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Through Liquid Democracy to Sustainable Non-Bureaucratic Government

Harnessing the Power of ICTs for a Novel Form of Digital Government

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Abstract: *The paper summarizes the concept of Self-Service Government (ss-Gov) as presented earlier and explores how the principles of Liquid Democracy (LD) can be applied in ss-Gov for collaborative decision making. A thorough insight into the history of LD is provided and its recent developments are summarized. By combining ss-Gov and LD, the concept of Sustainable, Non-Bureaucratic Government (SNBG) is developed as a novel, blank-slate approach to government of eligibilities within- and towards governmental systems. It is argued that such entanglement of LD with ss-Gov results in a closed-circuit system that can provide end-to-end self-management of jural relations. Thus, it is argued, SNBG is a vision concept capable to enable morphable self-managed government which requires virtually no mediatory human agents for government. The feasibility of such approach is discussed based on a Gedankenexperiment featuring a modern parliamentary decision-making process.*

Keywords: Liquid Democracy, Sustainable Non-Bureaucratic Government, Self-Service Government, e-Government, e-Democracy, Digital Government

A **recent study** (Paulin 2013) explored the computability of jural eligibilities by means of modern ICTs as a method for enabling what is named there *Self-Service Government* (ss-Gov). Ss-Gov is a model for governing a society in which a dedicated public administration system (a *bureaucracy*) is not required for asserting a subject's (e.g. citizen's) jural eligibilities in a particular context, but rather the eligibilities can be *calculated* by means of relational algebra based on raw data about the subject's jural facts.

This raw data, which serves as a basis of a subject's jural eligibilities, is read and written by active and passive jural subjects, who again do have the *calculated* eligibility to consume, and provide, respectively, this data. Thus, in theory, a closed circuit is established in which subjects of various jural statuses interact with a relational system of jural data, which through self-service manipulation of the raw data stored within enables transformation of jural eligibilities of subjects in juropolitical societies. This approach to the technical determination / calculation of jural eligibilities in a juropolitical society was named (ibid.) *Constellation-Based Reasoning* (CBR). The methodology on which CBR is based can be compared 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*" (ibid., 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 new 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 computerized systems. This

approach makes the existence of an administrative middle-layer of mediating agents (the *bureaucracy*) hypothetically obsolete, without however systemically rejecting or disabling such system.

This paper shall explore if CBR can be utilized to enable non-bureaucratic collaborative decision-making through *liquid democracy*, such as it might be used in republican juropolitical systems for empowering political leaders and representatives, or for creating common policies and jural regulations. Section 1 shall first elaborate the theoretical framework by describing the concepts of *Sustainable Non-Bureaucratic Government* (SNBG) as a vision encompassing non-bureaucratic collaborative decision making, and describe the principles and history of *Liquid Democracy* (LD); section 2 shall explore how modern parliamentary decision-making could be handled either through the principles of SNBG without changing the existing structure, as well as how the same would be transposed to the realm of LD.

1. Theory Frame – Concepts for Self-Management

The modern system of public administration and its dependent stakeholders relies on an ever-increasing influx of capital (through e.g. taxes or public resources) to sustain itself, which it does by constantly increasing its legitimacy that bases on an increasing self-imposed handling of new regulations, responsibilities, and taxes (cf. Shleifer and Vishny 1993). Within such bureaucratic ecosystem, informal networks take control, which Banfield (1975) terms *machines*. These machines are communities, which exist based on a system of exchanges of favors (such as jobs, opportunities to make money by legal or other means, perks, etc.) amongst officials and external interest groups. Such hierarchies, which arise *"from extralegal, if not illegal, arrangements, [are]* ad hoc*, and must be continually renewed by 'deals' in order to prevent [them] from collapsing"* (ibid., p.161).

Increasing requirements of these bureaucratic social networks for self-sustainment are an everlasting issue in any civilization – limits of bearable growth of government requirements (manifested through rising taxation) however are easily reached and, as Adams (2001) argues, have caused the dusk of many once strong civilizations, including Ancient Egypt, Greece, Rome, the Aztec Empire, and the European Empires.

A promising attempt to curb the impact and burden of bureaucratic social networks on the society was the introduction of office automation technologies and bespoke ICT systems introduced in the last couple of decades to automate routine tasks of government agencies and to provide self-service access to government information and services. Computerization of the public sector has in large parts of everyday bureaucratic chores shifted bureaucratic discretionary power from a predominantly street-level bureaucracy with *"large numbers of faceless officials whose freies Ermessen (discretionary power) could cause an open society to be smothered in the bud"* (Bovens and Zouridis 2002, p.174) to a system-level bureaucracy in which information is collected from various sources in an automated form and applications from citizens can be instantly handled – e.g. approved, rejected, or set aside for manual inspection.

No doubt, the digital era influenced the public sector. The available technology makes it possible for bureaucratic networks to manage their duties with greater ease, and to better supervise their subjects and its own kin. The digital era however seems to be merely another noteworthy change in environment which the bureaucracy aims to survive – the modern bureaucratic culture, which began in the mid-17th century (Walter 2011, ch.2), after all, is *too big to fail*, or is it?

The *continuity* of the bureaucracy, "*which survived the changes from monarchy to republic, from republic to dictatorship, from dictatorship to democracy*"[1] (König in: Walter 2011, p.27, own translation), has in the recent past been challenged by two novel concepts – *new public management* (Osborne and Gaebler 1992) as an organizational, and e-government as a

[1] *"Sie haben Regimewechsel von Monarchie, Republik, Diktatur, Demokratie überstanden und mussten in Zeiten des politischen Zusammenbruchs die Last öffentlichen Handelns tragen. Die Bürokratie ist älter als die Demokratie."*

technological challenger. Latter, driven by powerful myths (Bekkers and Homburg 2007), has constructed a hype portraying technology as the enabler to new and better government featuring transparency, rich participation, and self-service one-stop-shops. Alas, a deep change in structure, away from the well-established bureaucratic approach, has not been part of its vision.

