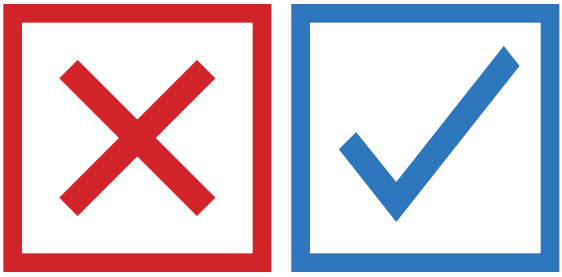
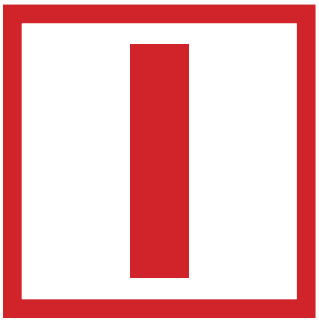
By Hugh Dubberly

US elections technology—the infrastructure on which democracy depends—is proprietary, locking up public data; unlocking that data is a design challenge on many levels.

VoteStream: Turning Elections Data into Open Data





N MOST COUNTRIES, elections and voting are managed by the federal government. In the United States, elections are overseen by the secretaries of state of each of the 50 states, but ultimate responsibility resides with local elections officials (LEOs) in each of the more than 3,000 counties in the country. That means US elections are broadly decentralized and can vary widely from one location to the next. Under this system, elections technology—the critical infrastructure that supports our democracy—is also broadly decentralized and also varies widely from one location to the next. What is more, our elections technology is aging, even antiquated. Some estimates suggest almost all of it will need to be replaced in the next 10 years.

The result? US elections are fraught with problems, and the experience of many voters is far from ideal—often unpleasant, sometimes downright painful. Problems range from long lines and confusing ballots to equipment failure and voter disenfranchisement—and worse, to election results that many no longer trust.

The causes of this situation are many and complex, but the bottom line is that our political system and our market system have so far been incapable of solving the problem—much less innovating. We need an alternative—and that requires design.

Introducing the TrustTheVote Project and VoteStream

The mission of the TrustTheVote Project is to develop a set of elections technologies that are trustworthy, up-to-date, and complete, and to make the technologies available on an open-source basis (that is, for free) for adoption or adaptation by any election jurisdiction in the US.

The TrustTheVote Project is a not-for-profit effort headquartered in Silicon Valley and staffed by social entrepreneurs and seasoned technologists

Notes

1. McKinsey & Company white paper, "Open data: Unlocking Innovation and Performance with Liquid Information," October 2013.
2. Larry Lessig, Open Government Data Conference, Sebastopol, CA, 2007.
3. Based on OMB Memorandum on Open Data Policy, May 9, 2013, www.whitehouse.gov

who are putting local elections officials at the center of their work. LEOs from across the country are sharing their views on requirements, collaborating to define specifications, and providing their feedback on prototypes. (The TrustTheVote Project is engaging LEOs using the same community process used to define and build the internet—the RFC (request for comments) process. The TrustTheVote community's deliberations and resulting specifications are published online and available to anyone.)

One of the key things LEOs have said is that citizens need to be able to trust the elections process and the technologies that support them. That means the technologies must be:

- *Accurate*—List all voters and only eligible voters on voter rolls. Count votes without errors, as they were cast.
- *Secure*—Ensure voter privacy, data integrity, system reliability, and proper authentication and authorization for access.
- *Transparent*—Allow verification of required accuracy. Log all changes to guarantee accountability.
- *Verifiable*—Enable everything that matters about an election to be independently verified, including accuracy and security.

The TrustTheVote Project has seven main building blocks:

1) Open data standards
2) An election management system
3) A voter registration system
4) Components for creating ballots
5) Casting ballots (voting)
6) Counting ballots
7) Reporting results

This last building block is where VoteStream lives. VoteStream is one of the first elements of the TrustTheVote framework to be built. It's an election results reporting system, funded in part by a grant from the Knight Foundation.

VoteStream has three facets:

1) A set of *open data standards* for election results and participation and performance data
2) Open-source *software* written to those standards
3) *Services* deploying the software

The goal of VoteStream is to make election results for every contest in every jurisdiction in the country—down to the precinct level—publicly accessible to all citizens, anywhere, in near-real time.

Open data

One of the key principles behind the TrustTheVote Project generally, and the VoteStream reporting system in particular, is that elections data should be open data. Open data is "the release of information by governments and [others]...to enable insights,"[1] and, like big data, it's a growing trend.

Unlocking elections data will lead to insights that will improve elections processes and strengthen democracy. American academic and political activist Larry Lessig made the point well: "The government could make its data available in a way that enables a wider range of people to help make the government function better."[2] VoteStream helps do just that for elections.

