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Future-oriented eGovernance: The sustainability concept in eGov research, and ways forward

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ABSTRACT

eGov (eGovernment/eGovernance) is a complex endeavor involving many actors, ambitions, and perspectives. The field has, in research and in practice, over the years expanded its focus from service orientation to a comprehensive perspective with the ambition to integrate all of government in coherent action. Comprehensive integration requires a future-oriented perspective so investment is made in robust and flexible solutions meeting not only today's demands but also sustainable to meet those of the future. This paper addresses the use of the sustainability concept in eGov research. We discuss definitions and elements of sustainability and conduct a structured review of eGov literature investigating how various sustainability areas (social, economic, environmental and technical) are addressed. We find 21 overall themes in 94 papers, with the highest number in the "social" category. Two cross-cutting themes to which 21 overall themes relate are also identified; Decision-making and Infrastructure. Findings show that sustainability is mainly addressed narrowly, focusing on projects rather than general issues, and shallowly with a focus on single factors rather than the complex interaction among them, and with little foundation in sustainability theory. The paper contributes with an overview of themes in previous research as well as theory-based input for future research efforts on eGov sustainability, from a dynamic and sociotechnical sustainability perspective.

1. Introduction

eGov (eGovernment and/or eGovernance) has been defined as "the use of ICTs, especially the internet, as a tool to achieve better government" (OECD, 2003). In a large amount of earlier eGov research the application of ICTs in the public sector has been promoted as if not a silver bullet so at least the best available solution to solving problems of efficiency in the public sector and thus providing opportunities for cutting costs and providing better services to citizens. However, the goals of eGov are many and diverse, and sometimes conflicting, so the way to get there is far from straight. As eGov focus has moved from department and service orientation to comprehensive all-of-government approaches, research has increasingly highlighted the complexities, interactions, and conflicts intrinsic to the public sector as pivotal for understanding eGov (Cordella & Iannacci, 2010; Dawes, 2009). Hence, the emphasis has shifted to focusing on *governance*, which is understood as a dynamic process involving a multitude of actors with a large degree of independence, rather than just focusing on *government*, i.e. the bureaucracy and institutions of the public sector. This emphasis following the changes in organizing core societal activities that includes involving not just government but also private actors as service providers, tied together by providing service and control components over shared electronic communication networks regulated by various arrangements such as outsourcing, accreditation, partnerships, and service level agreements.

1.1. Complexities of governance

Dawes (2009) discusses the need for a future oriented perspective where eGov is seen as a "dynamic socio-technical system encompassing interactions among societal trends, human elements, changing technology, information management, interaction and complexity, and the purpose and role of government". From this perspective, public sector use of ICT is increasingly perceived as matter of politics, societal fluctuations, changing information needs, changing technologies, and an increased amount of stakeholders and actors. It becomes a matter of eGoverNANCE, rather than a straightforward process of building a unified eGovernMENT to make the public sector more efficient. eGovernance means executions of various service tasks are distributed among many actors. However, distributing tasks does not mean that government can let go of leadership. In particular this has to do with values and control, which are the core of government; a fair distribution of resources, human rights, equality, privacy etc. Maintaining such values becomes increasingly difficult when tasks are distributed and at the same time more automated and standardized. eGov implementations often carry with them unintended consequences or new issues. For instance, it has been shown that the durability of such public sector values, risks to become diffused due to the often narrow

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focus on efficiency and effectiveness of eGov initiatives (Smith, Noorman, & Martin, 2010). Others have also pointed towards the issues of eGov initiatives that act in ways which are not consistent with the public sector values and structures, thus disregarding democratic principles (Scholl, Kubicek, & Cimander, 2011). A prevalent issue hence is what the purpose of eGov should be, as the public sector is changing while it still has to uphold certain public values.

Perceiving eGov as an open dynamic socio-technical system means that a large number of factors are acknowledged to influence eGov, many of which lie outside the control of the public sector. Dawes (2009) outlines six areas of concern as vital to eGov; Purpose and role of government, Societal trends, Human elements, Interactions & complexity, Information management and Changing technologies. The model depicts eGov as integrated in a larger context, in which it influences and is influenced by other factors. Perceiving eGov in this way raises the question of to what extent a government governs a country. This question is central to governance research (Pierre & Peters, 2000), and the answer is not yes or no but a matter of to what extent, and how. This means that the different interests to an increasing extent are influencing how the public sector operates.

This problematic picture is not unique to eGov research but adheres to general governance research, which acknowledges the importance of actors outside the public sector as influential in public services and policy making. For instance, the sheer number of actors in the public sector, the increasing involvement of private actors, as well as supra-national institutions, like the EU, and governance networks (with little or no decision making capacity) need to be taken into consideration (Hedlund & Montin, 2009). When looking at eGov projects, network approaches are often being employed where several public and private actors cooperate across traditional borders, for instance in interoperability efforts (Larsson, 2011). It is shown that public and private actors are included in the planning and execution of public duties. However management or leadership is challenged in such networks which has to be governed in very different ways compared to traditional bureaucratic structures. They are often rather loose initiatives, which due to this have little or no decision making power (Hedlund & Montin, 2009). This situation shows that although eGovernMENT is still the most commonly used word, eGoverNANCE is a more appropriate term to describe what is really going on. Government is only one actor out of many providing the necessary technical-, informational-, and institutional infrastructures, and indeed specific services. Although government in many ways is the central actor, public sector ICT efforts must be complemented by, and aligned and integrated with, other actors, such as businesses and civil society organizations, and indeed the citizens themselves. In a governance perspective, eGov research needs to be future-oriented (Dawes, 2009). To this end the concept of sustainability is fruitful as it is future oriented as well as holistic.

1.2. eGov from a sustainability perspective

The sustainability concept has been established as a central concept for the public debate and indeed established as a mainstream idea in policy on all levels (Blewitt, 2008). A canonical definition of sustainability outlines the concept as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (WECD, 1987). What this means for eGov is a relevant issue indeed. Heeks (2001) joked that "These days you cannot find the elephants' graveyard because it is hidden behind the ICT projects' graveyard where the bleached boards of thousands of PCs lie rotting. Considerations of sustainability must therefore be high on the agenda in planning e-governance initiatives". In recent publications sustainability has been highlighted as a suitable way to look into the full spectrum of eGov (Lessa, Belachew, & Anteneh, 2011). Furthermore, Klischewski and Lessa (2012) conceptualize eGov sustainability as interconnected with eGov success, as solutions need to be sustainable in order to succeed in the long run. They outline a framework of the relation between eGov success and sustainability, based on a review of selected eGov literature. Similarly Dzhusupova, Janowski, Ojo, and Estevez (2011) outline a number of vital aspects for sustainability of eGov programs in developing countries, based on eGov literature. However, while both papers include numerous important issues no common frame of reference does yet exist, neither an overview of the use of the sustainability concept in eGov research. As eGov today is mainly about connecting and integrating government the task of eGov extends beyond simply providing "better government" (OECD, 2003) to also incorporate a future-oriented perspective where the dynamics of government and society becomes highly relevant, i.e. in "better" is also included the ability to survive huge and sometimes rapid changes in many fundamental, social, technical and economic variables. This means that in order to understand the complex nature of eGov, existing in a governance context where several actors and complex interaction patterns are involved, we need to employ a perspective that allows us to not only highlight the needs of today but also understand how different initiatives shape the future of eGov in a societal context. What this means in practice is far from clear, and this is where our inquiry begins. To address these issues in a structured way we turn to the concept of sustainability, which is much used in other important societal areas. To address sustainability productively across government there is a need for a clear understanding of what is meant, as addressing sustainability will mean intervening in other interests. For example there may have to be trade-offs made between current and future needs.

