

Information Technology and Government Research: A Brief History

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Abstract

Governments have been using computers since the early 1950s and academics have been writing about government's use of computers for almost as long. This paper explores this literature and examines the evolution of research into and thinking about the use of information and communications technology (ICT) in government and public administration over the past 50 years. Questions asked include to what extent the technology of the time influenced this research, how themes and topic of interest have changed over this period and what lessons for future research can be drawn from a better knowledge of the past.

1. Introduction

The world's first commercial computer Lyons Electronic Office (LEO) ran its first application in 1951 [22]. Governments were amongst the earliest adopters of this new technology and by the early 1960s the first academic articles on the use of ICT in government were being published addressing such topics as the impact of electronic data processing on areas like taxation [59], [11], office automation [59] and local government [50], [57] as well as broader reflections on their impact on government and public administration (PA) [24], [27], [44], [46], [68].

This article examines the evolution of research into the use and impact of technology in government and PA from these early commentaries to the present day. Word count constraints mean that in what follows complex matters and developments have had to be highly condensed, but in so doing we have sought to keep the trajectory of events and ideas intact.

1.1 Framework

In this paper a more or less straight chronological framework will be used. However two major and related inflection points, one technical, one economic, that occurred during this period are of importance: the invention of the World Wide Web and the dot.com bust of 2000-2001 [32]. While governments were not above wasting money on ineffective web sites [31], the

relatively ponderous ways of government may have protected them from the worst of the bloodbath in the private sector. Post 2001 the volume of published e-government research climbs rapidly (see figure 1). As one informant observed, in 1990 it was still just possible for a researcher to be familiar with all of the existing literature; by the year 2000 it was impossible.

2. Methodology

This research is based on two primary sources of data: the literature and interviews with a number of major contributors to the field - particularly those who were active before 1995 (ten at the time of writing). Interviews were carried out by telephone, Skype and in person. Many further interviews are planned. Interviewees were asked four/five primary questions: what, during the period under discussion, were the main developments; the key themes researched (and why), the key theories used/developed and the seminal papers. The review of the literature focused on seminal papers and articles as well as on a number of important books. Analyses of papers indexed in the e-Government Reference Library (EGRL) and of the articles published in *Government Information Quarterly* (GIQ) and *Information Polity* (IP) over the period 2000/1-2016 respectively were undertaken.

It is convenient to consider work pre and post 2000. The year 2000 saw a change of focus reflecting both the new technology and the entry of many new researchers into the field. It is also convenient to discuss the period up to 1999 under two headings: research in the USA and research in Europe.

3. The USA: 1968 to around 2000

While articles about IT in government were published before 1968, the year 1968 has been chosen (somewhat arbitrarily) as a starting point. In this year Ken Kraemer published the first of what was to be many papers on IT in government [36]. In the early 1970s Kraemer set up a research group in University of California at Irvine (UCI) in the USA. This became known as the Urban Information Systems (URBIS) project and was described by one of its participants as

the first large systematic study of its kind [34]. Although a call for more widespread academic research into technology and government was made by Bozeman and Bretschneider [10] and a number of recommendations were in relation to IT were made by the National Association of Schools of Public Affairs and Administration in 1985 little progress was made with either until the National Performance Review in 1993 which was followed by a number of reforms [71].

Kraemer's initial interest was in urban planning. Over time this broadened into a wider interest in local government. Kraemer was an early and prolific contributor to the literature (e.g. [18], [36], [40]) and the work of the UCI group on US local government during the 1970s and early to mid-1980s is widely acknowledged as being at the forefront of research into government and ICT at the time [14]. Members of the UCI group included John King, Jim Danziger, Bill Dutton, Alana Northrop, Rob Kling, Jim Perry and Deborah Dunkel.

There are too many publications produced by this group to discuss here, but good examples of this output include [37], [38], [39] And, [56]. The earlier outputs were published during the mainframe era when the dominant paradigm was that of the centralised system [49]. The predominance of mainframe systems in US public sector computing continued into the mid-1990s and even beyond [13].

