Smart Governance: Analyzing 5 Years of Academic Output on the Subject Matter

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Abstract In 2014, Scholl and Scholl presented their now frequently cited "roadmap for research and practice" broken down into a matrix of eight "focus areas" and seven "elements of smart governance." This "Roadmap" intended to help researchers navigate their paths through the relatively complex subject matter of smart governance in the public sector given the multiple interdependencies and topical interconnections within the proposed matrix. Since that time, scholastic research on the subject matter has indeed mushroomed and covered almost the entire spectrum that Scholl and Scholl's Roadmap had laid out. With 171 identified research studies this chapter documents the actual overall coverage and pinpoints the few open spots. It also briefly reviews and discusses examples of research in the eight focus areas. Furthermore, the chapter determines major themes that permeate the research on smart governance in the public sector. Based on the illustrative review, it is concluded that the 2014 Roadmap has indeed been useful to identify potential gaps in research but also further guide empirical and theoretical research on the subject matter.

Keywords Smart governance · Public sector · Digital government · Bibliometric analysis · Smart governance research roadmap · Literature review

Introduction

Academic research uses "theoretical lenses," "theoretical frameworks," "conceptual frameworks," "roadmaps," and a number of other similar notions and descriptive terms like "conceptualizing" and "theorizing" to outline either the starting point, or the main focus, and/or the result of an academic report. Most such "framework," "concept," or "roadmap" articles in Digital Government research—see the Digital

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Government Reference Library (DGRL), version 15.0 (Scholl, 2019) appear to pursue the latter two approaches, that is, they develop and present such conceptual/theoretical frameworks and roadmaps rather than using them as guides for presenting empirical research. To give a perspective, in DGRL version 15.0, a total of 458 entries (or, 3.8%) had "framework" in the title, an average of 1480 (or, 12.6%) of entries had either "framework," or "concept," or "theory/theoretical" in the abstract, and the intersections of either "conceptual framework" or "theoretical framework" was found in the abstracts of a total of 808 entries (or, 6.9%). In other words, based on these numbers an informed, yet conservative, guess would suggest that about 7% of the known Digital Government literature develops and presents frameworks and roadmaps of some kind. While nothing is wrong with such conceptual and theoretical undertaking, it also appears that the ex-cathedra framework and roadmap production in Digital Government research is frequently the start and end result, that is, the framework/roadmap appears to be never used for any empirical research. Based on the DGRL one could now proceed and identify who in the scholar community developed which framework/roadmap, who developed the most unused frameworks, and so on. However, that would rather be the subject of a different study or the evaluation of a tenure and promotion case, so that avenue is not pursued hereafter.

Rather with this study, the explicit claim and promise of the 2014 "Roadmap" of smart governance research (Scholl & Scholl, 2014), which was to guide, structure, and analyze the body of knowledge on the subject matter, is honored, and the roadmap has been used here as prescribed in the review of the respective literature and the related bibliometric investigation. For the 5 years since the roadmap article had appeared, 171 academic and peer-reviewed articles were identified, which served as the basis for this review and analysis. This dataset of publications is not exhaustive, which means that some "cells" in the matrix could have been way more populated. However, for the purpose of this study, which seeks to illustrate the topical directions and emphases in the respective focus areas as well as to identify some gaps, where little or no research could be identified, the dataset entirely suffices. It sufficiently supports also the second, bibliometric portion of this study, in which author-defined keywords (after consolidation) and their thematic relationships were mapped and analyzed for identifying major "themes," which permeate the academic research on smart governance in the public sector.

The chapter is organized as follows: First, the "review" literature on smart governance in the public sector, that is, other "roadmaps" and "frameworks" on the subject matter, is presented and discussed. Second, the research questions along with the methodologies employed for the summary reviews and the keyword mapping are detailed. Next, the select literature in the eight "focus areas" is portrayed. Then, the findings of the keyword mapping are presented followed by a discussion of the findings in both portions of the study. Finally, the implications of this study for the roadmap and future research are deliberated accompanied by concluding remarks.

Review of the "Review, Roadmap, Framework, and Related Literature"

This section portrays the 2014 "Roadmap" article (Scholl & Scholl, 2014) first, which tried to develop an understanding of (1) what the elements of smart governance in a smart and open government environment were along with the interaction of those elements, and (2) what kind of research and practice agendas would be supportive of the development and evolution of smart governance in the public sector. Guided by Wilke's conception of smart governance (Willke, 2007), which emphasizes resiliency of government operations by means of adaptive capabilities, and Johnston and Hansen's findings regarding elements of smart governance (Johnston & Hansen, 2011), Scholl and Scholl empirically identified eight focus areas of public administrations in the first half of the twenty-first century (Scholl & Scholl, 2014). Governments they argued would have to prominently address and work on these focus areas in a novel and smart fashion with a smart governance model as a prerequisite. In order to understand the various aspects and implications of such an approach, they combined the seven elements from the Johnston and Hansen study (norms, policies, practices, information, technologies, skills, and other resources) with the eight focus areas (budgeting/controlling, government modernization, security and safety, high-speed connectivity, electric mobility, participation and collaboration, open data/big data, and open government) developed from their own case study and proposed to use the resulting matrix/roadmap as a guide that informs research and practice in the respective problem space (see Table 1).

Scholl and Scholl discussed the way the "Roadmap" was supposed to be used element by element and also requested to include research on outcomes, which could be categorized as "problematic" (Scholl & Scholl, 2014). The authors distinguished between "type A" problematic outcomes (desirable, but unsuccessful) and "type B" problematic outcomes (undesirable, but successful) and urged colleagues and practitioners to also acknowledge and study problematic such outcomes for deeper understanding and better mastery of the subject matter. In the authors' view, the evolution of smart governance was the centerpiece of the unfolding attainment of smartness in infrastructures, public-sphere interactions, public administration, and societal security and safety, all of which would constitute an improved state of smart and open government compared to traditional democratic government. Other studies since, many of which were reviews, while others were empirically based, have described elements and aspects of smart governance, which were already contained in the matrix/roadmap discussed above.