1.3. Research question and paper outline

The sustainability concept has been shown to lack a common definition, and can hence refer to a great number of different things (Faber, Jorna, & Van Engelen, 2005). In the eGov field, Klischewski and Lessa (2012) have proposed a research agenda for sustainability. However, no overview of relevant existing research exists. Therefore this paper aims to provide and so as to shape future research. The research questions are,

RQ1: How is sustainability treated in eGov research?

RQ2: How can the concept of sustainability be incorporated into eGov research?

Hence, one objective is to outline existing eGov research where the sustainability concept is used, in terms of what the different perspectives on sustainability are and what is to be made sustainable. A second objective is to outline directions and foci for future research based on this review as well as on sustainability theory. Hence we aim to contribute to the Klischewski and Lessa (2012) call for an eGov sustainability research agenda by providing an overview and a theoretically founded way forward.

First the conceptual framework is presented, followed by the literature review- and analysis method. The results of the review are then presented and discussed with regards to the different focuses of extant research. The paper is then concluded with a summary of the use of the sustainability concept in eGov research, as well as ways forward.

2. Sustainability as dynamic processes

Sustainability is a concept of the time. The colloquial use refers to various concerns for nature and environment. Typical examples include reducing transport and certain kinds of hazardous production so as to reduce, or stop the increase of, carbon emissions to the atmosphere. For such environmental care to happen, however, there needs obviously to be strong ties to economy; there must be a cost calculated for harming nature so that reducing the harm can be calculated as a gain not only for nature but also in companies' and governments' accounting. But economy cannot be discussed without social concerns. This has been clearly visible for example in the conflicts involved in distributing

pollution costs between countries, where e.g. developing countries feel they have to pay a too high price should they have to quickly reduce the environmental impact that comes from using older technology than that used in developed countries. Based on the close and complex interrelation between social and economic issues a common conceptualization of sustainability has evolved, the Triple Bottom Line (TBL), introduced in 1994 (Elkington, 1994). TBL is a method for "full cost accounting", where sustainability is defined by the above-mentioned three aspects which all have to be robust over time, individually and together; Social, Economic and Environmental sustainability. This is a pragmatic model for conceptualizing sustainability in economic terms, pointing out the interrelatedness among these different aspects and making them come together in accounting methods that include them all (Slaper & Hall, 2011). Sustainability, as of TBL, hence refers to all of them together. It is not possible, in the long run, to have one without the other two.

Importantly, the UN has ratified the TBL (in 2007) in a specific implementation established by the ICLEI, a large global network of over a thousand cities and regions – among which a number of "mega-cities" – in about half of the world's countries (ICLEI, 2013). This means that the TBL is not solely a theoretical construct but an important tool in everyday public sector practice.

While the TBL is an important concept for accounting, serving to expand the economic perspective, for the purpose of this study we add one more category, namely technology. There are two main reasons for doing so. First, technology is ingrained in almost every business and government activity today. Sustainability is a global and local business at the same time. Pollution travels across national boundaries by the wind, a joint concern for the environment requires standards and measures, and data for regulating business and governments regarding environmental issues, calculating and distributing costs for e.g. emission rights, auditing compliance, etc. need to be collected from governments and companies and shared across countries. Technology has an important role in providing governments with the ability to do this. For example there is a need to agree on technical standards at many layers and to develop and implement technology and train staff in numerous government agencies and companies to make this at all possible. The huge amount of failed eGov (and other) IT systems (BCS, 2004; Heeks, 2006) is a testimony to the fact that these are not trivial issues that can easily be contained within the three sustainability categories included in the TBL. To the contrary, implementation of large IT systems is a complex endeavor requiring special attention.

Second, technology is intimately and intricately intertwined with organization and people. As the interrelations are complicated and cannot be easily measured there is a need to put them under specific scrutiny. Technology and its users cannot be understood independently of each other, so there is a need to apply a perspective that includes both together. For the purpose of this paper we therefore add technology as a separate category so as not to miss out on aspects of technology that may have a fundamental impact on the categories of the TBL. Specifically, we apply a socio-technical perspective common for the Information Systems field.

Hence, in this part of the paper we first discuss technology in relation to sustainability, then present alternative notions of the sustainability concept and finally present the "dynamic and socio-technical sustainability perspective" which we employ in this paper.

2.1. A socio-technical sustainability perspective

A socio-technical perspective treats technology not as a mere tool or resource but rather as an important factor in relation to society, even an actor alongside humans (Latour, 2005). Technology is perceived as an active part in transforming society. It is not a neutral tool to be utilized, but is necessary to consider its interplay with other actors in the specific social context (Latour, 1999; Orlikowski & Iacono, 2001). Technology is thus seen as a central part in the development of the public sector and can act both as an enabler and an obstacle to sustainability. One example that lies at the core of technology's role is information infrastructures. An information infrastructure is a complex structure and involves conflict-prone matters such as standardization and questions of what the purposes of the infrastructure's existence are (Hanseth, Jacucci, Grisot, & Aane, 2006; Hanseth & Monteiro, 1997). Information infrastructures include "hard" components (e.g. hardware and broadband access) as well as "soft" ones (e.g. standards, information security, and information processes). The infrastructure lies at the heart of the public sector and is very complex as it is influenced by, and influences, economical aspects (potentially saving money), environment (fuel usage and carbon footprint) and social aspects (for instance access to internet, which can enable or delimit eService use and participation). Furthermore, the evolution of an information infrastructure is very much a part of a governance process, involving a large number of different actors both within and outside of the public sector. This also includes policy aspects as new arrangements between the actors involved might be needed.

Therefore it is also important to look at technical aspects of sustainability as they might not only be crucial for implementing other factors but also carry with them specific implications concerning organization and social issues. Technology is thus included as a fourth factor in this paper so as to be more informed of the interrelatedness of technology and social, economic and environmental factors.

2.2. Sustainability as dynamic

Although the interrelatedness of social, economic and environmental aspects is incorporated in several perspectives of sustainability, the TBL is not the only way to discuss these issues. In a review of sustainability guidelines, reports and indicator lists between 1960 and 2001, Faber et al. (2005) argue that more than 50 conceptualizations and definitions of the concept exits. They show that there is a growing awareness that the concept has to take into consideration the dynamics of sustainability. Such a perspective, however, still includes the interrelatedness of environmental and socio-economic aspects. For instance, Sen (1999) criticized the notion of sustainable development being discussed with a mainly economic emphasis. He argues that development cannot be about one-dimensional aspects (such as only focusing on social, economic or environmental sustainability) but is rather about allowing each individual to lead a life that s/he has reason to value. As such Sen's perspective is rather pragmatic. Ratner (2004) also provides an example of a pragmatic perspective, as he argues that sustainability is not about bringing grand solutions but provoking a dialog of values between different involved actors, such as the state and private businesses; "The sustainability concept is meaningful […] not because it provides and encompassing solution to different notions of what is good, but for the way it brings such differences into a common field of dispute, dialogue and potential agreement as the basis of collective action" (Ratner, 2004). Ratner further argues that sustainability should not be used as just another way to talk about sustained economic growth or successful development towards more consumption, but that meaningful interpretations are multidimensional and complex. Social, cultural, ecological and economical goals can sometimes converge but often require discussion and tradeoffs. As such, the dimensions are not considered to be fully commensurable (Ratner, 2004). In this sense, sustainability as a dialog between different perspectives, values are central.

