research, and to base the identification of central research areas on that principle. To pave the path towards a more integrated understanding of EG and its phenomena.

Design/methodology/approach – The paper analyzes which disciplines contribute to EG. It scrutinizes the scope and orientation of disciplines involved and invested EG. Key high-level variables in EG are derived from the literature. It is analyzed to what extent major EG phenomena are impacted by those variables and their interaction, which leads to the development of the principle of centrality. Central research areas of EG are identified based on the centrality principle. The integrative interdisciplinary research approach in EG is linked to trends in global science.

Findings – The paper finds the areas of transformation, integration, participation, and (information) preservation to be central to EG. It also identifies strong drivers in central EG research towards an integrative interdisciplinary approach.

Research limitations/implications – A systematic review of the extant EG literature is still missing but could be guided by the centrality principle.

Practical implications – When addressing the central areas, EG might manage to develop into an integrative science. In that case, its research results would likely be highly relevant to government practice and academia alike.

Originality/value – The paper develops and defines the principle of centrality in EG research. It identifies central research areas in EG and distinguishes those from non-central research areas in EG. In so doing, the paper provides guidance and focus, particularly, for integrative EG research.

Keywords Communication technologies, Government, Research

Paper type Conceptual paper

Introduction

Some time ago, Lenk and Traunmüller (2002) posed the question of where e-government (EG) was headed as a practice and study domain. While the term EG and the excitement around it back then was new, according to the authors the "informatization" of the public sector, as they called it, was no new phenomenon but rather a development, which had begun decades earlier, yet whose potential had remained unrecognized way too long by policy makers, legislators, and academics alike (Lenk and Traunmüller, 2002). They suggested that EG had to prove its soundness and viability after the heydays of high public attention and excitement were over (Lenk and Traunmüller, 2002). Lenk and Traunmüller (2002, p. 8) suggested to broaden the research perspective beyond the role of information systems and to include in the field of study the "complex socio-technical work reality" in public administration. Half a decade later, EG has in fact broadened its perspective significantly as recent studies show (Groenlund, 2004, 2006; Scholl, 2006). At least 13

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disciplines have contributed to the EG study domain (Scholl, 2006). In other words, the "complex socio-technical work reality" has seemingly been addressed. In so doing, EG has developed into a conglomeration of partially intersecting and mostly juxtaposed studies from various disciplines. Epistemic divergences have been ignored or glossed over (Scholl, 2006). Multi- or interdisciplinary studies are in short supply. Integrative reviews and multidisciplinary synopses are missing. While the volume of studies and publications in EG is rapidly growing, no common understanding has developed, nor has a grand theory emerged (Scholl, 2006). The mono-disciplinary research in EG falls short of capturing major aspects of important EG phenomena (Schuppen, 2006; Wind, 2006; Delcambre and Giuliano, 2005; Scholl, 2006).

Concerns and even anxieties have arisen among EG scholars regarding the academic soundness, legitimacy, and reputation of the research domain, which appears as a loosely-coupled conglomeration of studies, which somewhat reside underneath the same roof without a clear understanding of their relationships, academic quality, and relative scientific value (Groenlund, 2004, 2006). Some EG scholars recommend to adopt those standards and procedures of inquiry familiar from information systems research so that the still predominantly mono-disciplinary academic environment would have little trouble with accepting and embracing the newcomer discipline as a peer (Groenlund, 2004; Heeks and Bailur, 2006). Others would like to see EG officially become a subsection of Public Management Information Systems (PMIS, "*Verwaltungsinformatik*") (Schuppen, 2006; Wind, 2006). Yet, others prefer a multi- and interdisciplinary orientation of EG (Delcambre and Giuliano, 2005; Scholl, 2006).

This paper intends to develop an understanding of what is central to EG research and what is not. It also aims at developing clarity regarding what the central research areas and questions are in EG, and what are not. Central research areas in EG, it is further argued, require at least multidisciplinary, if not truly interdisciplinary research arrangements.

In this paper, it is first assessed whether or not the current formation of the research domain of EG qualifies as, or at least has the potential for becoming a "regular" discipline. Second, based on the result that EG does not qualify as a discipline but rather represents a multi-disciplinary endeavor, it is analyzed which research avenues have been followed so far, and which key variables have been identified by various disciplines involved in EG. Based on this it is discussed which central research questions, if any, have emerged from the various perspectives in EG. It is found that central research questions in EG reach beyond the scope of any single discipline. Third, alternatively, the prospects for EG to become an integrative science as opposed to a mono-disciplinary endeavor are conceptually explored. Finally and in conclusion, the emerging conception of EG as an integrative science is placed into the broader context of the rapidly changing academic landscape of the early twenty-first century, in which integrative EG might have the capacity of serving as a role model for novel high-relevance science. In the next section, I ponder the question of whether or not EG has the potential to turn into a "regular" academic discipline.

