

# Some Considerations on Trust in Voting – Draft 0.1

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October 19, 2006

## Abstract

We discuss some issues about how a voter sees a voting procedure and can trust the results to be fair. Even if the correctness of an election does not relies on the verification of each single voter, it is important to understand to which point a voter can trust the procedure and the instruments adopted to cast and count the votes.

## 1 Introduction

An important issue, probably too often ignored, when voting and elections are considered is how the voters perceive and can check the correctness and fairness of the voting procedure. In this note we consider in particular two aspects of the vote from the point of view of the voter:

- the integrity of the vote, that is that the vote is correctly counted and there is only one vote per voter
- the privacy of the voter, that is that it is not possible to match vote to voter.

We will see how *trust* is a fundamental component, from the point of view of the voter, of every voting procedure.

## 2 The traditional vote

To introduce the issues, let consider first a traditional election. The voter, with her voting credentials (often just an identification document) walks in the voting room. Here there are some voting officials usually representing all of the parties participating in the elections. Their role is to verify that the procedures are followed correctly.

In a big book there is the list of all voters listed by name, address, date of birth etc. In the book, next to each name there is also a space where to write when each voter has voted. The officials verify the credentials (identity) of the voter and check

in the book if the voter has not voted already. Then a single ballot, a single piece of paper, is given to the voter.

This procedure, done publicly in front of the voter by the officials who have opposite interests in the results of the election, guarantees to the voter that everyone can vote only once and only with one vote (one vote for each voter).

Then the voter proceeds to a private corner of the room where, unseen by everybody else, writes with a pencil a cross next to the name of the person or symbol of the party of her choice. The voter then folds the card and casts it in the ballot box. This guarantees to the voter that her vote will be counted and that it will be anonymous since it is not possible to distinguish the votes in the box. The officials then write in the book that the voter has voted.

Notice that the voter still should trust the officials to correctly count all votes, for example not to cheat in making the sums. But the voter can be reasonably sure of that since has verified in person that the officials represent different parties with opposite interests.

Following this procedure the voter has a first hand proof of the authentication (the book with the names) and of the privacy of her vote (the box with the votes). Of course there must be some trust in the system since the officials could collude to violate the protocol for example by having a camera taking pictures of every voter's vote or casting extra votes instead of voters who did not show up. But usually the opposite interests of the representative of all parties are enough to prevent frauds and to guarantee the voters.

### 3 The voting machine

Suppose now to substitute the paper voting sheet with a voting machine. Everything works as before except that the voter is not given a piece of paper on which to write with a pencil, but has to press a button corresponding to her vote on a machine. If the authentication phase works as before, the second part of the protocol is much more problematic from the point of view of the voter:

- how can the voter check that the vote registered by the machine is exactly the one she has casted ?
- how can the voter be sure that her vote is registered at all ?
- how can the voter check that the machine does not register the time of her vote, so to be able to trace her vote to herself ?

Even if there are paper trails, a voter who is not expert in the technology has very little possibility of understanding how it works and must trust entirely the process to be correct.

The level of trust is now much higher than in the previous case since not only the voter must trust the officials, but must also trust a machine and a technology that neither she nor (usually) the officials know or understand.

## 4 Web voting

In the case of web voting, no humans, except for the voter, are involved: the voter deals only with a machine, her personal computer, that she doesn't know nor understand. For the voter it does not make a big difference if the procedure adopts very advanced and sophisticated cryptographic protocols or has almost no security. In any case the voter is not able to understand nor verify the process, nor to have a first hand experience of the correctness of the procedure.

The voter must trust completely the officials who have setup the system *and* the system itself, in this case both for the authentication and for the voting part. At most the voter can try to cheat the system herself, for example by trying to vote twice, and see if the system allows her or not. Still this verification is not a direct indication for the voter that everybody else is allowed to cast only one vote. The machine could allow someone else to cast two votes, but allow her to cast only one.

## 5 Trust

For a man it is much easier to trust the actions of a group of people, in particular if they have opposite interests, than a machine. It simply boils down to be able to easily understand and verify how it works and what happens.

For example, if the voting machine would just print a sheet of paper with the vote which the voter would then fold and cast in the box, the voter would feel as if all characteristics of the fully manual voting system are preserved. In reality this is not true, since the machine could register the vote casted and the time so to allow someone to match vote to voter through the registrations in the book of voters.

Whenever a machine is used in a voting process, the voter

- must trust that the voting officials behave correctly (as in the case without machine)
- cannot verify how the machine works
- must trust that the officials have verified that the machine works correctly.

Thus the voter must rely much more on the voting officials for the correctness of the process when machines are used. Of course in the case of web voting the trust of the voter is the highest possible.

To obtain the trust of the voters, those organizing, managing and controlling a voting process must give enough and clear information to the voters themselves. It is obvious that if no or unclear information is given or if it is stated that no security measures have been adopted, the trust of the voters in the system, and in those organizing the election, cannot be high.

Instead a reasonable approach could be

- to use a system with clear and well stated security features
- to follow clearly stated procedures

- to make public an analysis of the properties of the voting system, strengths and weaknesses
- to have the system verified by independent security experts
- to make the specifications of the system (for example the source code of the software) public so that anyone competent can independently verify its properties.

We believe that only in this case it is possible to establish a clear chain of trust from the voter to the voting system.

Still we believe that today's technology is not able to cope with the requirements of very sensitive votes, like political elections, and that in these cases the use of voting machines, web voting etc. should be minimized as much as possible.

## **Acknowledgments**

We thank H. Bechmann-Pasquinucci for inspiring remarks.