The e-government approach, however, has many flaws: As Bekkers & Homburg (ibid.) emphasize, e-government artefacts frequently require the coordination of a multitude of heterogeneous back-offices within the public administration itself. Aiming for progress in this regard often results in what they call *battle of the back-offices*, which prevents the development of a sustainable, goal-oriented e-government system-of-systems.

Aside from this, Paulin (2013; 2014) elaborated three *hazards* of e-government, which make this approach unsustainable: *hazard I (expiry date)* targets the dependency of monolithic e-government artefacts on law – such artefacts are developed according to law which is valid at design-time, but which will inevitably change sooner or later, requiring either a costly re-engineering of the artefact, or making unconstrained changes to law unlikely due to systems that are simply too big to be changed; *hazard II (monopolization, corruption and exclusion)* targets the gap between the legislator defining the functional characteristics of e-government artefacts and their possible many heterogeneous, non-interoperable, technical instantiations (the European e-ID and the Slovenian system for electronic registered mail delivery are examples for this: they both led to nationally favored technical instances, which discriminated other providers); *hazard III (legal certainty)* finally targets the challenge how to provide e-government artefacts whose internal processes and interfaces would follow the core jural principle of legal certainty, whereby it is emphasized that users of such systems should be able to rely on jurally clearly defined and stable interfaces and system behavior.

At the end of the day, e-government remains a bureaucracy-driven approach that supports its continuation and influence in the digital era. In this context, modern e-government assumes the role of making the existing approach such that it **"*is perceived*** *as more responsive, accessible, transparent, responsible, participatory, efficient, and effective than before"* (Veit and Huntgeburth 2014, p.1 (emph. added)).

In search for a sustainable *self-management* of juropolitical societies beyond the limitation of modern e-government, concepts for self-managing jural relations, as well as self-managed collaborative decision making, shall be explored hereinbelow.

1.1. Constellation-Based Reasoning (CBR)

A logical necessity and common denominator in government, 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.

Assuming that *eligibilities* are based on *data*, it can be thought further how this *data* can be structured and informated within the digital realm.

For CBR, Paulin (2013) took relational algebra as a foundation to calculate eligibilities based on sets of stored data. Relational algebra was successfully introduced as a foundation for data query languages by Codd (1970) and later extended to provide inter alia functionality for recursive data queries (Agrawal 1988) – latter, as shall be demonstrated in section 2.1, is of crucial importance for the herein discussed liquid democracy. The *Structured Query Language* (SQL), which is one of the core technologies in each computer science student's curriculum[2], is the most known translation of relational algebra to the domain of applied informatics.

[2] See e.g. the ACM Computer Science Curricula recommendations; DOI: 10.1145/2534860

CBR can be thought of as a system in which *locks* restrict access to data, and *keys*, which unlock these locks. The metaphorical keys are virtual constellations of data known to the context, which enable somebody to realize its intention (e.g. to change his address of living in a database, to enroll as a student of a university, to receive a state pension, etc.), whereby the metaphorical locks define the composition of these constellations (e.g. one can receive state pension only after having reached a certain age and having accumulated a certain amount of work years). These locks in CBR can be defined as cascadingly applied sub-sets of the data, whereby each sub-set can have either a dynamic (related to the context of the request – e.g. restricting access to one's own data only), or static (e.g. subjects represented in a certain table) definition.

Figure 1 depicts a schematic visualization of how CBR locks reduce the accessible region of data. From the thus accessible data (if any), information on the existence of the desired eligibility can be determined. Such information then can be of relevance to an external agent (e.g. a judge, or an external information system), or required as a predisposition for a further CBR lock.

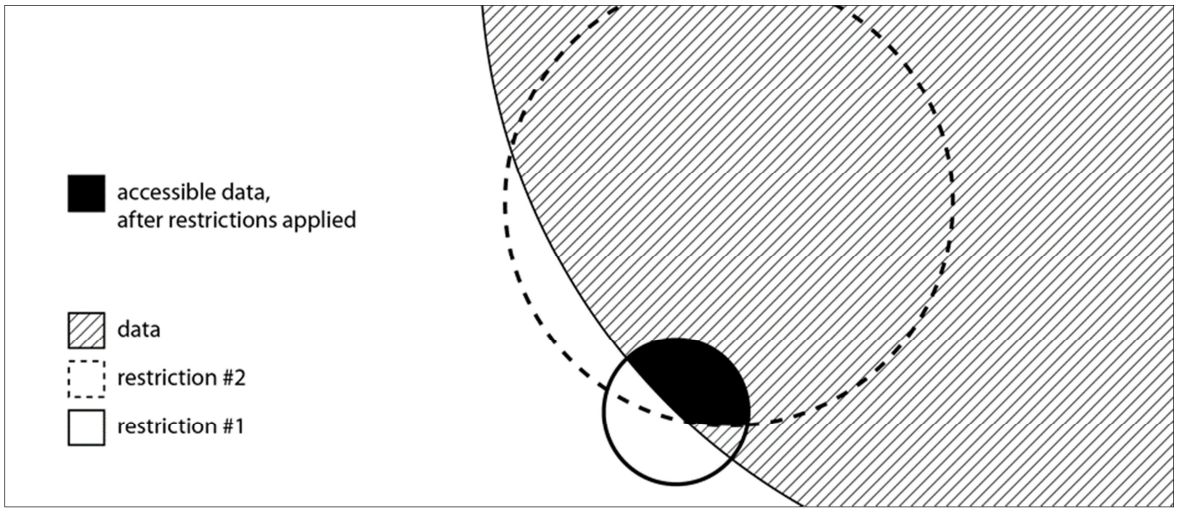

Figure 1: Schematic visualization of cascadingly applied projections (sub-sets) of restrictions for the data access, which constitute the virtual CBR lock that governs access to the request in a given context. The accessible region is the remaining cross-section (if any) of the restrictions and the available data.

How to engineer such system for real-world use is a non-trivial question. Storing and querying structured data from which eligibilities can be derived by means of the CBR approach could easily be realized using well-known technologies – using for example relational databases and the SQL query language for navigation through the data. Aside from this however, future research needs to define how to sustainably express *identity* within such system, how to assure non-repudiation of interaction with the system, as well as how access-/restriction-policies shall be expressed and embedded into the system for access control. An early-stage prototype instantiation of such system, which utilized SQL query rewriting to realize the principles of CBR was described by Paulin (2011).

