

The Dimensions of Electronic Voting Technology, Law, Politics and Society

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Abstract: Since the Internet boom in the 1990's the question has arisen, will it be possible to vote via the Internet one day. In many European countries and around the world initiatives of research institutions, private organisations and governments have tried to provide an electronic solution to this key democratic process. As many projects there are, as many different strategies lie behind that. Based on similar studies out of the United Kingdom, Germany, the Netherlands and Switzerland, this article develops a register of criteria to assess and compare different E-Voting initiatives on national and project level using four key dimensions: Technology, Law, Politics and Society.

1 Introduction

Since the beginning of the big Internet boom in the 1990's a lot has been discussed how to use information technology in public administration. Still it became clear in a very early stage that experiences made in the E-Business field cannot be attributed to public administration in the same manner. In this way the term "electronic government" evolved as a new name for the field of public information systems. In Europe the electronic government movement is hyped and by politicians it is often mistaken solely for the IT-enabled support of administrative tasks in the government¹. This leaves out a complete field of interaction between the citizens and government – the area of democratic processes, especially elections.

¹ For the opinion of MP's of the Austrian Federal National council see the explorative study in [AsFr04]

Therefore definitions of the term electronic government include these processes as well. Scholl for example defines in [Scho03] electronic government as, "the use of information technology to support government operations, engage citizens, and provide government services" which includes not only electronic administration but also electronic participation by citizens. This differentiation can also be found in Europe where Reinemann and von Lucke [LuRe04] distinguish E-Workflows and E-Democracy. Furthermore von Lucke and Reinemann define E-Democracy as the electronic representation of the democratic processes, which Parycek and Seeboeck divide in three subprocesses [PaSe03], (i) Information acquisition, (ii) Formation of an opinion and (iii) The decision itself. Electronic Democracy hereby contains two aims – the field of E-Participation (decision preparation, therefore consisting of process (i) and (ii)) and the field of E-Voting (decision making, therefore process (iii)).

For applications in the Internet one can distinguish them by their level of technical complexity. Combining the technical complexity with the political processes one can develop an E-Democracy application framework. This framework follows an approach introduced by the EU Forum E-Democracy working group [MacA03] where they match the political processes with the technical complexity.

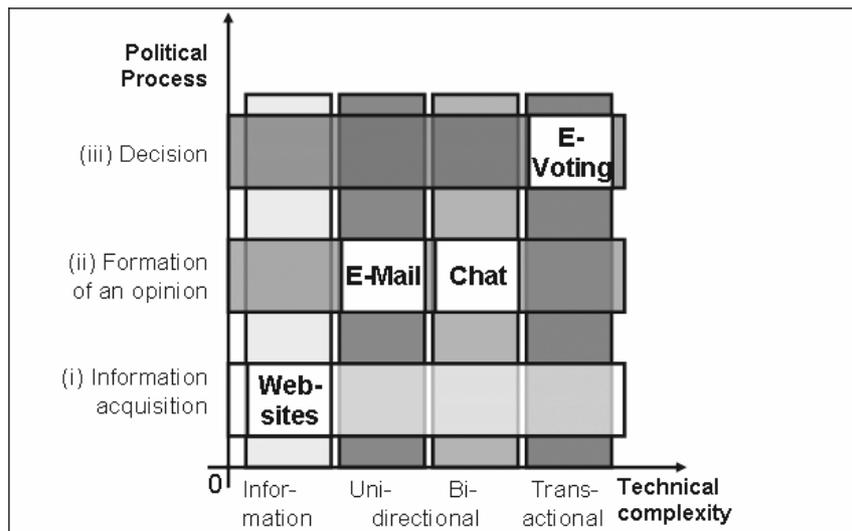


Figure 1: E-Democracy Application Framework

This results in four application types that are depicted in figure 1: (i) Websites as information provision for citizens, (ii) E-Mail communication with politicians as uni-directional as communication is asynchronous, (iii) Chats with politicians as discussion takes place at the same time, and finally (iv) E-Voting where a decision is ultimately made.