A 2015 empirical study (Lin, Zhang, & Geertman, 2015) argued that smart governance should be considered closely connected to the topic of social sustainability. The authors saw the massive and rapid influx of villagers in cities (ViCs) as a major challenge for urban sustainability and planning, which required participatory and inclusive smart governance, which was supported by modern information technologies such as geographical information systems and planning support systems. A

Table 1 The smart governance research and practice "Roadmap" (Scholl & Scholl, 2014)

	Budgeting/ Controlling/ Evaluating	Electronic Government/ Administrative Modernization/Process Streamlining	Security and Safety	Infrastructure Overhaul and Ubiquitous High-speed Connectivity	Electric Mobility	Participation and Collaboration	Open Data/ Big Data Provision and Use	Open Government, Transparency, and Accountability
	Per focus area the elements of smart governance need to be addressed in detail							
Norms								
Policies								
Practices								
Information								
ICTs and Other Technologies								
Skills and Human Capital								
Other Resources								

meta-study uses the consultancy lingo-breathing term of "smartization" when superficially comparing smart city initiatives in London, Stockholm, and Montreal (Ben Letaifa, 2015). While the study adds little, if any, novelty to the topic of inquiry, it claims that "smart cities differ from intelligent and creative cities by offering a balanced centricity among technology, institutions, and people" (p. 1415). It also offers a "SMART model," which, however, is starved from a lack of corroboration and academic explanation. In a 2015 editorial introduction of a book, *Transforming City Governments to Successful Smart Cities*, the author assesses that information and communication technologies (ICTs), while necessary in the context of smartness of governance and government, are nevertheless not sufficient prerequisites for a smart city (Rodríguez Bolívar, 2015). Other dimensions as laid out in the highly cited Smart City Framework of 2012 (Chourabi et al., 2012), the author maintains, also play major roles. In a 2016 review of the smart city governance literature, the authors maintain that smart governance was to be studied along the lines of "an emergent socio-techno practice, …a transformation and conservation of urban governance institutions, … <a> contribution of smart city governance to both economic growth and other public values, … <and regarding the—insertions by author> politics of smart city governance" (Meijer & Rodríguez Bolívar, 2015, p. 404). Another literature review of the same year finds that smart governance pertains to and should be studied on multiple levels inside government and outside government, that is, communities (Meijer, Gil-Garcia, & Rodríguez Bolívar, 2016). The authors also hold that smart city governance is a sociotechnical phenomenon warranting the study of both the social actors and their settings as well as the ICTs involved, which might also influence the creation of novel public value. Yet another study of the same year (Rodríguez Bolívar & Meijer, 2015) proposes a "smart governance model" of three main building blocks (strategies for implementation, arrangements, and outcomes), which the authors propose to apply to various types of research (configurations, impacts, and differences in configurations of smart governance). Five empirical case studies described and compared evolving governance structures in various smart city projects (Alawadhi & Scholl, 2016; Barns, 2018; Lopes, 2017; Scholl & AlAwadhi, 2016a, 2016b), the first three of which with reference to the Smart City Framework (Alawadhi et al., 2012; Chourabi et al., 2012). The most recent review on the subject matter of smart governance attempts to connect elements of traditional technology stage models (that have been found speculative about the evolution) of e-government with the concepts and practices of smart government, which subsequently, the authors claim, lead to and require the evolution of smart governance, in general, and in the context of smart cities, in particular (Pereira, Parycek, Falco, & Kleinhans, 2018). While the review enumerates a large number of contributions to the subject, it appears to struggle with regard to synthesizing previous theoretical and empirical contributions. Last, a 2018 study investigated governance models in smart cities relative to the creation of public value (Rodríguez Bolívar, 2018) and suggests that more collaborative and participatory governance models lead to higher public value creation as part of smart city evolution.

In summary, since its appearance the research and practice roadmap on smart governance in the public sector, or, for short, the "Roadmap" (Scholl & Scholl, 2014), no paucity of new reviews and empirical studies on the subject matter of smart governance can be observed. In most study domains, sometimes strongly enforced by gatekeepers such as journal editors and conference organizers, research thoroughly and carefully builds upon each other. However, in Digital Government Research, in general, and in the case of smart governance in the public sector, in particular, it appears that these above portrayed, quite many studies have rarely, if ever, built on each other, which makes the deeper and shared understanding of smart governance in the public sector rather more arduous. Despite its formal quotation in later articles (obviously for covering the bases) the ignorance of previous research manifests itself in even more effective and blatant ways. When previous research is practically silenced by formal (and, what can be called, insincere) quotations, it is rendered insignificant and subsequently obliterated. This non-collaborative practice does not only prevent intellectual scrutiny and discussion, but it rather also effectively hampers the domain of Digital Government Research and its intellectual contribution from advancing.

Research Questions

As stated above, this study attempts to understand how research on smart governance in the public sector has evolved over time before the backdrop of the Roadmap. It also tries to identify and map topical relationships within the subject matter, which leads to the two following research questions.

RQ#1: *In light of the Roadmap, how has academic research evolved, and which of the Roadmap's focus areas and elements has research covered?*

RQ#2: *What relationships of themes and topics are found inside the academic research on Smart Governance in the Public Sector, and what is their relative weight?*

Methodology

Sample and Searches. For identifying academic research for each cell of the Roadmap, primarily Google Scholar was used. While other literature studies based on keyword searches have traditionally confined themselves to using only commercial academic databases such as ABI/Inform (Proquest), ISI Web of Science, and Scopus EBSCO, for the purposes of this study the Google Scholar approach was seen as superior for reasons of currency and completeness, conference papers and book sections were also to be considered, many of which were missing from the

traditional databases. For each of the 56 cells of the Roadmap, an iterated search of the format "focus area" AND "element" was conducted, for example, "Safety and Security" AND "Policies." For the search results a custom range was established, which excluded hits before the year 2014, when the Roadmap was published. The results were inspected one by one, and hits that had no relationship to the public sphere were immediately excluded. The searches were iterated with the aim of resulting in at least three hits per cell. Targeted searches using the same search terms and ranges were conducted within the DGRL versions 14.0 and 14.5 in cases of insufficient numbers of hits from the Google Scholar searches.

Data Collection. The initially found articles were downloaded either directly from the Google Scholar site, if available, or retrieved via the University of Washington's electronic journal system; in some cases, interlibrary loan requests produced the articles. All articles were individually inspected and selected based on their topical relatedness to governance in the public sphere. For all selected articles the respective bibliographic references were retrieved.

Data Preparation and Cleaning. The references were inspected one by one for completeness and correctness. All reference records were inspected for containing keywords and abstracts. In cases of missing abstracts or keywords, these were transferred, that is, copy/pasted from the electronic version of the article. In some rare cases keywords needed to be created from the abstracts or the introductions. Keywords were consolidated to avoid underrepresentation, for example, "Internet of Things" and "IoT" to just "IoT," and "policies" and "policy" to just "policy," etc.