Elections data exists today, but it's not readily accessible—due to proprietary systems, lack of standards, and limited opportunity for viewing.

Elections data today	Open data[3]
Proprietary systems	Public by default
Proprietary formats	Accessible format
Little metadata available	Described
Reusable (if you can get it)	Reusable
Partial or incomplete	Complete
Release can be slow	Timely
Users are on their own	Managed post-release

Unfortunately, elections data rarely meet the definition of open data. Most elections reporting is limited to summary vote counts. Detailed reporting only comes much later, if at all—not because detailed data don't exist, but because the

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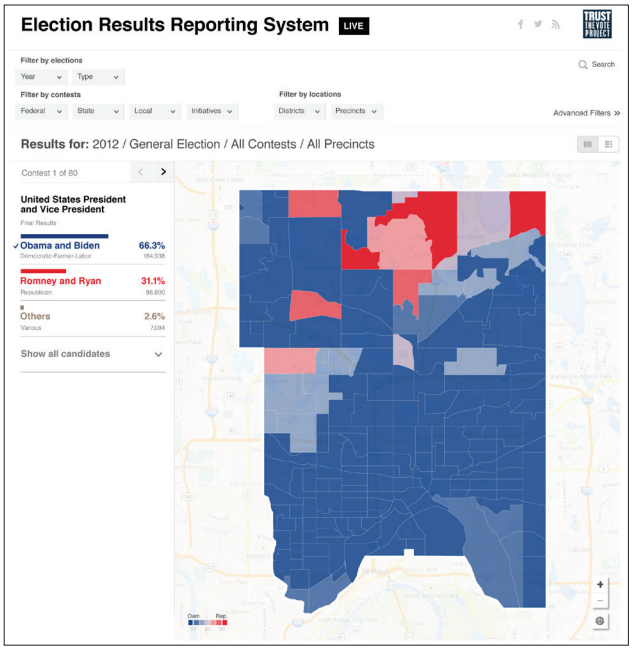
Larry Lessig

TODAY, RAMSEY COUNTY, MINNESOTA, REPORTS ELECTION RESULTS IN SPREADSHEETS AND PDFS—FORMATS USED BY MANY JURISDICTIONS.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
AUDITED GENERAL ELECTION - NOVEMBER 5, 2013																		
MAYOR																		
Longrie	Diana	123	137	115	93	156	108	147	141	45	130	69	31	145	57	107	199	1803
Slawik	Nora	151	234	266	171	210	298	311	324	118	293	223	85	252	116	339	386	3777
COUNCILMEMBER																		
Abrams	Marylee	115	194	211	135	165	253	256	253	100	256	167	59	188	86	262	288	2988
Behrens	Margaret Ann	135	133	139	125	186	153	193	191	61	166	104	38	188	70	165	247	2294
Cave	Rebecca	131	163	148	115	185	143	172	200	60	166	112	47	172	70	151	272	2307
Juenemann	Kathleen "Kathy"	115	189	217	122	159	231	244	244	92	228	168	78	179	92	266	267	2891
TOTAL REGISTERED VOTERS		992	1449	1184	881	1263	1690	1869	1877	705	1631	1268	1077	1653	641	1776	2165	22121
NEW REGISTRATIONS		2	17	10	8	2	8	20	12	5	10	3	2	14	3	8	7	131
NEW TOTAL REGISTERED VOTERS		994	1466	1194	889	1265	1698	1889	1889	710	1641	1271	1079	1667	644	1784	2172	22252
TOTAL NUMBER OF VOTES		267	360	378	252	357	370	417	439	144	397	272	102	373	171	431	565	5295
PERCENTAGE		27%	25%	32%	28%	28%	22%	22%	23%	20%	24%	21%	9%	22%	27%	24%	26%	24%
		P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	P 10	P 11	P 12	P 13	P 14	P 15	P 16	TOTALS

HERE'S WHAT VOTESTREAM LOOKS LIKE REPORTING RESULTS FOR RAMSEY COUNTY.



...citizens need to be able to trust the elections process and the technologies that support them.

data are locked away in proprietary systems that use proprietary data formats.

Current reporting methods and formats vary greatly by jurisdiction. The process is often manual, slow, and prone to error. In many cases, election officials must re-key results—by hand—to get them out of proprietary election management systems and into the public domain.

If we can legally unlock the data, we can turn elections results into open data.

