# Research Agenda towards Structured and Sustainable Non-Bureaucratic Government

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## Abstract

*This article aims to draft a research agenda for post-e-Government research and development activities. It is argued that research in e-Government has taken a non-sustainable approach to government transformation and the concept of Sustainable Non-Bureaucratic Government (SNBG) is presented as a post-e-Government research domain. A seed agenda for further research towards SNBG is described.*

## 1. Introduction

Twenty years since myths [4] drew academia, politics and the civil service to invest into research and development (R&D) in e-Government and e-Democracy, tangible government performance improvements continue to be waited for [21]. One might be tempted to explain observations of increasingly costly government despite high e-Government maturity by high development- and implementation costs, suboptimal return-of-investment due to slow user-take-up [2], or risk-compensation of an estimated 85% failure rate of e-Government projects (Todd Ramsey, IBM's worldwide head of government services in [8, p. 265]). Alas, *unsustainability of e-Government* does not have only an economic dimension, but is caused by factors from the jural and technical domains as well [21], [19].

Technical artefacts that make up the e-Government landscape are developed and operated as black-box systems, which through time become technically, jurally or organizationally obsolete [19]; these systems are developed within a gray zone of *useful illegality* (Luhman: *brauchbare Illegalität* [24, p. 44]), in which administrative corruption is shifted from professionalized civil servants to system designers and developers [6] who are out of reach of the *principle of legality* inherent to administrative law [23, Sec. 4.1.2]. Thus, in the best case, time renders these artefacts into costly ruins in the *e-Government jungle*, in the worst case, they evolve into intransparent *to-big-to-be-changed* sinecures over which future politicians and lawmakers will have had lost all control. Thus, e-Government R&D is at risk to end up in a cul-de-sac, being neither able to deliver tangible improvements of government to human society, nor advance its scientific progress due to a lack of clear structure of its research goals (continuing to contribute to a jungle of unsustainable and fundamentally *heterogeneous* technical and conceptual artefacts can hardly be deemed structured).

In search for a structured approach to post-e-Government R&D, we shall draft in this article a research agenda that takes the pioneering works towards *Sustainable Non-Bureaucratic Government* (SNBG) [18], [20] as a point of departure. In section 2 we shall outline the theoretical framework as the agenda's context. In section 3 we shall elaborate a seed research agenda with trans-disciplinary research questions that require further community attention. In section 4 we shall conclude with a summary of the main challenges ahead.

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## 2. Structuring Government

*"What, then, is government?"* Rousseau asked, arguing that it is *"an intermediate body set up between subjects and sovereign to ensure their mutual correspondence, [which] is entrusted with the execution of laws and with the maintenance of liberty, both social and political"* [22, p. 92]. This intermediate body is to be understood as an abstract concept, rather than a concrete organizational structure, whereby latter will vary depending on the historical and cultural context. In the context of the modern Western civilization, government is often understood as the bureaucratic machine comprising *"all legal, political, and administrative organizations, and their people, that control a state"* [23, p. 3]. This bureaucratic culture is sustaining since mid-17th-century [24, Ch. 2], having *"survived the changes from monarchy to republic, from republic to dictatorship, from dictatorship to democracy"* (König in: [24, p. 27]). In this context, e-Government assumed the role of *"aim[ing] to improve the relationship between government and society in such a way that government is perceived as more responsive, accessible, transparent, responsible, participatory, efficient, and effective than before"* [23, p. 1] – thus, not necessarily tangible improvements are its prime objective, but at least the intangible sensation of such.

Modern government meanwhile has overloaded Rousseau's core social functions with an ever-growing landscape of nonmarket social functions provided by an ever-growing network of governmental and government-reliant bureaus (cf. [7]). Within those bureaus individual subjects are vested with representative power to act directly or indirectly on behalf of the (abstract) sovereign – the state, for sake of social function delivery. These subjects gain and lose their power (their *active jural status* [11]) through the actions of other subjects (ibid.). Empowering subjects to gain eligibilities *within* (e.g. assuming the role of an official) or *towards* (e.g. assuming the role of a war veteran entitled to state subsidies) the bureaucratic machine is in modern states handled by subjects who are supposed to act according to regulations, and/or policies, respectively. To govern these assignments / modifications / revocations of eligibilities, advanced control-principles on micro- (e.g. right of appeal) and macro- (e.g. the separation of powers) levels are deployed, which bring further complexity to the *public-sector ecosystem*. These governance systems however are expensive and despite their complexity remain error-prone. At the end of the day, the bureaucratic machine can quickly turn into a source of injustice and corruption [3], [5] rather than being a warrant of justice.