Data Analysis. For the cell-by-cell analysis (RQ#1), the respective articles were inspected and summarized. The summaries were compared as detailed in the findings section. In terms of the topical mapping (RQ#2), the RIS file containing the full article references was used as an input to the VOSviewer tool (Van Eck & Waltman, 2009, 2011). By means of the frequency table of keywords, term maps were created, which show the relationship of terms and the relative weight of their links.

Findings

Ad *RQ#1* ("*In light of the Roadmap, how has academic research evolved, and which of the Roadmaps' focus areas and elements has research covered?*")

In the following for each of the eight focus areas as defined in the Roadmap, one, if any, article is briefly presented, which serves as a placeholder for other articles found for that particular cell of elements of smart governance. In the appendix, the full list of references for each focus area is provided and for each element in it. Furthermore, for each focus area, a small table provides a quick overview of the number of publications identified for each element in the respective focus area.

Budgeting/Controlling/Evaluating

Each of the seven elements of smart governance was studied in at least three articles in the reporting period of 2014–2019. Under "*norms*," a study on the governance of public–private partnerships found that long-term relationships might be better served by establishing "relational norms," which rely on transparency, risk sharing, collaboration including contract re-negotiations, rather than executing the stipulations in a previously signed contract to the iota even if the original assumptions and baselines no longer hold (Benítez-Ávila, Hartmann, Dewulf, & Henseler, 2018). Smart governance would, hence, find a balance between relational and contractual governance. In terms of "*policies*," the effect of outsourcing as a trademark New Public Management policy was found to be rather unsuccessful in shrinking the public sector in size or in curtailing government expenditures (Alonso, Clifton, & Díaz-Fuentes, 2015). However, from a smart governance perspective, other effects of outsourcing might be the results such as service improvements, workload reductions among others. With regard to "*practices,*" a study on the effectiveness and efficacy of funding for students' active commuting to schools along with the Safe Routes to School program showed that this kind of funding led to modest outcomes in terms of prespecified goals independent from the size of grant amounts (Hoelscher et al., 2016) suggesting that future (smarter) interventions might need to also consider other factors such as parents' influence. With respect to "*information*," one of the studies identified in this particular element portrayed the role of information sharing for successfully collaborating on complex budgeting issues (Chohan & Jacobs, 2017). As case in point the collaboration of the Congressional Budget Office with the White House when providing the groundwork in the context of shaping the Affordable Care Act was highlighted, which represented a smarter approach to governance and successful legislative process than observed in the previous failed attempts for such legislation. In terms of "*ICTs and Other Technologies*," a study investigated the potential role of information and communication technologies (ICTs) for providing information and transparency about budgeting and decision processes (Przeybilovicz, Cunha, & Póvoa, 2017). While ICTs provided access to the related information, without context, that is, without smart guidance, it was found, simply having access did not provide the expected transparency. Under "*Skills and Human Capital*," a study in the context of local government assessed the efficacy of trainings on interpersonal leadership skills and concluded that, while initially positive effects were measured, after less than a year after the training the skill levels would deplete (Getha-Taylor, Fowles, Silvia, & Merritt, 2015). Retraining, hence, would be necessary. Smart governance in this particular area would need to identify more long-term effective skill development and retention approaches. In terms of "*other resources,*" the involvement and active participation of communities in public budget planning has been portrayed as an effective and transparent process, which, however, might be limited in scalability due to resource scarcity (Kasdan & Markman, 2017). As the placeholder articles demonstrate, the seven elements of smart governance in the focus area of budgeting/controlling/evaluating are addressed by current research, although most articles make no explicit mention of the concept (see Table 2).

Table 2 Articles found per element

Elements of smart governance	Articles found (2014–2019)
Norms	7
Policies	3
Practices	4
Information	4
ICTs and other technologies	4
Skills and human capital	4
Other resources	3

Government Modernization

For "norms" of government operational streamlining and administrative moderniza-
tion as a part of smart governance, a study found the key in gradually induced
change of civil servants' values via training and retraining, which over time impact
the norms and readiness for change for new ways of defining and performing given
tasks and of internal and external collaboration (Schröter & Röber, 2015). With
regard to "policies," the topic of "smart regulation" as an important aspect of smart
governance was address in a study that investigated policies around low and zero
carbon homes in the United Kingdom (Greenwood, Congreve, & King, 2017). The
study emphasizes the need for private–public collaboration when it comes to adopt-
ing novel policies and "smart regulation" as in the case of LCZ homes and all what
the authors call "substantive definitions of mandatory and non-mandatory standards
with the outcomes sought" (p. 497). In terms of "practices," a 2015 study investi-
gated citizens' use of government social media sites for measuring the impact of
this particular access method for improving citizen engagement (Bonsón, Royo, &
Ratkai, 2015). While overall engagement was moderate at best, social media sites
that allowed for postings appeared to have a better reception. In regard of "informa-
tion," a study compared the practices around the Freedom Of Information Act
(FOIA) between the Bush and Obama administrations as an important pillar of
transparency and, hence, smart governance (Wasike, 2016). The results were mixed
with regard to "FOIA performance" (p. 425), although requests were found more
speedily processed under the Obama administration. In terms of "ICTs and other
technologies," a study inquired on civil servants' perceptions of the usability of new
technologies and processes (Claver-Cortés, de Juana-Espinosa, & Valdes-Conca,
2017). The study found that due to the lack of staff training regarding the techno-
logical and infrastructural advances, the potential of the ICT-supported process
improvements could not fully be realized. Under "skills and human capital,"
researchers studied the use of merit-based criteria for promotion to managerial lev-
els in public administration and discovered improved performance levels (Cortázar,
Fuenzalida, & Lafuente, 2016). With respect to "other resources," while New Public
Management (NPM) and smart governance do not necessarily go hand in hand, a
study on NPM implementation in Central Eastern European administration con-
cludes that NPM instruments might help bring about "smart practices" in a reformed

Table 3 Articles found per element

Elements of Smart Governance	Articles found (2014–2019)
Norms	4
Policies	4
Practices	5
Information	4
ICTs and other technologies	4
Skills and human capital	3
Other resources	3

public administration (Dan & Pollitt, 2015). Taken altogether, the focus area of Government/Administrative Modernization and Process Streamlining has been well covered in recent academic research along all elements of smart governance (see Table 3).

