

# The Use of E-Voting in the Austrian Federation of Students Elections 2009

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**Abstract:** The use of e-voting for the elections to the Austrian Federation of students (Hochschülerinnen und Hochschülerschaftswahlen) was one of the most sophisticated Austrian e-government projects in 2009. The task was to complement the paper based voting with an electronic voting channel in order to create new opportunities to vote. Together with the implementation of e-voting the legal basis of the federation of students was adapted to include an electronic election administration. The discussion around e-voting was rather controversial with clear pro and contra positions.

This first of a kind implementation of e-voting in Austria was technically successful. Almost 1% (2.161) of the eligible students cast their votes electronically between 18<sup>th</sup> and 22<sup>nd</sup> of May 2009. For identification and authentication, they used the citizen card (the Austrian model of a smart card with digital signature) and a suitable smartcard-reader device, which was handed out for free. The anonymity was performed by using a cryptographic protocol in the post-voting phase, similar to a paper based postal voting procedure. The e-voting servers were placed in two data centers of the Federal Computing Centre (Bundesrechenzentrum) to allow for fail-safe operation.

While the discussion around e-voting was rather controversial with clear pro and con positions, and marked a first nation-wide discussion around remote voting in general. For future uses of e-voting in Austria the penetration of identification and authentication means has to be raised as well as a more positive atmosphere amongst the stakeholders has to be reached.

## 1 Background

The first legally binding election offering a voting channel through the Internet in Europe took place at the University of Osnabrück (Germany) on February 2nd and 3rd of 2000 [FoIn00]. This served as the initial starting point for concrete thoughts around the use of electronic means in the elections to the Austrian federation of students. In May of that year the chairman of the federation of students took this as a reason to request the introduction of remote voting (either postal or Internet voting) to its elections in a public consultation process on the *Hochschülerinnen- und Hochschülerschaftsgesetz* (law on the federation of students) [Fais00]. Following this request a project group was installed consisting of members of the Federal Ministry of Science and the federation of students. This group decided to foster the development around electronic voting by piloting it at the Vienna University of Economics and Business Administration (WU). In the following months the legal grounds were laid for a first use in the federation of students elections (*Hochschülerinnen- und Hochschülerschaftswahlen*) taking place in spring 2001.

However in March of 2001 the project was stopped due to a continuous delay in the distribution of smart cards bearing a digital signature to the students of the WU [WUF101].

Two years later the research group E-Voting.at at the Institute of Information Processing and Management at WU developed an E-Voting prototype for a shadow election in parallel to the paper-based federation of students elections in May of 2003 [PKKU03]. 978 students participated in this test where they cast an additional electronic to the paper vote. For the 2004 election to the Federal President this setup was repeated and a shadow election was conducted where all 20.000 students at WU could participate [PKKU04]. In the same year the then Federal Minister for Interior, Ernst Strasser, started an inter-ministerial working group to evaluate the constitutional, technical and international questions around a potential introduction of e-voting in Austria. This group recommended to first making experiences in elections to self-governing bodies like the chamber of commerce or the federation of students. Furthermore it came to the conclusion, in order to introduce e-voting on federal level it would need to be included in the constitution [AG04]. In 2007 a research assignment to the Federal Ministry of Interior was agreed in the coalition paper of the XIII. Government to investigate e-voting.

On May 11th 2007 the Federal Minister of Science Johannes Hahn announced publicly at a speech at University of Linz to offer e-voting for the first in the 2009 elections to the federation of students [Hahn07]. This was the basis for the first legally binding e-voting project in Austria.

## 2 The Project

The first step in this project was a feasibility study conducted in summer of 2007 [Krim07]. The main task was to integrate e-voting without compromising the existing paper-based voting in the polling station. To do so, an additional voting channel via the Internet was to be offered, from Monday 8:00 through Friday 18:00 in the week before the paper-based election days. During these days, all students of Austrian universities should have the possibility to participate in an Internet election without pre-registration. For identification purposes the Austrian citizen card (a smart card bearing a digital signature) in accordance with section 2 nr 10 of the Austrian E-Government law 2004 was to be used. After the end of the Internet-based vote casting, the votes were to be stored in an encrypted way until the general counting of votes at the end of the last voting day. Students, who had voted through the Internet, would be marked “voted” in the voter register and thereby guaranteeing the one-man-one-vote principle. The next step was then to adapt the legal framework.