Test for an academic discipline fails

Some scholars have already expressed deepest concerns regarding the current state of EG and proposed to develop the domain into a fully-fledged academic discipline rather sooner than later (Groenlund, 2003, 2004, 2005, 2006). Like EG, many other start-up

endeavors in academia and elsewhere had to overcome the skepticism or outright hostility of incumbent forces before (Kuhn, 1996) disputing their scientific merit and questioning their scholarly reputation and legitimacy. Some newcomers in the past hurried to demonstrate their epistemological and methodological compliance with what was perceived as the accepted standards of inquiry in reputed reference disciplines. A case in point would be information systems research in 1970s, which quickly aligned to the standards upheld in North American business schools in those days (Scholl, 2006). Although the study field unlike the studies of PMIS in public administration schools made it to the rank of department in many business schools, over decades the discipline has been engulfed in an agonizing debate over the perceived rigor-versus-relevance tradeoff (Benbasat and Zmud, 1999; Davenport and Markus, 1999; Applegate and King, 1999; Lee, 1999). The debate in information systems is informative for EG, since it exemplifies the late potential pitfalls of any rash alignment without developing clear understandings of central research questions as well as epistemological and methodological stances of those disciplines and scholars involved in the early stages. In the case of EG, with that many disciplines already participating, the hasty alignment to a single hosting discipline would most likely be neither attainable nor desirable. However, this insight makes scholars holding the aforementioned concerns feel ever more uneasy, since undeniably academic careers, research funding, and other resources are appropriated on the grounds of academic reputation and legitimacy. So far, I have used the centrality principle to demonstrate the necessity for at least multi-disciplinary, if not interdisciplinary approaches to EG. Below, I argue that the prospects for EG to become a "regular" (in the sense of "traditional") discipline are slim at best, which, however, will not necessarily negatively impact the academic standing of EG as laid out in the subsequent section. Recently, I have discussed in detail (Scholl, 2006) and will recap for the purposes of this discussion here in brief the perspectives for EG to develop into a traditional mono-discipline.

When determining whether or not an academic domain of study qualifies as a discipline, six main criteria or indicators are frequently tested for:

(1) a formal definition of the discipline;

(2) a common knowledge base;

(3) a unique cluster of research problems;

(4) unifying theories;

(5) accepted procedures and methods of inquiries; and

(6) a shared vision of the study domain's significance (Scholl, 2006).

Besides those main criteria 11 collateral indicators have also been introduced for further testing:

(7) structural elements on university level (departments, schools, or colleges);

(8) graduate programs and students;

(9) a worldwide researcher community;

(10) both academic and professional associations;

(11) journals and recurring conferences;

(12) researcher self-identification with the discipline;

(13) icons, that is, visible/leading scholars;
(14) textbooks;
(15) expressed allegiance via artifacts and accepted rules;
(16) terminology/discipline-specific lingo; and
(17) strong interaction between academic discipline and the field of practice.

Upon using the six main criteria for a test, EG is indeed endued with a formal, clear, and widely accepted definition of the domain of study as quoted and emphasized already above. Also, a common knowledge base has developed on a worldwide basis. Furthermore, a cluster of unique research questions and problems exists. However, as far as unifying theories or accepted procedures and methods of inquiry are concerned, those theories and standards are greatly missing in EG. As Grönlund (2005) points out, in EG the theoretical underpinnings are borrowed from other disciplines and underdeveloped.

When compared, for example, with established disciplines a dominant (or at least) leading theory such as agency theory in economics, or resource-based theory in organizational theory is grossly missing in EG. Likewise, the procedures and methods of inquiry in EG range from action research over traditional survey-based research to computer simulation spanning the entire methodological spectrum.

So far, no shared vision of the significance of EG has emerged. However, this may change over the next few years, since in the North America, Europe, and Asia, regional digital government societies were formed, which will most likely foster the development of such a vision regionally and globally. Also, the appearance of new journals like, for example, *Transforming Government: People, Process, and Policy* and the topical reorientation of existing journals towards EG can be instrumental in helping develop a shared vision of EG's significance. In summary, three of the six main criteria for a "regular" academic discipline are not met, when EG is subjected to the test (Figure 1), that is, currently EG would not pass as a regular discipline.

If the aforementioned 11 collateral indicators were considered, the test results would not improve: EG-related administrative and institutional structures on university-level like colleges, schools, departments, or institutes are missing (indicator No. 7). EG-specific graduate programs are rarely found, if at all, so that graduate students of EG are not numerous (indicator No. 8). Yet, a worldwide, well-connected community of scholars and practitioners exists (indicator No. 9). Also, professional and academic associations have formed (indicator No. 10), and a number of journals and annual conferences have emerged (indicator No. 11). Even the self-identification of a growing number of scholars with the EG study domain can be observed (indicator No. 12), although EG falls short in offering equivalents to icons like Adam Smith, Herbert Simon, Ludwig Wittgenstein, Werner Heisenberg, Albert Einstein, Josef Schumpeter, or Max Weber (indicator No. 13). EG textbooks have not been published, however, at least one textbook is under preparation (indicator No. 14). So far, no specific lingo has developed in EG (indicator No. 15), nor have EG-specific, allegiance-indicating artifacts appeared (indicator No. 16). One of EG's strongest assets it has been said is its relevance to practice. In fact, the interaction between academic discipline and the field of practice is well developed (indicator No. 17). In terms of the collateral indicators, again for 6 of 11 EG would not pass the test (Figure 1).

