The Bell™

Safevote™ Newsletter on Privacy, Security and Technology in Internet Voting

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NEXT ISSUE...

- Marketing Study, Part II
  California, including Alameda, Los Angeles, Orange, San Diego and Santa Clara Counties
- Privacy versus Security
- Glossary

Welcome to Our First Issue

Welcome to the first issue of our newsletter, THE BELL, to be published monthly. THE BELL is free for Internet distribution and has a nominal cost for mail distribution in paper (see back cover).

Internet voting and its potential impact on society call upon us to understand and keep abreast of the latest developments in various fields of work. As a developer of leading edge Internet voting technology for OEM applications, including anonymous authentication and other privacy-preserving features, Safevote sees a widening gap between the 100-year old voting technologies in use today and what Internet voting needs to take into account.

THE BELL is dedicated to fill this gap by publishing timely material on Internet voting in general. This includes protocols, standards, technical papers, policies, legal requirements, market and case studies, as well as information on third-party products and services. Reading THE BELL is an opportunity for you to easily stay abreast of the latest developments in Internet voting and other areas of collaborative decision-making such as polling and proxy voting.

These are items that we need to trust. And, of course, you will want to make informed decisions regarding privacy, security, technology and markets. In the end, it is thus not only a matter of trust. Voters, election authorities in private and public sectors, clients and the public in general need to be informed.

This first issue contains two technical papers and the initial part of an extensive year 2000 market study that Safevote conducted in the U.S. regarding public elections *and* the perspective of Internet voting. The first technical paper discusses properties of voting in general and their reflection on Internet voting. The second paper contains a comparative study of actual paper-based voting systems in the U.S. using either punch card or mark-sense technology.

We believe that the information provided in this and in coming issues of THE BELL will help you form a better understanding of what the public and private election markets are, want and may become in terms of Internet voting.

Enjoy your reading and be sure to enter your subscription to THE BELL in order to ensure timely receipt of your next issue.

Mission bells were used in colonial California for telling time, announcing events, and for passing on news from one city to another. Our symbol is the classic outline of a mission bell because THE BELL newsletter serves similar purposes.

THE BELL™ Newsletter

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Submissions: Contributions are welcome. All material is to be submitted to the editor as an e-mail attachment in WordPerfect, MSWord or ASCII text. Submissions will be subject to peer review but authors will have the final decision on any editing. There are no deadlines for submission. Material that is timely may be published immediately. The editor reserves the right of discretion on what and when to publish.

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LETTER FROM THE EDITOR

Dear Reader:

THE BELL is an information resource for technology, marketing and policies related to Internet voting and collaborative decision-making in general. With this goal in mind, this newsletter will strive to provide high quality, non-partisan information that is timely, useful and at the cutting edge. The scope of topics covered in THE BELL will also include market data, privacy, security and the Internet in general.

Readers are invited to contribute content in the form of papers, letters, or other comments. For example, the Media Watch and Links sections will benefit greatly if readers spot an article, mail list discussion or website of interest and forward the information to the editor for publication.

Publication of selected parts of the year 2000 market study on Internet voting will be continued in the next four to five issues, which will dedicate approximately five full pages to each part. The entire market study will be available soon in print. With more than 200 pages, it provides an in-depth view of the various problems and choices facing the U.S. public elections market – which THE BELL readers can receive first hand.

Glossary Quiz

Next month, THE BELL will begin to discuss a glossary of technical terms that are relevant to Internet voting. How do we define privacy, for example? What is the distinction between "private" and "secret" in terms of cryptographic protocols? What do we mean by digital certificates and what do they warrant? What is non-repudiation?

Some of these questions are rather trivial, or so they seem. But we are not talking about words here, we are talking about concepts behind the words and in a way that (almost) everyone agrees – we need to find consensus. For example, many months were spent in hot debates just on the concept of "non-repudiation" at the IETF (Internet Engineering Task Force) PKIX Workgroup during the latter half of 1999, until a consensus emerged. Correct definitions are not easy to obtain – in fact, one can argue that by trying to make things completely clear, we end up making them very confusing. As this text may exemplify.

In preparation for the glossary, THE BELL would like to ask its readers to send suggestions. Do you have any?

Our website offers another opportunity for dialogue and information exchange. Please visit us at www.thebell.net for THE BELL archives, articles and breaking news. The website can also be used for submitting materials and letters to THE BELL.

See you in the next issue!

Eva Waskell, Editor
Communications Director
Safevote, Inc.

THE BELL'S MISSION STATEMENT

Our mission is to contribute to the public dialogue on Internet voting as well as to lead discussions on collaborative decision-making in general. THE BELL intends to provide high-quality, non-partisan, timely and useful information regarding privacy, security, technology, voting, their markets and relevant policy issues.

INTERNET VOTING: U.S. MARKET INTELLIGENCE STUDY, Part I

Safevote, Inc.[1]

Safevote, Inc. contracted Maurer Marketing Associates (see sidebar on page 4) to conduct an extensive study of the 2000 U.S. public elections market, focusing on customer information in phase one and competitive information in phase two. The study revealed the tension in having the power to identify a problem while lacking the means to solve it. For example, for vote recounting the majority of paper punching systems used in the U.S. do not produce repeatable results when ballots are tallied more than once, which means that election officials lack the means to objectively distinguish between fraud and error under these circumstances. Thus, the timeliness and usefulness of this study to the election community, vendors and interest groups cannot be overstated, as well as its relevance toward future benchmarks to rate Internet voting systems. The study shows that the performance of current systems is not the "golden benchmark" to which Internet voting systems should be compared. There are many faults with the current systems, as the report will describe, so we should in fact be looking to Internet voting systems in order to try to reduce those faults and thus provide for more security than what is available today – not less security. THE BELL will publish the overview section of this study, covering phase one, in several installments as space permits. This issue covers five pages of the overview. The entire report, with more than 200 pages, will soon be available in a printed edition.