Security and Safety

This is one of the few focus areas, where no academic contribution could be identified for one or two elements of smart governance, in this case with regard to "other resources." Furthermore, only one contribution was found for the element of "skills and human capital," indicating that these particular elements in the focus area of "safety and security" need more academic attention. In a thesis on the subject matter of "norms," Japan's potential normative security dilemma is portrayed (Dillard, 2017). The country constitutionally self-obligated itself to refrain from building and maintaining a large military apparatus and in the 1970s consequently signed and ratified the nonproliferation treaty to further assure her neighbors of its non-bellicose and peaceful-only intentions. While neighboring nations such as China, North Korea, and Russia have meanwhile built up sizable nuclear arsenals, which by their sheer existence present serious threats to the country, Japan has so far relied on the United States for nuclear deterrence. It remains to be seen, whether or not such norm of reliance on others in an existential matter of security is wise and can be maintained in the long term. A more robust military, which includes a credible nuclear capability, might change the current norm in favor of self-reliance in this premier security area. In terms of "policies," a study investigates and compares safety and security-related policies in two regions and metropolitan areas in the Southern United States and Southern Europe (Tulumello, 2017). The study finds different political traditions and perceptions to play major roles in explaining different policy approaches to addressing safety and security concerns, for example, if violence was seen as an external threat to a community rather than a community-internal problem. In the former case policies were mainly designed to fight and suppress symptoms, while in the latter case, policies attempted to address the deeper causes, which might have gone beyond the reach of the mere policing of the

Elements of Smart Governance	Articles found (2014–2019)
Norms	4
Policies	4
Practices	3
Information	3
ICTs and other technologies	4
Skills and human capital	1
Other resources	0

Table 4 Articles found per element

problem. With respect to "practices," the safety and security risks of "smart buildings" was the focus of a study (Wendzel, Tonejc, Kaur, & Kobekova, 2018), which reported on a number of successful recent cyberattacks on such building. The contribution discussed various practices and methods for protecting the buildings against such attacks. Regarding "information," a 2017 study proposes an integrated approach called "Systems-Theoretic Process Analysis" (STPA), in which a safety team and a security team have to perform the analysis from their respective viewpoints in an integrated fashion with the intended result of improved detection of conflicts and other constraints (D. Pereira, Hirata, Pagliares, & Nadjm-Tehrani, 2017). Under, "ICTs and other technologies," a 2018 study investigates safety and security concerns along with potential remedies regarding Internet of Things (IoT) devices, which play increasing roles in private households as well as businesses around the world. Unprotected or poorly protected IoT devices have so far introduced a myriad of vulnerabilities in countless homes and businesses, which may produce undesirable consequences if unaddressed (Bastos, Shackleton, & El-Moussa, 2018). In the only contribution found under "skills and human capital," a study on cyber-physical systems suggests that besides the technical aspects of such systems the social, process, and informational aspects deserve study, and in particular the engagement of relevant stakeholders (Törngren et al., 2017) (see Table 4).

Infrastructure Overhaul and Ubiquitous High-Speed Connectivity

This focus area was found less strongly covered than others, which was unexpected. While every element was covered, four of seven elements were only addressed by two studies. With regards to "norms," a study scrutinized the underlying principles, which finally helped foster a massive overhaul of the entire ICT infrastructure and its governance model of a major city government in Central Europe (Scholl & AlAwadhi, 2016a). In terms of "policies," a study looks at policy tradeoffs regarding infrastructure-related decisions in terms of temporal, regional, and sectoral complexities (Wegrich & Hammerschmid, 2017). Under "practices," another study

Table 5 Articles found per element

Elements of Smart Governance	Articles found (2014–2019)
Norms	2
Policies	3
Practices	2
Information	3
ICTs and other technologies	3
Skills and human capital	2
Other resources	2

investigates the evolving expectations and practices regarding energy consumption in ever expanding wireless and wired Internet and smartphone infrastructures, which became more demanding, but are also viewed as service opportunities (Wiig, 2016). With respect to "information," a study on the effects of ubiquitous smartphone connectivity found that among undesired outcomes and concerns, which need further assessment and study, are the lack of privacy protection and information overload (Gao, Liu, Guo, & Li, 2018). With regard to "ICTs and other technologies," another study discusses the implications of 5G technologies on the emergence of very fast and ubiquitous broadband infrastructures, which connect wireless and wired infrastructures allowing for cognitive objects and cyber-physical systems (CPSs) (Soldani & Manzalini, 2015). Under "skills and human capital," a study investigates to what extent medical and other care personnel can be supported and even replaced by advanced remote mobile sensor and monitoring systems, in particular in the context of a rapidly growing elderly population (Deen, 2015). In terms of "other resources," a study discusses the application areas of direct mobile-to-mobile communications (D2D), which takes advantage of the proximity of mobile devices (for example, in vehicle-to-vehicle communication) without using the wireless or cellular networks (Mumtaz, Huq, & Rodriguez, 2014) (see Table 5).

Electric Mobility

In this focus area, the smart governance element of "skills and human capital" is unrepresented since no study could be identified covering it. Under "norms," a study on the motivations or dislikes of potential buyers of electric cars included social norms (how socially well regarded and incentivized) as well as practical considerations such as range and recharging opportunities (Bobeth & Matthies, 2018). With respect to "policies," a study on adoption of "smart mobility" in Italian cities showed that little effects in terms of uptake could be shown unless policies directly subsidized and incentivized the adoption (Pinna, Masala, & Garau, 2017). Regarding "practices," along similar lines the evolution of practices regarding electrical vehicle charging infrastructures was analyzed in a study (Hall & Lutsey, 2017), which showed Norway and the Netherlands as the then current (early) leaders. When it comes to "information" in the context of electric mobility, a paper pointed out that

Table 6 Articles found per element

Elements of Smart Governance	Articles found (2014–2019)
Norms	3
Policies	3
Practices	3
Information	3
ICTs and other technologies	3
Skills and human capital	0
Other resources	3

electric vehicle recharging might lead to unwanted peaks, brownouts, and even blackouts unless properly balanced and managed (Kuran et al., 2015). Intelligent and information-based load and peak management in parking lot recharge scheduling might be an appropriate solution. With regard to "ICTs and Other Technologies," a study finds strong interconnections and cross-benefits between the various major variables of fossil fuel-free energy production, changed patterns of energy consumption, and non-carbon emission based transportation systems and their orchestrated and coordinated transition into a new type of modern economy (Canzler, Engels, Rogge, Simon, & Wentland, 2017). In terms of "other resources," a study focused on the vehicle-to-grid (V2G) capability of plug-in electric vehicles, whose batteries serve as a power storage, which enables such vehicles to release power back to the grid if the greed needed it (Shafie-Khah, Neyestani, Damavandi, Gil, & Catalão, 2016). So far, studies in this particular area have only produced mixed results due to the complex interplay of variables (see Table 6).