The value aspect of sustainability has also been highlighted by Marshall and Toffel (2004) who outline a sustainability hierarchy pyramid in four steps, based on Maslow's theory about human needs, from previous sustainability theory. Starting at the bottom of the pyramid the steps are; The survival of humans, Life expectancy and health, Avoiding species extinction and violation of human rights and on top they place Quality of life and convergence of values & beliefs, arguing that this is the least vital part of sustainability research. They suggest

that this aspect should not be incorporated under the sustainability concept as it would thus widen the concept to a greater extent than would be useful. However, from the perspective of Ratner (2004) and Faber et al. (2005), we argue that it is precisely this complexity that makes it not only fruitful but also necessary to incorporate conflicting values and complexities into the sustainability concept. Especially so when it comes to the eGov field as the use of ICTs in the public sector is very much a question of values.

A dynamic perspective of sustainability is outlined by Faber et al. (2005), who provide a meta-analysis of sustainability. They focus on what is to be made sustainable, which can be something concrete/physical like carbon emissions, or something abstract/conceptual like a policy. They also show that the common understanding of the sustainability concept is moving away from perceiving goal orientation of sustainability as absolute (where a grand plan of how to make something sustainable would be prevalent). Instead goals are perceived as relative, highlighting the importance of a pragmatic perspective where goals and practices vary over time and are dependent on context. Lastly, they show that the perception of the behavioral interaction between environment (natural, social, or other) is perceived as changing in relation to what is to be sustainable, thus focusing on a dynamic relationship rather than a static one. They argue that "sustainability is no longer perceived as an achievable goal, but as a continuing process of improvement" which no longer targets an "ultimate state" as no definitive good exist, but is rather context dependent (Faber et al., 2005), similar to what is argued by Ratner and Sen above. This fits well with the perspective on eGov as an open dynamic socio-technical system outlined above, as the goals of eGov both relate to changing the public sector (by improving it) as well as striving for upholding government values in a changing environment.

From such a perspective, sustainability is clearly not a sub-concept within eGov but rather and overarching concept to which eGov must relate. This has to do with the socio-political implications of subjugating sustainability as a part of eGov success, rather than perceiving eGov as one aspect of a large socio-technical context. Dawes (2009) positions eGov in the complex interplay of societal processes. This means that an eGov initiative (for instance a project) cannot be seen as an isolated unit that can be sustainable for its own sake. An eGov project may be economically sustainable but might at the same time be problematic in, for example with regards to accountability or democratic values (Scholl et al., 2011; Smith et al., 2010). Hence, the sustainability of eGov is not defined by the longevity of specific eGov implementations, but must be considered in relation to the society in which it functions and how the purpose and actual outcomes of the eGov project contribute to upholding, changing or (potentially) counteracting political and societal goals.

2.3. Conceptual framework: a dynamic and socio-technical sustainability perspective

We have above outlined aspects of sustainability. In terms of the TBL, as well as a dynamic perspective on sustainability, these perspectives are seen as complementary, as the TBL helps to highlight specific (although interrelated) aspects of sustainability, which are focused in eGov research. A dynamic perspective helps to highlight the specific aspects that are to be made sustainable and at the same time serve as an underlying theoretical base for critically discussing existing research efforts, so as to highlight foci and gaps. In this paper we use the TBL with the addition of the Technology dimension as a basis for categorizing findings from the literature. As these factors are seen as interrelated it is important to outline to what extent previous research covers these aspects. As complementary to this a dynamic sustainability perspective is used to chart the directions of previous research with regards to what the foci are. Furthermore, the dynamic and socio-technical sustainability perspective is applied not only as a way to categorize, but as a theoretical tool to critically reflect on existing research and ways forward.

In the next section the theoretical framework is operationalized in order to serve as a basis for our literature review.

3. Method

Literature was searched for in the *eGovernment reference library (EGRL) version 8.5*, published on December 15, 2012, a reference library comprising of 5524 eGovernment papers from peer-reviewed journals and conferences (Scholl, 2012). The library covers the period from 1981 up until December 2012, and consists of entries from core eGov journals and conferences, wherein the majority of eGov papers can be found, as well as other relevant publications from other journals, many of which in the IS field. The library thus covers a vast majority of research relevant to the eGov field. Additional complementary searches were also done, as to find sources that might have been missed in the EGRL.

The EGRL was searched using the reference management software EndNote. We searched the library for "sustainable", "sustainability" and "sustain" being present anywhere in the keyword, abstract or title of the paper. As the focus of the paper is on the sustainability concept specifically we choose to delimit or search to the concept and hence not include other concepts which may have some relation to sustainability, such as for example Green IT. This would have required another step where we first would decide what should be included in our definition of sustainability, which is not appropriate for a paper looking for how others define and use the concept. Instead we choose to approach the matter by looking into what extent research places within the frames of the concept. In the Conclusions section, however, we briefly suggest some areas which could be linked to eGov sustainability in future research efforts.

In an initial screening of the 96 papers found, 71 were found to be relevant. The range of the included papers was rather vast, ranging from sustainability being the central concept in a paper to being discussed as one of several aspects. The excluded papers were mainly such who only mentioned sustainability without any connection to the core of the paper. Other papers that were excluded discussed the sustainability of the eGov research community, and were considered to be outside the focus of this review as they did not focus on eGov as a phenomenon.

As the EGRL was found not to contain full key words and abstracts for all papers additional searches were done using Scopus (http://www.scopus.com/) and Web of Science/Knowledge (http://apps.webofknowledge.com/) so as not to miss relevant publications. In this process 23 additional relevant papers were found. Hence, a *total of 94 papers* were included in the review. Publications that were not peer-reviewed but simply project descriptions or reports were not included, as the focus is on eGov research, not practice. Also, some references to entire books were excluded where sustainability was only referred to in general terms, and no reference to a specific chapter was given.

In the next review step, all papers were read in full, focusing on the use of the sustainability concept as to get a contextual understanding of its use and meaning in the paper. In some instances where the papers could not be obtained in full text (7 papers out of 94) we had to solely rely on the information provided in the abstract. Overall, the initial reading of the abstract was in most cases enough for getting a picture of the sustainability focus of the paper, while the reading of full text provided additional details and nuances which would have been missed otherwise, such as to which extent the concept was discussed and applied. Hence, it is possible that some missing information in the additional papers might have caused some nuances and clarifications to be missed.

3.1. Analysis framework: sustainability dimensions

As a first step, all papers were mapped according to the analysis framework discussed above, containing four sustainability dimensions

(social, economic, environmental and technical). The analysis of what sustainability dimensions were found is exemplified in Table 1.

3.1.1. Sustainability dimensions

This mapping provided an overview of the perspective and focus of each paper. The analysis was done with regards to which sustainability aspects were focused. In some cases more than one dimension was treated, and in which case papers were put in more than one category, as the categories are not mutually exclusive but interrelated. For example, in one paper it was stated that ICT capabilities among citizens affected the ICT penetration, which would affect the sustainability of a country in terms of economic and social aspects. Hence, it was related to both social and economic aspects. The issue also has to do with technology (ICT penetration) but as the paper did not discuss the sustainability of ICT itself it was not mapped in the technology category.