The manifold objectives of e-government and e-democracy research center around the aim to informate government, or to improve social services by means of technology. To do so efficiently, one must understand the nuts and bolts of social function delivery, which then can be informated and controlled by means of ICTs. A wider debate on what such informatable nuts and bolts are, has to the best of our knowledge not yet taken place in the e-government community, with authors from different backgrounds having radically different opinions and views [12]. In this section we summarize Paulin's research on government informatability.

### 2.1. Computability of Eligibilities

A logical necessity and common denominator in governments, which is independent of the temporal and cultural context, is the existence of *eligibilities*, which are bestowed upon subjects in the respective society, and which enable these subjects to call upon jural rights with regard to the specific context of the situation. All these *eligibilities*, then, logically base on some kind of information / data, which was produced by other subjects with appropriate *eligibilities* to do so. Thus, a complex

network of *eligibilities* is what shapes the core of the government *fiat* system. If we thus assume that hypothetically all eligibilities can be based on data, we may think further, how this data can be structured and informated within the digital realm.

In [18] Paulin describes a model for computing eligibilities – there called *Self-Service Government* (ss-Gov), based on relational algebra and moderated access to structured *jural facts* – i.e. atomic data from which eligibilities can be derived. As a method to govern self-service read/write access to this data, Paulin introduces the concept of Constellation-Based-Reasoning (CBR) as a *"scaffolding for creating, storing retrieving and changing jural facts based on which eligibilities of jural subjects can be determined"* [20, p. 219]. This methodology he compares to *"a key opening a pin-tumbler lock, where the key due to its specific shape moves the pins into the right constellation, which allows the lock to be opened"* [18, p. 1775]. The *lock*, then, defines the constellation and definition of the required data (defined as a relational set), which must be satisfied by the *key*, i.e. the data of a stakeholder and/or context in a situation, to *unlock* a particular eligibility in a given context. Thus, ss-Gov enables a model of government in which eligibilities (e.g. rights) are not *obtained* in form of credentials from state authorities through administrative proceedings, but are rather *determined* by means of CBR.

The mathematical basis for the determination of eligibilities enables homogeneous, standardizable technical storage, rule-based generation and –access to the raw jural data, and hence its sustainable storage as structured data in digital systems. This approach makes optimization strategies feasible up till the point where administrative middle layers (such as e.g. the modern bureaucratic machine) become obsolete, without however systemically rejecting or disabling the existence of such intermediate governance systems.

## 2.2. Sustainable Non-Bureaucratic Government

In a later publication Paulin [20] describes the concept of *Sustainable Non-Bureaucratic Government* (SNBG) as a confluence of CBR and *Liquid Democracy* (LD). (LD is a self-organized way of collaborative decision-making in which decisions are made by means of a mechanism of revocable transient delegation of power [20], cf. [9, pp. 35–7].) In the SNBG-vision, LD is deployed for collaborative assignment of eligibilities, while at the same time the LD mechanism is governed by means of CBR. Thus, a closed-circuit system is created, in which the rules of the system (i.e. the CBR *locks*) can be defined and managed collaboratively by means of LD, whereby characteristics of the collaborative decision-making through LD (*locks* regulating the transitivity, *locks* regulating the threshold for a communal decision to be accepted, etc.) are regulated by the very same system of CBR *locks*. However, while this model provides a feasible approach towards a sustainable base platform for storing and communicating abstractions of eligibilities, it represents only a part of the complexity required to bring into reality the vision towards a form of government that does not require a bureaucratic machine for administering jural relations in a juropolitical society. Thus for example, if constellations of jural data enable eligibilities, then naturally the question is how to recognize such constellations? Domain-specific semantics, data structures, etc., would need to be defined, which would make it possible to recognize for example a constellation of data representing a university degree, a driving permission, a land parcel, or a political representative's mandate. It is a logical necessity that all these must remain independent from the *ss-Gov platform* responsible for *creating, reading, updating and deleting* (CRUD) the jural facts, in order to ensure sustainability of the platform. In this regard Paulin [20] describes a five-layer technology stack (fig. 1) that would