Objectives

The objectives of this study are to uncover the following information about the U.S. market for Internet voting systems for public elections:

- Interest and attitude of selected states and counties toward Internet voting systems
- Barriers to entry
- Product features and other requirements for market entry
- Age, brand and technology of current systems for election day and absentee voting
- Voting system replacement plans
- Elections and voting system cost data
- Certification requirements and currently approved systems

Study Scope

This study provides in-depth information on the voting system certification process, current voting systems, attitude toward system change and Internet voting in 5 states and 15 counties. The states targeted for this study were selected by Safevote and include: California, Florida, Illinois, New York, Texas. The states were selected based on population and geographic diversity. The states are the 5 highest ranked states based on population. The counties chosen within each state represent the largest counties by population, and were also selected by Safevote. The counties represent jurisdictions that are urban/suburban in nature.

States	Counties
California	
	Alameda
	Los Angeles
	Orange
	San Diego
	Santa Clara
Florida	
	Broward
	Dade
	Hillsborough
Illinois	
	Cook
	Lake
New York	
	Nassau
	New York City Board of Elections (includes Kings, Queens, New York and Bronx Counties)
Texas	
	Bexar
	Dallas
	Tarrant

Table 1: Study Scope

Study Methodology

This in-depth qualitative study was conducted through interviews with state boards of election officials and county election officials in each of the target states and counties. Interviews typically lasted 45 minutes to one hour. A complete list of the persons interviewed for this study is provided in the Miscellaneous Reports section and is considered private data. Information on state election laws

regarding voting system standards and certification procedures was obtained through on-line research and in hard copy form from the state election officials in the target states.

Use of Study Findings

This study targeted large states and urban/suburban counties. Studying less populated states and rural counties may yield different voting system issues and needs. The study reveals key issues and trends in voting systems, but percentage results are not statistically projectable to the universe of all states and counties in the U.S.

Strengths, Weaknesses & Product Requirements

Barriers to Internet Voting

- Lack of common voting system standards across states. Each state has a unique set of standards and procedures for certifying a voting system.
- Time and difficulty of changing state election laws to cover new voting methods. Legislators are generally reluctant to change the voting systems and standards that voted them into office.
- Time and cost of certifying a voting system in multiple states.
- Overcoming elections officials concerns about:
  - Equal access to Internet voting for all socioeconomic groups
  - Security of voting, including potential manipulation of votes and voter privacy
  - Loss of community experience
  - Time and cost of educating voters on a new voting system
  - Disruption of voting in the event of a power outage
  - Loss of votes in the event of a power outage
  - Disruption of voting if voters are unable to log onto the Internet on election day
  - Lack of a paper audit trail
  - Insufficient electrical outlets in some polling places
  - Difficulty of training election judges on a new voting system
  - Inability of election judges to handle the physical work of stringing and connecting computer cables
  - Difficulty of consolidating election results with multiple voting systems
  - Political risk associated with trying a new voting system.

Opportunities for Internet Voting

- Many counties are interested in touch screen DRE systems, but currently available systems are too expensive for election day voting.
- Internet voting options satisfy voters' desire for convenience. The popularity of early voting shows voter interest in convenient voting methods. Voters who have experienced touch screen voting systems have reacted positively. Election officials are receiving inquiries from voters about voting on the Internet. Recent news articles on Internet voting increase voter awareness and interest in Internet voting.
- Internet voting is a potential solution to meeting new legal requirements for accommodating the voting needs of the physically disabled.
- Many counties are contemplating voting system replacement and are frustrated with the limited number of options currently available. Currently available systems tend to be based on old technology and are expensive. Some counties are deferring replacement plans because they believe that new technology will become available in the next few years.
- All counties believe that Internet voting will occur at some point in the next 10 years. Some counties are ready to try Internet voting for a small application immediately.
- Counties need cost-effective solutions for providing ballots in multiple languages, accommodating increasingly lengthy ballots, having all ballot styles available at all early voting sites, and fast and accurate vote tallying. *(Continued on p. 7)*

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Thorough, professional market intelligence research for high technology and industrial businesses.

Elaine T. Maurer has over fifteen years of corporate experience in high technology, industrial and healthcare business. As a principal of Maurer Marketing Associates, Ms. Maurer applies her experience in corporate marketing research and strategic planning to the development of market research studies that enable companies to make more informed business decisions and to better utilize their corporate resources.

FROM VOTING TO INTERNET VOTING

Ed Gerck, Ph.D.[2]

Yes, the Internet! Who can ignore it? The Internet is indeed amplifying the way we live, communicate and make choices. So, why not use the Internet for voting? With the Internet we can do more – but we might also lose more. We value our increased communication power and the ease with which we can do it – and, in a reverse argument, we do not want it to run amok, run against us, with that same power and ease. Privacy is the first concern worldwide whenever the Internet is mentioned – security, as well. These questions will thus face us squarely as we contemplate voting as yet another application for the Internet. Ultimately, of course, the more we know about the concept of Internet voting and its possible implementations, the better prepared we will be to make choices about when, where and how to use (or not to use) Internet voting.

Introduction

Internet voting is often cited as a solution to lack of voter participation, rising costs, obsolescent paper punching machines and, of course, as the "next big thing." However, this is all a "red herring" – something that distracts attention from the real issues.

Why? Because there is no product or service available today which allows Internet voting to emulate the very basic properties valued in centuries of public elections: **anonymous** (no one can know the voter, knowing the vote); **secret** (no one can know the vote, knowing the voter) and yet **correct** (all votes must be counted; it is not a statistical measure) and **honest** (no one can vote more than once, or change the vote of another); in some cases with the additional property of being **complete** (all voters must either vote or justify absence).

