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Google Votes: A Liquid Democracy Experiment on a Corporate Social Network

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Abstract

This paper introduces *Google Votes*, an experiment in liquid democracy built on Google's internal corporate Google+ social network. Liquid democracy decision-making systems can scale to cover large groups by enabling voters to delegate their votes to other voters. This approach is in contrast to direct democracy systems where voters vote directly on issues, and representative democracy systems where voters elect representatives to vote on issues for them. Liquid democracy systems can provide many of the benefits of both direct and representative democracy systems with few of the weaknesses. Thus far, high implementation complexity and infrastructure costs have prevented widespread adoption. Google Votes demonstrates how the use of social-networking technology can overcome these barriers and enable practical liquid democracy systems. The case-study of Google Votes usage at Google over a 3 year timeframe is included, as well as a framework for evaluating vote visibility called the "Golden Rule of Liquid Democracy".

Introduction

Effective decision making is a challenge for any structured group. It can be time consuming, inefficient and frustrating since it depends on many different aspects of group dynamics (Postmes, Spears and Cihangir 2001). Democratic decision-making systems have great promise since 1) they can take input from many group members with diverse knowledge and experience, and 2) the generated decisions gain legitimacy from the democratic nature of the process improving chances for successful execution (Council of Europe 2008). Many decision-making systems take the name "democracy" and claim to follow ideas in accordance with the meaning of the original Greek word *δημοκρατία*, "rule of the people" (Liddell and Scott 1889). In practice, they often have low group engagement and only small sub-groups of people contribute ideas and decide among them (Noveck 2009; Serrano 2015).

This paper argues that *liquid democracy* is a particularly promising form for democratic decision-making systems and building liquid democracy systems on social-networking software is a practical approach. It presents the *Google Votes* system built on Google's internal corporate Google+ social network. Google Votes is an experiment in applying liquid democracy to decision-making in the corporate environment. It was developed in 20% time (Schmidt and Rosenberg 2014) by a small group of Google engineers. The concepts related to the topic will be described next, followed by an overview of the system and the specific case study of 3 years usage at Google.

Liquid Democracy

Democratic voting systems generally employ a form of *direct democracy* where everyone votes directly, or *representative democracy* where a small set of representatives vote on behalf of the larger group (Ford 2002). Figure 1 gives a direct democracy example where voters (circles) vote (solid-head arrows) directly on issues (squares), and a representative democracy example where voters elect (open-head arrows) representatives (large circles) who vote on issues.

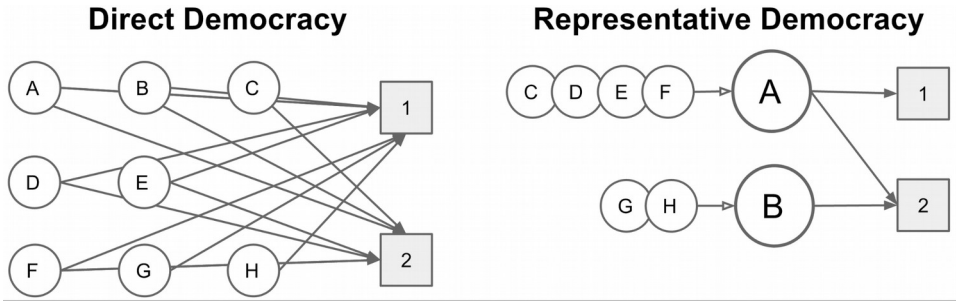


Figure 1. Direct and Representative Democracy

Direct democracy offers control, accountability, and fairness, but engagement falls off in large groups since voters generally do not have time or expertise to vote on everything (Ford 2002). Representative democracy is considered to scale to large groups better than direct democracy because: 1) Representatives can specialize and become experts who spend more of their time and effort understanding group-related decisions, and 2) discussions concerning group decisions involve fewer people, primarily just the representatives (Miler III 1969). But representative democracy has problems with transparency, accountability, high barriers to entry in becoming a representative, abuses of power, focus on superficial aspects of candidates, and decisions being influenced by the election process itself, e.g. election cycle effects (Hirst 1990; Woolley 1991).

With liquid democracy (aka. delegable proxy) voters may delegate voting power to other voters, but can also choose to override delegations and vote directly. Moreover, participants can change delegations at any time. Delegation is transitive, a vote can pass through several delegation links before being counted on an issue (Behrens, Kistner, Nitsche and Swierczek 2014). Figure 2 gives a liquid democracy example where voters (circles) delegate (open-head arrows) to other voters and voters vote (closed-head arrows) on issues (squares). The ability to override and vote directly gives the control, fairness, and transparency of direct democracy. Person *F* would normally have delegated their vote on issue *[1]* to person *H* through the path *F→G→H→[1]*, but instead *F* overrode the delegation and voted directly on *[1]*.