3.1.2. Sustainability foci

With regards to what is going to be made sustainable and that it can be seen as either concrete or abstract (as raised in Section 2) we rely on the latter, as eGov is per definition abstract. We instead highlight the specific focus of sustainability, i.e. *what* the focus is. In most papers it was stated what was to be made sustainable, however in some cases this was only defined indirectly and required some interpretation. In this sense the focus can, for instance, be eGov as a whole, a project, a community, or an ICT infrastructure. In a few papers, more than one focus was identified, for example sustaining the natural environment and the budget of an organization could be issues discussed together.

3.1.3. Other aspects

Other than the themes and foci the year of publication as well as whether or not the paper was based in sustainability theory was noted. The theoretical grounding was divided into three levels: No definition of the sustainability concept, operational definition, and theoretical discussion of the concept. Furthermore, we limited the focus of the review to exclude aspects such as degree of cross citations, which are publication outlets that are used, and disciplines of the authors. As the purpose is to understand the use of the concept rather than on the prominence of publications in terms of bibliometric measures we choose to exclude such aspects.

3.2. Outlining overall themes

The second part of the analysis focused on outlining the commonalities, i.e. general themes, in terms of what was discussed in relation to sustainability. This part of the analysis intended to answer such questions as; which of the four sustainability dimensions are covered, and how; which parts of eGov practice are focused, and how. The method applied is thematic analysis, where we start out with the creation of initial concepts and then move towards higher levels of abstraction as themes are created of similar concepts (Hansson, 2012).

4. Results from the literature review

A total of 94 papers were found. As Fig. 1 shows, the term sustainability is fairly new in eGov, increasing dramatically in occurrence starting 2008.

Table 1
Examples for mapping sustainability dimensions.

Social	Economic	Environmental	Technical
Governance, Citizen trust, Accountability, Adoption…	Funding, Budget, Shared resources…	Green IT, Carbon footprint, Simulation software for decision support…	Standards, Architectures, Infrastructure, Digital preservation…

In terms of the four main dimensions most papers (69) treated only one dimension, while a smaller number (19) treated two dimensions. Three or four dimensions were treated in just a few papers (4 & 2 papers respectively).

In 20 papers there is a theoretical discussion regarding the sustainability concept or an explicit reference to sustainability theory while in 31 papers the concept is defined in an operationalized sense although not having any deeper background in sustainability theory. For instance, an operational definition is offered by Liu (2012) who research sustainable agricultural informatization by operationalizing it as affordability and connectivity. In 36 papers the concept is used but not clearly defined. The 7 papers not acquired in full text are not included in the categorization regarding theory connection as this information could not be obtained from them. First we briefly present the different foci, and then we go on to present the themes for each dimension accordingly.

4.1. Sustainability foci

In Table 2 the sustainability foci are summarized, from most to least common. As stated in the Method section, this refers to *what is to be sustained* and not in what sense sustainability is discussed, which is the focus of the next section (themes).

Two of the most common foci are more or less specific parts of eGov, as they focus on, sustaining for instance a specific project or eService. Some foci are more process oriented, focusing on relations, citizen participation, and information access. Some papers focus on sustaining a technological environment or infrastructure (including interoperability aspects). A broader focus is on Policy, strategy & eGov as a whole. This category is used for papers where the focus either is on eGov strategies and policies, or where focus is not more specifically defined than being eGov as a whole. Less common is focus on sustainability of more general entities, such as a country, the natural environment and agriculture. The least common focus is security.

4.2. Overview of themes

We found 21 overall themes, 7 of which were social, 6 economic, 4 environmental and 4 technical. A summary is provided in Table 3. Note that some papers are represented in more than one theme. This means that the count of papers in Table 3 adds up to more than 94. (The full data set is available on request from the authors.)

Each category is briefly presented below.

4.3. Social themes

The social category is the largest and hence also broadest. At the core of the themes in this category lies knowledge processes in terms of understanding citizen & business needs evaluating and understanding practice as well as being aware that a continuous adaptation to an uncertain future is needed with regards both to goals and practices. The theme also revolves heavily around decision making, explicitly in relation to governance aspects and more implicit in terms of involving citizens and other stakeholders in the planning of eGov. Furthermore the matter of infrastructure as a sociotechnical matter is highlighted.

Needs and participation is the largest theme in terms of the number of papers, which also covers a wide array of topics, with the common denominator that they are related to inclusion, use, adoption and participation, and ways to assure this. The sustainability argument is in general that social sustainability cannot be achieved if people are not allowed or willing to participate in processes related to meeting their various needs, or actually adopt the services or infrastructure offered. Several papers focus on the need to include citizens and local stakeholders in planning and ensuring that solutions are fitting to the local culture and needs. (Aichholzer, 2003; Armenta, 2012; Brand & Schwittay, 2006; Chutimaskul & Funilkul, 2004; Grimsley & Meehan, 2008; Hoq, 2012; Kassim & Hussin, 2009; Klischewski & Lessa, 2012; Ray, 2012).

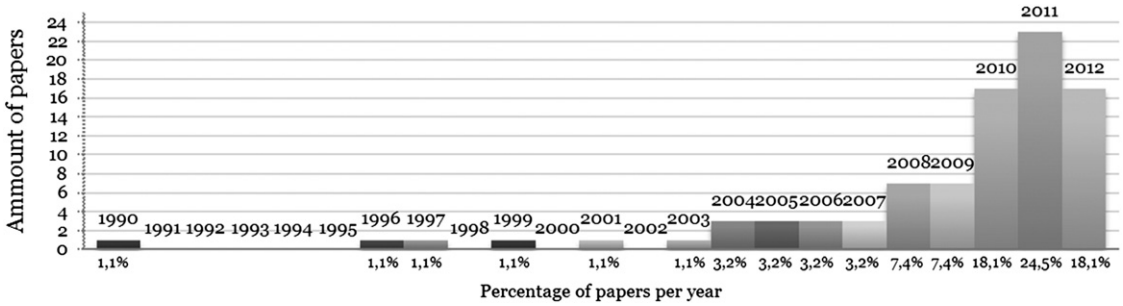

Fig. 1. Number of papers over the years.

Here, inclusion and adaption to local needs raise issues regarding involvement in decision making and adaptation to actual needs.

Furthermore the matter of achieving a critical amount of users is raised as central (Harrison & Zappen, 2005; LaRose, Strover, Gregg, & Straubhaar, 2011; Schellong, 2008). This also relates to human capital aspects, being raised as central to consider both in terms of the need to raise digital literacy for disadvantaged citizen groups, as to avoid a digital divide, as well as ensuring that eGov initiatives are supported by proper IT-skills. (Dzhusupova et al., 2011; Klischewski & Lessa, 2012; Krishnan & Teo, 2011b; Kumta & Datar, 2009; Nkosi & Mekuria, 2010; Sipior & Ward, 2005; Sipior, Ward, & Connolly, 2010; Szádeczky, 2010).

