

## Chapter 1

# THE EVALUATION OF VOTING TECHNOLOGY

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**Abstract:** The voting technologies in common use today each have distinct strengths and weaknesses. These technologies cannot be evaluated in isolation, but must be evaluated as parts of a larger social and legal system, as demonstrated by a discussion of the problems with the voting technologies in wide use today, the Australian ballot, including punched card and optical mark-sense ballots, and direct recording voting machines, including mechanical lever machines. Alternate models for canvassing and remote voting further complicate the evaluation.

**Key words:** History; Australian ballot; Human factors; Canvassing; Remote Voting.

## 1. INTRODUCTION

We are in the midst of a revolution in the way we vote. This revolution began in the 1960's with the introduction of punched-card ballots, continued with the introduction of optical mark-sense ballots and direct-recording electronic voting machines in the 1970's, and it continues as we begin tentative experiments with Internet voting. As a result, a jurisdiction interested in upgrading its voting technology today faces more choices than ever before.

It is important to emphasize that voting technology cannot be evaluated in isolation. Each voting technology is used in the context of a larger system, whether the voting technology rests on hand-counted paper ballots or on modern electronics. Some components of this larger system may be mechanical or electronic, but the system also includes the laws, administrative rules, and manual procedures surrounding the voting technology.

Thus, whenever votes are counted by hand, we must examine the laws and administrative rules governing the count, and when there are mechanical processes, we must ask how the mechanisms are prepared, maintained and inspected. When computer systems are involved, we must ask how the computers are programmed and what assurances we have that the intended programs are also the ones used to administer the election.

The suggestion that an honest electoral system must be based on trust is a dangerous one. If we extend our trust to any individual or organization, crooks intent on subverting the electoral system will certainly find a way to suborn that individual or organization. Therefore, we must design our electoral systems under the assumption that every participant is a partisan of some candidate and not fully trustworthy.

## **2. A BRIEF SURVEY OF VOTING TECHNOLOGIES**

There are five broad classes of voting technology in use today, hand counted paper ballots, lever voting machines, punched card ballots, optical mark-sense ballots, and direct-recording electronic voting machines. Each of these has its strong points, and each has significant weaknesses. It is important to recognize that none of these technologies is ancient. Prior to 1858, paper ballots were provided by voters or by political parties, and in many jurisdictions, voting was by voice.

In the US, it was not until 1888 that modern voting systems came into use. Reform was driven by two factors: First, election fraud was widespread and not at all secret [1]. Second, the institution of the general election, with several tens of offices on the ballot made it difficult and expensive to tally votes from unstructured ballots [2]. It is therefore quite correct to view today's revolution in voting technology as the second revolution, while viewing the changes of the 19th century as the first revolution.

### **2.1 The Australian Paper Ballot**

The Australian Secret Ballot, first used in that country in 1858, is the form of paper ballot most widely used today. Unlike earlier paper ballots, Australian ballots are printed at government expense, with qualifying candidates and parties listed on the face of the ballot. The use of pre-printed candidate names in a fixed order within each jurisdiction greatly simplifies hand counting, and the use of uniformly printed ballots makes it far more difficult to stuff the ballot box.

An election conducted using the Australian ballot is only trustworthy if every ballot is strictly accounted for. Every ballot distributed to voters must