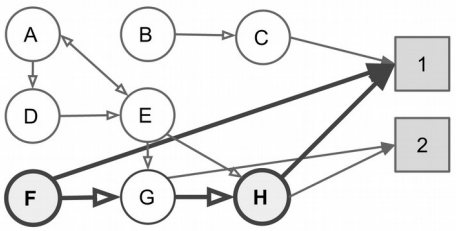


Figure 2. Liquid Democracy

The ability to delegate voting power allows liquid democracy to scale to large groups as well as representative democracy does. People who have others delegating to them are much like representatives in representative democracy systems, becoming specialists for group decisions and voting with greater power. For example in Figure 2, many people delegate directly or indirectly to person *H*, making *H* a powerful delegate. Liquid democracy systems tend to be meritocracies. As a person becomes more of an expert on issues facing the group, more people trust and delegate to them. The increased voting power can incentivize them to further increase their expertise and effectiveness. The opposite effect occurs when the delegate becomes less effective. This feedback process gives accountability and curbs abuses of power.

The ability to change delegations at any time eliminates many election-related distractions and distortions. There is no election-cycle and delegates must continuously prove their worth. And, they can do so in incremental manner, instead of wasting time and energy on all-or-nothing elections. The lack of elections lowers barriers to entry for non-delegate group members to start taking on leadership

responsibility. The person can attract a small number of delegators by serving their interests, and then either aim to grow delegated power or not, depending on their goals. Liquid democracy allows people with varying levels of skill, time and energy commitment, and numbers of like-minded people to contribute at proportional levels.

Delegates can be people well-known to those who delegate, instead of representatives who are likely not well-known. The transitive nature of delegation means that people do not need to know experts directly, they can "know people who know people" and their votes will follow a chain of trust (Ford 2002). These factors reduce the focus on superficial aspects of candidates. As shown in Figure 2, person *F* trusts *G* to make good decisions. *F* doesn't necessarily know *H*, but *G* trusts *H*. So, *F*'s vote flows to *H*. Contrast this with a representative democracy election, where *F* would likely be choosing among candidates with whom *F* has no personal connection. *F* might very well be swayed by superficial aspects of the candidates instead of any rational reason to favor one candidate over another.

The Golden Rule of Liquid Democracy

In the context of liquid democracy, define *vote transparency* as the guarantee that users can see all votes cast on their behalf including those cast through multiple delegation links, which is desirable to create user trust. Making all votes visible to everyone creates vote transparency at the expense of privacy, possibly compromising people's ability to vote honestly. Making all votes secret maximizes privacy, but violates transparency by compromising the ability of voters to verify the actions of their delegates. This is similar to the way in which the votes of elected representatives on issues are usually public, while the votes to elect them are usually private.

The designers of Google Votes propose a general framework to define the space of all vote-transparency-compliant policies for liquid democracy systems and name it "The Golden Rule of Liquid Democracy":

If I give you my vote, I can see what you do with it.

Treating the set of delegations and votes as a graph, we observe the minimal transparency-compliant vote-visibility graph is the transpose of the vote delegation graph. Every delegation link must have a corresponding vote-visibility link in the opposite direction. Vote-visibility is transitive. Figure 3 illustrates direct and delegated votes on two issues, categorized Food and IT respectively, and the corresponding minimal vote-visibility graph needed to satisfy vote transparency. In the latter, open-head arrows indicate 'has-votes-visible-to' relations. If the system supports delegations links constrained to specific categories (as Google Votes does), then the minimal transparency-compliant visibility links only need to cover issues with corresponding categories. Since delegation links can be added and removed at any time, the visibility links only need to cover the time-frames when their matching delegation links exist.

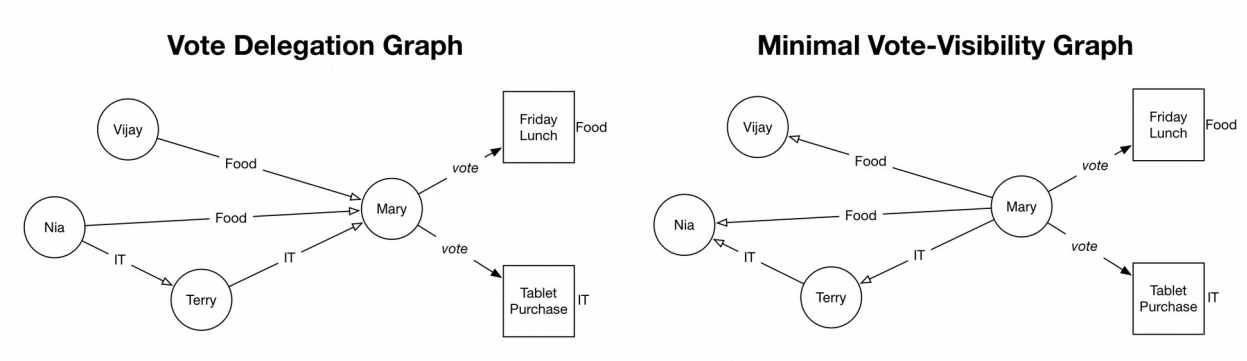


Figure 3. Delegation and Vote-Visibility Graphs

The vote-visibility restrictions of the Golden Rule are unidirectional. A user could receive delegated power from another user without knowing about that user or their votes. Many vote-transparency-compliant policies are possible. One compliant policy (which Google Votes uses) is to make all votes publicly visible to the voting group. A second compliant policy is to start with all votes private and with incoming

delegations disallowed. Then a user can choose to declare themselves a "politician" which simultaneously makes their voting record public and allows incoming delegations. A third compliant policy starts with votes private, and then requires explicit approval for accepting any delegation along with its corresponding vote-visibility.