enable and support the interaction with the ss-Gov platform, whereby changes in higher layers would not influence the features in the lower ones.
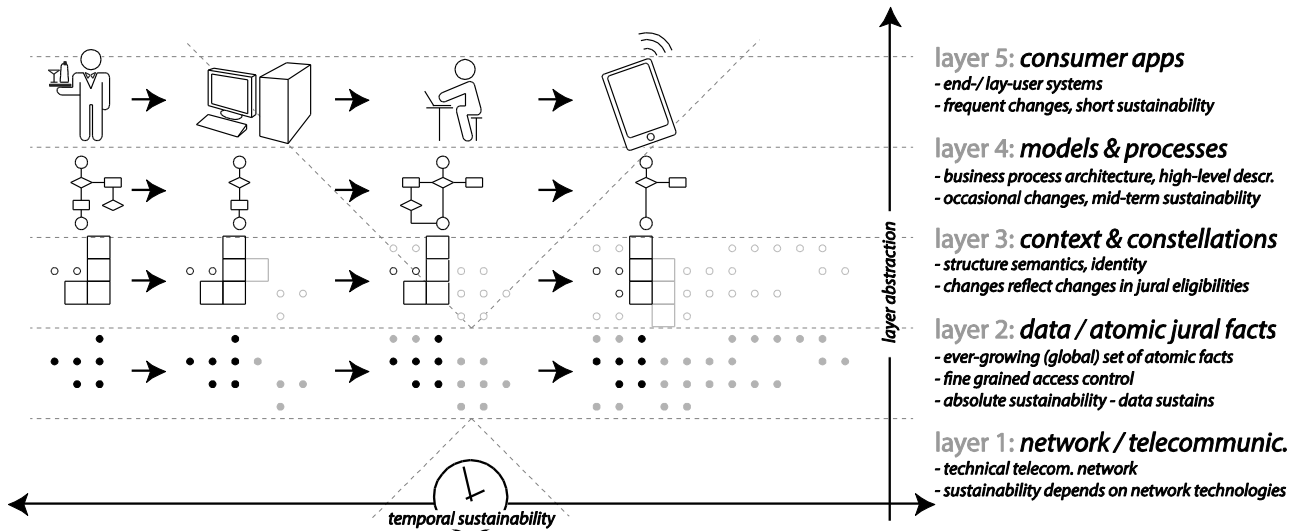


**layer 5: consumer apps**
- *end-/lay-user systems*
- *frequent changes, short sustainability*

**layer 4: models & processes**
- *business process architecture, high-level descr.*
- *occasional changes, mid-term sustainability*

**layer 3: context & constellations**
- *structure semantics, identity*
- *changes reflect changes in jural eligibilities*

**layer 2: data / atomic jural facts**
- *ever-growing (global) set of atomic facts*
- *fine grained access control*
- *absolute sustainability - data sustains*

**layer 1: network / telecommunic.**
- *technical telecom. network*
- *sustainability depends on network technologies*

*layer abstraction*

*temporal sustainability*

**Figure 1: Five layers of SNBG - Layer #2, where the jural data is stored, is by definition sustainable. [20, Fig. 2]**

The first, bottom-most, layer is a technical communication network, such as e.g. (but not mandatory!) the modern Internet. This layer is about exchanging arbitrary messages required for telecommunication. The second layer is about a content-agnostic technical infrastructure that enables arbitrary communication and manipulation of jural facts. In this layer, the ss-Gov platform as such resides as a system for storing and governing access to the data.

On the third level, a *contextualization-layer* would provide artefacts that would define domain-specific data structures, semantic conventions, *identity*, etc. This layer would enable interoperability between nodes that would constitute the platform on the 2nd level, and provide the corresponding semantics. This layer then would answer questions such as the one posed above, defining for example the structure and semantics of constellations that would denote a land parcel, a university degree, a diplomat's jural status, etc. A clear separation of this layer from layer#2 is crucial, as the semantics and structures of layer#3 will change through time – for *having* a university degree for example, the requirements of tomorrow might be slightly different compared to the requirements of today or yesterday; nonetheless, the *complex concept* of a university degree, which entitles individuals to certain eligibilities (e.g. only individuals with a university degree are permitted to compete for civil service jobs) may survive many changes in its intrinsic compositions, until perhaps in some point in the future this concept might lose its original value.