1.2. Sustainable Non-Bureaucratic Government (SNBG)

Self-Service Government (Paulin 2013) through its *Constellation-Based Reasoning* (CBR) concept represents a scaffolding for creating, storing, retrieving and changing jural facts based on which eligibilities of jural subjects can be determined.

However, while this model provides a feasible approach towards a sustainable base infrastructure for storing and communicating jural data, 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, if

constellations of jural data enable eligibilities, then naturally one must ask how to recognize such constellation – thus, domain-specific semantics, data structures, etc., must be defined, which make it possible to recognize for example a specific constellation of data representing a university degree, a driving permission, a land parcel, or a political representative's mandate. All these however must remain independent from the infrastructure responsible for *creating, reading, updating and deleting* (CRUD) the jural facts, in order to ensure sustainability of the infrastructure.

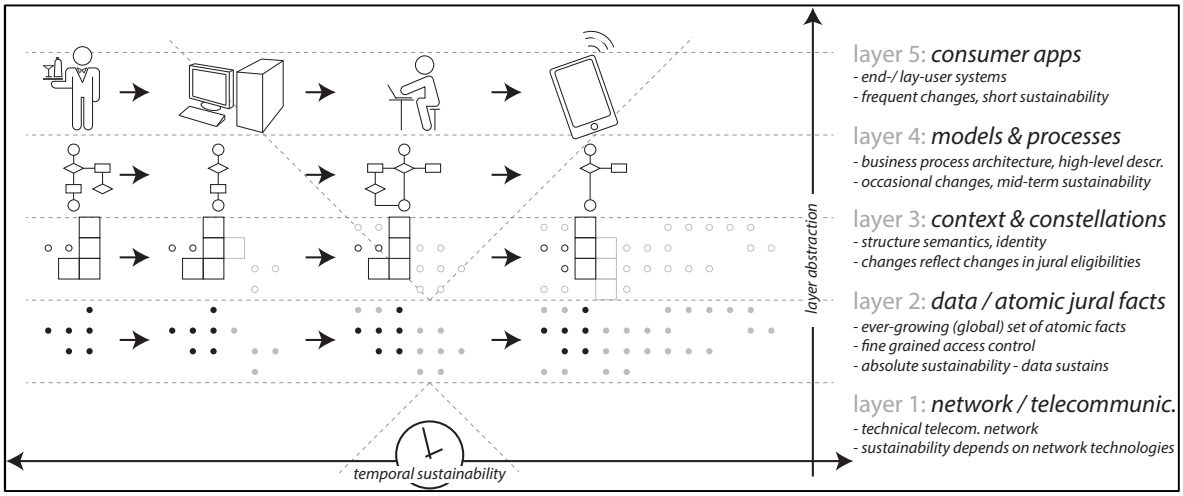

Figure 2: Five layers of SNBG: Layer #2, where the jural data is stored, is by definition sustainable. The individual eligibilities are determined by means of layer #3 semantics, whose range shifts through time. Layers #4 and #5 are unsustainable and can adapt to fashion without influencing the concepts from layers #2 and #3. The right-facing arrows illustrate the evolution of the respective artefacts through time.

How then, can self-managed, *sustainable non-bureaucratic government* (SNBG) be established by means of ICTs? Expressed through a technology stack, SNBG may be seen as an architecture comprising five layers:

The first, bottom-most layer is a technical communication network, 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. An instantiation of the ss-Gov model would be a suiting approach to deliver infrastructure for this layer.

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 network defined on the 2nd level, and provide the corresponding semantics. This layer then would address questions such as the one posed above, defining for example the structure and semantics of a constellation 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 composition, until perhaps in some point in the future this concept might lose its original value. (An example of such *complex concept* which through time became obsolete is, for example, the aristocratic titles of the Austro-Hungarian monarchy – once they *enabled* the access to government jobs, but became after the break-up of

the monarchy suddenly of no value.) These *complex concepts* of the *contextualization layer* act as *locks* in CBR reasoning, which are unlocked through the fulfillment of the required data constellations.

The contextualization layer might be established and governed 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 the European, or global level, how a bachelor degree is to be represented by layer#2 jural facts. This would enable a subject, who graduated from a British university to enjoy eligibilities associated with having tertiary education in Slovenia 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 societies.

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 (level #5), that would constitute 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 virtual 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 (Paulin 2013, 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.

The mistake of modern e-government was that it immediately went to providing monolithic layer #5 artefacts, which turned out to have issues with sustainability and interoperability (Paulin 2014), if the complex jural implications of system-level bureaucracy are left aside. Also approaching the design and development by e.g. starting at layer #4 – by for example developing a methodology for describing business processes on a high level and automatically translating them into the business logic of e-government artefacts, would, without considering layers #2-3 inevitably result in an unsustainable approach that might well satisfy acute needs (such as e-government does), but would not be prepared for future.

1.3. Liquid Democratic Collaborative Decision Making

Liquid democracy (LD) is a way of making collaborative decisions, which does not depend on elected representatives, but rather on the transient delegation of votes. This process can be described mathematically as follows (cf. Jabbusch 2011, p.35–7): each member *A* of a society can delegate its power to another member *B* (and withdraw it again at any time), whereat *A* – assuming each member's power is *v* and the sum of all *v* is *V*, has thus $(v_A-v_A)/V = 0$ influence when voting on a decision, while member *B* thus has $(v_A+v_B)/V$ influence on a decision made by all who are eligible to influence the given decision.

It is not clear who came up with LD first, and it appears that this idea arose from many minds independently. In terms of functioning information systems, to the best of our knowledge, four instantiations are known: in 2010, Paulin applied liquid democracy for executive empowerment to a student union, which was established mid-April 2010; a few weeks later, in May 2010, the German Pirate Party approved *Liquid-Feedback*, a system based on liquid-democracy that served as a backbone for their inter-party decision making process; in Russia, Leonid Volkov & Fyodor

Krasheninnikov launched in 2011 the portal *http://democratia2.ru*, which instantiates their specific flavor of liquid democracy - *cloud democracy* (cf. Velikanov 2013), while a fourth system, called *Polly*, seems to be under development in Australia since 2012 (Downing and Molloy n.d.).