Criterion	*Current Status*	*Criterion*	*Current Status*
Formal definition	✓	Academic and professional associations	✓
Common base of knowledge	✓	Journals and recurring conferences	✓
Unique cluster of research problems	✓	Researcher self-identification	✓
Unifying theories	*NO*	Icons	*NO*
Procedures and methods	*NO*	Textbooks	*NO Forthcoming*
Shared vision	*NO Emerging?!*	Allegiance, artifacts, etc	*NO*
Departments, schools, or colleges	*NO*	Lingo	*NO*
Graduate programs and students	*NO Some students*	Academia/practice interaction	✓
Worldwide researcher community	✓		

Figure 1.
The test for discipline: EG meets 8 of 17 criteria

In other words, EG clearly does not pass the test for a "regular discipline." Hence, the question arises, what the prospects are for EG to unfold into a discipline in its own right, or, at least, turn into a subfield in an established discipline. However, the proposed institutional integration of EG into a certain mono-disciplinary science (e.g. PMIS) collides with the well-articulated and vested interests of a number of disciplines, which have engaged in EG for many years. From those disciplinary perspectives it would remain unclear what added value the subordination of EG research under the rule and standards of another mono-disciplinary science would yield. Even if added value could sufficiently be identified, it would be questionable how the transfer and integration into that discipline would be orchestrated, leave alone how agreement could be reached. EG scholars trained in one particular discipline do not necessarily understand or even appreciate the study procedures of another discipline engaged in EG. So, one rather has to conclude that such a scenario is most unlikely.

More likely it seems that the disciplines involved will maintain or even increase their engagement. The rapidly rising numbers of academic publications on EG (Scholl, 2006) support that conclusion. As a matter of fact, EG has emerged as a loosely coupled multi-disciplinary endeavor. When multiple disciplines engage in the study of a phenomenon, as is the case with EG, the research designs maintain a mono-disciplinary orientation, yet sometimes the results are synoptically presented albeit not in an integrated fashion. Unlike interdisciplinary projects, multi-disciplinary approaches as observable in the context of EG do not encompass the integration of research designs or research results.

If turning into a "regular" discipline does not seem to be a realistic option for EG, then two non-exclusive alternatives remain:

(1) continue as a conglomeration of multiple disciplines, which may or may not converge to some common ground; or

(2) developing into an integrative interdisciplinary science (for example, like bioscience, information science, or even public administration).

It is noteworthy that those two alternatives can unfold simultaneously and feed on each other. The degree of integration it can be argued hinges upon the added value, which such interdisciplinary integration is expected to yield. It can further be argued that more added value (and hence, more scholarly interest and commitment to the laborious task of integration) can be expected from high-impact research central to EG as opposed to research with low impact on the periphery of the problem spectrum. What, then, would qualify as central and high-impact research in EG, and which research question would be central in EG? This is discussed in the next section.

Central research questions in EG

Interestingly, a systematic review of the extant EG literature with the aim of distilling, discussing, and synthesizing this domain's central research questions has not yet appeared. Although this paper has not been intended to and, hence, will not fill the void, it might help create a point of departure for a more systematic review and discussion of those central research questions.

Despite different disciplinary provenances, scholars engaged in EG have advocated a broad and inclusive approach to the domain's research agenda. As seen above, a systemic perspective on the phenomena in EG has been proposed for some time (Lenk and Traunmüller, 2002). Beyond information systems, EG was to include the study of policy, decision-making, and information management. The 2002 National Conference on Digital Government Research (dg.o 2002), for example, presented diverse EG research on integration of information, privacy, and presentation as well as on policy, public infrastructure, and planning, interfaces and human-computer interaction, and life cycle tracking of the ecosphere (Arens, 2002). Even more inclusive approaches suggested the study of government front and back offices encompassing services, business processes, interoperation, information flows, stakeholder analysis, and strategic management in a holistic fashion (Traunmüller and Wimmer, 2003). EG was understood as a facilitating element in "transforming traditional modes of governing and government into technology-enabled modes of the twenty-first century" (Scholl, 2002, p. 122). At the HICSS conference of 2007, for example, the EG track comprises eight distinct topical orientations including democratic participation and inclusion, ethics, management and organization, infrastructure, interoperability, information security, services, knowledge and information management, policy, law, and governance. If those topical orientations are mapped against the participating disciplines, at least 13 disciplines can be identified as contributors: public administration, computer science, information science, information systems, political science, law, ethics, philosophy, organizational science, strategic management, marketing, management science, and sociology (Table I). This list is, of course, not exhaustive, however, suffices to demonstrate the multiple-discipline involvement in key research areas of EG.

Unsurprisingly, in mono-disciplinary approaches to EG, research questions have taken different flavors. As a case in point, Wind (2006) poses the central research questions in EG from a (European) PMIS perspective, which include:

Topic/study orientation	Potential disciplinary perspectives
E-democracy, e-participation, e-inclusion	Political science (Pol Sci), public administration (Pub Admin), information science (Inf Sci), information systems research (ISR), computer science (CS) philosophy, law, ethics, etc.
E-government management and organization	Pub Admin, Org science, management science, Pol Sci, Inf Sci, strategic management, ISR, CS, etc.
E-government infrastructure and interoperability	CS, ISR, Inf Sci, Pub Admin, Pol Sci, Org science
E-government knowledge and information management	Inf Sci, ISR, CS, Pub Admin, sociology, Pol Sci, stragic management, etc.
E-policy, law, and governance	Pol Sci, law, Pub Admin, Inf Sci, ISR

Table I.
Topical areas and disciplinary perspectives in EG

(1) How information and communication technologies (ICT) change public administration?

(2) How ICT help modernize public administration?

(3) How decentralized government operations can be integrated?

(4) What influences and effects EG has in an international context?