The concept-definitions on the contextualization layer might be established and governed for example by professional guilds, who would find proper definitions and micro-architectures for complex jural concepts. Thus for example, a guild- or de-facto- standard could emerge, which would define on a European, or global level, how a bachelor degree is to be represented by layer#2 jural facts. This would enable a subject, which graduated from a British university to enjoy eligibilities associated with having tertiary education in Austria without the need for additional homologation – the British university in this case would be the technical host of the layer#2 jural facts, which could be referred to in order to utilize them as a *key* (or part of it) to *unlock* eligibilities in other countries.

On the 4th layer, a unified approach to *describing* processes needs to be found, which would engage the contextualized constellations from layer#3 into business processes (layer#5), that would consti-

tute the business logic of complex information systems, which could be used by lay (i.e. not adequately literate in terms of data-level command of ICTs) subjects to interact with the network of jural relations stored on layer#2. A process here is to be understood as a system consisting of multiple stages of hierarchically interdependent CBR *locks*, where unlocked earlier locks present part of the key for later ones. (E.g.: to be selected for a civil service job, one must have first applied for such job, whereby in order to apply for such job, one must have prior fulfilled all requirements for *having* an appropriate university degree.) A modeling technique that might be feasible for describing layer#4 processes is the diagraming tool as proposed in [18, p. 1780].

Layer five, finally, is about technical artefacts (such as information systems, in whichever form) that would provide means for lay interaction with the network of jural relations from layer#2. Graphical user interfaces, m2m APIs, technologies for planning, visualizing, analyzing, etc. of layer#2 data would enable a rich environment for subjects/citizens to interact with the state and service-providers, whereby latter might be either subsidized by the state or a local community, or be purely commercial providers of solutions for accessing layer#2 data.

Unlike modern e-Government systems, which are built as n-tier black box systems comprising of tailored-to-fit data structures, business logic and user-interfaces, and which easily become obsolete in their entirety, data (from which eligibilities are derived) in SNBG is stored in a separate layer, through which it can be accessed through e.g. the Internet over clear protocols by any suitable technical client. Stakeholders can thus choose to either craft their own solutions for interaction with the data (in order to e.g. influence their own or other's jural position within the society, to analyze the data, etc.), or to acquire solutions provided by others, such as e.g. program libraries for developers, or consumer applications for lay users. The proposed technology stack however is as of now purely theoretical. Further research is required, which would refine and concretize the concepts and artefacts envisioned as part of the SNBG idea.

## 3. Research Questions towards SNBG

Research towards SNBG is still deep in its pioneering stage and further R&D is required to define a landscape of sustainable artefacts for the five layers described in the previous section. In this section we shall outline a non-exhaustive list of research challenges for layers #2-4 (layer#1 is sufficiently covered by the capabilities of the Internet, while layer#5 involves end-user applications, which then base on the technologies provided by previous layers) and briefly discuss their relevance for SNBG.

### 3.1. Layer#2: Data Storage and Communication

As the base platform for storing and accessing jural facts, a network of electronic registries has been originally proposed [18, p. 1776]. Each node on this network should comply with the following requirements (ibid.):

1. The interface to the system – including the location of the interface in the network (e.g. IP address or URL/URI) must be definable through a law-equivalent system.
2. The format of incoming and outgoing messages must be legally defined.
3. The procedure how the incoming message is handled must be legally defined.
4. Reading and writing data must be done in an analogue manner, i.e. only the grammar and semantics for defining the commands for querying the data shall be defined.

5.  Legally significant and non-repudiable communication between the sender and the server must be ensured.
6.  Users must have full access to the *core data* within the legally imposed restrictions.