Interest in LD has recently gained momentum in the digital government research community. Thus, Zwattendorfer et al. (2013) and Bitsch Link et al. (2014) present schemes to support LD systems with cryptographically enhanced security features to enable secure and privacy-preserving delegation of power, as they consider it of relevance. Van Hulten (2014) deliberates on a global parliament for world-government, seeing LD as an enabler of such. McCarthy (2013) defends the vision of LD against considerations from Nijeboer (2013) that Liquid Democracy would be too complex and hence inferior to classical methods of direct democracy. The roots of the concept as such have been deeper analyzed by Jabbusch (2011, p.30–33), who aims to summarize the history of various concepts associated with LD based on an article by James Green-Armytage[3]. Jabbusch' summary shall be, for sake of completeness, repeated here (translated to English):

In 1912 the New York Times reports of William S. O'Ren, who demands for *interactive representation,* whereby each elected politician's – the so-called proxy's – influence would be weighted with regard to the amount of votes received. His idea was picked-up more than half a century later in 1967 by the mathematician Gordon Tullock, who in passing suggests that voters could "by wire" choose their representative or vote themselves (in the parliament) while the debate would be broadcast by TV. In 1969 James C. Miller argued that everybody should have the possibility to vote on any question themselves, or appoint a representative. This idea was welcomed by Martin Shubik in 1970, who calls it an "instant referendum", but is concerned that the speed of decision-making might influence the time available for a public debate.

Further roots of the LD-concept, Jabbusch argues, are to be found in the ideas developed by "sayke", an anonymous user of the web, according to whom *"liquid democracy can be thought of as a function that takes a question as an argument, and returns a list of answers sorted by group preference [… or] as a voting system that migrates along the line between direct and representative democracy."* ("sayke" in: ibid., p.31) Sayke's idea was developed further through a wiki until 2003, resulting in the concept that a decentralized information system (software) should enable citizens to participate in political decision-making, thus making parliaments obsolete. Each citizen shall have one vote, whereby the system would provide the citizen with all proposals on the question at stake. If the citizen would not want to do his own research on the particular question, he could subscribe to the opinions of friends instead. The system would further provide that decisions could be made automatically by the system (based on the friend's suggestions?). The idea was further developed by the anonymous user "Kragg", who dropped the subscription to friends' decisions and instead proposed that voters could be delegated transitively, which is vital for LD.

Liquid democracy is thus a method of collaborative decision making that allows equal members of a community to either express their decisions on a matter directly, or empower a proxy to act on their behalf, whereby thus received power can be transferred further. Thus for example, if Ann represents Bob and Carl, and Carl represents Dave and Eve, then Ann holds the power to act on behalf of all, including Dave and Eve, whose power transitively shifts from Carl to Ann. If this community would further consist of Franck and Gaby, thus in total seven people, then Ann's decision would represent 5/7 = 71.4% of the community's will, provided that nobody in Ann's network votes for herself. Would however Carl decide to vote on an issue himself, then Ann would suddenly be representing only (53=2)/7 = 28.6% of the community.

[3] As of 09/2014, the article cited is not accessible on the Web any more. In a recent self-published paper on the same topic Green-Armytage (2014) provides a short complementary, but less recent, excursion into the history of LD / proxy voting. It is relevant to understand that liquid democratic collaborative decision making is not a vision that would be linked through a long-standing academic debate, but rather a surprisingly natural way of thinking, which by means of informatics can be brought to life for the first time ever in the entire human history.

1.4. Liquid Democracy in the German Pirate Party: a Path Down the Rabbit Hole

Jabbusch, himself a former high-ranking party member of the German Pirates, sees the Internet as an opportunity to get rid of *"inefficient and costly organizations like parties and parliaments"* and sees LD as an enabler to *"exchange or completely remove representative democracy"* (Jabbusch 2011, p.8–9). Through LD, he argues, *"the people would assume all legislative roles of parliament – committee debates, amendments, formation of opinions and resolutions regarding even complex wordings of laws"* whereby *"citizens would have the right to propose new laws at any time"* (ibid., p.35). Jabbusch further envisions that individuals could delegate their voting power *"temporarily to organizations (such as political parties, NGOs, associations, etc.) or to individuals (politicians, experts, friends)"*, or, optionally, the citizen's vote could be delegated only for particular topics (idib., p.35).

As Jabbusch notes (ibid., p.41-2), LD was a priority of the German Pirates ever since their formation and rose to a wide-debated issue in the years 2007-2009. In 2009, when the Pirates experienced nation-wide publicity and a strong rise in membership, several working groups were founded to investigate how to introduce advanced collaborative decision-making approaches for inter-party decision-making processes.

One such group founded the association *Liquid Democracy e.V.*, which developed the software *Adhocracy*, which was later used by the German parliament (Bundestag) – albeit with no transitive delegation, for an e-participation pilot (Bundestag 2013). Adhocracy however, the Pirates found, did not suit their requirements, whereupon within two weeks the system *LiquidFeedback (LQFB)* was developed (Jabbusch 2011, p.42), which continued playing a vital role in the party's policy-making processes.

LQFB has been designed as a virtual place for forming opinions by the party base, which are to serve the party organs as recommendations and feedback (ibid., p.53). Opinion forming in LQFB takes place through *initiatives*, which can be proposed by any registered member, however, no discussions like they take place on other web forums are permitted in order to prevent *trolling* – i.e. counterproductive contributions. Once an initiative has been proposed, it must first receive support of at least 10% of the registered users within a certain time span; if it succeeds in doing so, time for discussion and eventual modifications of the initiative is allocated, whereby modifications are allowed only up to a certain time span before the end of the discussion period. After this, members can vote on the final proposal. The interesting point here is that discussion is deliberately excluded from the system and thus has to take place in wikis, other forums, or in real-world discussions (ibid., p.58-60).