Liquid Democracy and Social Networks

In recent years, use of social networking software has become ubiquitous. A social network's user-relationship graph bears similarity to a liquid democracy delegation graph, and a liquid democracy system can be built on top of an existing social network (Wiersma 2013; Boldi, Bonchi, Castillo, and Vigna, 2011). As an analogy, consider an electric wire. It carries information or power. Currently, social networks carry only information. Liquid democracy allows social networks to carry power as well, decision-making power.

Any group-decision-making tool faces high barriers to adoption since it has no value until a critical mass of people adopt it. This is even more true for liquid democracy systems since a network of delegations must be established. Specifically, liquid democracy systems have requirements common to any democratic group-decision-making system such as:

- Verifiable identity for vote counting.
- Mechanisms to cast votes and count votes.
- Means for issue creators to publicize issues and for voters to discover relevant issues.
- Fostering meaningful discussion on issues.

As well as requirements particular to liquid democracy:

- Establishing and managing delegation relationships.
- Providing feedback on delegated-voting activity - because a user's votes depend on the votes and delegations of others.
- Educating users on the use of liquid democracy.

Building the liquid democracy system on a social network fulfills or partially fulfills many of these requirements. Users of the social network become the voter base and identity verification uses mechanisms provided by the social network. Even social networks that allow account creation with weak verification such as simple email confirmation generally have invite-only grouping mechanisms, e.g. Google+ Communities (Gundotra 2012) and Facebook Groups (Hicks 2010). Groups can use these mechanisms to implement their own stronger verification.

Social networks provide messaging capabilities which can be leveraged for issue publicity, discovery, and discussion. Users can influence others since personal recommendations contribute to individual shifts of opinion (Price, Nir and Capela 2006). The messaging capabilities can be used for communications related to establishing delegation relationships, providing feedback on voting activity, and sending educational messages.

The liquid democracy system must implement its own mechanisms for vote casting, vote counting, and delegation management.

Google Votes System

System overview

Google Votes is a web application integrated with Google's internal corporate Google+ social network. Since internal Google+ accounts are synchronized with Google's corporate employee database, voter identity is assured. Google Votes complies with the Golden Rule of Liquid Democracy by making votes and issues visible to all Google employees, called *Googlers*. Google Votes uses Google+ posts as the basis for vote and issue discussions.

The main top-level pages of Google Votes are the *issue* and the *ballot* pages. An issue contains a list of *options*. Issues are created and edited as drafts with a "What You See Is What You Get" interface and then locked-in and opened for voting. Issues may be restricted to groups of users. Each user with permission to see an issue can vote to express their preference and can change their vote until the issue closing time. To minimize bias, options in issues are presented in per-user random order with incremental results hidden until the issue closes. If desired, a voting user can receive an email notification with the final results.

Issue creators can choose to group related issues into a ballot or to leave issues as standalone pages. For example, Figure 4 shows a ballot for a Google Food Fair where one of the issues is a vote on unsweetened teas. After the user votes on tea, Google Votes navigates to the next issue in the ballot. To eliminate arbitrary order bias, issues in ballots are presented in a per-user random order. Google Votes uses a card-based user interface paradigm. This allows the layout to work on devices with widely different screen sizes such as handhelds, tablets, laptops, and desktop machines. Depending on context, square cards can represent ballots, issues, options, or users.