Much of the early research was internally oriented in the sense of exploring the impact of ICT on public organisations. One of the ideas explored was the power reinforcement framework, i.e. the idea that computers tended to strengthen existing power structures rather than dilute them, something many people thought would happen [15], [16], [35]. Northrop et al [54] analysed the impact and effectiveness of IT in US city administration and arrived at similar conclusions though Sitarski [62] argued that much of the theory in regard to this at the time was not well grounded.

According to King, two characteristics of these early years were enormous optimism and a profound naivety. In practice, much of what was predicted to happen in the 1980s never did. Several attempts by the group to get ICT policy embedded in public policy making failed. This experience prompted Kramer and King to ask, in a 2012 paper the question "e-Government. Will this time be different?" [43].

4. Europe 1970 to around 2000

In Europe academic interest in IT in government first emerged in Germany and Austria in the early 1970s. This was followed by developments in a number of other countries during the 1980s including the Netherlands, the UK, Scandinavia and Slovenia.

In Germany interest in the impact of ICT on public administration evolved from research into *Rechtswissenschaften* or legal informatics. Early pioneers included Wilhelm Steinmüller, Herbert Fiedler and Heinrich Reinermann in Germany and Roland Traummüller (who unlike the others was from a IS background) in Austria. The main areas of study were the impacts of ICT on organisations and work and on systems design. Also studied were the impact of technology on major processing operations such as taxation. Unfortunately almost all of this work was published in German and it wasn't until a group based in Kassel university which included Klaus Lenk, Klaus Grimmer, Dieter Rave and Hans Brinckmann started to publish in English that this work came to the attention of the wider world.

In the Netherlands, the person responsible for first initiating a research programme into IT in government was Ernst Hirsh Ballin, then a professor of law in Tilburg University. The key figure was to be Ignace Snellen who was appointed to a position in the University of Tilburg in 1986. The new initiative was led by Snellen and others including two of his doctoral students Paul Frissen and Wim van de Donk.

A catalyst was a commission by the Dutch Minister of the Interior for a report on the impact of ICT on public administration. Work on this started in 1986 and was completed in 1989. This was the first time a large international survey of ICT in public administration had been undertaken. The focus of much of this work was on *informatization*, a term borrowed from Nora and Minc [52] which referred to the impact and influence of information in and on public administration. A number of books emerged from this work including *Informatization Strategies in Public Administration* and *Orwell in Athens*. There were three main questions that the group explored: what would be the impact of ICT on government, how would governments use ICT and would technology change the very nature and structures of government.

According to Frissen the Tilburg group had two strategic priorities. The first and earlier of these was to obtain Dutch government research contracts. Some years later, in 1994, it was decided to broaden and deepen this research programme and to widen it beyond the Netherlands and links were established with researchers in several other countries. At the 1987 EGPA conference in Valencia, the first meeting of the permanent study group (PSG) on informatization was held. This group was to be central to research in Europe for most of the next 15 years. In 1994/95 Erasmus university set up its own research group by enticing a number of the Tilburg researchers to come to Rotterdam. Notwithstanding this split, the group continued to work together.

One observation made by a group member was about the tremendous sense of excitement at the time; they felt like pioneers trying to assess what the impact of this rapidly evolving technology would be. As in the USA, many of their expectations turned out to be wrong. In particular the expectation that ICT and globalisation would weaken national government (and by implication nationalism) proved ill founded. As with the American researchers, there was much interest in the impact of technology on public agencies as well as in areas like identity management, privacy and surveillance [69].

The emergence of the Web altered the picture radically. By 2000/2001 it was clear that the impact of ICT on PA was and was going to be much greater and more complicated than had been foreseen in the mid-1990s. By the year 2003 European research had started to fragment and the focus of attention had turned to new areas and to the Web and e-government rather than informatization although younger scholars such as Victor Bekkers, Arthur Edwards, William Webster and Miriam Lips bridged this era into the new century [63].

Many ideas emerged from this work. In addition to informatization there was Arre Zuurmond's concept of infocracy [68] and John Taylor and Chris Bellamy's idea of the Information Polity [8], [65]. The culmination of this work was *Public Administration in an Information Age: A Handbook* [63] which, in 31 separate contributions, covered a remarkable span of ideas from a theory of public administration in an information age to trust and tele-cooperation.