Especially IT-enabling the core process of a democracy, the voting itself, leads to different imaginations where the future society could end up. In 2001, Aström [Astr01] depicted the following three possibilities:

- 1.) Thin Democracy: The voter is electing her representative and is constantly informed by the representative.
- 2.) Strong Democracy: In this model the citizen is constantly deciding on options presented by the politicians; there is always interaction between citizen and politician.
- 3.) Quick Democracy: In a quick democracy, the politician is only a handyman for the citizen, as the voter decides on any decision herself.

Those scenarios often come into discussion when talking about electronic voting but often cover up the real issues when talking about E-Voting like i.e. security, public acceptance of new technologies and so on. Also voting is a process with a lot of tradition involved – people have fought in some countries for this right for years and therefore discussions about this topic have to be led with care. Hence conclusions cannot be easily drawn or experiences transformed from one country to the other. This paper therefore tries to give a systematic overview of factors involved in a discussion on electronic voting, so E-Voting initiatives become comparable beyond country borders.

2 Existing Cross-National Research

In the field of public IT offerings comparing initiatives helps improving the applications. In electronic government the European Union is leading the way by organizing a yearly benchmark. Here the assigned company, Cap Gemini, is conducting a survey and counts and matches the number of administrative services to citizens and to businesses offered by each country [CG04].

For electronic democracy applications such benchmarks do not exist, nor is plenty of research available.

The first trial to describe different approaches to implement E-Voting was done in 2003 by Braun, Prosser and Krimmer where they compared the Swiss and Austrian initiatives in [BPK03]. Therein they identified three areas to include in their research: technology, law and socio-politics.

A similar approach was followed by Kersting in [Kers04] where he compared the E-Voting initiatives in Austria, Germany and Switzerland descriptively. He also looked at legal settings, technological solutions and the political necessity for introducing new forms of decision making.

Another paper on the scarce field of crossnational research was the report of the EU Forum led by Ann Macintosh from the Center for Teledemocracy at Napier University in the United Kingdom [MacA03]. Her working group tried to compare E-Democracy projects across European borders. It was structured in twelve points which concentrated on policy questions as depicted in table 1:

1	Stage in decision making
2	Level of engagement
3	Actors
4	Resources
5	Technologies
6	Rules of engagement
7	Duration & sustainability
8	Scale
9	Accessibility
10	Promotion
11	Evaluation
12	Outcomes Critical factors for success

Table 1: EU Forum Case study template

On the project and application level, Moosmann and Baumberger from the institute for business and administration from the University of applied sciences in Bern, did a study on electronic voting application design and security [MoBa03] and focused on manipulations and Denial of Service attacks.

Leenes and Svensson from the University of Twente In the Netherlands conducted an European wide study on E-Voting approaches where they distinguished in two levels – national and project based experiences [LeSv02; LeSv03].

Integrating and extending these several papers was the basis for the model that is presented in the following chapter. It allows comparing E-Voting initiatives across country borders.

3 The Model

In the previous chapter we presented several studies which all had the aim to compare different E-Voting approaches. All papers had in common not to concentrate on a single field of knowledge but to integrate different sciences like technology or law. But especially in the field of electronic democracy it is not only technological or legal questions determining how the application has to look like, but also politics and society influence E-Voting as proposed by Braun, Prosser and Krimmer in [BPK03]. Therefore one has to first differentiate four separate dimensions: (i) **Politics**, (ii) **Law**, (iii) **Technology**, and (iv) **Society**.