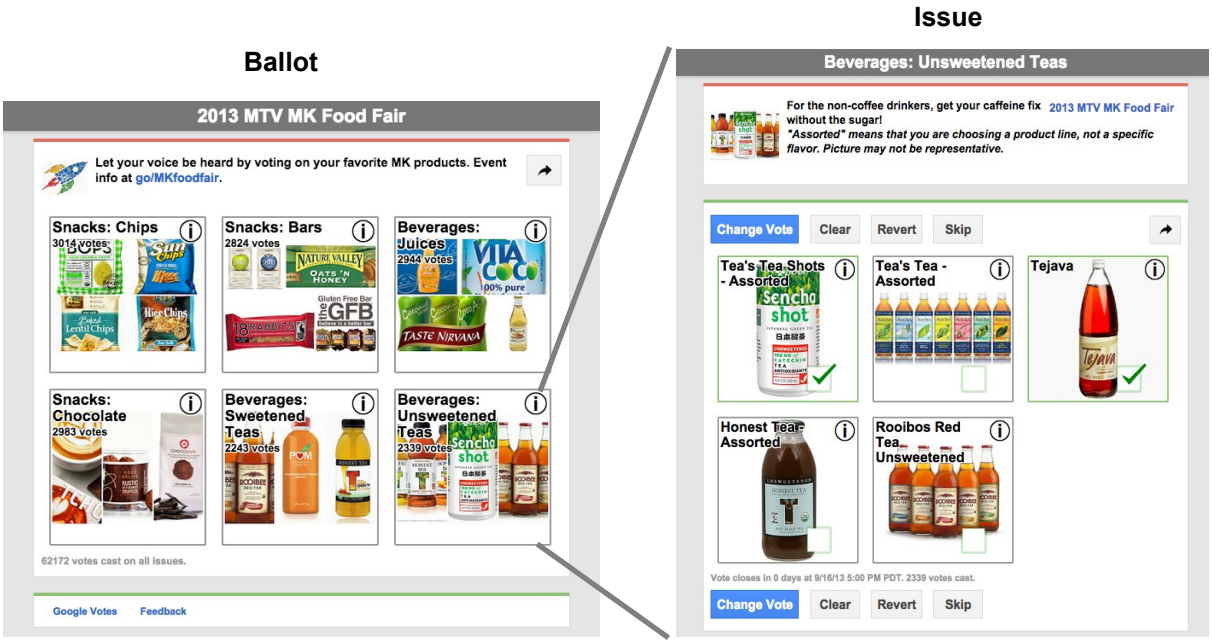


Figure 4. Ballot and Issue

Voting styles and tally methods

Google Votes supports 5 different voting styles in the user interface, each with one or more tally methods to count votes and determine winners. When creating a new issue, the creator selects a specific voting style and tally method which do not change over the issue lifetime. At vote time, users can click an informational link for detailed information on the style and method. Table 1 gives examples of all voting styles.

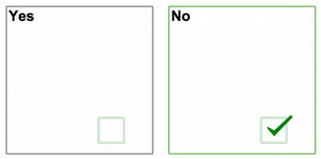
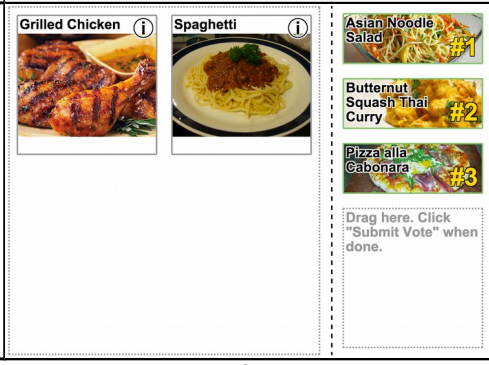
Yes/No Select one of two possible options.	
Plurality Select one of multiple options.	
Approval Select multiple options.	
Score Rate options from 1-5 stars. *2 tally methods*	
Ranked Drag-n-drop in preference order. *2 tally methods*	

Table 1. Voting Styles

For issues in all voting styles, Google Votes generates a ranked list of options after voting closes, i.e. first, second, third place, etc. Ties are permitted. Figure 5 gives an example of a two-way tie for third place. The tally method combines the cast votes to decide the ranking. For yes/no, plurality, and approval voting, Google Votes provides a single tally method which is simple per-option vote summation. For score voting, Google Votes provides max-score and average-score tally methods to combine the 5-star votes. The primary difference between max-score and average-score rankings is max-score treats unmarked options as 1 star (lowest value) while average-score ignores unmarked options (Smith n.d.).

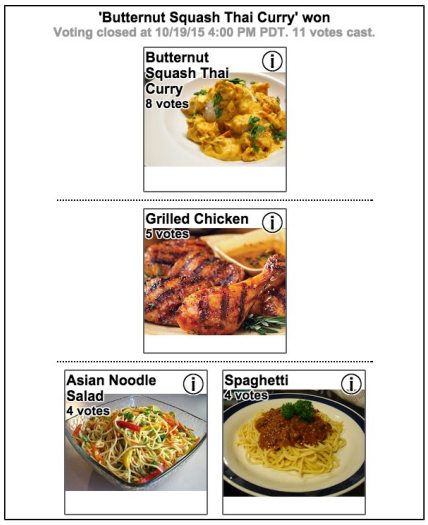


Figure 5. Closed Issue Results

For ranked voting, Google Votes provides the Schulze and Borda tally methods. Although many ranked voting methods exist, the Arrow Impossibility Theorem proves no single one can be ideal (Arrow 1963). The default voting method in Google Votes is ranked voting tallied with a variation of the Schulze method (Schulze 2011). Google Votes adds a user-visible heuristic score to the Schulze ranking to help users distinguish between issues with a clear winner and close races, score details fall outside this paper's scope. Google Votes used the Borda count (Borda 1781) for all issues created before Schulze was supported. In practice, the algorithms can produce different results. The voting data for the 194 ranked issues created over 3 years of Google Votes usage were compared and the two algorithms produce different first-place winners for 21 issues. Google Votes designers chose Schulze over Borda for Schulze's many desirable properties including clone independence and Condorcet compliance (Schulze 2011).

Unbiased and biased sharing

Google Votes provides social network sharing to address the "discovery and publicity" problem. Users discover relevant issues to vote on and receive vote recommendations from other users in their social network. Two types of sharing are distinguished with separate mechanisms for each (Table 2).