The requirements #1-3 ensure that everybody can know where and how to reach the endpoint of the respective registry, as well as how the request will be processed. Thus, the user is not bound to use specific terminal equipment or interfaces to interact with the system, but is free to build such system itself. To properly address requirements #1-3, further technical research is required to design concrete artefacts that would suit the context:

-   What is the protocol for interacting with the nodes?
-   What is the system for describing addresses on the network? How would nodes route requests between each other?
-   What is the structure of the request/response messages?

Requirement #4 would be achieved by defining an artificial language for reading and writing data, or by using existing standards. For querying data existing technologies could be utilized, such as e.g. SQL, or SPARQL/Update, whereby it is important that a system of governance of the incoming queries is assured, which would enforce directly applicable regulations (i.e. CBR *locks*) for access to data. An early proof-of-concept system addressing this functionality has been described in [14], [15], which bases on the MySQL relational database system and a custom-made fine-grained access control mechanism.

Requirement #5 is essential for "mashing-up" data from different sources, which are not originally linked. Thus, any communication received from a layer#2 node must be trusted to be genuine (non-repudiation of origin), while in addition to this, both requester and responder must be ensured that the communication was received by the other party and will be dealt with properly. Thus, fair-non-repudiation [17] becomes a relevant prerequisite for addressing this requirement.

The 6th requirement gives the subjects inhabiting the system the maximal freedom to design their legal relations in accordance with the surrounding legal frame. Here, relevant challenges are:

-   Design of a system of rules (thus, the legal frame), which would be directly applicable as CBR locks.
-   How to change these rules by means of collaborative decision-making as described in 2.2.?
-   How to ensure versioning of rules for sake of documentation?
-   How to ensure integrity of the system?

## 3.2. Layer#3: Identity & Context

Access to data would need to be governed by an appropriate system of fine-grained access control, which would take into account a specific representation of the digital identity, as well as further context-describing information, such as e.g. location.

Digital identity – i.e. functionality for identification, authentication, and signing, as of today is a challenging topic on its own [16] and requires significant focus to reach a status in which a clear digital *representation* of identity can be achieved. The representation of identity would need to take into account that the same identity would be used to identify a subject within the layer#2 reposito-

ries, while the subject would use the same identity to sign requests issued against the repository in order to provide non-repudiation of origin and to authenticate itself against the system.

- How then, would a subject receive its digital identity?
- Could it change it? What would happen, if the identity would become compromised?
- Could many identity-issuing authorities exist side-by-side?

In addition to challenges how to represent identity, focus is required on finding how proxies could be utilized to act on behalf of subjects. Proxies would be crucial to enable advanced services, such as when a request is routed through many complex instances, or when the requesting subject is not capable (too old / young, deceased, handicapped, etc.) to act on its own behalf.

A wide field requiring input from the semantics community is the handling of the context. In order to avoid becoming obsolete as semantic meaning changes, layer#2 artefacts deliberately omit semantics; layer#3 artefacts on the other hand then make up the descriptions of structure required for the particular fiat government system to determine eligibilities based on context. Artefacts in this layer address the challenge, how complex concepts, i.e. CBR *keys* are to be described and recognized. Such key for example would be a university diploma, which would be then used by subjects as a part of further keys to unlock advanced eligibilities.

- How then, would such diploma be represented in a world of distributed data?
- Would it be a simple attribute in a remote relational database associated with the identity of the subject? If so, how could we identify this attribute? What would its name be?
- Or, would it be a complex virtual object comprised of distributed attributes? If so, how would they be addressable?

A further significant challenge is coping with context change. Thus, in [18] a shift in the legal context is described, which occurs when the metaphorical passenger ship moves from one jural context into another. Shifts in context however do not occur only if a vehicle moves across political borders, but also in the course of political changes – revolutions, etc. Also in this regard, versioning becomes an important factor – the concept of the university diploma might sustain for generations, while both its consistency (which jural facts does it rely on?), and effect (which *locks* does it help to unlock?) will change meanwhile. Thus, a diploma gained in the past will be composed of a different constellation of jural facts than the diploma gained in the present, while having the equal unlocking capability in a given context. How, then, could such unpredictable shifts in context be addressed by layer#3 semantics?