In general, these five basic properties could also apply, totally or in part, to many other types of "voting" as collaborative decision-making processes – not just to public elections. For example, to proxy voting, polling, bidding, auction and consensus assessment. Indeed, what is the use of *any* collaborative decision-making process if the voter is not free to vote? What if the process is biased? What if the results can be defrauded without trace, especially when voting needs to be anonymous and secret?

The political issues of the "Internet divide" (i.e. lack of equal access to the Internet) are also undoubtedly important in some cases (e.g. for public elections). However, we may agree that if technology shapes Internet voting, then there is nothing to talk about unless we first deal with the proper technical requirements for voter anonymity, vote secrecy and security in general – from which equal access arguments will depend.

In discussing these ideas, I have encountered some groups that have become so disenchanted with Internet privacy and security problems that they simply reject Internet voting per se. This is perhaps well justified, given the hype and misconceptions surrounding Internet voting – for example, from those who believe that Internet voting is "just like" e-commerce. But in e-commerce, credit card companies accept a certain amount of fraud inherent in their business because, on average, loss is covered by insurance. Currently, credit card fraud on the Internet is recognized at the level of 10% of all transactions, a very high number. However, one cannot accept an average level of 10% of fraud (or even 1%) when conducting an election. In this sense, elections are similar to one-shot business transactions. Also, insurance is not an acceptable mechanism for dealing with fraud in elections. One cannot socialize the cost of fraud in elections.

So, rejecting Internet voting as a "bad idea" might seem to be the only way to fence it off, in order to preserve privacy and the sacred ballot. But, should Internet voting be compared to experimenting with the human genome? Is this something that one should simply not do? Hardly, in my opinion. We need to deal with the problem. We live in a society that values the "can do" attitude.

Indeed, it seems that time is ripe for a qualitative change in both voting *and* tallying methods. The Internet is perhaps just another vehicle for this need.

Toward a Real-World Model of Voting

Voting and elections are yet another primitive process that has remained essentially the same for centuries – in spite of the growing need for collective decisions, in spite of the growing numbers of people who do not vote and do not participate, in spite of the growing concern for lack of adequate representation by young voters.

Thus, by questioning that which we trust and which blocks our vision, it is possible to invite ourselves to verify that this is not all that there is, that we must not be victims of our own systems. If we created it, we can improve it. Yes, voting (and Internet voting) can be improved. Why not? Socrates himself also questioned the barriers to be overcome in order for elections to work in a democratic

society, because when it is time to vote all votes must be equally counted ... while when there is a problem, society does not accept anyone equally but wants to call an expert. Socrates questioned the balance between rights and duties, power and liability.

So, as Socrates might argue today, if elections would indeed provide the best answer to choose "the best qualified" from a list of choices, then all airlines should elect their pilots from the employee list and college students would be approved by election from the class list.

However, the principle behind voting has proven itself to be a useful one –albeit it now needs to be made precise and useful in Internet terms. And what might be this principle? When "voting" is understood as a class of collaborative decision-making tools, then it is possible to see that voting in its various forms (consensus, polling, bidding, elections, etc.) can help induce trust within a particular population. For example, if I know that 100 people *do agree* on something then I may trust it more than if I know that 100 people *may agree* with it, or if I know that *only* one or two do agree with it. This trust materializes itself to that particular population as *objective* reliance on information and will in turn legitimize an elected government or define a market value for shares of a company.

In this scenario, voting can be used not only to define who will represent the user (voting) and what the market wants (polling) but also to decrease the distance between price and value (bidding, auction). Value is no longer a vague market concept, and today's value-seeking society is increasingly able to use the Internet in order to define the price it wants to pay according to a publicly perceived value, for example, by using online auction or bidding as a simplified voting process (viz. the recent trend for Internet-based auctions in determining real-time values of air fares and even common goods). In an auction, the seller seeks the highest value that can be paid while in bidding the buyer seeks the lowest value it needs to pay –but nonetheless, value is being defined by collaborative decisions.

Thus, Internet voting in various forms can create tangible financial assets, creating or destroying value for shareholders, in a short time, as well as electing company officials, lawmakers or heads of state.

This is, of course, not to be confused with the use of voting tools to "justify" an agenda (e.g. based on few selective choices), to "set" a price in collusion (e.g. by spreading misinformation or fear) or "to shape" some desirable reality (e.g. by creating a false demand). Voting is a tool to make known what a collective decision should be, but this is only useful insofar as that decision must emerge from an unbiased selection list (though often biased and politically used to "justify" lesser evils according to rigged rules).

Thus, voting can support the true discovery of collective decisions by supporting the fair evaluation of evidence (e.g. opinions, votes, data) in intersubjective agreements eventually leading to a coherent object – the decision itself. In this model, which follows principles readily found in the real world, voting is any unbiased and representative process for collaborative decision-making, whose characteristics can be improved by design for a variety of old and new applications.

The MP Protocol

In order to make transactions secure, anonymous and verifiable according to those needs inherent to voting as noted above and contrasted to e-commerce, Safevote has developed a protocol called MP (Multi-Party) with several variants. With the MP protocol, Internet voting is based on the principle that every action needs both a trusted introducer and a trusted witness, creating a multifold of redundant links. An attacker has to cut or compromise a large number of links before the system fails, which allows the probability of failure to be modeled and then fine-tuned by defining the number and nature of the links according to a threat model adequate to each case at hand. This is important because when we are talking about an election or Internet voting in general, fraud cannot be handled in terms of statistical failure covered by insurance. We need a much higher level of assurances and they need to be *fail-safe*. **The paradigm that the weakest link defines the security of a chain of events is not fail-safe and does not suffice for Internet voting.**

The MP protocol also provides for a strong separation between identification and authentication –allowing for built-in voter anonymity and vote secrecy. For example, instead of trusting different servers to hold different parts of the ballot information, which can however be easily reconnected by those persons that manage the servers, the MP protocol builds a mathematical "wall" that cannot be circumvented.