Participation and Collaboration

Like with Electric Mobility, so with Participation and Collaboration, the "skills and human capital" element cell remained empty, because no studies on the subject in this focus area could be identified. And, likewise again, for most other elements at least three studies were found. In terms of "norms," a study compares select smart government and smart governance approaches in the PR China and in the West finding both bottom-up and top-down approaches in both (Lin, 2018). While some outcomes of these approaches appear similar, the basic and driving norms appear to be different. On "policies," a 2017 study looked at the Open Government Partnership initiative and policy, which was geared at smart approaches to transparency and participation in a smart government and smart governance context, and concluded, that "the initiative had limited impact on the type of policies that were proposed and enacted. In sum, the OGP is an administrative reform that was launched with great fanfare, but limited influence in the US context" (Piotrowski, 2017, p. 155). With regard to "practices," another study focused on public libraries' "microblogging" practices such as Twitter-based blogs and found that such practices help both creating new and maintaining existing relationships with patrons (Cavanagh, 2016). In

Elements of Smart Governance	Articles found (2014–2019)
Norms	3
Policies	3
Practices	3
Information	3
ICTs and other technologies	3
Skills and human capital	0
Other resources	2

Table 7 Articles found per element

terms of "information," another study that investigated the informational content of participation and transparency-related microblogs found these to be "posted for self-promotion rather than service delivery" (Zheng & Zheng, 2014, p. S106). With respect to "ICTs and other technologies," a study found that smart governance initiatives overemphasized technologies and underemphasized human factors and other hard-to-quantify gains (Jiang, Geertman, & Witte, 2019). In regard to "other resources," a 2017 study on participation and co-creation of public value found enablers and barriers, some of which were known from previous studies; however, data and technology literacy along with other related capabilities were also identified as indispensable (Toots, McBride, Kalvet, & Krimmer, 2017) (see Table 7).

Open Data/Big Data Provision and Use

Also, in this smart governance focus area all elements were addressed by at least three studies. Under "norms," a study pointed at the increasing cultural diversity in metropolitan areas with serious implications for the management of cities based on open and big data, which help inform government managers' cultural intelligence as conceptually and practically directly connected to smart governance (Faraji, Nozar, & Arash, 2019). Regarding "policies," another study compared the open data policies of several countries, and based on the comparison compiled a set of detail policies, which the authors proposed to further consider (Nugroho, Zuiderwijk, Janssen, & de Jong, 2015). With respect to "practices," a 2016 study developed the notion of an open data ecosystem, in which producer, innovators, and users of the open data would both contribute and benefit from the government-enabled ecosystem (Dawes, Vidiasova, & Parkhimovich, 2016). In terms of "information," another 2016 study set out to measure the quality of government-released open data and information at regional and national levels and found the aggregated national data of higher quality than the regional data (Vetrò et al., 2016). "ICT and other technologies"used in this focus area were studied in the context of and aiming at social inclusion, which were found major enablers toward that end (McKenna, 2017). With regard to "skills and human capital," a 2015 study reported on local and neighborhood projects, which emphasized the human skills and relationships sides of open data initiatives (Oliveira & Campolargo, 2015). For "other resources," a 2014 report described the practical

Elements of Smart Governance	Articles found (2014–2019)
Norms	3
Policies	3
Practices	3
Information	3
ICTs and other technologies	3
Skills and human capital	3
Other resources	3

Table 8 Articles found per element

challenges when developing a linked open data instance, for example, based on the Resource Description Framework (RDF) for a legacy dataset such as the British National Library (Deliot, 2014) (see Table 8).

Open Government, Transparency, and Accountability

Like the previous focus areas, so is this one on open government, transparency, and accountability fully covered by research across all elements. Since the focus areas of open data and open government are closely related, quite a number of studies could have been listed in either area. However, some nuances and emphases still differ, which is why these two areas are kept apart despite quite the expectable overlap. Under "norms," a study concerned itself with the long-term costs that (open) government incurs when it provides open (and authoritative) data (Johnson, Sieber, Scassa, Stephens, & Robinson, 2017), so that norms and priorities along with purpose definitions for data provision and constituencies are needed. With regard to "policies," the overcoming of barriers to open government and open government data requires the formulation of policies, which extend over the barriers of access to those regarding uses, innovation, and value creation (Smith & Sandberg, 2018). In terms of "practices," a 2015 study attempted to assess to what extent open government portals such as data.gov serve the purposes of transparency and accountability (Lourenço, 2015). It concluded that these portals were mostly neither in structure nor organization conducive (enough) to purpose. Regarding "information," a 2015 literature review on academic publications on the subject found participation, transparency, and collaboration at the core of open government, all of which rest on access to information and enablement by modern ICTs (Wirtz & Birkmeyer, 2015), which leads to "ICTs and other technologies." In this regard, a 2018 study, which investigated the Chinese Social Credit System (SCS), warned that the benefit of "trust," which systems of this kind can provide in interactions and transactions, may come at the high cost of other perils such as social control and violations of human rights (Chen, Lin, & Liu, 2018). Under "skills and human capital," a 2016 paper investigates the role of human skills in communities allow for a bottom-up approach to open government-style urban planning (Alverti, Hadjimitsis, Kyriakidis, & Serraos, 2016). With respect to "other resources," open government and open data

have also been linked to sustained commercial value creation. A 2016 study attempts to define guidelines for developing such ecosystem, in which the commercial value creation depends on the uninterrupted availability of open data (Zuiderwijk, Janssen, van de Kaa, & Poulis, 2016) (see Table 9).

In summary, as pointed out in the introduction to this section (RQ#1) of the findings, most elements in the Smart Governance Roadmap, were covered as illustrated in some details above. However, in three focus areas (safety and security, electric mobility, and participation and collaboration) the role and function of skills and human capital has remained unexplored by research. Furthermore, by virtue of using placeholders it has been attempted to illustrate where recent research has been directed, which provides some illumination and potential guidance for future research in these areas.

Ad *RQ#2* ("*What relationships of themes and topics are found inside the academic research on Smart Governance in the Public Sector, and what is their relative weight?*")

While in the previous section a subsample was used to illustrate the directions of smart governance-related research across the Roadmap, in this section the whole sample was subjected to a bibliometric keyword analysis, which identifies the relationship of these keywords to each other forming themes and topical threads (represented by the number of occurrences and the total link strengths, see Table 10) that permeate the entire sample of literature on smart governance.