The *Meinungsbilder* ("opinion-pictures/frames"), which are formed by the party base through LQFB however are not binding for the party leadership. Jabbusch (ibid., p.75ff) demonstrates how a Meinungsbild is formed on the example of *universal basic income (UBI)*, a political idea arguing that the state should give every citizen a living-costs covering income unconditionally. A Meinungsbild-forming is initiated by a proposer posting an initiative. Each initiative can receive counter-initiatives, which are then competing within the Meinungsbild for dominance. It may happen that many initiatives within a Meinungsbild are accepted, which results in a fuzzy representation of the party base's opinion. In addition, it is not impossible to initiate many similar Meinungsbild-forming processes, which further diversifies the results. At the time of Jabbusch's report, seven UBI-related Meinungsbilder were formed (not including the failed initiatives); as of summer 2013, more than ten other Meinungsbilder on this very topic existed. Despite that it is up to the party leadership how to consider the opinions and petitions from the base during their mandate, the Meinungsbilder are further processed in party meetings and committees and are eventually included in official policy documents. In the case of the UBI, Jabbusch reports, the leadership accepted a petition for supporting a demonstration, which the party did by publishing an appeal for support on YouTube.

This kind of collaborative opinion-gathering as exercised by the Pirates however cannot be regarded as more than an admittedly elaborate form of deliberation. The non-binding nature of the

Meinungsbilder does not prevent the party leadership from acting against the will of the party basis, as indeed has happened in 2013 (Herwatz 2013). However, even if the party leadership would be de-jure bound to the collaboratively expressed will, the Pirates might run danger to drawn in a torrent of different interpretations, contradictions, and juridical tricks that would allow the leadership to have its way in the end anyhow. The approach chosen by the German Pirates does present a significant novelty in the intra-party policy creating process, which could be eventually applied at a national level for a more democratic way of making political decisions. This way of collaborative opinion-gathering however does in no way affect the continuity of the bureaucracy but rather strengthens its legitimacy by making it appear more accountable and more participative.

2. Liquid Democratic Decision-Making in SNBG

In the domain of SNBG, LD is a core enabler for collaborative decision-making which does not require human agents for the moderation of the process. Unlike in the context of party politics, where LD is used for opinion-gathering and the shaping of the party-line respectively, in SNBG LD can be utilized to enact CBR locks and thus regulate the conditions under which individuals can assume and exercise eligibilities. The rules of the LD process again can – at least in theory - be tuned appropriately to fit different collaborative decision-making scenarios. And these very rules again can be regulated by means of CBR locks, yielding thus in a morphable system in which the transition from one form of government to another can be regulated *within* the system itself.

2.1. Calculating Liquid Democratic Relations of Power by Means of CBR

Section 1.1 described CBR as a system that can utilize the concept of relational algebra for describing rules and restrictions – i.e. CBR locks. Suggesting SQL as a universal artificial language to query data in relational databases, the utility of projections (sub-sets) was briefly described as a way of defining restrictions of access to data. If in this setting LD is to be used for collaborative decision making, one needs to be able to determine the majority in a collaborative decision-making context, which would be able to *enact* collaborative decisions according to its preference. Such rule, which would restrict the eligibility to enact such decision to a set of individuals, who together have a relevant majority, is then, what needs to be defined as a projection in this realm.

```
 1  DROP TABLE IF EXISTS vars;
 2  CREATE TEMP TABLE vars(id TEXT);
 3  INSERT INTO vars (id) VALUES ("carl"); // id of individual whose might
 4                                        // we want to calculate
 5                                        // (to be provided by context)
 6  WITH RECURSIVE
 7     my_followers(name, level) AS (
 8        VALUES ((SELECT id FROM vars LIMIT 1), 0)
 9        UNION ALL
10        SELECT m2.member_id, my_followers.level + 1 FROM
11           (SELECT * FROM members m
12            WHERE m.member_id NOT IN (SELECT v.member_id FROM votes v))
13            AND m.member_id NOT IN (SELECT id FROM vars LIMIT 1))
14           AS m2
15           JOIN my_followers ON m2.proxy = my_followers.name
16        ORDER BY 2 DESC
17     )
18
19  SELECT (COUNT(*)*100/(SELECT COUNT(*) FROM members)) || '%' AS my_might
20     FROM my_followers;
```

Figure 3: SQL query to determine a given individual's power at the moment of calculation.

In order to calculate such majority in LD, the entire network of transitive delegations of power must be traversed and the might of the requester's individual network in the particular context calculated ad-hoc. Let us assume that each individual can at any time delegate his vote to

anybody, whereby the delegation is done silently, without the delegate being notified on this. This, then, requires a recursive query over a table, which holds the information on who delegated their vote to whom.

Such recursive SQL[4] query is presented in figure 3, which assumes the existence of two tables: table `members { member_id, proxy }` holds the information on the subjects of the particular society, as well as the information to whom individuals delegated their vote (if they did so at all); table `votes { member_id, vote }` holds the individually expressed votes of the particular members. The information on the power of the individual member is calculated ad-hoc by means of the common table expression (CTE) `my_followers`, as described in figure 3. Said CTE traverses recursively all nodes (individuals) that link to the node of the inquired individual, excluding all individuals who expressed their individual preference in the table `votes` from the calculation of one's power in the moment of calculation (line 12), while preventing cyclical delegation of power (line 13).By setting a rule which mandates conditions for inserting the individuals' vote preference into the table `votes`, or to write (and revoke, respectively) their delegation of power in the table `members` the characteristics of the LD collaborative decision-making process *within* the system can be further tuned; likewise, the output of the described query from figure 3 can be utilized as a part of a further CBR lock, which e.g. mandates that a decision can be enacted only if an individual (or a collective of individuals) has at least 51% of all the power.

2.2. Apropos: Parliamentary Decision-Making through SNBG

Modern parliamentary systems institutionalize collaborative decision-making and regulate it through strict procedures conducted by elected representatives of the political community. National assemblies, legislative councils, Russian *Dumas*, Muslim *Majlis'*, or Western *Parliaments*, etc., are then but different names for the same concept of elected (or hereditary, or appointed) representatives deciding on rules, investments, and other matters from the public domain (of the *republic* so to speak). The process of making a decision by any such legislative assembly can be broadly divided into four distinct phases:

- first, the proposal is elaborated and presented to the assembly,
- next, the proposal is deliberated (often involving many instances),
- then the assembly votes on the last version of the proposal, and
- lastly, the proposal (if elected) is enacted and steps into action.