The MP protocol can thus afford engineering assurances on the Internet in support of the basic properties that have made voting useful for centuries, and it can do this irrespective of trusted or fraudulent behavior by a number of protocol agents – not just by one agent. Future articles will continue the discussion of the MP protocol and its useful features for Internet voting. ■

Ed Gerck received his doctorate in physics (Dr.rer.nat.) from the Ludwig-Maximilians-Universitaet and the Max-Planck-Institut fuer Quantenoptik, in Munich, Germany, 1983, with maximum thesis grade ("sehr gut"). He has worked in cryptography since 1987, from a background in quantum mechanics. Dr. Gerck is a founder of the Meta-Certificate Group (MCG), chief executive officer and vice-president of technology of Safevote, Inc., and chairman of the board of the Internet Voting Technology Alliance (IVTA) of Washington, D.C. Dr. Gerck can be contacted at egerck@safevote.com

(Marketing Study, Part I –Continued from p. 4)

Key Requirements for a New Voting System

- Security and reliability
- Fast and accurate vote tallying
- Cost-effective
- Eliminate need to print ballots in multiple languages
- User friendly for voters and election judges
- Vendor support and stability
- Ability to continue voting in a power outage
- Capacity for lengthy ballots
- Meets new ADA requirements for disabled voters
- Ease of consolidating results if more than one voting system is used
- Audit trail

Summary of Key Findings

Significant Differences Between States

This study uncovered significant differences between states on predominant voting systems and voting system replacement plans. These differences between states are based on statutory differences in voting system requirements, differences in currently available certified systems, and the use of early voting. Early voting allows voters to cast their ballots in county offices and satellite locations for a specific period of time before election day. Some of the major state differences are:

- California - Touch screen systems recently certified. The only state with an Internet Voting Task Force. One county (Riverside) is scheduled to implement a touch screen system for election day voting. Several counties are implementing touch screen systems for early voting. Punch card is the predominant election day voting method.
- Florida - No currently certified touch screen systems. Traditional DRE systems are certified, but none have been sold to any county. Mark-sense is the predominant election day voting method.
- Illinois - Election statute does not currently allow DRE systems. Counties can only choose punch card or mark-sense systems. Punch card is the predominant election day voting method.
- New York - Full face ballot requirement, all election day voting must be done on machines. DRE systems are certified, but few have been sold. Mechanical lever machines are the predominant election day voting method.
- Texas - DRE systems are certified and in use in one county (Upton) for election day voting. Several counties have purchased touch screen systems for early voting. Certification of new voting systems and re-certification of current systems is on hold pending definition of new requirements for access of the disabled to a secret ballot. Early voting is extremely popular. Mark-sense is the predominant election day voting method.

Lack of Common Voting Standards

All of the states covered in this study require that voting systems meet Federal Election Commission (FEC) voting system standards. But, in addition to the FEC requirements each state has its own voting system standards that vendors must meet. As a result, the voting system standards, certification procedures and the cost of certification differ by state. The individual state reports developed for this study detail the standards, procedures, and cost of certification in each case.

Changing Election Code: Difficult and Time-Consuming

Florida, Illinois, and New York note that efforts to change the election code to permit new voting systems or to adapt standards to new voting system technology have been in process for many years without success. Counties, along with voting system vendors, lobby for changes in the election code. Legislators are very reluctant to change the election code, viewing their roll as keepers of democracy. Furthermore, legislators are reluctant to change the voting systems and standards that voted them into office.

Voting System Decisions Occur at the County Level

The choice of voting systems is made at the county level. County election officials choose from a list of systems that have been certified for their state. Election officials must obtain approval and funding for new voting systems from the appropriate legislative body, such a board of supervisors or board of county commissioners. The choice of election system is dependent on currently certified systems, county financial resources, county geography (urban/rural, concentrated/disperse), demographics (educational level, multiple languages), the personal preferences and experience of the election official, political influences and voting system vendor marketing efforts.

Early Voting and Absentee Voting are Increasing

Early voting and absentee voting are increasing in states that offer these options and do not require voters to meet specific criteria in order to choose these options. In early voting voters are allowed to vote at any one of a number of sites during a specified period of time before election day.

The popularity of these voting methods is an indication of voters' interest in convenience. Counties that offer early voting are seeking easy and cost-effective solutions for providing all ballot styles at all voting sites. Currently there is significant paper waste with unused ballots.

Predominant Voting Methods

There are 547 jurisdictions (counties and city boards of elections) in the five states covered in this study. Amongst those 547 jurisdictions the following voting methods predominate for in precinct election day voting, as depicted in Table 2.

Predominant Voting System Vendors

Vendor market share varies significantly from state to state. Datavote punch card systems predominate in California.

Voting Method	Number of Systems	% of Total
DRE	1	0.2
Combination DRE/Mechanical Lever	3	0.5
Mechanical Lever	60	11.0
Paper Ballots	91	16.6
Punch Card	184	33.6
Mark-sense	208	38.0
TOTAL	547	100.0

Table 2: Predominant Voting Methods

ES&S mark-sense systems are the primary systems in Florida. Fidlar & Chambers punch card systems are the market share leader in Illinois. AVM mechanical lever machines predominate in New York State, and ES&S mark-sense and punch card systems are the primary systems in Texas. Table 3 shows the market leaders in the target states.

