Future Research Directions on the Science Base and the Evolution of the Digital Governance Domain

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Introduction

Digital Governance (initially 'Electronic Government', and later 'Electronic Governance' incorporating also ICT-based innovations and transformation) has emerged as a research and practice domain aiming at the exploitation of information and communication technologies (ICT) in government, in order to support, transform and enhance its activities, both the internal ones, as well as the 'extrovert' ones concerning communication with the external environment (dialogue and consultation with citizens and firms, and also transaction with them), in order to increase their effectiveness and efficiency. During the last decades, Digital Governance has been recognized as a well-established domain with a highly ambitious objective, which is quite beneficial for the society and the economy: to study and advance the exploitation of ICT for addressing problems and needs of public sector organizations, and develop novel methods and frameworks for enhancing their internal efficiency, service quality and policy-making effectiveness through the use of ICT. Though substantial progress has been made through government funded as well private sector research in a number of areas of it, yet the lack of a science base of the Digital Governance domain seems to hinder unlocking the real transformative value of ICT in the public sector, as well as the full contribution and creativity potential of all its stakeholders, from researchers to industry and SMEs. Such a scientific background would enable a better documentation, organization, structuring of the existing knowledge in this area, as well as its dissemination through training, and also provide systematic directions for high priority future research, in order to develop a portfolio of systematic solutions to specific problems concerning the exploitation of ICT in government organizations (methods for assessment and identification of problems, as well as methods for providing solutions, which can be applied (possibly with some adaptations) in a wide range of organizational, cultural and legal contexts, as it happens in 'mature' sciences, such as the engineering ones). Therefore, extensive research is required in order to develop a sound science base of the Digital Governance domain.

At the same time the Digital Governance research and practice is evolving, on one hand due to the emergence of new digital technologies, as well as the increasing maturity and decreasing cost of the existing

and established ones, and on the other hand due to the evolving and increasing needs and problems of modern societies, and the emergence of new ideas concerning the role and the nature of government (such as the 'open and collaborative government'). This has given rise to the emergence of different 'generations' of Digital Governance, which differ in the government functions their aim to support, transform and enhance, as well as in the methods and ICT tools they use. Furthermore, in the most mature of these Digital Governance generations one can distinguish some distinct sub-generations, meant as maturity evolution stages. Therefore, the above research on the science base of the Digital Governance domain should be complemented with research on the evolution of the domain, in order to identify evolutions in its main elements as well as in the main components of its science base.

This paper provides some research directions concerning the development of the science base of the Digital Governance domain as well as its evolution, and proposes specific relevant research questions that have to be addressed.

Science Base

As science base of a domain is a structured, ordered and semantically searchable body of knowledge defining the underlying principles, methods and applications of a scientific domain, together with its relationship with knowledge arising from other related domains (Charalabidis et al., 2014). Previous research in other domains (Jardim-Goncalves et al., 2013; Charalabidis et al., 2014) has identified some important components that the science base should include, which are shown in Figure 1 and explained in Table 1 below.
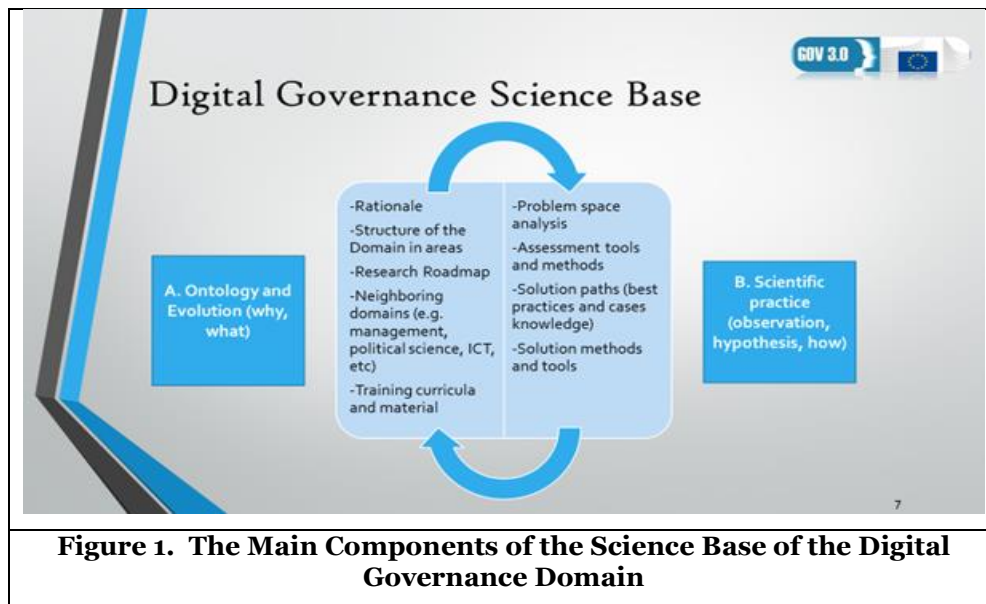

Figure 1. The Main Components of the Science Base of the Digital Governance Domain

Table 1. Explanation of the main Components of the Science base of the Digital Governance domain	
Why	
I. Rationale	Rationale includes a clear explanation of the importance of the existence of the digital governance science base. It provides a comprehensive analysis and understanding of the objectives of the science base including, also, all the aspects of its development and maintenance.
What	
II. Domain Structure (Areas)	The second component of the digital governance science base includes the scientific areas that comprise the Digital Governance domain. These areas provide a deep and extensive knowledge and understanding of the field, a decomposition of the domain.