## 3 Legal Basis

The Federation of Students law 1998 (HSG) and the corresponding decree Federation of Students Election Regulations 2005 (HSWO) are the two legal texts forming the grounds for this project.

In Austrian self-governing bodies are regulated by national law passed by the parliament. In the course of the initial discussion around e-voting the national parliament passed an amendment to the Federation of students law in 2001 [HSG01]. It followed the principal of technology neutrality and only regulated certain corner stones. In section 34 paragraph 4 HSG 1998 the use of electronic signatures for identification purposes in accordance with the Austrian signature law, as well as the data protection law 2000 (DSG) were regulated. This led to the fact that for the e-voting system had to be approved by the Austrian data protection commission as it handles sensible data by interpretation of section 18 paragraph. 2 DSG. Furthermore the voting system has to provide technical means for the control of the electoral process to the election commissions.

The law also enabled the minister of science to introduce e-voting by the way of a decree, which included more detailed regulations for the e-voting system, like

- A definition of terms
- Change of time periods and mile stones for the electoral processes of the federation of students election
- Introduction of an additional voting channel
- Introduction of an election administration system

## 4 Diffusion of Smart Cards

A major challenge in the project was to distribute the Austrian citizen card amongst the students, as penetration with this technology was limited at the start of the project. For this the Austrian chancellery, the Federal Ministries for Finance and Science initiated the project [studi.gv.at](http://studi.gv.at) to foster the adoption of this new technology in fall of 2008. The project took place in parallel to the e-voting project due to synergies and both projects benefitting from each other. The main focus was to raise the public awareness amongst students for the citizen card itself as well as to promote services accessible with it.

The Austrian citizen card is an integral part of the social security card which every member of the Austrian social security system possesses<sup>1</sup>. To activate one's citizen card, a 10 minute procedure has to be done where a qualified person checks the activator's identity and then he/she can freely enter two PIN codes.

To raise the number of activations several activities were started

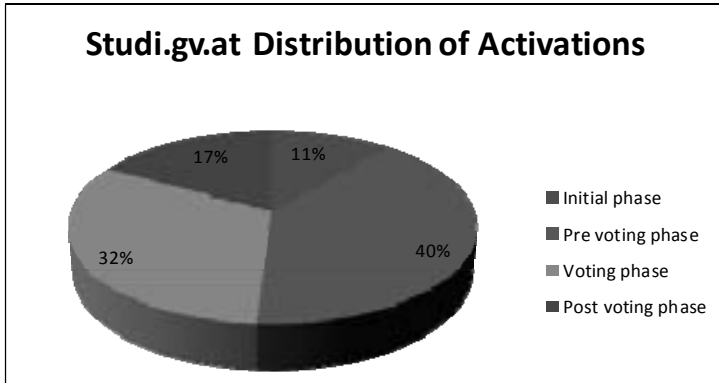
- The website [studi.gv.at](http://studi.gv.at): this website provided information on the digital signature, the smart card itself as well as how students can make use of it. While in fall semester the focus was on general applications, the summer semester made a complete turn towards electronic voting as an application for the smart card.
- Distribution of free-of-charge card readers: Every student, who activated his/her citizen card, got a card reader for free.
- Posters and flyers promoted the project.
- Tutors: As the activation required a qualified person, 22 tutors coming from different universities around the country who would then activate as many students as possible using a laptop with 3G data cards and explain the new technology to the potential users.
- As the project moved on, the tutors were trained to train other students for this activation procedure so that a snow-ball-effect could take place.