Standards

One way to unlock data is to follow standards. The VoteStream election results reporting system is built on the Voting Information Project's (VIP) data standard. The TrustTheVote Project is collaborating with VIP's underwriter, Pew Charitable Trust, as well as with election officials, Google, and standards bodies (for example, IEEE and NIST), in an open, public process, to extend the VIP standard to include:

- Contest and question data (for example, what's on the ballot in each precinct)
- Location data (for example, precinct and district geo-spatial data)
- Results for each location and contest combination (in a form that's accessible individually, in chunks, or in aggregate)
- Performance and participation data (for example, numbers of ballots cast and rejected)

In order for VoteStream to work with existing election management systems, the project team has written connectors—applications that translate from existing formats into the extended VIP data standard. Connectors are a type of application programming interface (API).

Software and services

VoteStream includes a data store, back-end logic to manage the system, and feeds for near-real-time delivery of data to subscribers. The back-end software also answers API calls—requests for data that follow defined rules. That means anyone who follows the rules can access the data—anytime, from anywhere. People are free to create their own tools and republish the data or do their own analysis.

VoteStream also includes a visual scoreboard, a web front-end, to enable local elections officials to easily share their data with the public. The scoreboard displays results for each precinct in a county for each contest as both tables and maps. The maps are generated with underlying data from the Google Maps API, with overlays for precinct and district geo-spatial data. Users can toggle to Satellite View, zoom in and pan—and reset. Mousing over a precinct pops up detailed information.

Users can scroll through contests, or filter data to quickly find specific content. Users can also search by keyword, such as entering the name of a candidate. For journalists and researchers, there's an advanced search feature, enabling queries on performance and participation data. And it provides a feature for exporting data files.

All this software is available free to anyone, under an open-source license. Local elections officials can download the software and set up their own systems, and third parties can build products and services based on the software.

The TrustTheVote team completed an alpha version of VoteStream in March and demoed it to the Knight Foundation and the public. Refinements are under way, as is work on the rest of the building blocks in the TrustTheVote Project.

Implications

VoteStream will enable researchers to look closely at elections. They will be able to compare rejected ballots with demographic data and determine, for example, if rejection rates are significantly higher for the elderly or other communities. That's the kind of research that will help us find problems, fix them, and restore trust in voting—and ultimately help preserve democracy.

Hugh Dubberly *is a design planner and teacher focused on developing integrated systems of hardware, networked applications, and human services. He is best known for producing the first corporate future vision video,* Knowledge Navigator, *and for his large concept maps. Dubberly spent 10 years at Apple as creative director, managing brand design, and 5 years at Netscape as vice president of design. In 2000, he co-founded Dubberly Design Office, a software and service design consulting firm. The firm is designing interfaces for all the TrustTheVote software and is producing the project's communications materials. While practicing, Dubberly also regularly teaches design, including courses in systems design at Stanford, Illinois Institute of Technology, and Northeastern University. He has written and lectured extensively on design methods, systems, and modeling and was elected to the ACM CHI Academy in 2012. He has a BFA from Rhode Island School of Design and an MFA from Yale.*

For more about the VoteStream elections results reporting system, visit votestream.trustthevote.org. For more information about the TrustTheVote project, visit www.trustthevote.org.

The role of design

Creating a better experience for voters—and enhancing the critical infrastructure that supports our democracy—is a complex nested set of design challenges. In the TrustTheVote Project and the VoteStream elections results reporting system, design plays a role on many levels.

Easiest to see is design's role in giving form to ideas. VoteStream and other software applications in this family of elections technologies have to look like something. The visual form of interfaces, instructions, and communications materials must be designed and content must be developed. Perhaps more important, the process of prototyping—creating, testing, and iterating mock-ups—helps the development team and local elections officials clarify goals, understand possibilities, and chose between trade-offs. Prototypes are also important for usability testing.

Another level of design involves working out how voters and elections officials interact with each other and with technology to co-create elections. That means defining the possible voter registration journeys, the several voting paths, and the paths by which elections are defined and ballots are created, cast, counted, and reported. Each touchpoint must be effective and efficient, which requires interaction design. And these systems must work independently and together, which requires both service design and the design of software application architectures, data models, and data standards.

A complete set of elections technologies cannot be created by one person. The sheer amount of labor requires a development team. But while a team is necessary, it is not sufficient. In order to succeed, the team needs the trust and help of the community of elections officials. That is to say, standards are only meaningful if they are adopted, and even free software is not guaranteed to draw users. Drawing community support is not an accident. It requires the design of systems and processes that support conversation and engagement.

In addition, the development team needs resources and must interact with the market and with government entities. This requires another sort of design focused on business and organizational structures, facilitating operations, and social dynamics.

And, of course, elections technologies are embedded in our larger political system, which was itself designed and which we continue to evolve.

In practice, these levels are anything but clear and distinct. They connect and overlap (or fail to) in lots of messy ways. Bringing them all together in the right sequence, efficiently and with good humor, is a challenge in any project. It involves working together to create understanding and agreement—a process at the heart of design. And it demonstrates that all design is political in nature, not just the design of elections technologies. ■