4.1. Developments in the UK

Research in the UK started independently of developments in the Netherlands though both were to converge. The main initiators were John Taylor and Chris Bellamy who with Charles Raab and others worked on developing a research programme. Taylor emphasises that the springboard for this work was technology convergence. Reflecting the pattern elsewhere, there was much excitement and optimism and a degree of technological determinism [70] about this work. One of the projects they studied was the Coordination of Computerised Criminal Justice Systems (CCCJS) which failed in part due to problems with siloisation and internal turf wars [2], [3]. This period was, as in America and the Netherlands, marked by utopianism. Taylor and Bellamy summarised the findings from their work in the form of almost a roadmap book published in 1998 [9] though, with unfortunate timing, this appeared just before the Web and the emergence of the e-government movement.

Another noteworthy contribution from the UK came from Helen Margetts [48]. Margetts' book drew

on Hood's concept of the tools of government [30]. With Dunleavy and others, Margetts was later to develop the concept of Digital Era Governance [19].

In the late 1980s the UK and Dutch researchers established contact via EGPA. This led, in the words of one informant, to a flourishing of informatization and related research. In 1996 Taylor took over an existing journal, changing the name to *Information Polity* (IP) with a mission to have a publication rich in ideas and grounded in good research. IP was closely linked to the EGPA Permanent Study Group on informatization a this relationship that continues the present day.

5. Developments Post 2000

Tracking the development of e-government post the year 2000 is much more challenging. The growth in the volume of output, the diversification in topics and the emergence of niche specialisations makes it hard to categorize things neatly. Another problem is definitions [71]. Even a quick glance at e-government journals will reveal that the net of what constitutes e-government research is cast wide. New technologies almost invariably create new streams in the literature. For example while social networking technology dates back to the last century, it was the public launch of Facebook in 2006 that turned it into a global phenomenon. A Stella search of peer reviewed publications shows that nearly 700 papers mentioning electronic government and Facebook had already been published by the end of 2008. See [47].

The turn of the century saw an influx of new researchers, ideas, themes, technologies and to a lesser extent theories. Work in what might be called the informatization tradition continued, but this was soon overshadowed by a dramatic rise in publications about what was now called e- or digital government. Another change was that more people with technology backgrounds in information systems, computer science and computer engineering were coming into the field. Many of the new generation came with limited knowledge of public administration (in theory or practice). Their focus was much more on the impact of technology on services rather than things like internal power structures, reflecting, *inter alia*, the growing interest by practitioners and government in the use of the Web for service delivery (one commentator has suggested that much e-government research has followed developments in practice rather than the other way around). Unsurprisingly services became one of the dominant topics of the early 2000s.

5.1. Rate of Publication

The explosion of interest in the field can be seen using any one of several metrics including the volume of publications, the number of new journals and the number of new conferences and conference tracks. This growth can be seen crudely by counting the number of hits on Google Scholar using the search term “electronic government” between 1986 and 2006 (see table 1). The word “Electronic Government” is first found in English in 1986 and appears with slowly increasing frequency until the late 1990s when the use of the term accelerates rapidly. See table 1.

Table 1: Number of publications containing the term “e-Government” 1993-2007 (selected years)

Year	Number of Hits
1993	18
1994	47
1995	62
1996	86
1997	111
1998	201
1999	270
2000	507
2002	1290
2004	2000
2006	2650
2015	4430

5.2 Journals

Another development was the increase in publication outlets. Prior to 1989 research into ICT in government/PA had been published in PA journals. With the re-branding that was *Information Polity* the research community now had for the first time a journal dedicated to their field. *Government Information Quarterly* (GIQ) had been in existence for some time before that, but it was only in 2001 that a new editor, John Bertot, set out to switch what was by that stage a dying publication to one with e-government as its core discipline. The fact that GIQ was already indexed was a major attraction for academics seeking tenure or promotion and GIQ soon established itself as the leading journal in the USA and later globally followed by IP [20]. In the following years several new journals dedicated to e-government and related research were launched (see table 2). Meanwhile many researchers continued to publish in PA and IS journals such as EJIS and ISJ.