In the overall view of keywords and their relationships (Fig. 1), it is confirmed that "open data" is the by far most frequently occurring keyword in smart governance-related research (as was already shown in Table 1). However, in this overall overview it becomes also clear how close and how closely connected "open data" is to "big data," "open government," and "digital government." The keywords "smart governance" and "smart city" also appear central and strongly related to each other. The overall overview also allows for the inspection of keywords that are represented more peripherally than centrally in smart governance-related research. Among those more distal are keywords such as administrative reform, public sector reform, budget, public finance, stakeholders, smart grids, electric vehicles, electric mobility, sustainability, and policy analysis to name a few. Also, topics such as public finance, budgets, electric mobility, information, linked open data, and open data policies were addressed earlier, that is, in the 2015 timeframe, whereas newer topics

Table 9 Articles found per element	Elements of Smart Governance	Articles found (2014–2019)
	Norms	3
	Policies	3
	Practices	3
	Information	3
	ICTs and other technologies	3
	Skills and human capital	3
	Other resources	3

Table 10 Top 25 keywords by occurrence and link strength

Rank	Keyword	Occurrences	Total link strength
1	Open data	34	26
2	Open government	15	14
3	Smart city	14	13
4	Public administration	12	10
5	Digital government	11	10
6	Big data	10	9
7	Participation	9	9
8	Transparency	9	7
9	Policy	9	6
10	Smart governance	8	8
11	Internet of things	7	3
12	Collaboration	6	5
13	Policy analysis	6	5
14	Electric mobility	6	3
15	Administrative reform	6	2
16	Innovation	5	5
17	Sustainability	5	3
18	Renewable energy	4	4
19	Smart government	4	4
20	Budget	4	3
21	Electric vehicles	4	3
22	Local government	4	3
23	Linked open data	4	1
24	Privacy	3	3
25	Control	3	3

(2016–2019) include policy, policy analysis, governance, and smart governance itself (see Fig. 1).

The VOSviewer analysis tool allows for representing keywords and their link strengths in a focused fashion, which then more prominently reveal the strongest links between the respective keywords. For example, if taking an "open data"-centric view (Fig. 2), the particular links come to the fore. The strongest links exist between "open data" at the center and "open government," "open data policies," "big data," "governance," "innovation," and "stakeholders." No strong, if any, links exist between "open data" at the center and, for example, "electric vehicles," "electric mobility," "administrative reform," "collaboration," "sustainability," and the "Internet of Things."

When the perspective is switched to an "open government"-centric one, as Fig. 3 shows the by far strongest link goes to "open data." Other strong links include "digital government," "public administration," "open data policies," "big data," and "collaboration." As a surprise, no strong links were found between "open government" at the center and "administrative reform," "public sector reform," "smart city,"
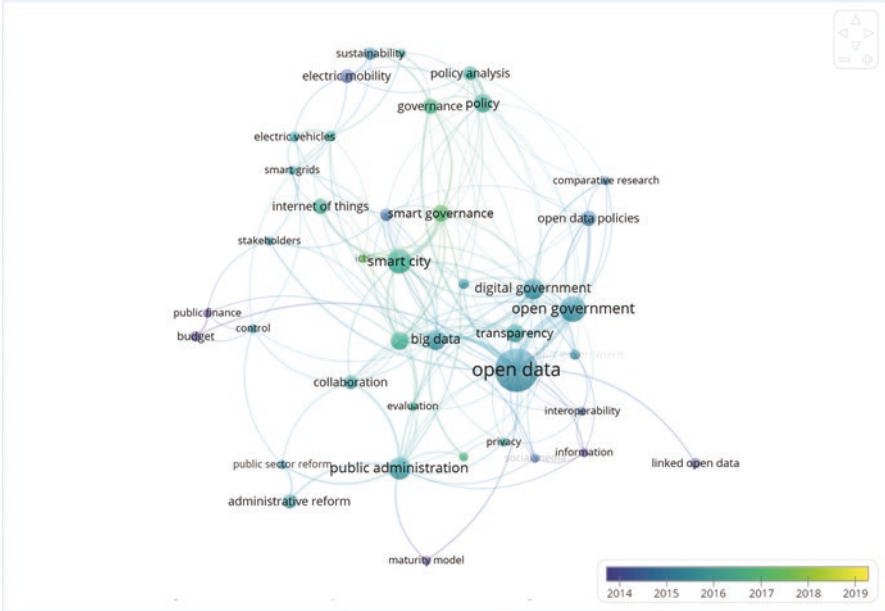
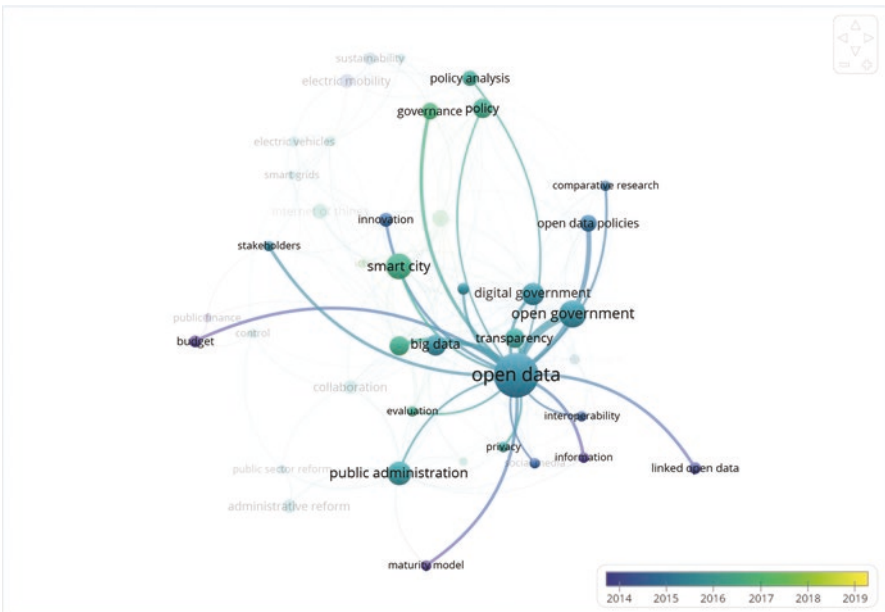**Fig. 1** Overall view of keyword occurrences and link strengths