California			Florida			Illinois			New York			Texas		
Vendor	#	%	Vendor	#	%	Vendor	#	%	Vendor	#	%	Vendor	#	%
Datavote	28	48	ES&S	24	36	Fidlar & Chambers	45	41	AVM	53	85	ES&S	158	62
DFM	12	21	Global Election System	13	19	ES&S	31		R.F. Shoup Corp.	6	10	R.F. Shoup Corp.	2	1
Votomatic	11	1	Election Resources Corp.	10	15	Govern. Business Systems	29	26	Sequoia Pacific	2	3	Sequoia Pacific	2	1
ES&S	5	9	Triad Govern. Business Systems	10	15	Chicago Software	2	2	ES&S	1	2	MDJ Voting	1	0
Global Election System	2	3	Fidlar & Chambers	3	4	Election Resources Corp.	1	1				Randall County Voting Systems	1	0
			Sequoia Pacific	3	4	I.L. Richards & LRS	1	1				Paper	90	35
			Mechanical Lever	2	3	Lasalle Co. In-House	1	1						
			ETNet	1	1									
TOTAL	58	100	Paper	1 67	1 100		110	100		62	100		254	100

Table 3: Predominant Voting System Vendors

A complete list of voting systems used in all counties in the target states is provided at the end of each state report.

Many Counties Contemplating Voting System Replacement

Many of the counties interviewed for this study have either recently replaced a voting system or are contemplating system replacement at present or within the next 2 to 5 years. Primary motivations for system replacement are:

- Equipment obsolescence - Some counties are beginning to have difficulty in repairing aging card readers.
- Early voting - Counties with early voting need an efficient way of providing multiple ballot styles at early voting sites. Early voting sites are often used as the first phase of implementation for a new election system.
- Ballot Length - Some counties with requirements for lengthy ballots have reached the capacity of punch card voting systems, which are limited by the number of punch positions.
- Multiple Language Ballot Requirements - Some counties with multiple language requirements have reached the capacity of punch card voting systems.
- Americans with Disabilities (ADA) Requirements - Some counties will need to purchase new or supplemental voting systems to meet the ADA requirements for providing a practical and effective means for voters with physical disabilities to cast a secret ballot.
- Desire for Faster Results - Some counties are under pressure from the media and politicians to provide faster election results. Some counties with central tabulation of votes experience time-consuming, labor-intensive, and expensive logistics to physically transport ballots from the poll sites to the central tabulation facility.
- Frustration with Hanging Chads - Counties with punch card systems regularly experience problems with hanging chads as election results change when recounts are required. Chads open, close or fall off when punch cards are re-read by the counting machines causing different totals each time the cards are read.

List of Available Choices

A complete list of voting systems used in all counties in the target states is provided at the end of each state report. For a partial list see Table 3.

Some Counties Frustrated by Available Choices

Some counties are frustrated by the lack of system choices currently available. Some counties would like to purchase touch screen systems, but those systems are either unavailable in their state or are too expensive to justify for election day voting. Others hesitate to invest in one of the currently available systems because they believe new technology will be introduced to the market in the next few years.

New ADA Requirements May Benefit Internet Voting

Counties are interested in cost-effective means of satisfying the new ADA requirements. The per unit cost of the ES&S voting machine for the disabled is $15,000. The Elections Administrator in Tarrant County, Texas anticipates that 30% of the voting systems on the market will be eliminated with the new ADA requirements – providing a substantial opportunity for vendors to fill this need. The Tarrant County Elections Administrator believes that Internet voting could provide a solution to meeting the ADA requirements. Currently, states are awaiting federal guidance on what will be required to satisfy this new law. Texas has passed a state law requiring systems to meet the federal ADA law. (The Texas law is detailed in the Additional Information section of the state report on Texas.)

Counties' Interest in Internet Voting Ranges from Immediate to Long Term

A few counties are willing to test Internet voting in some form immediately. Others are interested in Internet voting after it is successfully used in other jurisdictions. Others see Internet Voting as an inevitable long term voting system technology.

Counties with Highest Interest in Internet Voting

Tarrant County, Texas expressed the highest degree of interest in serving as a test site for Internet voting. Tarrant County has previously worked successfully with vendors to test new systems, and has sufficient political influence to gain support for an Internet voting test. Los Angeles County is interested in trying Internet voting for a small application. San Diego County sees its recent decision to outsource Information Technology (IT) and communications to Computer Sciences Corporation and Pac Bell as providing the necessary technical expertise for Internet voting.

Some smaller counties that were not included in this study may also be good test site candidates. Smaller counties may have less complex elections, smaller numbers of voters, and less intense media scrutiny than large urban jurisdictions.

States' Inclination to Adopt Internet Voting

- California - California's Internet Task Force is clarifying the requirements for Internet voting, thereby facilitating the certification process. San Mateo County, whose

election official is on the Internet Task Force, recently stated his intention to cast ballots via the Internet in the November 2000 presidential election. Of the states targeted for this study California is likely to be one of the first states to implement some form of Internet voting in the near term.

- Florida - Florida has the reputation for having a difficult certification process. To date touch screen vendors have not been able to certify their systems in Florida. Florida has at least one county participating in the Internet voting test for military personnel in hazardous locations. State Election Division officials note that it may be possible to certify an Internet voting system as a ballot delivery system under current election law. Florida is likely to fall into the medium term category for implementing Internet voting.
- Illinois - Illinois election statute does not currently allow DRE systems. Given that certification of DRE/touch screen systems is often mentioned as a precursor to Internet voting, Illinois will probably fall into the longer term category for implementing Internet voting.
- New York - New York State's full face ballot requirement will impede the adoption of any system that cannot display the entire ballot on one computer screen without scrolling. New York is unlikely to adopt Internet voting in the near future. New York will probably fall into the longer term category for implementing Internet voting.
- Texas - Texas has certified touch screen systems. ADA, as well as Texas law requiring voting systems to be accessible to persons with physical disabilities will create opportunities for new voting system solutions. One forward-thinking county is willing to test and showcase Internet voting. Texas is likely to be a state that will implement Internet voting in the near term.

Phased Implementation of Internet Voting

Most counties believe that Internet voting will occur in phases. Some counties suggest early voting or absentee voting as a first phase. Others suggest a small jurisdiction, a limited number of polling places, a municipal or other small election, or a specific segment of voters, such as the disabled, as a starting point for Internet voting.