In other words, the effects of the facilitating variable technology (ICT) on the subject-area variable public administration represent the direction and orientation of research. Public administration researchers would most certainly employ a different perspective, when studying organizational development in, for example, technology-enabled government operations.

In Europe, or at least in the European Union (EU), a more ICT- and implementation-oriented flavor seems to prevail in EG than in North America. By serving the goals of the EU Lisbon agenda, for example, the European roadmap of technology and research development towards the year 2020 (eGovRTD2020) attempts to "identify and characterize the key research challenges, required constituency, and possible implementation models" (Anonymous, 2006b), which would help "the EU becom{e} the world leading information society" (Wimmer and Bicking, 2006) by that year. By contrast, the US National Science Foundation, for example, appears to have funded more foundation-oriented research in EG, which helps:

> ... develop new knowledge about the integration and co-evolution of social and technical systems, especially those that have the potential to transform learning and discovery and enhance quality of life and economic prosperity for all people (Anonymous, 2006c).

This tendency is echoed in the mission statement of the Digital Government Society of North America, which holds that EG is about "the use of information and technology to support and improve public policies and government operations, engage citizens, and provide comprehensive and timely government services" (Anonymous, 2006a). This crisp definition of EG distinguishes six major concepts or high-level variables, that is:

(1) information use;

(2) technology use;

(3) public policy;

(4) government operations;

(5) government services; and
(6) citizen engagement.

In the following, those high-level variables will be referred to as facilitating (information, technology) or subject-area (public policy, government operations, government services, and citizen engagement) variables.

It is noteworthy that the above definition of the "aboutness" (Hjorland, 2001) of EG implicitly incorporates a cross-disciplinary perspective on the object of study: The use of information or of technology can be viewed from the perspective of public policy or government operations; or vice versa public policy making and government operations can be viewed through the lens of information and of technology use. Likewise, the perspectives of citizen engagement and government services could provide the focal orientation on information and technology uses, and vice versa. In fact, even if reduced to just bidirectional relationships between the two main facilitating variables (information, technology) and the four main subject-area variables (public policy making, government operations, government services, and citizen engagement) as shown in Figure 2, various disciplines have developed an interest in or claim of ownership regarding those relationships.

None of those six high-level variables are "owned" by any one discipline. As the chart implicitly suggests, relationships might not simply be bidirectional, but rather involve feedback between the facilitating variables, on the one side, and the subject area variables, on the other side. Furthermore, relationships are likely to exist between all variables defying the establishing of any clear-cut cause-and-effect, independent-to-dependent-variable hierarchy between them. For example, when taking Wind's first research question (effects of EG on government operations and government services), it is immediately evident that the two subject-area variables government operations and government services are simultaneously also influenced by the information use variable and by public policy and citizen engagement. More importantly, all high-level variables interact with each other in a feedback fashion. When, for example, certain policies are imposed on the uses of technology, not only that particular variable will be affected, however, over time all other variables in the grid will be impacted. For example, the actual use of technologies under those policies in government operations or government services will feed back on the policies in terms of

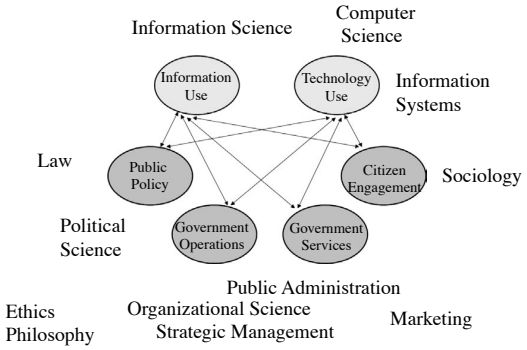

Figure 2.
Relationships between key variables in EG and select disciplinary interests

their effectiveness. Intended and unintended side effects might be observable also with other variables in Figure 2. Fountain's (2001) proposed framework of technology enactment provides another example geared at capturing the feedback between organization, governmental institution, and technology in EG.

In other words, the research domain of EG deals with a mesh of interdependent variables with no single discipline "owning" any of the variables or even any of the relationships between them. Further, employing the frequently (and successfully) used scientific tactics of dividing and reducing research questions to manageable sub-relationships in order to fit a given disciplinary scope and linear cause-effect-oriented methodological frame will not help increase the understanding of the interdependent variables and the interdependent processes.

This leads to the insights that central research questions in EG:

- have to account for the six high-level variables;
- have to address their complex interrelationships and the processes between them;
- which typically involve more than one discipline; and
- further important aspects in the relationships between those variables may even fall outside the scope of any one discipline.

As a consequence, EG phenomena are seemingly harder to tackle than in traditional mono-disciplinary research set-ups.

Expectedly, as the synopsis of disciplinary research interests in EG below reveals, the high-level variables are addressed by those disciplines in different ways and to different degrees. Please note that this overview below is meant to crisply illustrate the above point and not intended to qualify as an exhaustive treatment, which I hope we will see in a future systematic review of the EG literature.

Public administration research, for example, is interested in the political, organizational-behavior, organizational design, public/private, service presentation and design, and regulatory aspects of EG (Garson, 2003; Bretschneider, 2003; Rocheleau, 2000; Holden, 2003; Danziger and Andersen, 2002). In particular, public administration research has a need to study:

- the impact of information technology on the distribution of power;
- information resource equity and the "digital divide";
- use of IT as symbolic action;
- the impact of IT on discretion;
- the impact of IT on organizational culture;
- privatization;
- decentralization;
- remote work;
- implementation success factors;
- "persuasiveness" of governmental web sites;
- regulation of IT-related uses; and
- other regulatory issues (Garson, 2003, p. 331).