Several papers focus on eParticipation and eDemocracy, highlighting the need to include citizens in the decision-making process as well as issues in sustaining citizen engagement in such initiatives. (Burinskiene & Rudzkiene, 2004; Cleland, Mulvenna, Galbraith, Wallace, & Martin, 2012; Gordon & Manosevitch, 2011; Rose & Sæbø, 2008; Valtenbergs & Aizstrauta, 2008). Other papers highlight eParticipation and eDemocracy directly, arguing for the need to ensure that such initiatives actually support desired results in terms of democracy and decision making (Lidén, 2011; Molinari, 2010). Others argue that such efforts in fact *can* support democracy and participation (Chutimaskul & Funilkul, 2004; Trotta, Scarozza, Hinna, & Gnan, 2011), or provide public value by enhancing civic engagement and awareness (Misra, 2012; Traunmüller, 2010). One paper raises the need to include external knowledge in order to sustain knowledge management in government (Phusavat, Anussornnitisarn, & Rassameethes, 2008).

Politics and governance is the second largest theme, with the overall commonality that eGov decision making and implementation must be doable in order to be sustainable. Several papers highlight the need for engagement, initiatives and leadership from top level management and politicians (Bhuiyan, 2011; Cheverie, 1999; Dong, Yu, Wang, & Na, 2012; Kassim & Hussin, 2009; Kumar & Best, 2006; Lal & Haleem, 2009; Ray, 2012), favorable political conditions (Brand & Schwittay, 2006) as well as leadership and strategic implementation (Chung & Chatfield, 2011).

Governance and inclusion of relevant actors are highlighted in several papers, including aspects such as coordination of projects (primarily not only inside a country, but also internationally), project management, leadership, governance structures and arrangements as well as involvement of non-state actors. (Abdelsalam, ElKadi, & Gamal, 2010; Aggoune, Imache, Khadraoui, & Mezghiche, 2011; Chun et al., 2011; Chung, 2009; Chutimaskul & Funilkul, 2004; Dong et al., 2012; Farooq, Shamail, & Awais, 2006; Harrison & Zappen, 2005; Klischewski & Lessa, 2012; Shvaiko et al., 2009; Szádeczky, 2010; Xia, 2010). In parallel, two papers raise how IT can be utilized to better governance (Cloete, 2003; Janowski, Pardo, & Davies, 2012).

A more condensed theme deals with Evaluation, analysis measurement, focusing on the need of evaluation in general, assessing maturity and readiness or continuous monitoring, review and evaluation of eGov initiatives as well as organizational learning as part of such a process (Aggoune et al., 2011; Chen & Wang, 2011; Chutimaskul & Funilkul, 2004; Dzhusupova et al., 2011; Fonou Dombeu, 2010; Kasimin, Sahari, Noor, Yahya, & Aman, 2009; Klischewski & Lessa, 2012; Misra, Hariharan, & Khaneja, 2003; Ray, 2012; Yang, Xin, & Feng, 2011).

Values, goals and policies are discussed on a high level, including general statements such as the need for legitimacy, policy and strategies as well as the need to consider what are values and goals that drive eGov initiatives (Chung, 2009; Chutimaskul & Funilkul, 2004; Dzhusupova et al., 2011; Linders & Wilson, 2011; Siddhartha, 2011; Wihlborg, 2012). One paper also highlights the need to recognize sustainability as a mainstream concept in public administration (Klischewski & Lessa, 2012).

A few papers highlight the social aspects of Future uncertainty, arguing for the need for eGov initiatives and strategies to be adaptable to a changing environment (Aggoune et al., 2011), a number of possible future scenarios (Aichholzer, 2003), changing goals (Falck, 2003) and the need to consider that outcomes are uncertain and that initiatives might create social and cultural imbalance (Kumar & Best, 2006).

The need for Regulations, trust and security is also highlighted, referring to the need for legal frameworks to be aligned with initiatives, and vice versa; the need for trust from citizens and the need to consider security cultures inside organizations, as well as how eGov can sustain administrative responsibility (Decman, 2003), eServices need citizens trust (Grimsley & Meehan, 2008; Kawtrakul, Mulasastra, & Tawa Khampachua, 2011; Molinari, 2010; Yang et al., 2011) and the need for a sociotechnical perspective concerning security cultures in organizations (Trotta et al., 2011; Winkel, 2007), which relates to other papers that strongly focus on the need for a broad perspective. Concerning the need to have a Holistic view of organization and technology, the need to consider the full picture of organization and IT is highlighted. This includes the need to consider the whole of government, the relation between infrastructure and organization and avoiding a techno-centric perspective (Armenta, 2012; Chun et al., 2011; Grimsley, Meehan, &

Table 2
Sustainability foci.

Sustainability focus	Count
Project and program	14
Relations, processes, practices & roles	11
eServices, portals & applications	11
Electronic participation & deliberation	10
Technology and infrastructure	10
Policy, strategy & eGov as a whole	10
Information access & availability	7
Natural environment & agriculture	6
Government and country	5
Service centers & community Information systems	4
Development of local area	4
Security	2

Table 3
Themes.

Social (63 papers)	Economic (28 papers)	Environmental (12 papers)	Technical (20 papers)
1A. Needs and participation	2A. Cooperation	3A. Decision making and information	4A. Standards and interoperability
1B. Politics and governance	2B. Security & control	3B. Infrastructure & energy	4B.Information preservation over generations
1C. Evaluation, analysis and measurements	2C. Feasible plan and model	3C. Environmental strategy	4C. Holistic view
1D. Values, goals and policies	2D. Stakeholders & citizens	3D. Environment as an important value for eGov	4D. Technical infrastructure
1E. Future uncertainty	2E. Alignment of social & technical		
1F. Regulations, trust and security	2F. Decision making and information		
1G. Holistic view of organization and technology			

Tan, 2007; Winkel, 2007). This also incorporates the need for strategic alignment of organization and IT as a whole (Dong et al., 2012; Klischewski & Lessa, 2012; Nurdin, Stockdale, & Scheepers, 2012; Panagiotopoulos, Al-Debei, Fitzgerald, & Elliman, 2012; Sá, 2011). Overall, the understanding of infrastructure as intrinsic to eGov is highlighted, especially in terms of its interrelatedness with practice.

4.4. Economic themes

The economic themes are mainly concerned with cooperation, within the public sector as well as with actors outside it (for instance in sharing infrastructure and human resources), and control measures (as to regulate behavior that might affect economic sustainability) for involved actors. At the core of the theme lies the need for sustainable plans and funding structures of different initiatives, as well as assuring that decisions are made with proper knowledge.

Cooperation is suggested, between public sector as well as with private actors, in sponsorship and service provision, as well as sharing technical and human resources with other public organizations, as to save money (Bhattacharya & Vashistha, 2008; Hosman, 2011; Karim, 2004; Naik, Joshi, & Basavaraj, 2012).

Papers focusing on Security and control raise aspects like control measures of networks of enterprises so as to avoid opportunistic behavior (Kartseva, Hulstijn, Gordijn, & Tan, 2007), to implement policies to delimit data usage, to reduce running expenses (Odinma, Butakov, & Grakhov, 2011), to secure e-transactions for sustained economic growth (Kawtrakul et al., 2011) and to inform that security of eGov needs to be sustainable in terms of financing (Wangwe, Eloff, & Venter, 2012).

Central to economic sustainability is the need for a Feasible plan and model. This includes the need to secure funding in the long run and build a lasting structure for this funding, as well as ensuring that initiatives have feasible financial plans. Related to this is also the discussion of whether or not involvement of private actors in funding is sustainable or not. (Brand & Schwittay, 2006; Cheverie, 1999; Danner & Taylor, 1997; Detlor, Hupfer, & Ruhi, 2010; Klischewski & Lessa, 2012; Kumar & Best, 2006; Liu 2012; Molinari, 2010; Naik et al., 2012; Stanimirovic & Vintar 2011). A more practical paper presents a model for eTrade to deliver eGov services that can contribute to sustainable growth (Agbabiaka & Adebusuyi, 2011).