Voter Interest

A number of county election officials report receiving regular inquiries from voters regarding Internet voting. Although many election officials site concern about senior citizens' ability to use computers for voting, those counties that have tested or implemented touch screen systems have received very positive feedback from older voters.

Involve an Elections Expert

Several county elections officials noted the importance of involving someone with extensive elections experience in the development of the Internet voting system to ensure that the system takes into account all of the practical and logistical issues of the voting process. The involvement of a seasoned expert contributes to the credibility of the voting systems vendor. ■

To be continued in the JUNE 2000 issue – Marketing Study, Part II. California, including Alameda, Los Angeles, Orange, San Diego and Santa Clara Counties.

The COOK Report on Internet

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The *COOK Report on Internet* is your best guide to the infrastructure and governance complexities on which Internet voting is based. The COOK Report is a monthly newsletter focusing on the technology and policy complexities of Internet infrastructure development. It monitors the increasing convergence between voice and data networks as it follows the technologies (IP fax, IP telephony, optical networks, etc.) that are being used by the next generation telcos. Published since 1992 by the former Director of a U.S. Congress Office of Technology Assessment of the NREN, who is beholden to no federal agencies, private companies, or advertisers for funds, it is independent and sometimes investigative in its coverage.

For instructions on how to subscribe, see
http://cookreport.com/subscriptions.shtml

INTERNET VOTING TECHNOLOGY ALLIANCE

Internet Voting Technology Alliance Forms in Washington, D.C.

WASHINGTON, D.C. (February 28, 2000) – An international group of experts and companies officially formed an alliance today to work on the public development and open peer review of standards to be used in voting over the Internet.

About 50 participants from government, non-profit and private backgrounds attended the public founding assembly of the Internet Voting Technology Alliance, representing a first step in the self regulation of the Internet voting industry. An open call for participation was issued February 11, in public media, Internet work-groups and newsletters.

The founding assembly decided to elect an Advisory Board and a Board of Directors. Dr. Ed Gerck was elected chairman of the board of directors, and appointed Christine Lavin (West Coast) and Ray Kennedy (East Coast) as the other two directors, who were also elected by the assembly. Two workgroups were approved by the assembly –one for technical matters and another for internal legal matters such as drafting the by-laws. All decisions were made by consensus.

As defined in its mission statement, the IVTA affords companies, individuals and government sectors with a way to provide and request input in a unified environment with public peer review, while preserving the independence of each participant. The alliance is dedicated to serving the public by acting as an information center, discussion forum, voluntary standards setting body and Web publisher focused on technological issues of Internet voting.

For details about the alliance, or to learn how to participate, visit the Web site at www.ivta.org

IVTA Mission Statement

The Internet Voting Technology Alliance (IVTA) is dedicated to serving the public by acting as an information center, discussion forum and voluntary standards setting body and web publisher focused on Internet voting. The primary goal of the Alliance is to ensure a high level of quality and integrity in the resources and information provided, in order to foster public confidence in Internet voting. In keeping with established Internet traditions, the Alliance will operate in an open and collaborative manner and favor consensus.

IVTA Strategy

A technical board (the Advisory Board) will issue white papers and oversee the development of voluntary standards by specific workgroups. The Alliance will form a Media Watch to collect published mainstream references regarding Internet voting. The Alliance will also offer a website as a "one stop" reference for Internet voting and elections in general, including public elections. The Alliance is composed of participants from hardware, software, security and election-related companies as well as from government sectors and interested organizations and individuals. Membership is open to anyone who has something of value to contribute. No member of the Alliance shall in any way act as if they are representing the Alliance unless the consensus is that representation is appropriate.

THE BELL'S MEDIA WATCH

See also "Safevote in the News" on p. 15.

Vast Online Credit Card Theft Revealed
In the largest known case of cybertheft, a computer intruder stole information on more than 485,000 credit cards from an e-commerce site and then secretly stored the massive database on a U.S. government agency's Web site.
http://www.msnbc.com/news/382561.asp?cp1=1

Bill Would Form Privacy Commission
WASHINGTON (AP) - Even as the push for new laws protecting the privacy of consumers on the Internet appears to be picking up speed, two congressmen want to create a commission to study privacy issues for 18 months and hold at least 20 hearings across the country.
http://www.usatoday.com/life/cyber/tech/cth567.htm

Web Firms Have Sorry Record on Public's Privacy
Internet businesses love nothing more than self-regulation. They just want to be left alone, free from government meddling, to serve their shareholders and the public interest by building the new economy. But no issue demonstrates their hypocrisy better than how they handle the issue of privacy.
http://www.latimes.com/business/cutting/20000320/t000026443.html

Casting a Vote of Caution on Online Voting
Internet voting is the latest in a series of examples of how industrialized societies are rushing to move nearly everything to cyberspace, citing convenience, economic growth and the popular fascination with high-tech systems.
http://www.latimes.com/business/columns/dnation/20000320/t000026449.html

Internet Voting a Matter of Technicalities – Letter to the Editor

The concerns that Gary Chapman raises ["Casting a Vote of Caution on OnlineVoting," March 20] about the security of online voting are legitimate, but they ultimately will prove trivial when a technical solution is found.
http://www.latimes.com/business/cutting/20000327/t000028840.html

Can Hackers Kill Credit Cards?
Spate of e-commerce intrusions might mean a new form of payment system will come sooner than expected.
http://www.msnbc.com/news/382141.asp

Why the Net Doesn't Belong to America
Up until now the United States has undoubtedly been the Net's top dog, but that can't last. Europe is catching up fast (and may already be ahead in the wireless space), closely followed by Latin America and Asia. In other words, the Net is well on its way to becoming a truly international e-business communications tool.
http://dailynews.yahoo.com/h/zd/20000324/tc/20000325020.html