In general the project [studi.gv.at](http://studi.gv.at) was very successful as the number of citizen card users on paper reached 14.000. While in the beginning the numbers were rather low, the closer it got to the e-voting taking place in May 2009, the more students activated their smart cards. The project could be divided into four phases:

- Initial phase: October to December 2008
- Pre voting phase: January to April 2009
- Voting phase: May 2009
- Post voting phase: June 2009

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<sup>1</sup> The citizen card basically is a functionality available not only to the social security card but also Austrian bank cards, credit cards etc.



**Figure 1:** Distribution of Citizen Card Activations

## 4 The E-voting Process

The e-voting process from the point of the voter - amending it with certain steps happening in the e-voting application – took place as follows:

1. First the website <https://www.oeh-wahl.gv.at> was opened and then the voter chose the field “To the electronic vote”
2. Then the students selected the university at which he/she wanted to vote electronically. In case one wanted to vote for more than one university this step had to be repeated each time.
3. After the selection of the university the voter got concrete descriptions how to use his/her citizen card
  - a. First the card reader had to be connected to the computer and the citizen card inserted
  - b. Then the voter could either use a locally installed or a web-browser-based solution of the so-called citizen card environment, which basically is a driver set for web applications to access the smart card.
  - c. Then the voter had to input a four-digit PIN-code which released his/her identity to the voting application
  - d. This identification procedure was concluded with the authentication using the digital signature on the smart card which was activated by entering a six-digit PIN-code.



**Figure 2:** E-voting screenshot with PIN-code

4. After successful identification and authentication a ballot sheet was displayed for every race the voter was eligible to vote in. Normally an average students would cast two ballots
  - a. The first ballot sheet was for the university board of the federation of students. Here one group could be elected.
  - b. The second and more ballot sheets were for the study board representation. Here up to five student representatives could be elected.
5. Invalid votes could be cast by either not selecting any choice or by selecting too many.
6. After all ballots were cast an overview with all choices was displayed to the voter and had to be confirmed. This should prevent junk votes.
7. The confirmation took place with an affidavit where the voter confirmed to have cast the ballot in person and not have been influenced by a third person. This had to be signed digitally again with his/her six digit PIN-code.
8. The voting system showed after the successful vote a confirmation code. This code could be used after the end of the election to check whether one's vote was counted.

In the following figure we tried to amend this process with the cryptographic steps taking place similar to the process when filling out a postal vote.

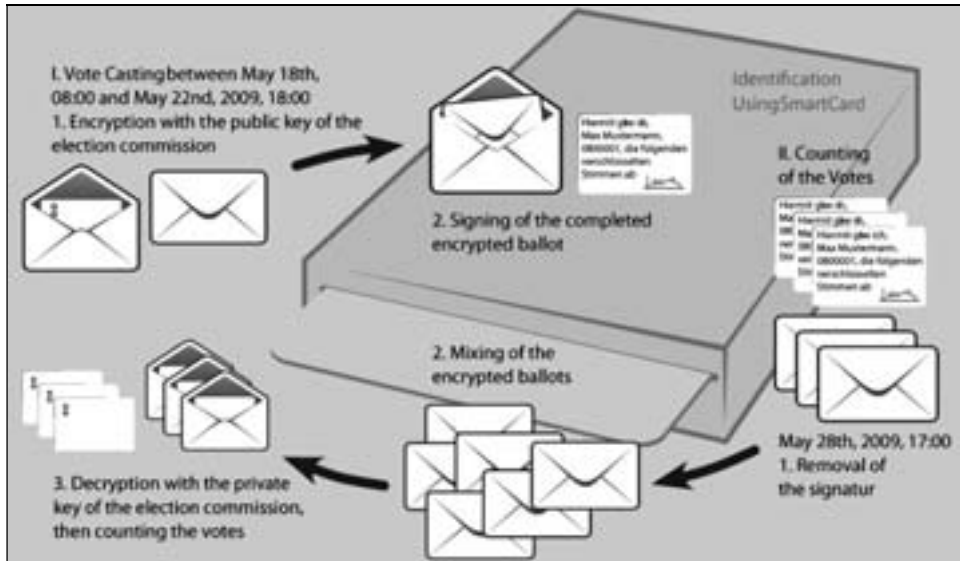


Figure 2: Overview of the E-voting Process

## 5 Pre Voting Phase

The project can be divided into three phases – (i) the pre voting, (ii) the voting, and (iii) the post voting phase. While the voting phase was the most intense period, the preparatory steps were manifold. A first step was the certification process.