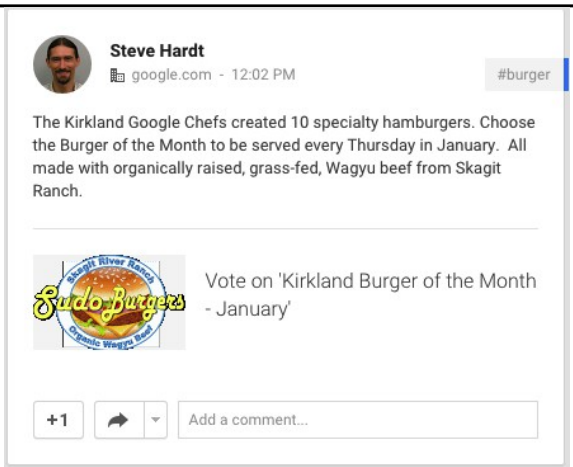
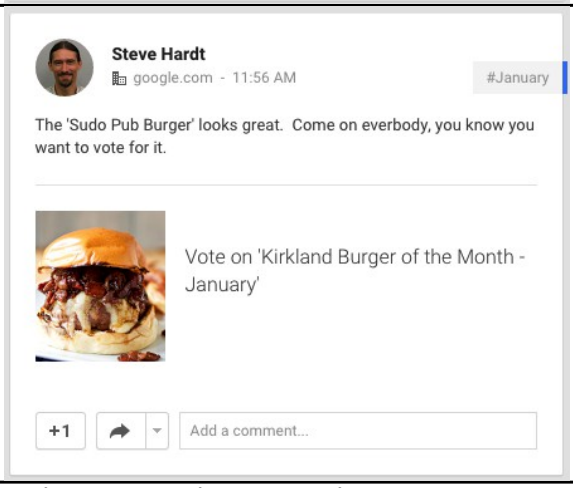
Unbiased sharing Share an issue.	
Biased sharing Share a vote on an issue.	

Table 2. Unbiased and biased sharing

With unbiased sharing, a user shares an issue giving no preference over the options. The message includes issue-specific information such as the issue title and issue overview image. A common use-case is when the creator of an issue wants to attract votes and generate an accurate aggregate group preference. Issue sharing is available on the issue page at any time.

With biased sharing, a user shares an issue along with their specific vote. The message includes vote-specific information including the name and image of the most preferred option. A common use-case is when a voter wants to influence the issue outcome and convince others to cast similar votes. Users receive the option to share their vote immediately after they vote.

Discussion aggregation

An important part of the decision making process is discussion and deliberation. Google Votes shows all Google+ posts related to an issue on the issue page itself with options for sorting and filtering by social network affinity (Figure 6). So, even though relevant posts may be widely spread across the Google+ network, at vote time a user can see the entire discussion and perhaps make a better-informed decision. Google Votes uses the same underlying technology to aggregate comments as is used to integrate Google+ comments with YouTube comments and Blogger comments (Janakiram and Zunger, 2013; Zunger 2013).