III. Research Roadmap	A research roadmap is needed, which acknowledges the digital governance state of the art and future research challenges/issues. These challenges can be presented in the form of a research roadmap without favoring any specific solutions. An extended look at the future of a chosen field of inquiry sets the action plan by identifying the research objectives which it aims to meet.
IV. Neighboring Domains	Digital Governance needs to be analyzed together with a selection of established and emerging neighboring scientific domains that can provide useful knowledge and inspire the development of its scientific base. In few words "Neighboring Domains" refers to the Recognized interdependencies among Digital Governance and other scientific Disciplines.
V. Training Curricula	Training Curriculum for future researchers and practitioners in the domain. Thus, the groundwork for a young generation of practitioners and researchers will be laid, which will advance the practical contribution and the knowledge in the Digital Governance domain.
How	
VI. Problem Space	A taxonomy of the spectrum of the main application and theoretical problems and challenges that have to be addressed by the domain, organized so as to be used to characterize the 'real life' application and to link them to elements of the solution space
VII. Assessment Methods & Tools	Methods and tools for assessment and identification of existing problems in government agencies concerning the exploitation of ICTs for supporting, transforming and enhancing important functions of them. Problem space and assessment methods & tools components constitute a multidimensional vector which aims to reveal the existing 'as is' and the desired 'to be' situation. Understanding the 'to be' situation is of major importance, as it assists in the identification of solution paths as well as specific solution methods and tools that allow the transition from the 'as is' to the 'to be' situation.
VIII. Solution Paths	It is the converse of the problem space, as it provides a taxonomy of knowledge available that allows the identification of paths – directions for the solution of domain application problems. In turn this assist in identifying links to specific solution methods and tools
IX. Solution Methods and Tools	Elaboration of the above solution paths towards the development of more detailed methods for solution for the identified problem/issue, as well as specific tools for this

This scientific base aims to bring the Digital Governance domain to a level of maturity similar to the ones of the established and mature domains, such as the engineering ones, and ideally enable whenever two independent Digital Governance experts are exposed to the same administration situation – problem, and working separately, to come to the same diagnosis for it, and propose the same set of ICT-based solutions (= sets of actions that the specific government agency has to take in order to overcome the problem and reach the desired state). Taking into account the main science base components shown above in Figure 1 and explained in Table 1 in order for these to be achieved research is required mainly along the following three main directions:

a) Identification and elaboration of the main areas of the Digital Governance domain, both the current and the emerging ones (component II).

b) Analysis of existing methods and tools for Digital Governance related assessments and problems identification, development of new methods and tools for this purpose, as well as concepts and theories that can be useful for this (component VII).

c) Analysis of existing approaches, as well as methods and tools, for the solution of the above problems concerning the development of Digital Governance), development of new methods and tools for this purpose, as well as concepts and theories that can be useful for this (components VIII and IX).

d) Analysis of concepts and theories, as well as solution-oriented approaches, from neighbouring scientific domains, such as computer science, management, political science, sociology, law, economics or service science, which could be applied in the Digital Government domain; and also the opposite as well: analysis of concepts, theories and solution-oriented approaches from the Digital Governance domains, which can be used in the neighbouring scientific domains. Recognition of such knowledge sharing provides the opportunity for domains to advance by absorbing methodological and technical advances from related ones (component IV).

e) Envisioning a roadmap for future research to tackle broader governance problems via the applications of ICT in combination with innovative approaches from the above neighbouring scientific domains (component III).

f) Enrichment of the above components of the science base of a domain with additional ones that are important for the Digital Governance domain.

Evolution

Evolutions in the needs and problems of modern societies, in combination with technological evolutions, have given rise to evolutions in Digital Governance research and practice, and the emergence of new generations of it. It is therefore important to identify these Digital Governance generations, and also analyse the main features of them. Some first research that has been conducted in this area (Lachana et al., 2018; Charalabidis et al., 2019) has identified three main Digital Governance generations, and also developed a framework for analysing them, which included seven main analysis perspectives, and is shown in Table 2.

Table 2. A Framework/Perspectives for Analyzing Digital Governance Generations			
#	**Perspective**	**Research Question**	**Explanations**
1	Main Goal	What is every generation aiming to achieve?	The result/objective that each generation of eGovernment aims to achieve.
2	Main Method	How can their goal(s) be achieved?	An established, prescribed, or logical, practice or systematic process of achieving the main goal with accuracy and efficiency based on a credible approach.
3	Usual Application Level	Which is the targeted government level?	Related environment of offered services
4	Key Tools	Technological tools for accomplishing their goal(s)?	Main technological tools used for accomplishing/achieving the main goal.
5	Key Obstacles/ Risks	Are there any obstacles/risks?	Determining factors capable of preventing the main goal to be achieved. Could be a policy or the users' resistance to change.
6	Key ICT Areas	Which technologies are being used?	Key enabling technologies allowing the deployment of the main method and the development of the key tool.
7	Most Needed Discipline, beyond ICT	Which are the important scientific discipline(s) to be leveraged beyond ICT?	Identification of the most important scientific discipline(s), beyond ICT, for the achievement of the major goal of each generation.