In Slovenia for example, the *Constitution* of the Republic (*Ustava Republike Slovenije* – URS[5]) defines a bicameral legislative system with a *national assembly* (Državni zbor, hereinafter: parliament) as the legislative body and a *state council* (Državni svet) as a second chamber with a right to request a second round of deliberation on an already accepted proposal from the former (URS §91). The parliament consists of a fixed number of 90 members (URS §80), who decide in most cases with majority of the then-present assembly, whereby more than half of all members must be present for a decision to be valid (URS §86). A bill can be proposed either by the government, any member of the parliament, or by at least five thousand voters (URS §88). The process of deliberating and deciding on a proposal is defined as a multi-phase procedure regulated by rules of procedure of the parliament (CRS §89, §94).

The *National Assembly of Slovenia Rules of Procedure* (*Poslovnik Državnega Zbora* – PoDZ-1) defines how the legislative procedure is conducted, as well as the structure of the proposal. Latter must be sent to the president of the parliament (PoDZ-1 §114) and must contain (PoDZ-1 §115) an

[4] The syntax is addressing the SQLite database.

[5] http://www.us-rs.si/en/about-the-court/legal-basis/constitution/

explanation of the causes of the proposed statute, its aims and goals, an estimate of the financial implications for the state budget if the proposal was to be enacted, a review of similar regulations in other legal systems and the conformance of the proposal with European Union law, and a discussion of other consequences the enacted law would imply. The president of the parliament initiates the legislative procedure by immediately distributing the received proposal amongst the members of the parliament.

At least ten members of the parliament can request within 15 days a deliberation on the reasons for the proposal (PoDZ-1 §122), as a result of which the proposal can be rejected preliminarily if the parliament finds that the proposal is not fit for further consideration. If the proposal is to be considered further, it is delegated to a taskforce, where it undergoes deliberation and where it can be brought through amendments into a further stage of ripeness, before the task force presents the thus updated proposal to the parliament. The parliament then deliberates a second time on the updated proposal, where further changes can be made. After that, a third round of deliberation takes place after which the voting on the final version of the proposed statute is done.

Could this procedure be translated into the domain of SNBG? To evaluate how a multiphase legislative procedure could be handled by SNBG, two distinct ways shall be considered: as a first option, a continuation of the existing principles and stakeholders shall be assumed; as an advanced alternative, the legislative process conducted by means of fully-fledged liquid democracy will be explored.

If the same bodies, their characteristics and powers were to be kept, then there were four distinct jural subjects that would contribute to the enacted statute – the proposer, the national assembly (parliament), the president of the latter, and the assistive taskforce. In such scenario, the proposer would generate a proposal by writing it into the respective ss-Gov registry. The eligibility to write proposals into that registry would be given based on the qualification of the proposing subject – either the subject would be a member of the parliament, a representative of the government, or it would be a proposal signed by at least 5.000 subjects whose membership in the voting registry would be valid. Once registered in the respective ss-Gov registry, the proposal would be available to the members of parliament (MPs) for deliberation. Within 15 days, 10 members of parliament might flag the proposal as blocked, whereupon the majority of the MPs together would either unblock or reject it by declaring their vote. The proposal would then remain in a status where the parliament could not decide on it, until the responsive taskforce would flag it (or an updated version of it) as ripe. The taskforce would be set-up and empowered by the president of the parliament, and based on the membership in this taskforce the majority of its members would be able to set the flag. Once flagged by the taskforce, the president of the parliament would flag the ripe proposal in order to denote that it passed the second deliberation (the first deliberation happened if the 10 MPs flagged it at the beginning). Provided this flag has been set, the president would have to once further flag it in order to denote that it passed the third deliberation, making it ripe for voting. After that, the majority of the MPs would be able to flag the statute as either enacted or rejected.

Through the flow of changes in the status of the proposal, the proposal (as updated by the taskforce) would be finally enacted. However, unlike in the present-day procedure, the role of the subjects taking part in this flow would be focused on setting flags – i.e. changing information that describes the readiness of the proposal. The transactions thus change form *push* to *pull*, i.e. the subjects do not *push* documents to each other, but rather *pull* the status of the proposal and change it once the status permits it. This implies the need for periodic *pull-requests* into the corresponding registries which would enable the subjects to be notified on changes, such as e.g. the appearing of a new proposal, the changes in its status, and so on. Also the final enactment of the proposal would be a pull-action, which then could be done by a subject in whose interest it is to enact the accepted statute – this for example could be any MP, or the proposer itself. The enactment of a statute today is limited to its publication in the official journal or similar media; in SNBG however an enactment of a new regulation would imply the immediate change of law. Aside from this, complex constraints such as for example a certain required minimum time between the approval of a proposal and its enactment might be possible as well.

How then would the MPs deliberate on the proposal in SNBG? As SNBG does not deal with deliberation, but merely with the government of eligibilities, it does not impose any constraints on how human beings exchange their opinions. Thus, if so desired, the *Parliament / Duma / Majlis* may remain as a place or institution where members and the public present their opinions in formal or informal ways, behind the lectern or in the lobbies, according to strict rules or traditional customs, in any way, so to speak, that pleases the expectations of the society. The same liberty applies to other aspects of the procedure which leads to the enactment or rejection of a proposal, such as the flow of information about a new proposal, its status, change, etc. It is reasonable to assume that humans remain to interact with each other in an SNBG-enabled system and thus information is conveyed with at least the same efficiency between subjects, which then may act upon the received news.

How about secret voting? Also here, SNBG does not set any constraints – thus, although CBR would require the identity of the voter to verify that the subject is a member of the eligible body, the identity does not need to be stored with the vote preference. This would be analogous to checking the identity of a voter entering the polling place.