In terms of EG, information science (Webber, 2003; Choo, 2002; Saracevic, 1999), on the other hand, focuses on information generation, communication, and utilization in public administration as well as information management (including information services) in the organizational context of public administration. In the EG context, information science also studies information systems and information and communication technologies in the public sector from an information perspective as well as the information environment and policy in public administration (Webber, 2003).

Regarding EG, the research agenda of information systems, as seen from a North American perspective, would be concerned with "capabilities" and "practices involved in planning, designing, constructing, and implementing" information systems (IT artifacts) (Benbasat and Zmud, 2003, p. 186), the human behaviors affected by and usage of those systems, the practices for influencing system usage and evolution, and finally the overall transformational impacts of information systems on humans and organizations in the context of public administration (Benbasat and Zmud, 2003; Agarwal and Lucas, 2005). On a much more technical level than information systems, computer science is also interested in providing IT tools and algorithmic solutions to public-sector challenges (Delcambre and Giuliano, 2005). Unlike information systems, computer science is unlikely to study the context of the tools in its non-technical dimensions as proposed by Agarwal and Lucas.

In political science, policy-related and politics-relevant technologies and their consequences for public policy have seemingly not made it to the center stage in that discipline, although some streams of research (for example, e-voting and e-rulemaking) have appeared, for example (Macintosh, 2004; Shulman, 2005). It is noteworthy, that a keyword full-text search across the three North American top-tier political science journals yielded no results for the search terms "electronic" or "digital" in combination with the terms "governance," "government," or "policy" for the timeframe of 1999 to mid-2006. However, as conference entries and research contributions elsewhere indicate, there is a growing interest in the EG study domain also from a political science perspective.

When looked at EG from a sociology perspective, the impact of information technology on social order becomes a major focus of research (Sassen, 2002). The embeddedness of technology and the interplay between the digital and material dimensions are also main avenues of interest (Mackenzie and Wajcman, 1999; Orlikowski, 1992). Furthermore, the sociological view would also include the study of mediating cultures between technology providers and technology user; and destabilizing of existing hierarchies "material conditions and practices, place-boundedness, and thick social environments" within and through which these technologies operate (Sassen, 2002, p. 366).

In summary, the various disciplines and fields capture certain aspects of what I have called high-level variables in EG, while other important aspects involved in those variables escape their attention. This leads to the question, whether or not a purely and isolated mono-disciplinary treatment of a given EG phenomenon would lead to robust and relevant results. Or, formulated another way: could a mono-disciplinary approach be expected to satisfactorily address any of the central research questions in EG? In light of these questions, it appears that the more central a research question in EG, the more it would need at least a multi-disciplinary treatment.

EG centrality

Central research questions in EG, I have argued above, must involve more than just one high-level variable and go beyond the facilitating variables of information use and technology use. Aligned with the second argument. that is, relevant research central to EG would need to be at least multi-disciplinary in nature, it appears that research questions central to EG basically have two distinct characteristics:

P1. Central research questions in EG involve (a) multiple (both facilitating and subject area) high-level variables and (b) at least multi-disciplinary perspectives.

Along this line of reasoning, the mono-disciplinary treatment of a research question, for example, the characteristics of electronic government information systems (EGIS) from an information systems perspective, would, of course, clearly qualify as EG research, however, not in terms of a *central* research question. In order to claim centrality, not only the impact of such EGIS on government services or government operations in a technical organizational understanding would be studied (as partially done in information systems), but also, for example, the impact of these EGIS on the distribution of power or on resource equity would be in focus from a public administration perspective, which would clearly fall outside the scope of information systems. The study of certain characteristics found in or in the context of EGIS, though, could be important in information systems from a mono-disciplinary perspective without having greater importance to EG; likewise, the study of changes in power distribution induced through EGIS, for example, could be an interesting research topic in its own right in public administration regardless of the specific EGIS involved and without commanding any high attention in EG.

Under the premises of *P1* (EG centrality), which particular research topics (and questions) would likely qualify as central to EG? In the following discussion I propose the four areas of transformation, integration, participation, and preservation as central to the EG research agenda. Of course, more areas and their associated research questions might be found central to EG under the above definition than just these four. They are presented here to illustrate the approach.

Transformation

From a practitioner perspective it is evident that EG is seen as instrumental for improving policies, operations, and services alike and also increase citizen engagement (Balutis, 2001a, b). From a research standpoint, such incremental improvements or increases might be interesting, but hardly suffice to define a study domain, least of all a multi-disciplinary one. Unless improvements and increases prove substantial and sustainable, and hence, likely transformational in nature, research would develop meager interest, if any. Some public administration researchers utter precisely that concern about EG (Bretschneider, 2003). In that perspective, the addition of technologies to existing structures in public administration hardly changes but rather strengthens those structures (Bretschneider, 2003). However, others argue that the transformational dimension of EG is already taking visible shape (Scholl, 2005b). However, the assumed or contested transformational impact of EG on public administration and public governance does not only speak to the (assumed or contested) legitimacy of the study domain, but (almost axiomatically) also serves as a

central research question for EG. In line with Giddens' (1984) and Orlikowski's (1992) structuration perspective, the study of the transformational impact would not be limited to the institutional and organizational dimensions of public administration, but would also encompass all interacting elements including the technology components and the human actors. Hence:

P2. Transformation is central to the understanding of EG.