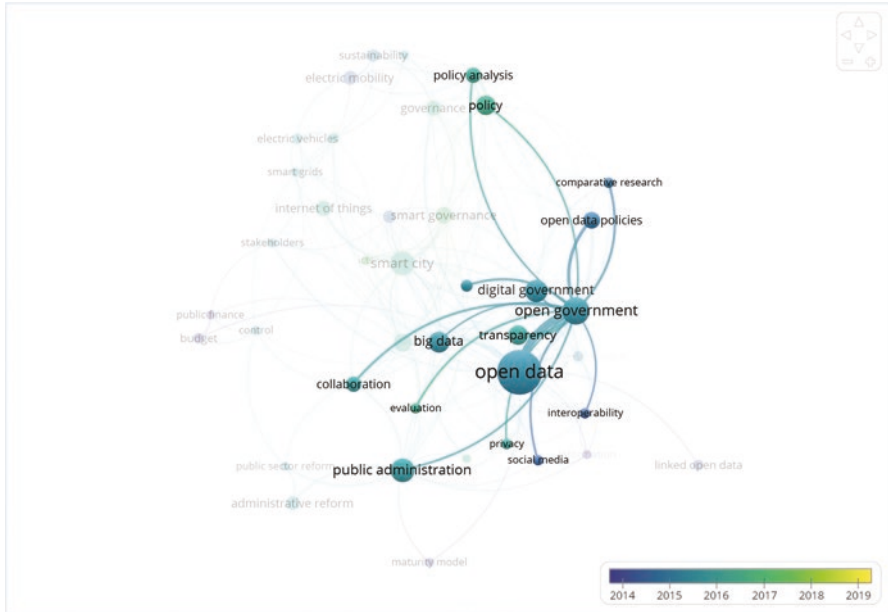

Fig. 2 Open data-centric perspective

Fig. 3 Open government-centric perspective

"smart governance" (as a keyword), as well as topics such as "budget," "public finance," and "control."

Upon taking a "smart city"-centric perspective (Fig. 4), the strongest and more recent links can be found to "smart governance" and the "Internet of Things." Also, strong links exist between smart city at the center and "open data," "smart grids," "renewable energy," "innovation," "collaboration," "digital government," and "smart government." Interestingly, no strong links were found between "smart city" at the center and keywords such as "administrative reform," "public sector reform," "electric vehicles," "electric mobility," "sustainability," "transparency," "interoperability," and "open government" the latter of which can also be seen as surprising.

In summary, the frequency of occurrences of keywords provides another angle for looking at the most recent body of publications identified in the context of smart governance-focused research as laid out in the Roadmap. The top-three most frequent keywords in the sample of recent-years studies on smart governance were "open data," "open government," and "smart city." For this second research question, the three top keywords and their respective links to other keywords were investigated. As the keyword-centric perspectives reveal, some of the most frequent keywords strongly connect with a certain number of other keywords, which form topical and thematic clusters inside the smart governance study space. Remarkably, some of the keywords do not strongly connect to some other keywords, which one might have expected to connect, for example, "open government" to "public finance," or "smart city" to "electric mobility."
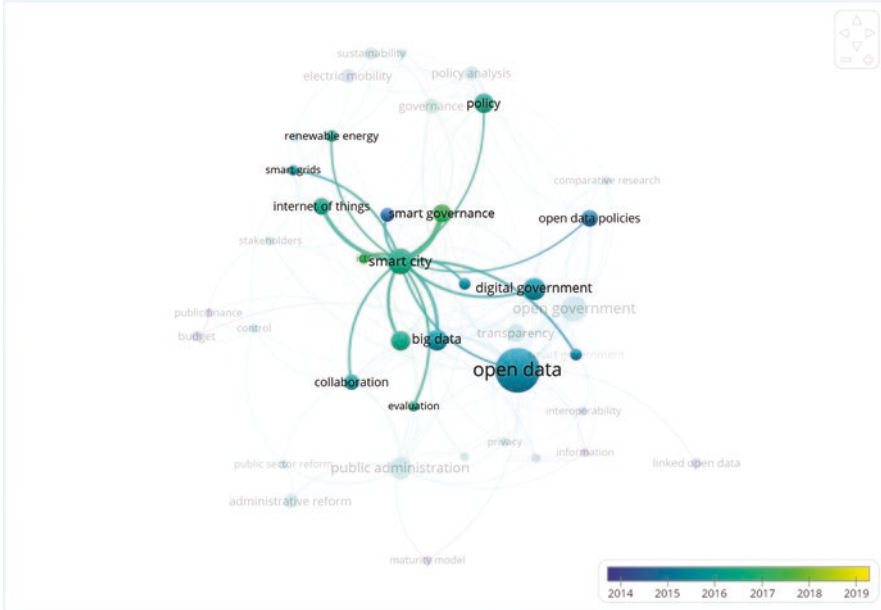
Fig. 4 Smart city-centric perspective

Discussion

General Observations and Limitations

In the context of RQ#1, while the review of the literature presented above is comprehensive with regard to covering, with one placeholder study each, the cells of the "Roadmap" that represent the intersection of focus areas and elements (see Table 1) it is important to emphasize that the coverage is deliberately non-exhaustive. Whereas in some instances only a single study could be identified for a given cell, in other instances double-digit numbers of studies were found. Forasmuch as the chosen placeholder approach limits the overall generalizability of the review results, it nevertheless allows for an assessment of coverage and resulting usefulness of the Roadmap for research and practice as well as for an initial overview of research directions across the topical span of the roadmap, which was the object of this research. If the entire Roadmap was used for organizing a comprehensive and exhaustive review across the topical spectrum, the researcher would quickly realize that she or he dealt with a rapidly expanding and fast-moving target. Therefore, for reasons of the sheer quantity of continuously emerging new studies, in-depth reviews that attempt to capture at least the lion's share of relevant contributions at a given point in time will be more practical, manageable, and meaningful when targeted at only a single focus area across all elements, or on one or two adjacent elements (for example, norms and policies) across all focus areas. Despite these

limitations, when inspecting the findings for each of the seven elements of smart governance across the eight areas of focus, several observations are made and some interesting details emerge. In the following the findings regarding RQ#1 are discussed for each element of the Smart Governance Roadmap.

Norms in Smart Governance Initiatives

Among the norms of smart governance initiatives emphasized in several focus areas were stakeholder inclusion as a prerequisite for transparency, both of which seen as serving as the foundation of long-term relationships and collaboration. Purpose and priority definitions were also considered normative prerequisites in smart governance initiatives. Depending on geography, cultural, and historical context, different normative approaches to smart governance were found ranging from bottom-up to top-down and blends of the two approaches, all of which appear in need of inclusion and "cultural intelligence," as one paper stated.

Smart Governance-Related Policies

Echoing the notion of stakeholder inclusion as a norm discussed before it was again emphasized in the context of formulating novel smart governance policies. Smart governance policies were shown to differ quite markedly depending on stakeholders' basic assumptions suggesting that a discourse about those assumptions might be necessary at the outset. Smart governance policies need to be designed for overcoming initial barriers, for example, by providing incentives, but might also incorporate time, regional, and sectoral tradeoffs. As with in the case of norms, geographical, historical, and cultural differences lead to a variety of smart governance-related policies.