How then about liquid democracy? – So far the translation of a classical legislative process into its SNBG-enabled clone was described, in support of the claim that SNBG is capable to maintain the existing context without much ado. Next, it shall be explored how to further evolve collaborative decision-making into the novel domain of liquid democracy (LD): The basic principle of LD is that subjects delegate their eligibilities to vote in collaborative decision making to other subjects, but may temporarily repossess them to express their own decision in specific cases. The individual subject's power in contributing to the collaborative decision is thus a frequently changing variable rather than a foreseeable and fixed constant. LD is by no means restricted to a certain predefined community of eligible members – thus, in the here discussed case of parliamentary decision-making, three scenarios might be feasible:

- One would be that only the (here: elected) members of the parliament take part in LD-decision making, whereby after they are elected they can delegate their voting power to their colleagues (e.g. to the presidents of their fractions), which might result in a significantly reduced amount of powerful MPs, who would transparently represent the power structures within the parliament. Such approach might make more sense in larger parliaments (such as e.g. the European Parliament), where the sheer amount of members make decision-making less clear.
- Another option would be to treat the entire community of voters in the nation as members of the LD system, which might make the concept of political parties as special entities obsolete, as the delegated eligibilities would shape into a network with a couple of very powerful nodes to which large numbers of individual subjects would link transitively.
- The third option would be to take a hybrid approach where voters might have an opt-out option from the LD system by voting for MPs. Latter then would in total represent the community of voters who cast their vote in the elections, either in equal shares (i.e. each MP would have one vote in 90 as in the case of the parliament of Slovenia), or relatively in accordance with the amount of votes received. The voters that would remain in the LD mode might still be able to delegate their votes to MPs, or contribute their own decisions.

In either case, the multi-phase mode could be maintained, or at will transformed into a full LD-style decision making single-phase activity. While, in the former, every changed state in the process of making a decision would be collaboratively decided through the logic of LD, in the latter a proposal would be accepted as soon as the required majority through LD would be found. In order to prevent hasty decisions, constraints regarding the time required for forming a decision might be set on an elevated legislative level (e.g. on the constitutional level) – a statute thus could be passed for example after at least one hour once the consensus of *all* members of the voting body is reached, or e.g. after at least one week once a two-third majority is given.

For storing the LD-relations between subjects, a dedicated ss-Gov registry would be required, in which each subject would be able to address the attribute denoting to whom the voting power was delegated (if at all). The proposal being voted on might then contain a snapshot of the network of relations at the time of its enactment / rejection for sake of accountability / documentation. The network of delegations relevant to determining the decision on a particular proposal would remain dynamic and modify-able and a snapshot of it would be frozen at the point where a decision is made. Thus, each subject would be able to either actively change its preference at any time until the final decision, or remain passive and thus support another member or do not participate in the decision-making at all.

As this scenario shows, SNBG is compatible with both conventional and progressive collaborative decision-making techniques, which implies morphing from one mode to another being feasible.

3. Conclusion

This article described *Sustainable Non-Bureaucratic Government* (SNBG) as the entanglement of Self-Service Government (ss-Gov), a model for determining jural eligibilities based on jural facts stored in digital form in a dedicated ICT network, and *Liquid Democracy* (LD) as a method of self-organized collaborative decision making.

Section 1 described the SNBG vision as a five-level technology stack featuring ss-Gov as an essential basis, though not a complete enabler of SNBG. Further, the principles and history of LD was described, and an overview of the liquid-democratic approach as adopted by the German Pirate Party for intra-party agenda-setting was provided, which was criticized as unfeasible to generate systemic change towards self-managed government.

Section 2 applied the principles of SNBG to the existing parliamentary decision-making procedure in Slovenia and examined how it would perform under the joint principles of SNBG and LD. It was found that the *key/lock* approach (i.e. *Constellation-Based Reasoning* – CBR) of ss-Gov can be feasibly applied to the existing parliamentary procedure, and further that an introduction of LD as an approach to increase inclusion and accuracy in shaping / determining the *common will* in democratic systems is conceptually doable by means of CBR.

Thus, it can be concluded that a combination of SNBG and LD would yield a powerful approach, which would enable the emergence of truly self-managed juropolitical societies, where law, public spending, as well as the empowerment of active subjectivity in public functions would become a matter of collaborative decisions made based on ultra-democratic principles. The here presented vision on *Sustainable, Non-Bureaucratic Government* however is purely theoretical. While conceptual artefacts on proof-of-concept level have been presented in previous research as referred-to throughout the paper, significant further research remains required, which would evaluate the principles of CBR and/or LD in detailed real-world scenarios, as well as such research, which would contribute to the searching-for, the development and improvement of particular technologies in the SNBG technology stack.

References

Adams, C. (2001). *For Good and Evil: The Impact of Taxes on the Course of Civilization (second Edition)*. Lanham, Md.: Madison Books : Distributed by National Book Network.

Agrawal, R. (1988). “Alpha: An Extension of Relational Algebra to Express a Class of Recursive Queries.” *IEEE Transactions on Software Engineering* 14 (7): 879–85. doi:10.1109/32.42731.

Banfield, E.C. (1975). “Corruption as a Feature of Governmental Organization.” *The Journal of Law and Economics* 18 (3): 587–605.

Bekkers, V., & Homburg, V. (2007). “The Myths of E-Government: Looking Beyond the Assumptions of a New and Better Government.” *The Information Society* 23 (5): 373–82. doi:10.1080/01972240701572913.

Bitsch Link, J.A., & Tchorbadjilski, A., & Wehrle, K. (2014). “Opportunistic Vote Delegation for E-Voting Based on Liquid Democracy.” In *Proceedings of the 6th Extreme Conference on Communication*. Galapagos Islands: ACM.