Computer Security Attacks, Losses Surging - Study
http://dailynews.yahoo.com/h/nm/20000322/wr/techsecurity 1.html

Control of Private Data Belongs in Hands of Consumers, Not Vendors
http://www/latimes.com/business/cutting/20000320/t000026450.html

Essay on Privacy by William Safire
http://www.nytimes.com/library/opinion/safire/092399safi.html

LINKS

Microsoft's case study on the 10-year experience of electronic national elections in Brazil, with security provided by Modulo Security Solutions
http://www.microsoft.com/security/resources/bnecasestudy.asp

Ken Thompson's paper "Reflections on Trusting Trust"
http://www.acm.org/classics/sep95

Ed Gerck's definition of trust in communication systems
http://www.mcg.org.br/trustdef.htm

The Administration and Cost of Elections Projects
http://www.aceproject.org

Electronic Privacy Information Center
http://www.epic.org

Federal Voting Assistance Program
http://www.delve.com/fvap/

International Association of Clerks, Recorders, Election Officials and Treasurers
http://www.iacreot.com

International Foundation for Election Systems
http://www.ifes.org

International Institute for Democracy and Electoral Assistance
http://www.idea.int

Internet Engineering Task Force
http://www.ietf.org

Internet Meta-Certificate Group
http://www.mcg.org.br

National Association of State Election Directors
http://www.nased.org

People for Internet Responsibility
http://www.pfir.org

VOTING SYSTEMS

Roy G. Saltman[3]

The history of administering elections in the United States could be characterized as incremental change. In the 1890s, the adoption of a standard paper ballot, called the "Australian Ballot", was considered to be a significant advance. The mechanical lever machine came into use in 1898. By the late 1950s, about one-half of all voters in the U.S. cast their ballots on these machines. Today, this hundred-year-old technology is still employed in some jurisdictions. Voting with computer-readable punch-card or mark-sensed ballots commenced in the 1960s. At first, ballot-readers were attached to large central processors, and the voted ballots were carried from local polling places to the central location. As smaller, portable, and less environmentally sensitive computers became available, precinct-located processing replaced much central processing. By 1988, about 50% of all U.S. voters used paper-based, computer-readable ballots. Now, to compare with the possible introduction of Internet voting, it is useful to recall the operating principles and problems of paper-based computer-readable ballots.

Punch Card Ballot Systems

The use of data processing cards as a voting medium began in 1964. In that year, Fulton and De Kalb counties in Georgia, Lane County in Oregon, and San Joaquin and Monterey counties in California used the system. In 1972, of the 100 largest U.S. cities, 16 used punch card voting. In Los Angeles County, the nation's largest, 2.9 million punch card ballots were processed in the presidential election in that year. By 1974, the system was used by about 10% of U.S. voters. The advantage of using data processing cards was that readers accepting these cards were standard data input equipment with business computers at that time.

Punch cards are simply computer-readable paper ballots, and as such, have all the problems of paper ballots except for the inaccuracy and slowness of manual counting. Accurate dimensions in manufacture, and use of appropriate material are factors required for punch cards not needed for paper ballots.

Automatic ballot readers must be fundamentally accurate. Cards are stacked at an input station, and a typical system repetitively takes the bottom card and transports it past the reading heads. As each column on the card passes the reading heads, each voting location in the column is sensed for a hole or no hole. An electronic "1" is entered into the computer for a hole and a "0" for no hole, or vice-versa. Cards are re-stacked at an output station. The system must be able to handle mechanical errors: card jams and transport of more than one ballot at a time. If a card jams, it is important to know whether the ballot has or has not been read; otherwise the totals of votes and ballots may not be correct. Similarly, only one ballot must be transported at a time past the reading heads, as only one ballot can be read at a time.

The punch card system initially put in use, called the "votomatic" system, was based on a concept introduced by Dr. Joseph P. Harris, whose 1934 book on election administration is often cited. The cards used are identical in size to standard data processing cards except that they have a stub attached to one of the narrow edges.

In typical use of the "votomatic" cards, the voting locations are "pre-scored." That is, the piece of card constituting a voting location (called a "chad") can be manually removed, leaving a hole of consistent dimensions, because the card, in its manufacture, has been mechanically scored at each such location. The removal is easily accomplished by a person pressing firmly on the location with a sharp-pointed tool, generally called a stylus, when the card is placed on a resilient backing such as styrofoam or rubber. The concept was first used in data processing (in a device called a "port-a-punch") to allow computer-readable data to be originated in the field without recourse to a mechanical card punch.

A major problem in the "votomatic" system is the pre-scoring. Sometimes, the chad is not completely removed by the voter, and creates what is called "hanging chad." This may happen because of problems with the "votomatic" device, with the cards themselves, or because the voter may not be properly instructed. The materials in the "votomatic" device may have deteriorated, or the device may not have been put together well. The voter may not apply sufficient force to completely separate the chad, or the voter may not have correctly inserted the card into the holder. The card itself or the pre-scoring manufacturing process may be of poor quality.

One result of hanging chad is that pieces of fallen chad are seen in the card reader or in its vicinity after cards are read. One cannot be sure in that case whether it was the intention of the voter to remove the chad or not to remove it. Chad may have been loosened in manual handling or in the reading process. Hanging chad may be pressed back into a card when voted cards are stacked in preparation for reading. Thus, with "votomatic" cards, one can always expect small differences in vote summaries if the cards have

to be run through the readers more than once. It is disconcerting to know that the vote-tallying system is changing some actual votes, and there is no way to determine what the original vote was.

Another type of punch card system is called by the name "datavote". In this system, data processing cards of standard size are used, as before, but the names of the candidates and description of issue alternatives are on the cards themselves. Provision of space for writing considerably reduces the number of available voting locations. Generally, in this system, voting locations are in one row down the right-hand long edge of the card. After the front side of the card is voted, the card is turned over around its long axis, providing a second row along the new right-hand edge. This system allows about 50 voting locations per card.