Smart Governance-Related Practices

While policies might have provided monetary and other material incentives, that notwithstanding cases that did not yield the intended outcomes were reported suggesting that other influencing factors also need consideration. Other smart governance practices included the effective shielding of smart infrastructures against cyberattacks, bringing to the fore that high-speed wireless and wired infrastructures were not only enablers of smart governance practices but rather also their potential Achilles' heels, for example, in terms breaches of privacy and additional novel vulnerabilities. Smart governance practices appeared to have evolved faster when the necessary upfront and ongoing investments were made. While open data practices

demonstrated quite a number of effective private–public service co-productions, the overall approach to smart governance practices including government portals and social media use appeared to be missing in consistency and maintainability (also in terms of stakeholder relationship creation and maintenance).

Smart Governance-Related Information

Information sharing was portrayed as important capstone to smart governance in a number of studies, in particular, with regard to transparency, participation, and collaboration. It was likewise seen as effective means for discovering conflicts and constraints in safety and security-related efforts. On the downside, information sharing was also found in a number of situations to lead to information overload at the receiving end. Furthermore, information flooding was also part of the aforementioned problem of privacy breaches. In some cases, information sharing was found to have pro-cyclical effects exacerbating peak load problems, for example, in EV recharging.

ICTs/Other Technologies and Smart Governance

Interestingly, the studies presented somewhat mixed results regarding the observed impacts and desired effects of ICTs and other technologies. On the one hand, while they were generally seen as fundamental enablers of new ways of smart interactions and smart transactions, users rated several new systems not superior to their predecessor systems. Furthermore, IoT devices were seen critically for introducing novel vulnerabilities. On the other hand, high-speed 5G-infrastructure were also understood as foundations for "intelligent" cognitive objects and cyber-physical systems, which were seen as critical building blocks for a carbon-free new economy. Some studies suggested that too much emphasis was put on novel ICTs and their capabilities at the expense of understanding and factoring in the human factors. Finally, the Chinese Social Credit System (CSCS) has been discussed as a comprehensive system for enabling trust and credibility among parties that do not know each other. The perils of such systems were seen in the potential of social control and government surveillance.

Skills and Human Capital and Smart Governance

As mentioned above, skills and human capital was the element in the "Roadmap," for which the least studies could be identified across the eight focus areas. Skills and human capital are fleeting and moveable properties, which are not owned by an

organization, and which cannot be stored and managed in a fashion like fixed assets. However, merit-based rather than seniority-based promotions appear to better suit a smart governance regime. As another study showed though, training, re-training, and skill development investments were found relatively ineffective because of their quick depreciation over time and the low rate of retention. This phenomenon along with stakeholder involvement appears to be understudied in the context of smart governance.

Other Resources and Smart Governance

Under this particular rubric fairly diverse topics were studied reaching from types of community involvement to the use of instruments known from New Public Management for the purpose of smart governance. Furthermore, integrating legacy systems and their data into the overall scheme of smart governance was studied as well as new methods of directly connecting smart devices (D2D) along with smart-grid balance and management topics.

In summary, using the 2014 "Roadmap" for categorizing, analyzing, and reviewing the academic literature published in the 5 years after the Roadmap's publication provides a comprehensive overview of focus areas and smart governance elements covered in academic research for that period of time. From that perspective, the Roadmap can be said to have served as a potent hindsight analysis tool. With regard to understudied areas, this analysis furthermore shows that additional research is needed in the areas of skills and human capital as they relate to the establishment and development of smart governance.

Themes and Topics across Smart Governance Research

Regarding the findings in the context of RQ#2, the keyword frequency and link strengths analysis provided additional and important insights regarding the structure and major components of smart governance-related research as represented in the sample. It is important to distinguish that while the findings under RQ#1 were based on the subsample of over 50 placeholder studies, the VOSviewer-based analysis included the entire sample of 171 studies. However, even though the sample size is much larger in this regard, for all the reasons elaborated above, it would not be justifiable to generalize the results garnered from analyzing this larger sample. That notwithstanding, certain focus area and element-permeating themes and topics along with their relative weights and linkage strengths could be identified. So far, within and across the aforementioned focus areas and elements, smart governance research has revolved around nine major, that is, most frequent keywords and concepts (in this order) (a) open data, (b) open government, (c) smart city, (d) public administration, (e) digital government, (f) big data, (g) participation, (h)

transparency, and (i) policy. When analyzing the top-three keywords in research and their relationships to other keywords, a more detailed and refined picture emerges, which also informs the discussion on the focus areas and smart governance elements discussed before. Some topics (keywords, themes) appear to be more closely related to others, while disconnected from yet others. As case in point for the latter, the missing connection between "open government" and "administrative reform" shows that a holistic understanding of the smart governance concept is still in an early evolutionary phase. Similar non-existing links were found elsewhere. While one can argue that the strong foci on certain research areas may have prevented the establishment of some (almost intuitively obvious) links to other adjacent areas, much research reported on in this chapter upon its initiation was conducted without a clear directional sense or a roadmap of the overall topic in mind, which is just how research unfolds in pursuit of a new topic in the early stages.

Concluding Remarks and Future Research

It has been the object of this chapter to investigate to what extent the research on smart governance was informed by or can be categorized in hindsight by the proposed 2014 "Roadmap" for study and practice (Scholl & Scholl, 2014). Furthermore, this chapter intended to establish the major themes and topics in the study of smart governance and their interconnections.

While despite quite a number of citations the "Roadmap" article of 2014 has not directly "guided" identified research on the subject in the subsequent 5 years, it can nevertheless be invoked for hindsight analyses of where research has been directed. Interestingly, the vast majority of topical elements of smart governance proposed in the "Roadmap" were found covered to at least some extent. The roadmap appears robust in terms of the eight focus areas, although some areas might be revised (for example, "electric mobility" to "emission-free mobility"). Likewise, the elements of smart governance (infrastructure) defined by Johnston & Hansen in 2011 appear to have stood the test of time (Johnston & Hansen, 2011).

The here presented cross-cutting topics/themes analysis might further inform researchers regarding important connections and linkages to be considered in future research.

Future empirical research might benefit from referencing itself regarding the "Roadmap," since it makes transparent where exactly research on the subject is targeted, and what likely connections might exist. In any case, as a (very reluctant) producer of "frameworks" and "roadmaps" himself, this student of smart governance and other digital government topics urges his colleagues to gracefully abstain from presenting more "conceptual," "theoretical," and otherwise high-flying constructs, if there is no immediate intention to follow through and no later evidence of having followed through with future empirical research based on such frames.

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