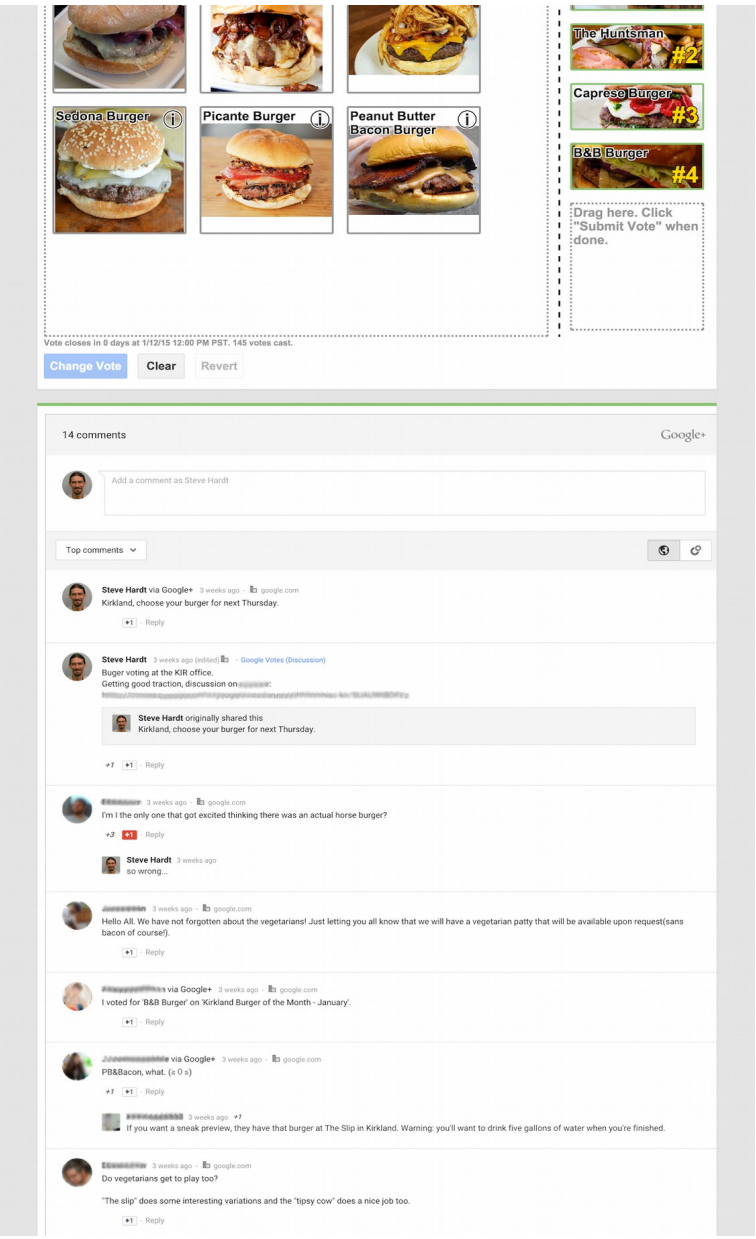


Figure 6. Discussion Aggregation

Delegated Voting in Google Votes

It is assumed that users generally have experience with direct and representative democracy, but not with liquid democracy. Google Votes uses a learn-as-you-go approach to teach liquid democracy concepts. To start with, the system can function as a traditional direct democracy voting system, and works well for users not familiar with the delegation features. Delegation features are introduced at key points in user interaction flows, targeting users likely to benefit from delegated voting. At times Google Votes borrows familiar concepts from representative democracy to describe aspects of liquid democracy.

Google Votes implements delegation by category at the issue level. A category is a short string like "food" or "events". The creator of an issue assigns the issue a single category. Although the low-level voting engine supports multiple categories, for simplicity the Google Votes system allows only a single category per issue. A delegation is a directed link from one user to another user annotated with a category. When a user casts a vote on an issue, the vote is counted as one vote for them plus one vote for every user who has

delegated to them in the category of the issue. This does include indirect votes from transitive chains of delegation. But it does not include votes from delegating users who voted directly or voted via a different delegate closer to them in the delegation chain.

Democracy Dashboard / Voting Page

Google Votes maintains a voting page for every user and users can see other users' voting pages. Since liquid democracy makes no distinction between representatives and the general public, the voting page must be useful to people who have delegations from others, to people who have delegations to others, and to people who have both. The voting page displays all issues and ballots the user created and all votes the user cast. From a user's own voting page, the user can add and remove delegations to other users and can view delegations from others to them (Figure 7).

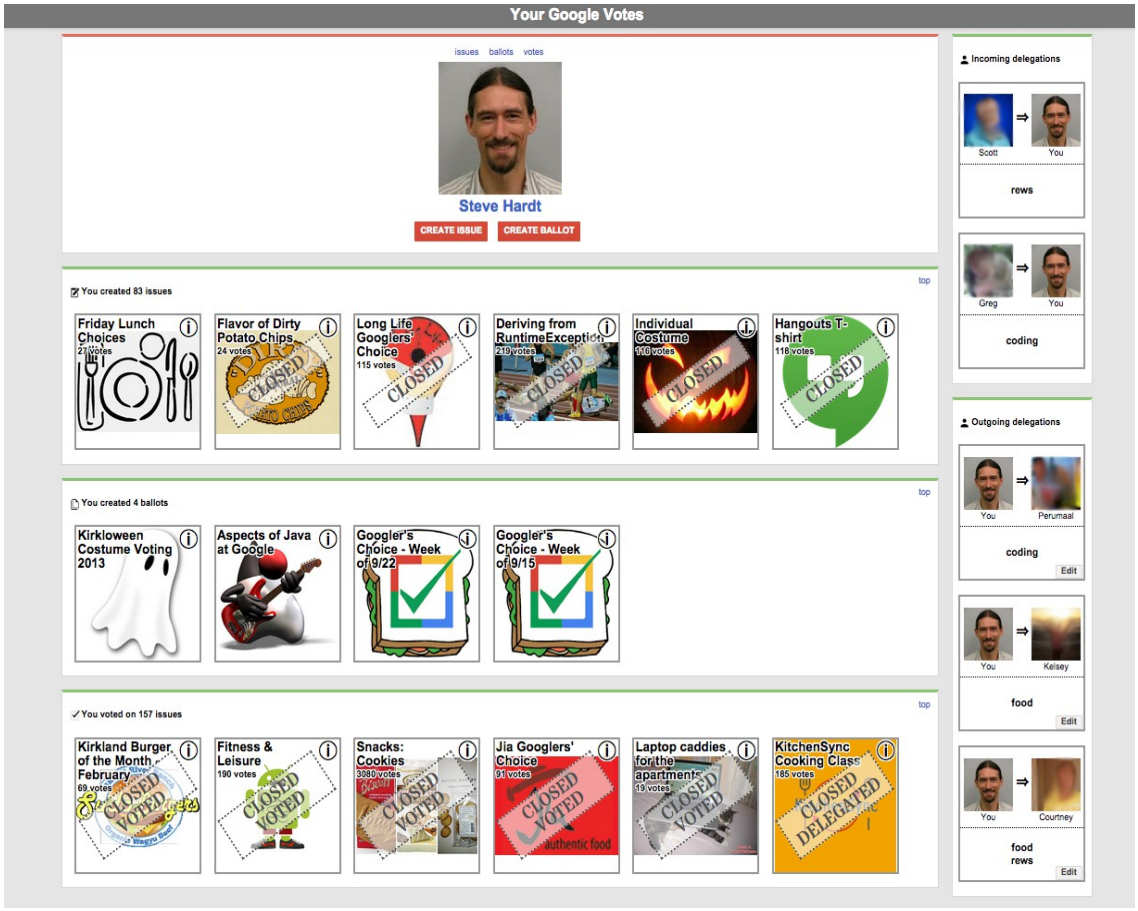


Figure 7. Democracy Dashboard / Voting Page

The list of votes includes delegated votes where another user cast the vote on behalf of the user. Clicking a vote marked as "delegated" shows the issue page with information on who cast the vote on the user's behalf. The voting page acts as a real-time "Democracy Dashboard" whereby a user can see all voting activity including what has been done "in their name".