The first generation referred to as 'e-Government/e-Governance 1.0' is efficiency oriented and aims: to improve efficiency of internal processes and functions of government agencies through the electronic

support and automation (e-Government 1.0), as well as transformation and enhancement of them (e-Governance 1.0), using complex internal information systems; and also to enable citizens and firms to conduct through the Internet (and even through mobile phones) any time and from anywhere e-transactions with government agencies. The second generation referred to as 'e-Government/e-Governance 2.0' is transparency and citizen participation oriented, and aims to offer ICT-based capabilities towards increasing citizens' participation, as well as openness and accountability of governments, and thus enhance the quality of democracy (similarly as 'e-Government 2.0' is defined the digital support of existing practices concerning government transparency, openness, accountability and citizen participation, and as 'e-Governance 2.0' is defined the digital transformation and enhancement of them). Finally, the emerging third generation of 'e-Government/e-Governance 3.0' comes as a response:

- on one hand to the growing problems and challenges that modern societies face, which have to be managed through effective government policies,

- and on the other hand to the deluge of data produced from the first and second generation of Digital Governance: mainly large quantities of data produced by government agencies' internal as well as e-transactions (Internet or mobile based) information systems of government agencies, and also textual data from various social media accounts of them or other external sources); and also data produced from the use of new digital technologies, such as sensors, Internet of Things (IoT), etc.

This third generation of Digital Governance aiming to exploit these data for providing support for better policy-making towards addressing the above social problems and challenges, and secondarily for providing advanced services to citizens and firms (e.g. for citizen-level decision support services, such as 'find the quickest route to your destination by-passing high traffic areas', etc.).

A first analysis of the abovementioned three Digital Governance generations (Lachana et al., 2018; Charalabidis et al., 2019) has provided some results shown below in Table 3.

Table 3. A Framework/Perspectives for Analyzing Digital Governance Generations				
#		e-Government/ e-Governance 1.0	e-Government/ e-Governance 2.0	e-Government/ e-Governance 3.0
1	Main Goal	Efficiency -Better Services	Openness and Participation	Societal problem-solving citizen well- being, optimization of resources
2	Main Method	Interoperability for Connected Governance	Open and Collaborative Governance	Smart Governance and data-intensive decision-policy making.
3	Usual Application Level	National	National - Local	Local to International
4	Key Tools	Portal	Social Media	Ubiquitous Sensors/Smart Devices/AI
5	Key Obstacles/ Risks	Public Sector Mentality	Public Sector Mentality	Public Sector Mentality
6	Key ICT Areas	Organizational Infrastructures	Social Media & Open and Big Data	Artificial Intelligence & IoT
7	Most Needed Discipline, beyond ICT	Management	Social and Political Sciences	A wide variety of disciplines concerning the domains of government activity, such as economic, environmental, behavioral sciences

Another interesting finding from this first analysis is that within the first two (and more mature) generations of e-Government/e-Governance 1.0 and 2.0 there have been substantial advancements, which have created distinct sub-generations of them, revealed and investigated through extensive relevant growth/maturity stages research. Most of this research has dealt with the first generation of e-Government/e-Governance 1.0, focusing on a part of it that concerns informational and transactional electronic services provision. The most widely known relevant model is the Layne and Lee (2001) model of e-government growth, which focuses on these services, and identifies four stages in their evolution: the "catalogue" stage, the "transaction" stage, the "vertical integration" stage, and the "horizontal integration" stage.

Conclusion

In the previous sections have been presented some critical research directions concerning the development of the science base of the Digital Governance domain as well as its evolution. The next steps of the research required should aim at elaborating and extending the contents of Table 1 and 3, with main emphasis on:

- determining and elaborating the main components of the scientific base of the Digital Governance defined by the framework shown in Figure 1 and Table 1;
- and also expanding this framework with additional components;
- validating and elaborating the main characteristics of the three Digital Governance generations that have been identified by our first analysis outlined in Table 3;
- especially concerning the connection of the analysis perspectives 4 and 6 with the analysis perspectives 1 and 2 (use of the key ICT areas and tools towards the main goals and methods), and the analysis perspective 5 (key obstacles/risks)
- and also expanding the framework for the analysis of Digital Governance generations shown in Table 2 with additional perspectives;
- investigating to what extent this evolution of the Digital Governance domain and the emergence of new generations of it leads to corresponding differentiations/evolutions in its science base;
- exploring and researching further the emerging third generation of 'e-Government 3.0', and proposing research directions for the development of it, possible sub-generations of it, etc.

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