The respective central research question reads, "What is the nature/extent of EG-related/relatable transformation in government?"

P2a. The transformation-related interaction between the high-level variables is central to the understanding of EG.

The respective central research question reads, "What role do the *interactions* between information use, technology use, public policy, government operations, government services, and citizen engagement play with regard to EG-related/relatable transformation in government?"

Integration

In one of the earliest analyses of EG-related phenomena, Layne and Lee (2001) proposed their frequently cited four-stage model, in which they held that both vertical and horizontal integration would become a major focus of EG the more the practice of EG was going to unfold. Integration in government, however, has many implications fairly different from those in the private sector. Democratic government rests on the principle of division of powers enacted by a system of checks and balances (Jaeger, 2002). Beyond those constitutional and legal constraints eight other factors such as:

(1) jurisdictional;
(2) collaborative;
(3) organizational;
(4) informational;
(5) managerial;
(6) cost;
(7) technological; and
(8) performance constraints,

have been identified to exert strong constraining influence on public-sector integration (Scholl and Klischewski, 2008). Also, with process integration as opposed to information integration, distinct forms of integration have been observed (Klischewski, 2004). Beyond horizontal or vertical integration in government also cross-sector integration has come into focus. On the technological side of integration, the interoperation between EGIS as well as the capability and the conditions under which to interoperate (interoperability) have become a study focus. For a number of years, the EG practitioner community has been deploying enterprise resource planning systems in government known from the private sector (Ward, 2006). Evidently, EG-related integration has numerous facets and aspects and also represents a study area involving most if not all high-level variables and more than one discipline. Also, the more

integrated processes and information, the more the interdependencies between the high-level variables might be influenced. Hence:

P3. Integration is central to the understanding of EG.

The respective central research question reads, "What is the nature/extent of EG-related/relatable integration in government?"

P3a. The integration-related interaction between the high-level variables is central to the understanding of EG.

The respective central research question reads, "What role do the *interactions* between information use, technology use, public policy, government operations, government services, and citizen engagement play with regard to EG-related/relatable integration in government?"

Citizens' participation

Citizens' participation is instrumental to any system of democratic governance and to effective democratic government. However, in a wider societal context, this might also include the participation in the society's economic process and its results, and as a prerequisite for that the citizens' participation in education, which also requires the unrestricted access to information. While constitutional and legal provisions in democratic societies guarantee those basic rights and resources to its members, via EG new dimensions for making available (or restricting) those rights and resources seem to be emerging. It needs to be far better understood, how the participation-related principles of governance can be preserved or appropriately re-interpreted within an EG context. For example, representative formats of governing might be amended and complemented by more direct and more immediate involvement of citizens in the public decision-making process. While technology and information use might make possible the direct participation in public decision making for many, it might effectively bar others, although inadvertently. On the one hand, EG practice and research need to address, how the digital reach can be expanded across technology, educational, economic, and other divides (Bertot, 2003). On the other hand, widest public participation might demand and enforce immediate administrative action leading to potential pitfalls. The extant representative format of governance has not only been designed to adequately represent the citizenry, but was intended to also serve as a safeguard against hasty decision and law making. Yet, via enabling electronic technologies, increased participation ranging from direct involvement in local government matters to general elections and other public votes might become available to many more citizens than ever thought possible in the traditional setup. Multiple challenges confront lawmakers, citizens, and both government leaders and workers regarding the potential change in participation through EG. Those challenges include equity of resources and opportunity, power distribution, security and safety among a few others. Citizen engagement (which represents a narrower concept than citizen participation) and the other high-level variables as well as their interactions are involved in this context. Hence:

P4. Participation is central to the understanding of EG.

The respective central research question reads, "What is the nature/extent of EG-related/relatable citizen participation in government?"

P4a. The participation-related interaction between the high-level variables is central to the understanding of EG.

The respective central research question reads, "What role do the interactions between information use, technology use, public policy, government operations, government services, and citizen engagement play with regard to EG-related/relatable citizen participation in government?"

(Information) preservation

Practitioners have long demanded to pay increased attention to the enormous challenges regarding electronic record management (ERM) and document life management (DLM) that come along with the unfolding of EG (Plocher, 1999; Relyea, 2002, 2003; Mullen, 2001). The preservation of government information serves short-, mid-, and long-term information needs, which might be very different in nature. Government information unlike its private counterpart commands authority with all legal consequences, that is, it needs to be preserved unaltered and unalterable for hindsight scrutiny. With the rise of EG, government must cope with two realms, the paper-based and the rapidly growing digital realm (Scholl, 2005a). While the integration of the two presents a cluster of problems in itself, appropriate policies for preserving the various digital records still need to fully unfold (Glenn, 2004; Sprehe, 2000). Among the foremost challenges in ERM and DLM rank:

- the treatment of e-mail records;
- the update of paper records; and
- integration of ERM and DLM with EGIS as well as EGIS planning (Patterson and Sprehe, 2002).

Also, since those sites have become "the primary public face" (Patterson and Sprehe, 2002, p. 313) for most government agencies, web site records need systematic and comprehensive preservation. Moreover, unlike their paper predecessors, electronic records need to be migrated frequently from one technology generation to the next (Scholl, 2005a). In other words, the life cycles of EGIS and documents are interdependent, that is, planning and implementing EGIS must take into account the life cycle of documents stored on them, and vice versa (Patterson and Sprehe, 2002). It appears that information use and technology use along with public policy, government operations, and government services play major (interacting) roles in the preservation of digital government information. Hence:

P5. (Information) preservation is central to the understanding of EG.