Delegation advertisements

To assist in generating delegation relationships, Google Votes supports delegation advertisements. These are messages sent over Google+ where a user says why others should delegate to them. The posts include a link giving the viewer a chance to view the potential delegate's voting record and a mechanism to add a delegation (Figure 8). In addition to the user feeling rewarded as others delegate, the user's expertise and popularity is reinforced as delegating users see other users who have delegated. Thus, delegation advertisements can enable group leaders and potential leaders to build and reinforce their reputation which fosters greater group participation (Koh, Kim, Butler and Bock 2007).

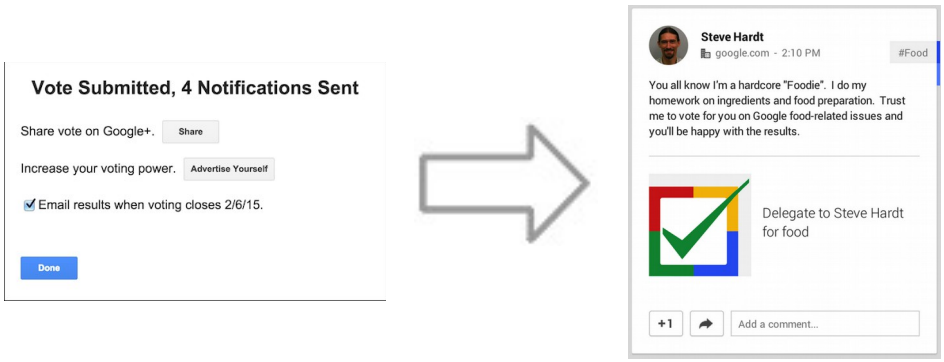


Figure 8. Sending a Delegation Advertisement

To educate users on delegation and delegation advertisements, Google Votes displays a teaser message "Increase your voting power" immediately after voting. Users who have just engaged with the system by voting can be intrigued by the idea of increased voting power and encouraged to try out delegation features.

Voting power estimates

To give users more feedback on how delegation can help them, Google Votes provides a voting power estimate on every issue at vote time. It tells users how many votes they would have if they voted and who would be delegating to them. For users with no delegated power, Google Votes says "Voting power: 1 vote" to hint there is a way to get more than 1 vote. And clicking this gives a secondary entry point to send delegation advertisements, see previous. Note, it is only possible for this voting power value to be an estimate. The exact voting power is only set when the issue closes and the final tally occurs. Up until that time delegation relationships can change to increase or decrease voting power, and people delegating to the user may vote directly which decreases voting power.

Delegated vote notifications

As part of providing delegated-voting feedback, Google Votes sends Google+ posts to users when others cast votes on their behalf (Figure 9). This gives transparency to users on how their votes are being used. If the user agrees with the vote, they do nothing. The notification serves to increase confidence that their delegate is representing them well. If the user disagrees, they can vote directly and override the delegated vote. Here, the notification serves both as a discovery mechanism for an interesting issue and as a chance to prevent an unwanted vote. If the user disagrees not just with that one vote but with how their delegate is voting in general, the user can remove their delegation. Now, the notification serves as a warning mechanism that their delegate is not representing their interests.

For full disclosure and for compliance with Google+ privacy policies, Google Votes always prompts the user before sending a Google+ post in their name. So, as a person with delegated power submits a vote, they immediately receive a warning that notifications will be sent to everyone delegating to them. At this time, they can choose to cast a "personal vote" which means they decline all incoming delegations and use only their own single vote. No notifications need to be sent for personal votes.

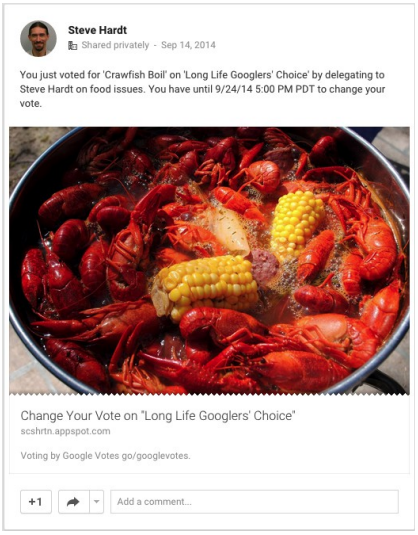


Figure 9. Delegated vote notification

Figure 10. GoogleServe 2014 Logo

Google Votes at Google

From March 2012 to February 2015, Googlers using Google Votes have created 370 issues, 131 of them grouped into 30 ballots. Google Votes has been visited by 20,000 Googlers, with 15,000 casting over 87,000 votes (including delegated votes). Issues with category "food" have the highest number of votes cast, over 73,000, and the largest number of issues, at 150. Other popular categories are "googleserve" (a volunteer work program at Google), "coding" (topics related to software engineering), "rews" (Real Estate and Workplace Services which includes the Food team as well as other workplace teams) and "google-store" (company-internal Google Store).