The need to include Stakeholders and citizens is raised in papers arguing for the need of support from local actors and citizens in order for initiatives to be financially sustainable (Hosman, 2011; Karim, 2004; Naik, Basavaraj, & Joshi, 2010; Naik et al., 2012) on the one hand, and that citizen use and participation in eGov initiatives can contribute to economic sustainability (Krishnan & Teo, 2011b; Misra, 2012; Mureşan, 2010) on the other hand. Furthermore, understanding of the need for Alignment of social and technical aspects in planning is held as important (Armenta, 2012; Grimsley et al., 2007).

4.5. Environmental themes

Environmental themes are narrower than economic and social. Mainly the themes focus on building an understanding for environmental aspects as important to consider, both for decision makers and citizens. The themes also incorporate infrastructural aspects in a broad sense, highlighting the need to consider energy efficiency and electronic waste disposal.

Decision making, information and support is a broadly defined theme, with the main sustainability focus that ICT can be used as a means to support decision making and understanding of environmental aspects through support systems, information provision and information channels. This includes geographic information systems, sensor systems and, decision support systems. An issue in this is the complexity that is persistent in understanding the interrelatedness of environmental aspects with other parts that has to be regarded in public decision making, as well as encouraging citizens to increase their understanding of such issues (Aichholzer, Allhutter, & Strauß, 2012; Burinskiene & Rudzkiene, 2004; Krishnan & Teo, 2011b; Manning, 1990; Misra, 2012; Mureşan, 2010; O'Looney, 2001; Rao, Kumar, Rane, & Pawde, 2011; Waltman et al., 2004).

A few papers focus on Infrastructure and energy, like the need to cooperate between public and private sectors regarding infrastructure (Krishnan & Teo, 2011a), as well as considering digital waste disposal (Kumar & Best, 2006). With regards to energy efficiency one paper explores the use of "smart grids" (Sarfi, Tao, & Gemoets, 2010).

Others also highlight Environment as central to eGov (Grimsley et al., 2007; Karunasena & Deng, 2011, 2012). On the other hand, another paper focused on *Environmental strategy* shows how plans for an environmental Information System become diluted through policy layers, as goals on an organizational level were seldom fully adhered to operationally (Haigh & Griffiths, 2008).

4.6. Technical themes

The technical themes are mainly focused on the infrastructural aspects, both referring to "hard" infrastructure, such as electricity, and "soft" infrastructure, like standards and information preservation. Standardization and information exchange are also implicitly related to decision making as decisions need to be taken in order to agree upon which standards, formats and practices should be used.

Standards and interoperability lies at the core of technical sustainability. The literature raises the need for interoperability, including aspects such as common standards, upgrade routines and accessible or open formats (Anthopoulos, Gerogiannis, & Fitsilis, 2010; Bhuiyan, 2011; Jaeger & Bertot, 2010; Kumar & Best, 2006; Lundell & Lings, 2010; Meneklis, Kaliontzoglou, Polemi, & Douligeris, 2005; Szádeczky, 2010; Wangwe et al., 2012).

This relates to Information preservation over generations, regarding the longevity of data and information. Issues in this respect include the matter of evolving technologies and standards, lack of preservation strategy and input from a multitude of actors and platforms, such as in the case of social media use (Becker, Barateiro, Antunes, Borbinha, & Vieira, 2011; Jaeger & Bertot, 2010; Karim, 2004; Kasimin et al., 2009; Lundell & Lings, 2010; McConnell, 1996; Valtenbergs & Aizstrauta, 2008).

As in the social theme the need for a Holistic view is raised in a handful of papers. Mainly highlighted is the need to consider the whole of government in planning initiatives, the applicability of certain technologies to fulfill goals and how well infrastructure and architecture can be integrated into an organization (Chutimaskul & Funilkul, 2004; Kassim & Hussin, 2009; Shvaiko, Villafiorita, Zorer, Chemane, & Fumo, 2010; Shvaiko et al., 2009; Wangwe et al., 2012). Other papers also focus more on the Technical infrastructure, arguing that a stable power supply and internet access, or infrastructure in a broader sense, is at the core of sustainable eGov (Bhuiyan, 2011; Grimsley et al., 2007; Schware & Deane, 2003).

5. Discussion: "sustainability" in eGov research

This literature review started with the definition of sustainability as a dynamic and socio-technical phenomenon in which social, economic, environmental, and technical aspects are involved and interrelated. Within these categories our study found 21 themes. In brief our review shows that;

- Research focus is most often on projects or other limited eGov initiatives rather than eGov as a large and complex phenomenon;
- Social aspects are the most represented focus while other aspects are less researched;
- Most papers focus on one of the four aspects. Only two papers cover all aspects.
- Interrelatedness between two or more aspects is seldom discussed;
- Little, if any, cumulative knowledge on eGov sustainability exists.

While the papers discuss issues that match well with the sustainability agenda at large, there is a lack of depth in the discussions. As concerns the theoretical basis, only few papers discuss the concept of sustainability. In 20 papers there is a theoretical discussion or an explicit reference to the sustainability theory, while 31 papers make some kind of operational definition without any clear theoretical connection. In a large portion of the papers (36) the concept is used casually without definition. When the concept is theoretically discussed, this is most commonly done with reference to the TBL and/or the Brundtland commission's definition, which are briefly referenced and/or quoted. Some papers look to other sources of the sustainability theory, and some – very few – to other eGov sustainability papers. This indicates that the use of the concept is rather scattered and refers to a vast array of different things, often rather arbitrarily. What appears from the review is not a coherent research field but rather a number of quite different papers that do not, with a few exceptions, attempt to build cumulative knowledge regarding what sustainable eGov might be. It is apparent that the sustainability concept is new to the eGov field and that its definition and use are in need of discussion.

In the breadth of topics brought up by the paper review it is possible to discern two meta-themes that are cross-cutting in the sense that they bridge the categories social–economic–technical–environmental and focus on general issues that may serve to integrate the scattered set of papers into a more coherent picture. Let us now turn to them and discuss how focusing on them can help us strive towards more focused and theoretically based eGov sustainability research.

5.1. Meta-themes, foci, and ways forward

Looking for common denominators across categories we found two meta-themes that are either explicitly mentioned or implicitly underlying several other themes; *Decision-making* and *Infrastructure*.

Both these themes are at the heart of governance. By definition, governance involves a number of more or less independent actors who have to coordinate their actions – under the leadership of government – so as to achieve societal goals which in their entirety lie beyond the business focus of each organization. Achieving such goals requires coordination of decisions across actors so that they each can focus on parts where they can find both business benefits for their own part and contribute to the overall greater societal good.

For example in the "social" category many papers concern Citizen participation and Adoption, topics that by definition are related to decision making. In fact influencing decisions is the very point of being involved. But how do we arrange that in a governance perspective, where decision making is distributed across many actors and subject to economic considerations by all these actor independently of each other? Just how should people in their role of citizen be in practice involved, for example, in school issues when schools are privately operated but central government regulated (for quality) and local government financed? There is clearly more than one possible "involvement point", and very different possibilities and incentives for arranging access and communication at those points. For example, how should the individual schools balance their relation to parents' different roles as customer, citizen and stakeholder?