The respective central research question reads, "What is the nature/extent of EG-related/relatable (information) preservation in government?"

P5a. The (information) preservation-related interaction between the high-level variables is central to the understanding of EG.

The respective central research question reads, "What role do the *interactions* between information use, technology use, public policy, government operations, government

services, and citizen engagement play with regard to EG-related/relatable (information) preservation in government?"

In summary, the discussion so far has attempted to establish the principle of centrality of research areas (and questions) in EG, and by using this principle has argued that (without any claim of exhaustiveness) the four areas of transformation, integration, participation, and preservation are at the core of EG and yield four central research questions in EG, which were presented as propositions for further discussion and testing.

Moreover, through this elaboration, the uniqueness and the added value of the EG research agenda has been shown and detailed. No single discipline involved in EG would capably address any of the central research questions alone. By addressing those central research question, EG will be able to develop a rich research agenda, which connects with numerous disciplines in both directions. Furthermore, EG would become part of a trend, which is observable most strongly in the natural sciences, but has also produced some precedents in social science research (Hess *et al.*, 2005). In the next section, I briefly discuss the trends of internal (intra-) and external interdisciplinary integration, and how integrative EG fits into them.

Integrative trends in science and how they relate to EG

In recent decades the natural and social sciences have produced such an enormous volume of new knowledge (Lattuca, 2001), that knowledge segments of narrow bandwidths have emerged, which prove foreign even to scholars within the same discipline (Despres *et al.*, 2004; Morillo *et al.*, 2003). This fragmentation and division within disciplines has detrimental effects in quite many areas of research and application, since critical knowledge relative to a given problem cannot be synthesized in due time. Furthermore, like in EG so in other fields of study complex problems in research and practice typically transcend disciplinary boundaries (Despres *et al.*, 2004; Morillo *et al.*, 2003). Some disciplines have responded by either ignoring such boundary-crossing research or practice problems, or by attempting to address those problems within its own conceptual and methodological limits, albeit at the expense of relevancy to practice. Hence, quite a few disciplines are struggling with:

- re-integration of knowledge segments within their own boundaries; and
- integration of problem-related relevant knowledge from other disciplines (Despres *et al.*, 2004; Morillo *et al.*, 2003).

As observed in the history of science several times before, so also in this case the natural sciences pave the path; for example, "bioscience" draws from numerous specialty and subfields in physics, chemistry, and biology, and integrates that knowledge in an interdisciplinary fashion. Reportedly, the collaboration for researchers from the various subfields was initially arduous; however, research from one decade and a half of integrative and interdisciplinary research in bioscience has demonstrably produced high-quality results, which would have hardly been attainable without the integrative effort. Other integrative sciences have emerged in the areas of engineering/technology, physics, and chemistry. As a consequence, a host of new interdisciplinary journals has emerged, which publish the integrated research results. As a bibliometric study recently demonstrated, between two thirds and three-fourths of all newly launched academic journals in the areas of bio medicine,

engineering/technology, physics, and chemistry in the US employ an integrative and interdisciplinary perspective (Morillo *et al.*, 2003). Still, those new interdisciplinary outlets maintain a certain connection with their parenting disciplines creating a new grid of publishing opportunities for scholars. Remarkably and as the above numbers already suggest, new interdisciplinary journal launches outnumber mono-disciplinary journal launches by a high margin (Morillo *et al.*, 2003).

In EG, the premises are similar to those described for the natural sciences. The participating disciplines in EG also suffer from internal fragmentation, and as seen before they need external inputs for relevantly addressing an EG problem. The integrative pressures are frequently exerted from the realm of practice or from funding agencies such as the NSF on the participating disciplines in EG. Hence, integrative EG seems to be in line with the global trend towards interdisciplinary integration supporting the arguments of advocates for such an orientation of EG (Delcambre and Giuliano, 2005; Scholl, 2006).

Although integrative interdisciplinary collaboration is reportedly time-consuming and hard to do (Hess *et al.*, 2005), it promises to yield high-impact and highly relevant research results central to EG. However, the disciplines involved in EG almost cover the whole scientific spectrum of methods, epistemological stances, and ontological claims. Integration and even collaboration between disciplines remote to each other in terms of their procedures of inquiry and epistemologies might be found difficult. A clear understanding of and respect for those different standards and stances is, therefore, indispensable for all scholars engaging in such endeavors. As I laid out elsewhere (Scholl, 2006), when describing the scientific landscape, frequently Biglan's (1973) grid is invoked, which distinguishes the sciences along the lines of hard/soft methods and pure/applied dimensions. As demonstrated, the disciplines involved in EG populate the entire Biglan grid (Scholl, 2006). Integrative efforts, hence, need to bridge the gulches between pure and applied as well as between hard and soft. While, for example, like in bioscience, the integration between pure and applied disciplines appears to work in a relatively straightforward fashion as long as it involves homogeneous "hard methods," integrating pure and applied sciences on the soft method side might be much harder to arrange due to greater methodological heterogeneity. Likewise, the integration between hard and soft methods might meet a few challenges, particularly along the lines of different or even opposing epistemological stances. While Biglan's grid helps map the sciences and provides orientation regarding their preferred epistemological stances, methods, and focus, it does little to further any integrative effort.