Of the total vote count across all issues, 3.6% were delegated votes. This is a small percentage but is significant considering effectively all users were new to the concept of delegated voting. Delegation advertisements were effective, 486 delegation advertisements were sent and 355 delegations currently exist.

Google Votes project leadership purposely chose food-related decisions as the primary initial theme and coordinated with Google Workplace Services to run food issues. Google has a strong food culture with free snacks and meals at on-campus cafes and free snacks at numerous *microkitchens* near work areas. Food decisions have wide appeal, affecting the daily lives of Googlers in all product areas. Food-related issues have produced lively discussions and led to high voter engagement. These issues gave space for product experimentation with little risk of failure on Google mission-critical decisions. In addition to providing real-world Google Votes usage, the food voting project set and met goals to increase Googler participation in food-related decisions and to improve the efficiency of the Google Food team in making meal and snack decisions.

The largest usage of Google Votes was for an event called the "Mountain View Microkitchen Food Fair" that took place in Google headquarters in Mountain View, California. During one day in September 2013, food vendors offered samples to several thousand Googlers (Louisville Business First 2013) in booths with a QR code that Googlers could scan to access a ballot with 25 categories of snacks (chips, energy drinks, chocolate, food bars, etc). In addition to the QR code, the Food team created a short link to the ballot and publicized it via email lists, Google+, and posters. Voting remained open for the week following the food fair.

Google Votes received over 175 thousand pageviews during the week of the fair and almost 4600 Googlers cast over 62 thousand votes. The average pages viewed per visit was 18, showing that most people voted for almost all categories. 30% of the visits came from Google+ showing the success of social-network sharing. Only 8.5% of the votes were cast by mobile devices, which included all the QR code votes. This

low number may be due to the dynamics of the live event and extra steps in the authentication process for mobile device access.

The fair produced good examples of delegation usage. One Googler has a vegan diet and so advertised his expertise on both Google+ and an internal vegan mailing list. He received delegations from 14 people which counted towards his food fair votes. Relative to votes overall, the fair had a larger proportion of delegated votes at 4.7%.

The results of the food fair became the basis of Google Mountain View microkitchen selections. The first place winners in all categories along with a number of the runner-ups became stocked in microkitchens. A smaller food fair was held a month later for the San Bruno, California Google office. It was also successful with 38% of all San Bruno Googlers voting and the results used for San Bruno microkitchen selections.

The second largest usage of Google Votes was to decide the logos for GoogleServe 2012 and GoogleServe 2014 (Marbin 2012; Marbin 2014). Over 2 thousand Googlers voted for the 2014 logo (Figure 10), and about 600 for the 2012 logo. GoogleServe is an annual event where Googlers volunteer in their local communities, e.g. in 2014 over 12 thousand Googlers participated worldwide.

Other than food fairs, Google Votes food decisions included lunch menus, the burger of the month, cooking classes, and other snack and food options such as flavors of frozen yogurt. Other than GoogleServe, non-food issues included several team t-shirt designs, a Halloween costume contest, building amenity names, items for the Google internal store, and Java programming language coding standards.

Successful issues were run using all supported voting styles. Yes/no worked well for a ballot of true/false trivia questions in a team-bonding exercise. Plurality worked for a two-option tote bag issue that did not fit the yes/no paradigm. Approval voting fit well for the food fairs since it requires only a single "approve" user click per option and there were many options, 202 options in the Mountain View Food Fair. Score voting worked for a robot-naming contest which also had many options, 51, and the contest organizers wanted more per-user information than simple approval. Ranked voting worked as a good default for the majority of issues.

Conclusion

Although democratic decision-making systems have enjoyed many successes, the implementations in direct and representative democracy systems have not lived up to the potential of democracy. The ubiquity of internet communications and social-networking software enables new forms of decision-making systems. Practical liquid democracy systems combining the best of direct and representative democracy systems are now possible. The Google-internal experiment, Google Votes, demonstrates that it is possible to implement a liquid democracy system on a social network in a scalable manner with a gradual learning curve.

Future Work

Features under consideration for Google Votes include:

- Issue recommendations - based on voting patterns by the user and the user's close social-network connections.
- Delegate recommendations - based on voting pattern similarities and social network affinity.
- Delegation-network change notifications - notify delegates when they gain and lose power to further encourage the meritocracy feedback aspects of the system.
- Issue lifecycle notifications - e.g. notification when an issue is about to close.
- Rule-based notifications - e.g. user requests notification when a vote is cast on their behalf for all issues categorized 'purchasing'.

- Private vote-visibility policies - see the "explicit politician" and "explicit delegation acceptance" approaches in "The Golden Rule of Liquid Democracy" above.

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