Infrastructure is another central issue in governance. By definition, infrastructure is something that is available for all to use, something crucial for everybody's daily activities, like roads, electricity, and internet connection. Because it must be available to all it must be financed by all some way. Previously government was the main provider of the most important infrastructures, such as roads, as they are a societal good and government is set up on the promise to provide social goods. In a governance system – particularly in today's world where the number of important infrastructures has grown to encompass e.g. the digital communication systems which are also increasingly global and hence beyond the control of individual governments – government cannot afford or manage to provide infrastructures solely through tax financing but needs to set up joint financing models and ensure compatibility across projects, e.g. regarding railroad track dimensions, internet communication standards, hospital patient records and other information infrastructures so that they become as universally usable as possible. Our review found a vast array of themes relating to various dimensions of infrastructure. Beyond themes explicitly including the term infrastructure, themes such as "security and control" also necessarily involve infrastructure dimensions. For example, there is a need for an extended legal infrastructure to regulate security and privacy, a technical and organizational infrastructure to implement e.g. digital identities (e.g. a Certification Authority structure), and an international (technical and legal) infrastructure to make national digital identities and e-transactions operational across countries.

All of the themes found in our literature review involve both decision making and infrastructural dimensions. Table 4 illustrates this by some examples for the "Social" category (the largest category), and Appendix A provides tables for the other dimensions. It should be noted that the examples go beyond what we found in the papers; we provide the tables so as to illustrate what eventually needs to be researched and practically addressed, not just what is already done in eGov research. Note that the tables are in no way complete lists of issues to be considered, but are intended to provoke further discussions with regards to the meta-themes.

With regards to the discussion regarding information infrastructures, in Section 2 of this paper, the findings serve to illustrate the entangled relations between technological, social, economic and environmental aspects. As discussed in Section 2 of the paper, eGov is perceived as situated in a dynamic socio-technical context. Hence the meta-themes are particularly important as they influence, or even determine, several other themes, at the same time as they to a large extent are influenced by potentially disparate initiatives from the public as well as private sector as a vast array of actors influence both the infrastructure as well as take part in decision making. Hence, such contested overall foci are of much interest from a governance perspective, due to their multi-dependency and, hence, complexity.

Regarding the focus of research, clearly the traditional eGov project-centricity is not enough. Discussing eGov sustainability must take into consideration the bigger picture; discussing how eGov can contribute

Table 4
Infrastructure and decision making dimensions of the themes within the "social" category.

Themes found within the category "Social"	Example infrastructure dimension	Example decision making dimension
1A. Needs and participation	1A Must be consistently and practically dealt with across multiple actors. Requires legal regulation and technical tools ensuring interoperability across actors.	1A National goals must be implemented also by decisions by non-political actors.
1B. Politics and governance	1B Must be consistently implemented across multiple non-political actors. Requires standardized measures and interoperable systems for data transfer.	1B Consistent decisions must be made by multiple independent political as well as non-political actors.
1C. Evaluation, analysis and measurements	1C Measurements from many actors must be solicited, collected, and analyzed which require data standards and technical infrastructure.	1C Politically decided measures must be so formulated that also non-political actors can decide to implement them (e.g. operationalized).
1D. Values, goals and policies	1D Values must be consistently implemented across actors, e.g. as regards to privacy guarantees.	1D Values must be so formulated that also non-political actors can decide to implement them.
1E. Future uncertainty	1E Information infrastructures must as far as possible draw on global standards so as to minimize the risk for all actors that need to invest in them.	1E Decisions made by local actors must as far as possible be made taking global standards into consideration.
1F. Regulations, trust and security	1F As many actors are non-public, regulations apply differently than in the public sector. Hence service level agreements often replace laws as executive documents, and have to be formulated in such a way that political goals are fulfilled.	1F Service level agreements are commercial documents between individual organizations, hence decision making in such context, most prominently public procurement, must be developed to cater also for policy issues regarding quality of service (not only economic).
1G. Holistic view of organization and technology	1G As technology is decreasingly developed within an organization but needs to be increasingly standardized, the relation between people and technology must increasingly be dealt with at a supra-organizational level, such as standards for quality of work (e.g. fair trade type of requirements). This means that such standards need to be included in a legal infrastructure.	1G A stronger dependence on international standards, e.g. internet regulating bodies and supranational political organizations such as the EU and the OECD. This means decisions will increasingly be made globally and interpreted locally.

to sustainability of something, be it environmental care, social cohesion, technical standards and interoperability, or economic efficiency. From the findings presented in Section 4 it is clear that a focus on projects or delimited initiatives is predominant in the current literature. While such discussions are of course also necessary, more importantly they need to be contextualized with regards to how a project interacts with its environment in terms of how it can contribute to the public values, such as democracy, accountability, wellbeing, "green" impact, equality, and more.

As can be seen in Section 4, the different (narrow) foci of the contemporary research on eGov sustainability by and large mean that sustainability in a broader sense or the relation between eGov and broader societal goals is typically not discussed. In the dynamic sustainability view advocated in this paper, this is problematic. In this perspective, an initiative cannot be perceived as being sustainable in its own right, only by living up to project goals. Goals related to sustainability might be subject to change over time and due to the necessity to adjust to, or incorporate, goals of other initiatives or other societal values. The dynamic perspective on sustainability is grounded on the conclusion that, because of these changes over time, sustainability cannot be achieved once and for all but must be seen as an on-going dialog of values.

One might argue that as one of the key rationales for eGov is the modernization of the public sector and its services, sustainability of the public sector (i.e. making it more viable for the future) could be assumed to be included in making eGov more sustainable. However, as we have argued in this paper, that if we continue to discuss sustainability mainly in terms of how a project can survive – as our empirical data show to be the current case – we risk losing the bigger picture of what role eGov plays in our society. It is important to be able to discuss eGov efforts with respect to important general public values. This is arguably especially important from a governance perspective, as the effect eGov has on the world and society in which it emerges is hard to predict, and cannot be assumed to be only positive. Hence, in order to understand sustainability as several interrelated dimensions and without a pre-defined goal or definitive good, a contextual and dynamic perspective is needed.

In summary, we have found that while eGov research so far indeed brings up many themes and foci related to sustainability and sustainable development the sustainability discussions are largely scattered (as discussed in the introduction to this section of the paper). However, there is a growing interest in sustainability to be seen in a rapid increase of papers in the past few years, and the existence of at least a few papers discussing sustainability as a concept, including defining its nature and components. With a basis in the discussion in this paper as well as that in Klischewski and Lessa (2012), and in view of the generally increased use of the term sustainability in public debate, we look forward to seeing the emergence of a theoretically informed and fruitful research field. In the last section of the paper, we summarize what we found in our review, and ways forward for an eGov sustainability research field.

6. Conclusions

This paper sets out to investigate how the sustainability concept is used in eGov research for the purpose of starting a discussion about how it can be defined so as to be fruitfully used in future research. The argument motivating the research was that in order to understand the complex nature of eGov, existing in a governance context where several actors and complex interaction patterns are involved, we need to employ a perspective that allows us to not only highlight the needs of today but also understand how different initiatives shape the future of eGov in a societal context. The review found that;

- The use of the sustainability theory in current eGov research is weak, and use of the concept is to a large extent arbitrary and shallow.
- Most eGov papers focus only on one sustainability dimension, while papers that include and integrate all four categories (social, economic, environmental and technical) are sparse.
- Social aspects of sustainability are focused in a majority of the papers, while other aspects are highlighted to a lesser extent.
- There is a limited view of what is to be made sustainable as there is more often a focus on the sustainability of a project or eService, rather than more generally applicable factors directly derived from public sector values, such as trust, participation, or economy.