Table 2: Journals publishing relevant research

Journal	Year First Published
Information Polity (ex Infrastructure, Technology and Policy)	1996
Government Information Quarterly	2000
Electronic Journal of e-Government (electronic publication only)	2003
Journal of e-Government (later Journal of Information Technology and Politics)	2003
International Journal of Electronic Government Research	2004
Electronic Government, an International Journal	2004
Journal of Information Technology and Politics	2004
International Journal of Electronic Government Research	2005
Transforming Government: People, Process and Policy	2007
International Journal of Electronic Democracy	2008
International Journal of Electronic Governance	2008
eJournal of eDemocracy and Open Government (electronic only)	2009
Journal of E-Government Studies and Best Practices	2010
International Journal of Public Administration in the Digital Age	2014
e-Governance	Not clear

5.3 Conferences

A similar picture emerges from looking at conferences. The first meeting of the Informatization PSG at EGPA took place Valencia in 1987. In 1988 the first meeting of International Federation for Information Processing, Working group (IFIP WG) 8.5 (chaired by Roland Traunmüller) on information systems in public administration was held. In 2002 this became part of the DEXA conference as IFIP EGOV. It eventually became a stand-alone conference in Lausanne in 2010. The first major American equivalent, dg.o(nline), convened for the first time in 2000 and the inaugural meeting of the European Conference on e-Government (ECEG) was held the following year in Dublin. The International Conference on Theory and Practice of Electronic Governance (ICEGOV) was founded in 2007.

There were also new e-government streams within major IS conferences such as ICIS, ECIS, AMCIS and

most importantly in HICSS where by 2015 it had become the second largest track in that conference. Many other conferences have been set up though not all have lasted. In addition special interest conferences have been established for topics such as mobile government (m-Government) and e-voting (e-Vote-ID) established by Ibrahim Kushchu and Peter Parycek respectively. Today these all of these conferences continue to attract good numbers. Research by Jochen Scholl suggests that for citation purposes, scholars rank the top conferences (notably HICSS) as highly as the top journals [60], [61].

After 2000 e-government research expanded geographically in North America, Europe and beyond. Countries such as South Korea started to produce a steady stream of research and research started appearing from Africa (where Richard Heeks had done some pioneering work, [28]), the Middle East and South America (notably Brazil (e.g. [33])).

5.4 Researchers

The number of researchers in the e-government field is today enormous compared to the period before year 2000. The EGOV library, which is the only source focusing on e-government publications exclusively, includes contributions from 11,460 authors, all but a dozen first appearing after the year 2000. Out of these, however, 8,806 have only contributed one publication and another 1,444 only two. Even though this seems to indicate a field where many researchers publish occasionally, there are also many researchers contributing frequently; 139 people have contributed ten or more publications over the period and 200 have published the equivalent of one paper every two years. These numbers show that there are now several e-government nodes around the world. While the number of researchers with a strong focus in the field, the core e-government community may be only a few hundred, thousands are interested in the issues of the field; hence the high number of occasional contributors.

There have been several studies of the research community that there is insufficient space to discuss here. These studies include contributions by Scholl, Dwivedi and others [20], [60], [61].

6. Other Developments

A number of other developments have contributed to the growth and spread of research into technology in government. The founding in 1993 of *the Center for Technology in Government* in Albany, New York (where it is connected with the University of Albany) was a first and to date remains a unique venture. The

center's first director was Sharon Dawes (the current Director is Theresa Pardo). The center was set up by the then New York Governor Mario Cuomo and is, to as far as we can ascertain, the only research center of its type mixing as it does academic researchers with government practitioners. Another particularly valuable development has been the aforementioned E-Government Reference Library (EGRL) by Jochen Scholl and the University of Washington in 2005. The EGRL is a list of references available in a number of standard formats (such as BibTex and EndNote) which can be downloaded free of charge. The library is created using some 40 search terms applied to a large number of journals and conferences. Papers are selected using five criteria including that they have passed an academic peer review process. Currently there are approximately 8,000 references in the library. Of its nature, there is much that the library does not capture, but it provides a valuable resource for researchers.

Elsewhere funding by the European Union for research into e-government has enabled research groups to be set up in a number of European locations including Maria Wimmer's group in Koblenz. Such research projects are important for many reasons, but they do not always result in much by way of academic publication; they tend to result in reports and sometimes products including models and frameworks. A noteworthy feature of the landscape today is extensive interaction and cooperation between e-government researchers across the globe. It is now routine to find papers co-authored by scholars from two or more different institutions in different countries.