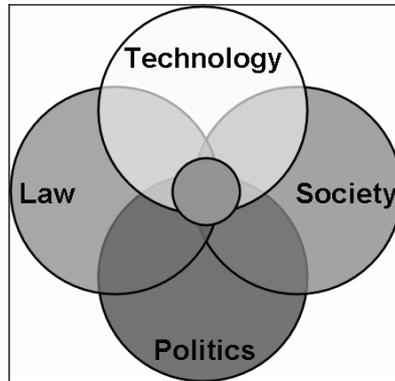


Figure 2: Dimensions of E-Voting

When using the four dimensions one has to distinguish two levels, as used by Leenes and Svensson in [LeSv03]. In their study they used a project and a national level to get clear results. We included this approach in our model as it is clear that electronic democracy applications are prototyped in a small environment and then rolled out on a larger level². This usually leads to an unaccounted bias in country studies, when it is ignored in the benchmark, as pilot experiences are often mistaken for national experiences. By introducing the two levels, a national and a project level, one can rule out such a bias³.

3.1 Dimensional Factors on the National Level

In the next step we describe the different points attributed to the separate dimensions on the national level. As the political system builds the foundation, we start with **(i) Politics**. In this field it is important to know what kind of *political system* is found (constitutional monarchy, parliamentary democracy, etc.), the *method and frequency of elections* as well as *general statistics on elections* (eligible voters, electoral districts, number of polling stations). A second important point for politics is the *official attitude* towards E-Voting. The *stage in the policy making process* is relevant, the *aim of the policy*, and if an *official organisation* is planned for the implementation of E-Voting (maybe even integrated in an E-Government organisation).

The kind of *legal system* is the key element of **(ii) Law**, with the *electoral law* in special as the basis for the technological solution. For E-Voting the existing *legal principles for elections* are important, the way E-Voting is (could be) implemented and in which stage E-Voting is in the *legislation-making process*.

² For example the German Ministry of the Interior follows a way of implementing E-Democracy applications on a step by step basis as described in [KaRu03].

³ This also a problem f [CG04].

In the third dimensions **(iii) Technology** it is important to know the status of *registers* in general, in special a register of *citizens* and as a subgroup of that of *eligible voters*. Further important technological infrastructure questions are the *implementation* of a *digital national ID card*, of the *digital signature* and if the adoption of *international E-Voting standards* are planned. Furthermore it is interesting to know the *level of E-Government offerings* in general.

For the last dimension of **(iv) society** the factors concentrate basically to *the level of political participation*, the *turnout for postal voting* and the *public attitude towards new technologies* and *E-Voting* in particular. It is also necessary to know the *penetration rate of telephones, mobile phones, personal computers, the Internet including broadband access*, and finally *Internet transactions* in the society.

Using these four dimensions one can do a basic assessment of approaches towards E-Voting on a National level. As E-Voting has not been implemented on a national level so far, there usually is more than one E-Voting project per country. Therefore the more detailed especially technological points are included in the next part.

3.2 E-Voting Project Level

As pointed out before the national and the project level differ a lot – especially the key dimensions are not applicable in that way to the project level. Out of this reason we differentiate the project description in three parts: (i) **Project overview**, (ii) **The used technology** and (iii) **The outcome of the project**.

For the project overview it is useful to include the *type of project, status, duration, sustainability, setting* (public/private), and the *aim* of the project. Further aspects include the available *resources*, consisting of the *budget* and *kind of funding*. For an assessment it is also necessary to know the *actors*, the *initiator* and if there is *scientifically background* to the project. The *scope of the project*, i.e. the *legal validity*, the *participants* and the *turnout* and finally the used *promotion* and *advertisement channels* are important general project determinants.

As the technology is essential for the success of an E-Voting project, the second point is the (ii) used technology. This consists of general information, the E-Voting procedure and security. For the *general information*, this should be on *hard-* and *software used*, the *developer* and the *forms of E-Voting* that were used.