An advantage of the "datavote" system is that the holes in the card are punched out with a hole-punching tool. The card is not pre-scored, except for absentee use. Therefore, except in the latter case, there can be no hanging chad, and no chad fallout. A second advantage is that space for a write-in can be provided on the card for each contest, and the voter can write the candidate name right on the card.

A disadvantage of the "datavote" system is the limited number of voting locations on each card. In some elections, both sides of several cards may be required for a voter to completely vote all offices and issues. This procedure may be confusing to some voters, and those voters may not turn over the cards or use all cards. More and/or faster reading equipment is required to process the cards in a reasonable time.

Mark-Sense Ballot Systems

In this type of system, the voter makes a mark with a pencil, pen, or inked stamp in a small rectangular or circular voting location on the ballot. The marks are read by an automatic reader, and voters' choices are summarized, as they are with punch card ballots. The concept is often used with scholastic achievement tests and statewide lotteries. A mark-sense type ballot was offered to Los Angeles County as early as 1958 and used in the June primary of that year (Norden Division, 1958), but that county eventually adopted the pre-scored "votomatic" punch card.

At one time, pencil was required to be used for certain systems, and electrical conductivity of the pencil mark was used to distinguish a mark from no-mark. More recently, marks are distinguished by the different quality of the reflection made by a mark as distinguished from a no-mark, in response to an impinging and reflected beam of energy. This reflecting beam may be in the light spectrum, or it may be in the infra-red spectrum. If a signal in the light spectrum is used, the process may be known as "optical scan." The advantage of infra-red is that any kind of writing instrument may be used, provided that the mark is not colored red.

Mark-sense ballots have all the problems of paper ballots, and of course, all the problems of computer-read ballots. Highly accurate printing is necessary, so that there is proper synchronization between the feeding mechanism of the reader and the voting locations. Mark-sense ballots have not been restricted to the size of standard data processing cards. Typically, mark-sense ballots are much larger, allowing for the candidate names (including space for write-in candidates) and issue descriptions to be printed on the ballots. Ballots are usually large enough so that only one ballot sheet is required for each voter.

A difficulty of mark-sense ballots is the variability in marking resulting from the heterogeneous quality of the electorate. An automatic sensor must accurately detect marks made by a variety of writing instruments, with various writing forces applied, and with various percentages of the location filled with the mark. In addition, smudges, sweat stains, and paper imperfections must be distinguished from true marks. In contrast, in punch card systems, there is either a hole or no hole in the voting location, certainly an easier question for a machine to answer. In addition, with mark-sense ballots, it is difficult to constrain the voter from marking outside of the voting location, and therefore, determining the voter's intent may be more of a problem than with punch card ballots.

Some mark-sense systems take into account the problem of distinguishing marks from no-marks in a low signal-to-noise ratio situation. If the system of this type fails to record any marks, it returns the ballot to the input. Then, if there are votes on the ballot that the machine could not read, the ballot can be counted manually. Note that the ballot is returned only if no marks can be read. If the machine can read some marks and not others, those others may never be counted.

Some systems may return the ballot to the input if an overvote situation is discovered (i.e. the voter has voted for more choices in a contest than permitted). This procedure is helpful if the ballot reader is precinct-located, and the voter is still present in the vicinity. Then, the voter may retrieve the overvoted ballot and correct the "error." It is the opinion of this writer that some voters may deliberately overvote a contest because they have no strong preference; they approve of more than one opposing candidate without consciously realizing that their conflicting votes cannot be counted. ■

Roy G. Saltman, M.S., M.P.A., works as a consultant in computerized voting. He is retired from the U.S. National Institute of Standards and Technology (NIST) and is well-known for his reports and presentations on the integrity of computerized voting. He is a member of the Advisory Board of the Internet Voting Technology Alliance (IVTA). Saltman can be contacted by email at roysalt@aol.com, by fax at (410) 997-4355, or by phone at (410) 730-4983.

SAFEVOTE IN THE NEWS

March 10, 2000 ZDTV CyberCrime - Privacy
By Jennifer London. Excerpted by THE BELL.

A Model Idea

According to Kurt Neumann, vice president of marketing at Safevote, the biggest problem in online voting now is that people want "to transfer the e-commerce model into a 'voting model,' [which is a] two-party system: a client/server system," he told [Jennifer] London.

"We don't think that's a viable way to provide voting, primarily because voting has to be anonymous and private; and e-commerce [is] an open information flow, Neumann said. "You pretty much have to know everything about the two parties that are dealing together."

Neumann says Safevote's three-party model will verify the user's eligibility to vote, while also keeping their identity secret once they cast their ballot.

One system will authenticate a voter, a second system will allow the person to vote, and the third system will tally the vote, minus the person's identity.

This way, if someone breaks into the online voting system, the electronic burglar may be able to find out how a person voted, but they won't know who actually cast the ballot....

Links

Net Voting Alliance To Propose Standards For Online Elections
http://newsbytes.qpass.com/news/00/144616.html?QIID=144616

The Politics of Privacy
http://www.zdnet.com/zdtv/cybercrime/privacy/story/0,9955,2114574,00.html

Brazil: Internet Pioneer?
http://www.zdnet.com/zdtv/cybercrime/privacy/jump/0,9975,2455521,00.html

Brazil Ahead of U.S. in Net Voting
http://www.thestandard.net/article/display/0,1151,9024,00.html

FBI Tracks Famous Hacker in Germany: UCLA joins list of California universities used in attacks
http://www.sfgate.com/cgi-bin/article.cgi?=/examiner/archiver/2000/02/13/NEWS9001.dtl

The Net Vote's Still out
http://www.thestandard.com/news/letters/

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