A key contribution as to how sustainability is treated in previous research also includes the 21 themes, presented in Section 4. With regards to how sustainability can be defined our contribution is the perspective we developed, by which the themes are organized into a coherent eGov sustainability perspective, the "dynamic and socio-technical sustainability perspective" (DSSP). This perspective extends the Triple Bottom

Line for use in an eGov context by (1) identifying and defining a technology dimension to complement the social, environmental, and economic ones, and (2) defining two cross-cutting themes, based on a governance theory, which join all the others together, namely infrastructure and decision making.

Another contribution includes the suggestions for how sustainability can be approached in future research efforts. We argue that research on eGov sustainability should focus less on the sustainability of projects, programs, and specific initiatives in themselves, and more on what aspects of eGov as a whole as well as of the world should be made sustainable; social, economic, technical, and environmental. There is also a need for more research that takes into consideration the dynamics of eGov sustainability, considering the interrelatedness between different sustainability dimensions, government levels as well as wider societal goals, and the changes these factors are subject to over time.

The following are examples of future research which would make eGov research more attuned with the sustainability agenda and hence contribute to eGov relevance for contemporary challenges;

- The cross-cutting themes of infrastructure and decision making require a special focus as they are crucial for many fundamental aspects, such as economical and social factors. They are also critical in view of an increasingly implemented governance perspective, where a large number of actors with a considerable degree of independence need to cooperate towards societal goals that usually go far beyond their business plans, and where gains do not necessarily emerge as direct return on investment but are of more global value.
- Stronger emphasis on the interrelatedness between social, economic, environmental and technical aspects of eGov sustainability, and what this means for eGov practice.
- Case studies of how eGov projects contribute to sustainability or are problematic in that respect.
- Conceptual development regarding the relation between eGov and sustainability in general. We have in this paper used Dawes' model, which is at a very general level; in order to discuss sustainability more contextualized, e.g. within a specific activity area such as digital identities or international health care information exchange, and more detailed models for various relations and development areas must be developed.
- Further theoretical work concerning how the sustainability concept should be defined and operationalized. Our proposal, following the argument in this paper, is that this should be based on the definition of sustainability as dynamic and context dependent, hence giving it a process focus. This could for instance be done by building upon the DSSP developed in this paper, utilizing the meta-themes of infrastructure and decision making.

As this study has been limited to the existing literature and is explorative in nature we do not claim to have outlined a complete picture of all aspects that should be included in a research agenda for sustainable eGov. We hope to inspire the research community to further studies and encourage more research with clearer conceptualizations of what sustainability might imply. The contribution to practice is to raise the understanding that incorporating a future-oriented perspective into the "doing" of eGov is important so as to be able to deal with the dynamics and conflicts in the distributed decision making setting of contemporary governance. One specific point here is moving away from perceiving sustainability as being limited to "green IT" and similar issues and incorporating the concept into mainstream eGov practice. While the downside of this is increased complexity, the upside is that only then will eGov be able to meet the challenges of today by following governments in the move from eGovernMENT to eGoverNANCE.

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Appendix A. Tables

Table 5
Examples of infrastructure and decision making dimensions of factors in the Economy category.

Themes found within the category "Economy"	Example infrastructure dimension	Example decision making dimension
2A. Cooperation	2A Cooperation across several organizations in service delivery requires a technical infrastructure and information and data standards for efficient operations.	2A Cooperation across several independent organizations requires coordinated decision making and economic incentives for each actor.
2B. Security & control	2B Requires national infrastructure for e.g. digital identities, such as a certification authority structure	2B Typically security and control infrastructures require both private and public actors. E.g. digital identities may be produced private, legally regulated by government and economically regulated privately
2C. Feasible plan and model	2C Cooperation across several organizations requires a technical infrastructure including a technology governance model for sustained operations.	2C Plans involving multiple independent actors require coordinated decision making and "feasibility" involves economic incentives for each actor.
2D. Stakeholders & Citizens	2D When citizen and customer roles are mixed for the same individuals in the same service chain, aspects such as citizen rights and provider accountability require an uninterrupted chain of control across the service process, which requires both technical and legal infrastructures.	2D When private actors execute public sector services, the roles of citizen, customer and stakeholder become mixed. Citizen aspects need to be formulated in "customer" terms so as to be possible to implement.
2E. Alignment of social & technical	2E Alignment across actors requires a legal infrastructure for the rules of the game, e.g. worker rights, and an information infrastructure for audit.	2E Implementation of politically decided goals and rules must be decided by multiple actors in a compatible manner so as not to hinder e.g. changes in service chains.
2 F. Decision making and information	2 F As different rules apply for information and decision making in the public and the private sectors, interfaces in the information infrastructure must be defined so that information necessary for operations can be transferred and e.g. privacy protected information is protected.	2 F In a governance system, decision making is by default distributed and necessary to coordinate so as to make joint action possible.

Table 6
Examples of infrastructure and decision making dimensions of factors in the Environment category.

Themes found within the category "Environment"	Example infrastructure dimension	Example decision making dimension
3A. Decision making and information	3A Distributed decision makers require arenas for making decisions. Often called networks, such arenas require an information infrastructure as well as proper environmental information to be effective	3A Decision making involves a multitude of actors who interpret environmental information; hence information must also be available.
3B. Infrastructure & Energy	3B Infrastructure can contribute to environmental sustainability by being energy efficient, hardware should be shared as well as that is full life-cycle and disposal should be considered.	3B Energy infrastructures are a mix of private and public providers and users who can choose from a number of providers, hence decision making is a complex mix of decentralization and complex regulation and incentives, all factors influencing each other.
3C. Environmental strategy	3C Most environmental measures require multiple actors to be involved, e.g. rules concerning emission quota require data administration and data collection for monitoring, which requires an information infrastructure to be effective.	3C Most environmental measures require multiple independent actors to make decision, including individuals. Strategies must include ways of providing them with reliable data for decision making.
3D. Environment as an important value for eGov	3D Environmental considerations should be a main concern in eGov infrastructure.	3D When planning eGov initiatives, environmental considerations should be seen as central as eGov can highly impact, positively as well as negatively, the natural environment.

Table 7
Examples of infrastructure and decision making dimensions of factors in the Technical category.

Themes found within the category "Technical"	Example infrastructure dimension	Example decision making dimension
4A. Standards and interoperability	4A In order for an infrastructure to be functional some degree of interoperability and standardizations is required.	4A In order to achieve and maintain interoperability and standardization multiple actors inside and outside of government have to be involved in taking these decision (as well as resolving conflicts around them).
4B.Information preservation over generations	4B Technical as well as information infrastructure needs to be both stable and adaptable in order to preserve information and access to it.	4B Decisions regarding future access to information imply the need to agree upon practices among several disparate actors.
4C. Holistic view	4C Infrastructure cannot solely be seen as limited to one organization or country, but is to some extent (perhaps increasingly so) might be shared by several different actors.	4C In order to take decisions regarding infrastructure one cannot only look to a separate initiative, geographic area or sector, as infrastructural decisions in one place also shape how other actors must react to it.
4D. Technical infrastructure	4D A stable infrastructure is crucial to functional eGov.	4D Infrastructural decisions play a key role in forming the basis of eGov functionings and directions.

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