TRANSITIONING TO EVOTING: THE PROVOTE PROJECT AND THE TRENTINO'S EXPERIENCE

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Abstract – The use of new technologies for voting can bring significant advantages, with respect to process improvement and accessibility; at the same time, it poses great risks, such as guaranteeing the security of the system and anonymity of the votes, and ensuring equal access to everyone (that is, eliminate digital-divide). Thus, even in various countries (such as Brazil, USA, India) voting electronically is a standard practice, several other countries look cautiously to the introduction of new technologies for voting.
In this paper we report on the Trentino's experience, where the local government is aiming at introducing eVoting systems for the next provincial elections in 2008. To do so, it is co-leading a multi-phased, multi-disciplinary project, in which research centres, university and the public administration work together to understand the concerns of the citizens and ensure the delivery of trusted, state-of-the-art eVoting system.

1. Introduction

The use of new technologies to support elections has been and is the subject of great debate. Not surprinsigly, there are both advocates of the benefits it can bring - such as improved speed and accuracy in counting, accessibility, voting from home - and people more concerned with the risks it poses, such as digital divide, violations to secrecy and anonymity, alteration of the votes and of the results (either because of malicious attacks or simply because of bad design and coding). See, for instance, [1–5] for a more in depth view on some of the topics mentioned above.

The position of different governments towards eVoting varies accordingly. In countries such as Brazil, India, United States, Belgium, for instance, the use of eVoting is widespread. Various other countries, e.g. Argentina, France, Estonia are experimenting or have just introduced eVoting systems. Other countries, among which Italy, are more cautious towards

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the use of eVoting technologies for political elections. In Italy computers are now entering in the polling stations, in trials, with experimental value, in parallel to the standard procedures, and only to automate the tabulation of data and the transmission of the results from the polling stations to the electoral offices.

In Italy, the Autonomous Province of Trento (also PaT, from now on) can be considered an early adopter. For historical and political reasons Trento benefits of special autonomy and can determine by its own legislation how the council and the president of the province are elected. As a result, the electoral service of the Province introduced quite a few years ago systems for transmitting results electronically from the polling stations to the electoral office. The Province has now decided to move a step further. Art 84 of PaT law 2/2003 mandates the introduction of forms of eVoting for the next provincial elections, to be presumably held November 2008. To actuate the law, PaT has promoted and is sponsoring the ProVotE project, which has the goal of ensuring a smooth transition to the new way of voting.

This paper reports on the actuation of the law and on the steps that the PaT has undertaken in order to ensure a smooth transition to the new technologies in the voting area. The project named ProVotE (an acronym of "Progetto Voto Elettronico" – Electronic Voting Project in Italian) is a two phase project which is now entering its second phase, namely the extension of the new technologies to the entire local territory. After two successful pilots held in parallel to local elections in 2005 (which are among the largest - if not the largest - experimentations of eVoting in Italy), from what it can be foreseen now, ProVotE may lead to the largest introduction of eVoting technologies in Italy.

The next section provides a brief overview on the eVoting experimentations, with focus on the experimentations conducted in Italy. Section 3 introduces the ProVotE project and motivates some of the project choices. We continue by providing some results of the first phase. Finally we draw some conclusions on the experiences so far and describes some future work.

2. Related work

Providing a complete or detailed view of the usage of eVoting technologies in the world and in Italy is outside the scope of this paper. We decided therefore to provide some highlight on other recent international experimentations and a more detailed view on the Italian panorama.

The most recent experimentation are probably those of the city of Buenos Aires and that of Estonia. Last November the municipality of Buenos Aires conducted an experimentation in which four different systems (deploying various technologies) have been tested during local elections. One of the goals of the project is understanding which technologies are most trusted and considered usable by the electorate. For such reason, the project brought together competences from both ICT and Sociological sciences. ProVotE's approach is similar in many respects. Fore more information, see, for instance, [6].