7. Themes

Various estimates of the number of papers and articles published on e-government and related themes since the year 2000 have been made and while each has problems, it is safe to conclude that whatever the number is it exceeds 10,000. Figure 1 shows the rate of publication of articles listed in EGRL.

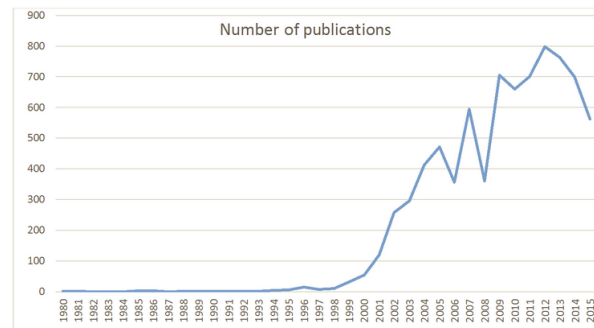


Figure 1: Publications in EGRL

It is challenging to summarise this enormous volume of output. Various scholars have tried to do so in different ways. An early analysis covering the period from 1998-2003 was done by Andersen and Henriksen [1]. They concluded that the literature at that time was more concerned with what they called conceptual domains and interactions than with the way value is distributed or with policy. They lamented the lack of interest (up to that time) in democracy and participation and made the curious observation that the research reflected a legacy of IS research themes (rather than, say, informatisation).

In theory, major themes in e-government research can be identified by analysing the literature. In practice this is not easy to do as the type of data necessary is currently not available in a format which facilitates easy analysis. The EGRL is a major potential resource for such analysis and we hope to be able to analyse this later in the project; for this paper it was not feasible because of the limited software we had available to us. We therefore relied on manually extracted data on articles published in GIQ and IP from year 2000 to early 2016. This covers 694 and 260 articles respectively. As these are considered the two leading journals in the field [61], they are a good proxy for the better quality research being published. Based on these two publications, areas that have attracted much attention since the year 2000 include adoption (on the back of the Technology Acceptance Model and its derivatives [67]), transparency, open government and, more recently, open government data. The analysis reveals some interesting patterns shown in table 3 (IP scores have been factored up to allow for the difference in the number of articles). These include the relative frequency of topics and the differences between the two journals. The most striking is the absence of any article on adoption in IP and the much greater interest in democracy in the European journal. Another difference is the greater number of papers in IP on privacy and surveillance. While these distributions reflect editorial policy, they are a useful indication of primary areas of interest.

Topic	GIQ	IP	IP Adjusted
Transform	15	3	8
Adoption	21	0	0
Smart Cities	2	6	16
Benchmarking	10	2	5
Open Gov	20	8	21
Open Data	10	6	16
Mobile	8	4	11
Transparency	15	6	16

Stage models	7	0	0
Democracy	5	14	37
Policy	58	16	43
Interoperability	5	1	3
Surveillance	5	11	29
Privacy	9	9	24
Governance	28	16	43
Social media	32	3	8
Service	43	6	16

Table 3: Occurrences of various terms in GIQ and IP

Analysing publication patterns in five year periods from 1995 to 2015 using Google scholar suggests that the number of publications on a given topic tend, with rare exceptions, to increase monotonically. Leaving aside portmanteau words such as “management” (and allowing for limitations with the search engine in Google Scholar) some interesting patterns can be observed. Topics like stage models, the subject of the most cited paper in the e-government literature [45] are much less frequently encountered than many other topics such as e-governance and transparency. Open government (including open government data) is barely mentioned before 2000, but has grown in popularity since 2011. Some topics have a much smaller literature. These include transformational government and smart cities though the latter is perhaps not surprising as it is still an emerging topic.

There has been a number of other literature reviews in the past 15 years. The most cited is by Yildiz [71] who gives a good, though quite partial, account of the field. Reese [58] published a fairly eclectic review while other such as Titah and Barki [66] confined themselves to subsets of the literature.