Retrieved November 11, 2014, from https://www.comsys.rwth-aachen.de/fileadmin/papers/2014/2014-bitsch-extremecom-liquid-democracy.pdf
Bovens, M., & Zouridis, S. (2002). "From Street-Level to System-Level Bureaucracies: How Information and Communication Technology Is Transforming Administrative Discretion and Constitutional Control." *Public Administration Review* 62 (2): 174–84. doi:10.1111/0033-3352.00168.
Bundestag. (2013). "Internetenquete Zieht Nach Drei Jahren Bilanz [Select Committee Sums up Activities of the Last Three Years]." *Deutscher Bundestag*. April 16. Retrieved November 11, 2014, from http://www.bundestag.de/dokumente/textarchiv/2013/44022649_kw16_sp_internetenquete/index.html
Codd, E. F. (1970). "A Relational Model of Data for Large Shared Data Banks." *Commun. ACM* 13 (6): 377–87. doi:10.1145/362384.362685.
Downing, A., & Molloy, B. (n.d.). "Polly." Retrieved November 11, 2014, from https://github.com/ppau/polly
Green-Armytage, J. (2014). "Direct Voting and Proxy Voting." Retrieved November 11, 2014, from http://inside.bard.edu/~armytage/proxy.pdf
Herwatz, C. (2013). "Vorstand Ignoriert Basis-Votum - Wie Demokratisch Sind Die Piraten? [Presidency Ignores Party Base: How Democratic Are the Pirates?]." *N-Tv.de*. March 4. Retrieved November 11, 2014, from http://www.n-tv.de/politik/Wie-demokratisch-sind-die-Piraten-article10233026.html
Jabbusch, S. (2011). "Liquid Democracy in Der Piratenpartei - Eine Neue Chance Für Innerparteiliche Demokratie Im 21. Jahrhundert? [Liquid Democracy in the Pirate Party - A New Chance for Interparty-Democracy in the 21th Century?]." Greifswald: Universität Greifswald, Philosophische Fakultät. Retrieved November 11, 2014, from http://www.sebastianjabbusch.de/wp-content/uploads/2011/10/Liquid-Democracy-in-der-Piratenpartei-Eine-Neue-Chance-fur-die-innerparteiliche-Demokratie-im-21-Jahrhundert-By-Sebastian-Jabbusch.pdf
McCarthy, S. (2013). "Demystifying Complexity: Why Worse Is Better in Voting." *SSRN Electronic Journal*. doi:10.2139/ssrn.2342701.
Nijeboer, A. 2013. "Liquid Democracy versus Direct Democracy through Initiative and Referendum: Which Is Best?" Retrieved November 11, 2014, from http://www.democracy-international.org/liquid-democracy-versus-direct-democracy-through-initiative-and-referendum-which-best
Osborne, D., & Gaebler, T. (1992). "Reinventing Government: How the Entrepreneurial Spirit Is Transforming Government." *Reading Mass. Adison Wesley Public Comp*.
Paulin, A. (2010). "Župa - Grassroots E-Democracy Revolution on the Web." In *Proceedings of the 4th International Conference on E-Democracy*, edited by Peter Parycek and Alexander Prosser, 265:113–23. Books@ocg.at. Krems: Österreichische Computer Gesellschaft.
Paulin, A. (2011). "Towards the Foundation for Read-Write Governance of Civilizations." In *Third International Conference on Software, Services and Semantic Technologies S3T 2011*, edited by Darina Dicheva, Zdravko Markov, and Eliza Stefanova, 101:95–102. Advances in Intelligent and Soft Computing. Berlin, Heidelberg: Springer. Retrieved November 11, 2014, from http://apaulin.com/research/2011/s3t-rwgov
Paulin, A. (2013). "Towards Self-Service Government - A Study on the Computability of Legal Eligibilities." *Journal of Universal Computer Science* 19 (12): 1761–91. doi:10.3217/jucs-019-12-1761.
Paulin, A. (2014). "(Un-)Sustainability of E-Government: Hazards and Questions for Future Research." In *Central and Eastern European e|Gov Days 2014 - eGovernment: Driver or Stumbling Block for European Integration?*, edited by Alexander Balthasar, Hendrik Hansen, König Balázs, Robert Müller-Török, and Johannes Pichler, 300:307–16. Books@ocg.at. Budapest: Austrian Computer Society. Retrieved November 11, 2014, from http://research.apaulin.com/research/2014/ceeegov14-unsustainability
Shleifer, A, & Vishny, R.W. (1993). "Corruption." *The Quarterly Journal of Economics* 108 (3): 599–617.
Van Hulten, M. (2014). "Democratisation of the World: Do We Need a Global Parliament?" Retrieved November 11, 2014, from http://blog.hulten.org/essays/global_democracy.pdf
Veit, D., & Huntgeburth, J. (2014). *Foundations of Digital Government - Leading and Managing in the Digital Era*. Springer-Verlag.
Velikanov, C. (2013). "О демократии обыкновенной, прямой и электронной [On Traditional-, Direct- and e-Democracy]." *Otchestvennye zapisky* 6 (57). Retrieved November 11, 2014, from http://www.strana-oz.ru/2013/6/o-demokratii-obyknovennoy-pryamoy-i-elektronnoy
Walter, A. (2011). *Das Unbehagen in der Verwaltung: warum der öffentliche Dienst denkende Mitarbeiter braucht [The Apprehension of the Administration - why the Civil Service Requires Staff that Thinks]*. Berlin: Edition sigma.
Zwattendorfer, B, & Hillebold, C, & Teufl, P. (2013). "Secure and Privacy-Preserving Proxy Voting System." In *Proceedings of the 10th International Conference on E-Business Engineering*, 472–77. IEEE. doi:10.1109/ICEBE.2013.74.

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Post Scriptum

Both the concept of *Sustainable, Non-Bureaucratic Government*, as well as *Liquid Democracy* are, as of today, mere visions in early prototyping stages (Liquid Democracy exists in real life only to the extent as had been practiced by the German Pirates). Significant research is required especially to satisfy the technical aspects of the visions in order to deliver

sustainable solutions, which could serve humanity for many generations to come. As a research community we do not only lack proper infrastructure, such as e.g. living labs to test visionary new concepts, but also a proper research agenda that would synchronize efforts of digital government researchers with backgrounds from technical science and social science respectively. Hence, the author would like to call herewith to the community to jointly strive for a truly novel form of government that would shift the administration of human civilization to a level, which yet a couple of decades ago could not have been imagined even in the wildest dreams. As ICTs have reached a level of maturity which revolutionized the culture in most sectors of human civilization, administration of the *res publica* remains a sector which yet is waiting for its revolution.