### 3.3. Layer#4: Modelling Processes

Layer#4 addresses methods and tools to plan, present, deliberate, decide on, and translate between a lay and technical audience the artefacts deployed in layers #2 and #3. This includes R&D efforts towards modeling tools and methods which would enable describing the concepts comprising CBR locks and keys. These models would be then used to depict the complex relations of layer #2 and #3 artefacts towards political stakeholders, decision-makers, policy-planners, as well as designers and developers of information systems which would provide user-friendly advanced access to layer#2 data.

## 3.4. Societal Questions

Most of the questions outlined above are of a nature which requires engineering skills to be addressed properly. However, aside from the technicalities of the SNBG technical artefacts, many more interdisciplinary questions require further thinking. Thus, juropolitical societies which strive towards the completion of common societal goals (res publica / commonwealth) require systems of public funding, e.g. through (most common, but not exclusively), taxes. A significant challenge thus is to find ways how to assess and exact taxes in a self-organized manner by means of SNBG.

- Can the economic system be represented within SNBG – meaning handling financial transactions by means of CBR keys and locks?
- How can we generate public funds to which the community's members would contribute, based on the technical stack of SNBG?
- How then, can access to such public funds be granted and governed?

Furthermore, it would be naïve to imagine a giant global community. Instead, a natural division into myriads of local / regional / national communities should be assumed, similar to modern municipalities, countries, etc.

- How then, would division of competences be achieved?
- The division of funding?
- How would membership in sub-communities look like?
- How would funding of public projects look like?
- How would permanent activities like public education, or a public health sector be realized by means of SNBG?
- How would it be financed?

Also publicly-funded permanent activities (such as universities) and publicly funded projects (such as the construction of a bridge) would yield special micro-communities, which would need to be represented properly within SNBG. (Or would the forming of micro-communities – e.g. public companies, be avoidable? Islamic Sharia law for example does not know the concept of companies – i.e. legal subjects, but only the concept of the cause and its leader / representative. Thus, Islamic endowments – Waqfs, can endure for centuries as accumulations of capital administered by a single assigned administrator [10].)

## 4. Conclusion

As e-Government R&D is failing to improve government from a civilian perspective, while at the same time government institutions through enhanced utilization of ICTs increase their surveillance activities, Western civilization is following the path of many once mighty civilizations, which withered away due to über-greedy and –controlling civil service (cf. [1]).

Developments in ICTs during the last half of a century, including major milestones such as the Internet (1960ies), the relational database and SQL query language (1970ies), and the invention of asymmetric cryptography (1970ies) as a foundation for the electronic identity, have introduced a novel dimension to humanity – the *digital realm*. Never ever before in the entire human history had we available such powerful tools and concepts, which bear true transformative power to be applied

to re-think traditional concepts in a way which was not possible ever since so far. ICTs transformed the way we communicate, the way we transfer credits (think of the SWIFT network for financial transfer), the way we travel (Amadeus system for booking flights, Booking.com, Tripadvisor, etc.), the way we find information (Google, Wikipedia). Truly tangible advances in civil services and industry leave one to wonder what went wrong in government – why did government not become neither cheaper (reduction in taxes), nor better (e.g. faster dispute resolution, less court cases due to less disputes)? Might perhaps Parkinson's law [13] provide an explanation?

How to systemically address informatization of government – this *"intermediate body set up between subjects and the sovereign"* [22, p. 12], remains one of the last unresolved challenges in the transition to the digital age.

In this article we summarized *Sustainable Non-Bureaucratic Government* (SNBG) as a concept in which government is achieved by means of self-managed governance of jural eligibilities. By enabling rule-based self-managed read/write access to a technical network of jural data, from which jural eligibilities are derived under the conditions of the particular context, self-managed empowerment of eligibilities within and towards the state is enabled in a structured, informatable form. We summarized the five layers of SNBG as introduced in [20] as a scaffolding for sustainable future digital government, and discussed open research challenges in this domain.

The idea to structure societal relations (also jural relations fall under this category) is not new – already Leibnitz, the famous 17th-century German mathematician, devoted his live towards defining a *characteristica universalis* – a mathematical system for handling societal issues. Alas, Leibnitz was still far away from the might of the digital dimension. Giving the possibilities of our generation, we appeal to researchers in the e-Government and e-Democracy domains to contribute to future-oriented research that would address goals beyond merely serving the existing context. Science, after all, is also about advancing beyond the status quo, or is it?

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