A particular use of the literature review is the meta-study and a number of these have been published since the year 2000. Such studies examine which topics were being researched and how. Works in this vein include Grönlund and co-authors [25], [26], Heeks and Bailur [29] and Norris and Lloyd [55]. In each of these studies the authors looked at subsets of the literature over a number of years. Heeks and Bailur looked at GIQ and IP as well as ECEG over a four year period and identified several problems criticizing, *inter alia*, ‘narrow practice’, atheoretical work and poor practice including self-promotion and baseless theorizing (a charge also levelled by Norris and Lloyd). Change over time, they conclude, has been limited though a longer time window would be needed to provide strong support for this claim. All of these studies are quite critical of methodology and note that dominance of the descriptive and usually atheoretical case study.

Such analyses can be informative, but the degree to which they are representative of the field as a whole is

open to question. They were all carried out some time ago and there is arguably a need for replicating this research today.

Some topics are interesting to track over time. One of these is the stage or maturity models. This is a niche topic, but a persistent one. New stage models have appeared at regular intervals over the past 17 years. Stage models date back to 1973 [53], but their deployment in e-government dates from 2000 [7]. Layne and Lee [45] were the first academics to write about e-government stage models and to this day their article remains the most cited in the e-government literature. As noted, this paper was to be followed by many others [17].

Theory too has evolved. There is not space to discuss it here except to say that both new theory and adoption and adaptation of theories from other disciplines have been a feature of the literature despite complaints to the contrary. For more on this see [5].

8. Concluding Reflections

Writing history presents many challenges. The historian usually has to choose between a wealth of material and whatever he or she selects is never going to be fully reflective of the course of events [12]. As this subject is only about 50 years old, we have the advantage of being able to talk to many of those involved though sadly, some of the major contributors are no longer with us or are not accessible. This project is at an early stage and this paper is only a preliminary report. The observations that follow are in some cases tentative, but provide food for thought.

- A first point is the rather obvious one that the nature of the research has been and continues to be strongly influenced by technological developments. There is no reason to believe that this will not continue.

- A second pattern and a direct consequence of the above is a propensity in such research to what today is called techno-optimism.

- The above is reflected in the failure of many forecast developments to happen. Many visions of transformative change have not (yet) materialized. The same may prove true of current fashions such as open government data.

- Associated with this optimism is a degree of naivety. Informants are surprisingly honest about acknowledging this. Despite this, history repeats itself and new technologies continue to be hailed as ushering in new dawns.

- Changes have also been driven by the entry into field of large number of researchers with technical as opposed to PA backgrounds and this has led to many ideas and theories as well as papers which are sometimes highly technical.

- An interesting finding is that that many of the questions examined by early researchers remain open questions today. While the technology may have changed, its impact on government and politics remains a live topic of research. In part this is because of the evolution of technology itself. Researchers in the early 1970s did not have to contemplate the impact of big data or mobile phones on government agencies. They did have to consider the impact of the technologies of the time and the evidence suggests that the questions have not changed much.

- Apart from those driven by the latest technology, new topics have continued to emerge. Topics that have attracted attention recently include smart cities, open government data and co-creation.

- Some early ideas and theories, such as the reinforcement framework, might be revisited in part because they challenges some of the techno-optimism and technical rationality that continue to be influential.

- There is evidence that the increase volume of output has been accompanied by a loss in overall quality. Excellent research continues to be published, but new and interesting ideas and theories are not common and much research is of local rather than general interest; there is a lot of ‘me-too’ type research.

- Themes rarely seem to vanish entirely from the literature. Most have continued to grow (as measured by publications). Other areas, such as the failure of e-government systems are arguably under researched.

- The impact of research on practice appears to continue to be modest. Such impact as there is is through commissioned government reports and institutes such as the CTG rather than through practitioners reading the literature.

- The position of e-government in the PA literature and the relationship between e-government and PA research continues to be fairly arm’s length. There are scholars who bridge these two worlds, but they are a small minority in the community as a whole.

- Finally, despite attempts to replace it, the term ‘e-government’ persists (for now). Various other terms are used to reflect certain aspect of e-government, but as yet no consensus candidate for a better term has emerged.

9. Further Work

This paper is a form of preliminary report. There is much work to be done. Apart from further research in areas already started, there are other aspects of the use of technology in government that remain to be catalogued and analysed. These include theory and methods. As noted in section six, there are some useful contributions in the literature on both of these, but a

systematic historical study to trace their evolution has yet to be undertaken. This work continues.

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