For the *E-Voting procedure* it is important to know the way the *legal principles of elections equal and free* were guaranteed, how the voter is *identified*, how the *anonymity* is guaranteed as well as if an *election committee function* is implemented. For the E-Voting security this consists of *certification of the system, system stability and endurance testing, organisational protection, crisis management, protection from Denial of Service attacks* as well as *virii, Trojan horses or man-in-the-middle* and *spoofing* attacks. For the voting procedure itself the *double voting* and *proxy voting* is important as well as how acts of *sabotage* can be identified, and if *pre-counting of votes* can be inhibited (i.e. knowing the results before the end of the election). The *rules of engagement* are a final point for the technology side of the projects.

The third and most important point is the (iii) **Outcome of the project**. This is consisting of the *results of an evaluation, other outcomes, critical success factors* and the *contentedness of the voters*.

Having these points as part of a project description one can give an all-embracing overview one's project experience.

3.3 Assessment

The model consists out of two points of view, a general and a detailed project view. These views are each divided in relevant aspects, on the national level in technology, law, politics and society and on the project level in general information, technology and outcome. This makes an objective assessment of nations and projects possible.

4 Conclusions

In this paper we showed that comparing project dealing with E-Voting cannot be done without considering the context in which they are situated. Furthermore the identification of a national level and a project level makes the assessment of E-Voting initiatives much easier as well as the introduction of four dimensions technology, law, politics and society shows great potential to explain certain specifics of E-Voting projects that could not be explained otherwise. It would be very interesting to conduct a major analysis of European E-Voting projects based on these proposed dimensions.

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References

- [Astr01] Aström, J., Should Democracy Online be Quick, Strong, or Thin? Communications of the ACM 44(1), 2001.
- [AuFr04] Ausmann, R., Fremgen, G.: Internet und Politik - Der Nationalrat. Diploma Thesis, Vienna University of Economics and Business Administration, Vienna, 2004.
- [CG04] Cap Gemini Ernst & Young: Webbasierte Untersuchung des elektronischen Service-Angebots der Öffentlichen Hand, 2004. Available online at http://www.at.capgemini.com/servlet/PB/show/1289862/eEurope4_DE.pdf accessed on 2004-04-10.
- [Kers04] Kersting, N.: Online-Wahlen im Internationalen Vergleich. Aus Politik und Zeitgeschichte, pp. 16-23, B18/2004, Bonn, 2004.
- [KaRu03] Karger, P., Ruess, O.: Sicherheit is conditio sine qua non. In: Braun, N., Heindl, P. et.al. E-Voting in der Schweiz, Deutschland und Österreich, Working Paper 2/2003 Institute for Information Processing and Economics, Vienna University of Economics and BA, Vienna, 2003.
- [LeSv02] Leenes, R., Svensson, K.: Adapting E-voting in Europe: Context matters. Proceedings of EGPA, 2002.
- [LeSv03] Leenes, Ronald, Svensson, Jörgen, ICT in the voting process – A report on 17 european countries, University of Twente, 2003.
- [LuRe04] von Lucke, J., Reinermann, H.: Speyerer Definition von Electronic Government, 2004. Available at <http://foev.dhv-speyer.de/ruvii> accessed on 2004-04-28.
- [MacA03] Macintosh, A.: Working Group 4 to the European Commission, Brussels, 2003. Available at <http://www.eu-forum.org/summit/docs/WG4e-democracy-FINAL%20RESULTS.doc> accessed on 2004-03-05.
- [MoBa03] Moosmann, R., Baumberger, P.: eVoting-Sicherheitskonzepte – eine vergleichende Studie. In: Brücher, Heide: E-Government Präsenz 2/2003, Zeitschrift des Institut für Wirtschaft und Verwaltung, Bern, 2003.
- [PaSe03] Parycek, P., Seeboeck, W.: Elektronische Demokratie: Chancen und Risiken für Gemeinden. In: Prosser, A., Krimmer, R.: E-Democracy: Technologie, Recht und Politik, OCG publication #174, Vienna, 2003.
- [Scho04] Scholl, Jochen: E-government: A Special Case of ICT-enabled Business Process Change. 36th Hawaiian Conference of System Sciences (HICSS36), 2003.