### 5.1 Certification

The components of the e-voting system, which were used for vote casting and verification of the voters' identity, had to be certified 60 days before the first day of use by the independent certification body A-Sit established by the Austrian signature law<sup>2</sup>. The standard against which the e-voting system is checked against was the Council of Europe recommendation on legal, operational and technical standards for electronic voting [CoE04].

<sup>2</sup> The legal basis is laid down in section 64 paragraph 3 HSWO 2005 and section 34 paragraph 6 HSG 1998.

The certification lasted from December 1 2008 till March 25 2009 and was conducted using the source code as well as technical documents written by the e-voting provider. A-Sit checked whether the security architecture of the software was able to fulfill the requirements in the law. Furthermore the source code was used to verify if the described architectural protection methods were also implemented correctly. On March 27 2009 A-Sit published the certification [ASit09].

## **5.2 Usability Test**

On March 18 2009 two universities<sup>3</sup> conducted a usability test. Aim was to verify the actual ease of use of the e-voting system and to collect feedback from the students. These comments were reviewed critically and implemented in the final version of the software.

## **5.3 Vote Eligibility Check**

The vote eligibility check was offered from 23<sup>rd</sup> to 30<sup>th</sup> of April 2009. This was the first possibility to use the citizen card within this project. Here a single voter could check his/her own eligibility to vote. Around 370 persons made use of this opportunity. It was noted that a number of people had problems remembering their PIN-codes for the citizen card. During the whole time of the eligibility check a support hotline was offered.

In case a voter found an error with his/her personal voting rights, he/she had the possibility to appeal against it with the election commission at the respective university. On the basis of these appeals missing voting rights were corrected after decision by the election commissions.

## **5.4 Review of Certification Report by Members of the Election Commissions**

The minister has to provide members of the election commissions following section 64 paragraph 3 and 7 HSWO 2005 with the possibility to review the certification report and the source code of the e-voting system software.

This review took place on 8<sup>th</sup> of May 2009. The participants had to sign up for this occasion. Based on the regulation only members of the elections commissions were allowed to participate, which count for 250 persons.

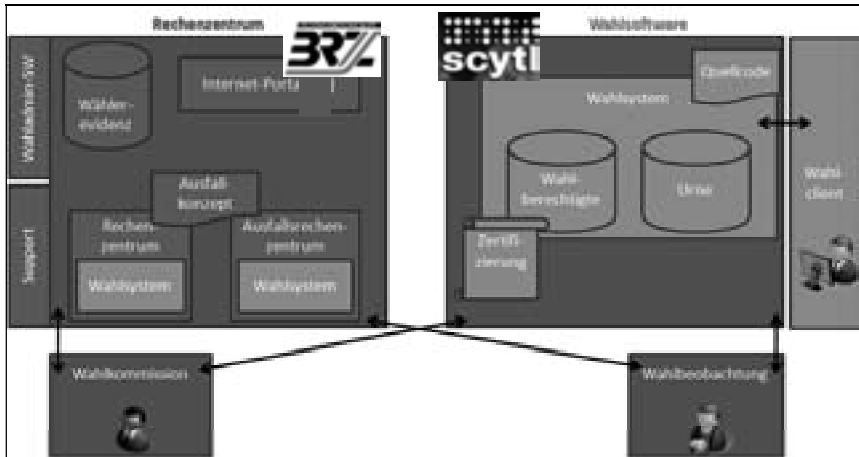
The review meeting was designed to accommodate all of them, however only 28 took part in the event. At the beginning the agenda was discussed with the participants. It was arranged in sessions, where experts – including the developers of the system – presented the underlying principles. In parallel the certification report and the source code could be reviewed and questions asked to the experts.