A different approach has been taken in Estonia, where last October 2005 about seven thousand people voted on the internet for the general elections. The Estonian system allowed voters to express their vote more than once and it had to maintain a correspondence between voter and vote till the end of the election period – encryption and other procedures guaranteed

the anonymity of the vote. The Estonian experience would be complex to replicate in Italy, unless various changes will occur in the current legislation. The main obstacle seems to be secrecy of the vote, which, in the Italian legislation, is both a right and a duty. Voting from unsupervised stations – as it usually happens with internet voting – would not be possible in Italy as there will not be any way of ensuring secrecy. (The possibility of voting more than once guaranteed by the Estonian system helped somewhat to address this issue, even though not completely w.r.t the Italian law.)

In the past, various experimentations have been conducted in Italy to try and introduce new technologies to support voting procedures. We must remind that in Italy the competence for elections is of different bodies according to the type of election. Experimentations for political elections in Italy have mainly concerned municipalities. The current position of the Ministry of Interior, that has the normative right over general elections, is rather cautious and more focused on automating counting and transmission of data from polling stations to the central offices.

The oldest experimentation in Italy we are aware of was conducted the 16th of April 2000 in San Benedetto del Tronto [7]. The experimentation, without legal value, involved about 900 voters during the local elections and included systems for automating from registration to tabulation of the results. The system experimented was based on administrative and voting stations. The administrative stations, operated by polling officers, were used to register voters, enable the voting machines, and store the votes. The voting stations were based on touchscreens.

Some experimentations have been conducted within the e-Poll project, an European sponsored project [8]. Trials included polling sites in the cities of Avellino (2001), Campobasso (2001), Cremona (2002), Ladispoli (2004), and Specchia (2005). The e-Poll system is based on voting kiosks, usually made available in the territory (rather than in polling stations). The data collected by machines is transmitted via GPRS to a central server. Scarce information is available about the participation to the different trials. See [9] for an overview of the legal framework.

Other experimentations in different projects in Valle D'Aosta, Friuli Venezia Giulia, and Milano. Little information on the trials, however, is available.

Finally, the Ministry of Interior, together with the Ministry of Innovation and new Technologies, experimented at the last European elections (4th and 5th of April 2005) a system for automating tabulation and transmission of the data. The experimentation was conducted in 47 different polling stations in Liguria, in parallel to the standard procedures and with no legal value. A new experimentation, still with no legal value, is planned for the next political elections. See [10] for more details.

3. The ProVotE Project

(Figure 1): The eVoting prototype in a polling station during the elections May 2005

Article 1 of Provincial law 84 mandates the introduction of forms of eVoting in Trentino for the next provincial elections. To give full realization to the law, the Province started a two phase project – ProVotE - in 2004 involving various local actors: Provincia autonoma di Trento, Regione autonoma Trentino-Alto Adige, Consorzio dei Comuni Trentini (which represents the 223 municipalities of Trentino), Comune di Trento (the municipality of the biggest town in Trentino), IPRASE, ITC-irst (Center for Technological and Scientific Research), Faculty of Sociology - University of Trento, Informatica Trentina SpA, Fondazione Graphitech. The project is co-lead by the Electoral Service of the Autonomous Province of Trento and by ITC-irst.

The goal of the project is the full automation of both all the procedures related to voting and registration of voters. The approach that has been chosen is that of the development of two separated and independent systems. ITC-irst and Fondazione Graphitech are developing the eVoting machine and the systems for aggregating data and determining the elected people, whereas Informatica Trentina SpA is developing the registration system.

Given the traditional importance Italians associate to the *ritual* of voting, the project has been organized in modules and areas, with various check points, in order to ensure a smooth transition to the new procedures. The main distinguishing characteristics of the project are: involvement of the citizens, a multi-disciplinary approach, a tight integration of research centers in the loop, strong focus on experimentations and verification points.