Peirce's framework might offer additional orientation in this regard (Peirce, 1960, 1957, Peirce *et al.*, 1992, Peirce and Moore, 1998). Peirce distinguishes the sciences into three classes:

(1) *The science of discovery*. Explanatory and heuristic sciences including mathematics, philosophy, physics, chemistry, biology, psychic sciences, and history.

(2) *Science of review.* Including history of science, theoretical review, practical review, and pedagogy.

(3) *Pragmatics.* Including engineering.

It is obvious that EG plays a role in all three of Peirce's main pillars of science, discovery, review, and pragmatics. As Peirce suggests these pillars of science feed on

each other. Even at his time the fragmentation in the science of discovery had reached an extent that an intra- and interdisciplinary review science was necessary for capturing and connecting the knowledge assets and identifying the knowledge gaps (Peirce, 1960, 1957, Peirce *et al.*, 1992, Peirce and Moore, 1998). In other words, the problem that EG faces is not new. Also, EG's anchoring in practice (Peirce's Pragmatics) is a strong asset. The interaction between academic theory and government practice has consistently led to high relevancy of research results. This interaction has been a two-way avenue in terms of influence and direction. Like in other practical fields such as engineering and technology development, EG practice has proven to be a strong driver of more integrated research endeavors, which ultimately require more than multi-disciplinarity but rather interdisciplinary collaboration.

Conclusion

Currently, EG presents itself as conglomeration of research methods, standards of inquiry, and epistemological stances drawing from and involving many traditional disciplines. It does not qualify as a "regular" discipline, and there is little evidence that it ever will. However, the phenomena studied in EG are unique, complex, and important to the proper functioning of modern democratic government and to society at large. Those phenomena escape purely mono-disciplinary treatments, for example, from public administration, political science, information science, information systems, computer science, or sociology to a large extent. In this paper, I have argued that the more central the research questions in EG, the more they need the simultaneous attention and collaborative effort from various disciplines. Or, said another way, the more mono-disciplinary the treatment of any research question central to EG, the more it risks compromising relevancy. Six high-level variables have been identified which play a role in central EG research questions:

(1) information use;
(2) technology use;
(3) public policy;
(4) government operations;
(5) government services; and
(6) citizen engagement.

Four (non-exhaustive but rather exemplary) central research questions involving those variables have been proposed, which revolve around the phenomena of transformation, integration, participation, and preservation in EG.

Two drivers seem to direct EG into integrative efforts involving multiple disciplines:

(1) the central research questions, and in line with that; and
(2) a global trend in science.

The trend towards holistic, integrative interdisciplinary science is growing stronger (Gibbons, 1994). In line with this global trend, EG represents an almost prototypical example for the need of interdisciplinary integration and Mode 2 knowledge creation, dissemination, and utilization (Gibbons, 1994). Missing so far is a proof of concept in

terms of truly interdisciplinary research exemplars in EG. With the relatively high number of disciplines invested and interested in EG, it might need quite a few interdisciplinary exemplars for developing and establishing the criteria and norms of such integrative projects. If those exemplars prove successful, EG might also be thriving as an integrative science, which will subsequently lead to institutional arrangements in support of that effort. This paper contributes to the study domain's knowledge in that it establishes the notion of centrality of research questions and variables in EG. It also paves the path for systematic review research and integrative interdisciplinary research projects in EG.

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Appendix
Table AI follows overleaf.

Discipline/ field	Research directions related and relevant to EG	Research gaps regarding EG
Public administration	Democratic public governance Public decision-making Public good Effective and efficient government Political, organizational-behavior, organizational design, public/private, service presentation and design, and regulatory aspects Interaction/interdependence of digital and traditional formats of government	Technologies and information-related aspects, which have the capacity to enable/disable democratic public governance, public decision-making, etc.
Information systems	Planning, designing, constructing, and implementing information systems (IT artifacts), which fit public sector requirements Human behaviors in that context Practices for directing and facilitating the usage and evolution of public information systems Impacts of public information systems on individuals and organizations	Public governance and government structures, public decision making, effectiveness and efficiency requirements in the public sector, policy implications
Computer science	Development of computational tools and algorithmic solutions, which can be used in a public-sector context	Public governance and government structures, public decision making, effectiveness and efficiency requirements in the public sector, policy implications
Information science	Information retrieval in the public sector Information management in the public sector Information policy (access, privacy, etc.) Information assurance Information quality in the public sector Process view of information Human-computer interaction	Public governance and government structures, public decision making, effectiveness and efficiency requirements in the public sector
Political science	Implications of EG on political theory Implications of EG on national government (for example, undercutting the division of powers, digital citizenship) Comparative EG International relations in the digital age/via EG	Technological underpinnings of electronic voting, participation, and inclusion, rulemaking Technological prerequisites for government integration
Sociology	Implications of EG on social order (hierarchy, power, contestation, and other relations) in government and society at large Embeddedness of technology and information in social context Interaction between digital and material government worlds Implications of information ubiquity and limited access to information on social order and relations	Technologies and information-related aspects, which have the capacity to enable/disable democratic public governance, public decision making, etc. Public governance and government structures, public decision making, effectiveness and efficiency requirements in the public sector

Table AI.
Disciplinary interests in EG and research gaps regarding EG