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## 5.5 Fail-safe Operation of the E-voting Servers



**Figure 3:** Overview Infrastructure

The servers were operated at two separate locations:

- Federal Computing Center (Bundesrechenzentrum GmbH)
- Parallel Computing Center

The two computing centers were about five kilometers apart from each other. Both locations met highest international standards regarding physical security, energy supply, fire protection, access control systems, recording systems (real time video surveillance, access logging).

The e-voting system was classified as highly critical system and was underlying special security mechanisms within the federal computing center (BRZ).

All components were put in a security rack in each computing center location. Access to the protected zone around the security rack in the server room was only possible for authorized personnel. Access of any kind was logged and controlled by the security control center.

Additionally both security racks were secured using steel cables and cable seals from the point of installation till the secure data destruction. Each single cable seal was registered using a unique number.



**Figure 4:** Sealed security rack

### **5.6 Ethical Convention on E-voting**

In the field of e-voting the Council of Europe has developed with the 2004 recommendation on legal, operational and technical standards [CoE04] a very important instrument. Since then it has observed the developments in its member countries on this issue. In communication with the federal election commission of the federation of students elections, the Council of Europe recommended them to publish an ethical convention on e-voting based on the experiences in Estonia [TSBA07]. The commission developed an initial version and forwarded it to the commissions at the respective universities. For future elections it deems necessary to make a broad discussion process on this convention in a timely distance to the election days (on a political level and also in the public sphere).

## **6 The Voting Phase**

230.479 students were eligible to vote at the 21 Austrian universities where the federation of students elections 2009 took place. A total 375 races had to be decided, consisting of 21 university body elections and 354 study body elections. 2,411 candidates campaigned for 1,633 mandates.

On Monday, 18<sup>th</sup> of May 2009 at accurately 8:00 the electronic voting was started. The system automatically opened the vote casting which was observed by several representatives of the media. Shortly afterwards the first legally binding vote was cast successfully.

The electronic voting ended technically successful on Friday, 22<sup>nd</sup> of May 2009 at 18:00. Until then 2,161 students participated in the elections.

During the electronic voting the servers and the number of participants at the 21 universities could be watched in a 24hrs accessible observation room at the federal computing center. There a screen was directly attached at the database server to allow for election observation.

On the first two days of the e-voting the Austrian Federal Ministry of European and International Affairs had organized an international seminar on voting from abroad. The participants watched the whole process and concluded that e-voting election observation must allow for an end-to-end observation of all process steps. An observation solely on election day allows only for limited assessment [VEVS09].

After the e-voting voting channel was closed, the voter directories at the universities were updated in accordance with which voting rights were used by participants in the e-voting. The paper based election took place from Tuesday, 26<sup>th</sup> to Thursday 28<sup>th</sup> of May 2009. Here for the first time an election administration system was offered to all election commissions at the 21 universities, including the approximately 50 sub-commissions.

## **7 Post Voting Phase**

In the post voting phase the counting of the votes was started right after each polling station had closed. While the paper-based votes were counted right at the respective polling stations, the electronic votes got counted at the Federal Computing Center where representatives of the federal election commission of the federation of students elections were present, as well as from certification body A-Sit, and the operational team from the Federal Computing Center, after the last polling station had closed at 17.00. After detailed security and documentation procedures were completed it took only 1.5 hours in total to come up with the final e-voting results. A special challenge was the aggregation of the electronic and paper-based results, as some election commissions had problems to operate the election administration system which was used for this purpose. This was especially unfortunate as this led to a disappointment with the media for whom e-voting mainly is a tool for faster results calculation.

Three weeks after the election days all data – but the votes and protocols – were destroyed using physical and then thermal destruction.

## 8 Conclusions

In this Austrian premiere with a the first implementation of a remote electronic voting channel in a legally binding election it was shown successfully how a participation via the Internet is possible in a political decision making process. Hereby many experiences – common to pilot projects – were made. This includes especially the adaptation of paper election processes to the requirements of processing electronic votes as well as the intensive public discussion. Especially the public discourse had to be led and was very important especially to the topic of e-voting as well as to the discussion remote voting channels in Austria in general.

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