Involvement of the citizens in the project. One of the strong goals of ProVotE is encouraging the citizen's participation, to make the relationship with the institutions more transparent and to support the inclusion of the disadvantaged social categories (eAccessibility). The citizen's involvement in the developing process aims to avoid the risk of imposing systems that are not trusted and to ensure an equal access to the vote for everyone (mitigation of risks associated to digital divide). In order to achieve the goals mentioned above, various trials with citizens have been conducted and different campaigns for collecting advices and information have been conducted.

Multi-disciplinary Approach. eVoting is an extremely critical sector, as the applications and the systems which are built are to be trusted by various stakeholders, among which citizens, politicians, Public Administration (which is ultimately responsible of guaranteeing that election are conducted according to the law). For such reason, the project develops among different lines:

- **Sociological/communication,** which has the goal of understanding citizens needs and helps ensuring that the solution is usable and trusted. During the first phase of the project different usability trials have been conducted. The indication coming from the usability trials have been implemented in the prototypes.

- **Normative,** which has the goal of ensuring that the solution is compliant with the local law and which is responsible, together with the technological partners, of adapting the current procedures to the new technologies. The Electoral Service, therefore, provided the requirements of the solution and the normative constraints that the solution had to satisfy.

- **Technological,** which has the goal of developing the eVoting and registration systems. The choice of developing a local solution (rather than adopting an existing one), in the first cycle, helped ensuring quick round-trip between sociological studies and system development.

Tight integration between research and production. The project brings together industries and public research centers from the ICT sector. This approach helps ensuring that the solution incorporates the best practices and it is built according to the experiences in the rest of the world. At the same time, the involvement of industries guarantees the infrastructure which is necessary for experimentations and deployment. Ownership of the system is of the public.

Focus on Experimentations and Verification Points. ProVotE is strongly focused on experimentations, as these are a main source of information for understanding those sociological and organizational/technological aspects that have to be addressed to introduce on a large scale eVoting. For such reason, the project has been structured in two phases. The first phase ended in November 2006 after two trials which involved about 7300 voters. The goal of the first phase have been that of verifying whether Trentino is ready for voting electronically. The project is now entering its second phase, which aims at introduction on a large scale. The next step is a new experimentation, which will be conducted in Peio, May 2006. Peio will be the testbed for some of the procedures that will be in place in 2008.

4. ProVotE Phase 1: main Results

The first phase lead to an analysis of the attitude of the Trentino's electorate towards the new technologies, allowed for the development of an eVoting machine prototype that takes into account the indications of the Electoral Service and several indications of international literature and policy documents, and ended with two different experimentations, in which about 7300 citizens tried the system and were interviewed about the new modality of voting.

The sociological analysis basically confirmed the positive attitude of Trentino's population towards the electronic voting. The quantitative and qualitative analyses (focus groups, phone

interviews) conducted before the trials suggested that citizens are generally in favour of adopting electronic voting.

The analyses conducted also allowed to take some important decisions affecting the voting process and equipment, among which the main ones are isolation of the equipment from the net and user interface, which closely resembles the paper ballot and whose behavior has been closely tested in different monitored trials by volunteers before the experimentations.

In a series of phone interviews made six months after the 2005 trial, Trentino's eVoting solution is perceived as safe as (if not safer than) paper voting procedures. See [12] for more details about the sociological analyses.

From the technological point of view, registration and voting systems are completely separated, developed independently. A few set of requirements, allocated to the voting machine, are devised to procedurally and electronically ensure that no match between voters and vote can happen. The voting machine (see figure 1), in fact, not only uses cryptography and digital signatures to protect the internal data, but also "scrambles" votes, so that it is not possible to get to the sequence in which votes have been given. For the same reason, the equipment is provided with a printer (as suggested by various international documents – see e.g. [2,11]) which cut each vote after it has been confirmed by the voter. The vote is stored in a ballot box inside the voting machine.

Other technological choices involved the adoption of open source or operating system independent tools and languages, coherently with the public nature of all the actors involved. The system is based on Linux and Java and other open source components. This simplifies aspects related to inspection of the source code and allows to implement policies related to *security by transparency* rather than *security by obscurity*, as recommended in the open source software community.

The preliminary sociological and technological actions allowed to experiment the systems in two pilots. The first experimentation was held on May the 8th, 2005, during the local council elections held in all towns and villages of the province of Trento. This experimentation involved sixteen polling station chosen in order to expose all statistically significant sections of the population (eight polling stations in Trento; the remaining in four other Trentino's municipalities, Fondo, Coredo, Baselga di Pinè and Lomaso). About seven thousand people took part in the experimentation, which required voters to repeat their vote using the electronic systems after the standard vote had been cast. The second experimentation was held on November 6th, 2005 in Daiano, a little village of the province, where the automation of some other electoral operations (that is the electorate's registration and the recording of the electoral trend) has also been tested.

Experimentations' results represent an important advance towards the automation of the electoral procedure in all Trentino. The electorate accepted the innovation positively: 60% of the voters in May and 90% in November tested the voting machine, and the positive level of satisfaction expressed in the after-vote interviews seems to indicate that the proposed system is technically successful and socially acceptable for the community.

The result of the electronic election, without legal value, has been made available the day after the election, at 7.15 am, and anticipated the result of the traditional ballot, that is, the

results of the electronic election closely matched those of the election on paper. This results may indicate that many voters had no difficulty in using the machine, as it has been confirmed by the interviews performed on the people who tried the system at the polling stations.

For the organizational point of view, an interesting result concerns the time required for voting electronically, which was comparable to that on paper (on which, however, certain data does not exist) and considerably shorter than that forecasted. The data provides useful indications related to the number of machines to be installed in the polling station. If the data available are confirmed, two machines may be sufficient for polling station.

5. Conclusions and Future Work

A transition to new technologies, especially in a country which is particularly cautious towards new technologies, is extremely delicate. The ProVotE project, with its multi-disciplinary and multi-phased approach is trying and mitigate all the risks associated to a change which is perceived as radical.

So far we experimented the new systems in two trials. The experiment we conducted are, to our knowledge, among the largest eVoting experimentations in Italy. Results are very promising, as the experimentations and the other sociological studies basically indicate a positive attitude toward the usage of new technologies. This result has been achieved also by taking into account the opinions of the voters, the end-users. Various choices on the system (such as that of having the eVoting machines completely isolated from the net) have been implemented taking into account requirements from voters.

The project is now moving to its second phase, whose objective is full-scale deployment of an electronic vote solution in the entire Provincia by 2008. Several challenges still lay ahead in all the areas characterizing the project. The extension to a larger scale will require a significant logistical effort both w.r.t pre-electoral procedures and w.r.t. assistance during the electoral day (Trentino is sparsely populated, with about 400.000 citizens living in 223 different municipalities). We are currently extending the electoral procedures to incorporate all the matters related to the new technologies. From the sociological point of view, mitigating digital divide risks is probably the biggest challenge. Among the technological ones, the prototypes will have to be refined in order to reduce costs and improve robustness.

6. Acknowledgments

The work described in this paper has been and is being developed within the ProVotE project, sponsored by Provincia autonoma di Trento. As with any large project, the results presented in this paper based on the joint and coordinated work of several people. We wish in particular to thank: Sergio Bettotti, Carlo Buzzi, Letizia Caporusso, Alessandro Ceschi, Costantino Charalabopoulos, Giuseppe Conti, Claudio Covelli, Raffaele Deamicis, Giorgia Fasanelli, Alberto Faustini, Giolo Fele, Patrizia Gentile, Luciana Giuliani, Francesca Gleria, Bianca Lanzalone, Antonella Lavarian, Giuseppe Negri, Enrico Parola, Ernesto Passante, Giampaolo Pedrotti, Pierangelo Peri, Nicola Prantil, Roberto Resoli, Francesca Sartori, Gianfranco Stellucci, Catherine Tonini, Paolo Troebinger, Michele Welponer. Finally, we are particularly thankful to Silvia Tomasi who has greatly con-

tributed to the development of the tools used to generate the Java code from the UML statecharts.

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