VOTING DYNAMICS IN INNOVATION SYSTEMS

Voting in social and collaborative systems is a key way to elicit crowd reaction and preference. It enables the diverse perspectives of the crowd to be expressed and aggregated into an overall view that can inform decision-making.

However, voting at scale (and in enterprise systems in particular) has unique challenges. To create an effective and accurate voting mechanism, one must understand and account for the voting behaviors that can arise in a social enterprise environment, such as herding behaviors, sparse voting, and cultural norms that influence voting engagement. In this whitepaper we examine several of these voting behaviors, and the approaches that successfully provide the best results. Ultimately, a social collaboration system must be intelligent and flexible enough to adapt its voting mechanism to the appropriate model for the context at hand.

Introduction

Voting is important in social systems as a way to aggregate opinion. Not all voting mechanisms work well in all contexts and scenarios – thus flexible and intelligent voting models must be employed to get the best results.

Voting in social and collaborative systems is a key way to elicit crowd reaction and preference. It is a means to aggregate opinions across a group, which in turn enables more informed decision-making. Indeed we all have an intuitive sense that obtaining advice and opinions from a diverse set of individuals, each with their own perspective and experience to share, provides us with the ammunition to make the best choices – typically much more informed choices than we would make individually without access to the diversity of knowledge in the crowd. In fact, this is precisely what the wisdom of the crowds principle has shown us to be the case – that the aggregate knowledge of the crowd provides more accurate and better results than any of us could generate individually [1].

As such, enabling and encouraging voting as a means to reach a conclusion that speaks for the group is a key mechanism for collaborative and social systems – to enable the crowd's diverse views and opinions to come together via votes into a crowd opinion that represents the collective voice of that group's knowledge.

Voting in social enterprise systems however, particularly at scale, has unique challenges. To obtain the best results, one must understand group voting behaviors and limitations, and create a voting model that takes those behaviors and limitations into account as it aggregates the crowd wisdom. Otherwise the aggregate opinion is inaccurate, not a true reflection of the crowd opinion. This is turn is quickly noticed by the crowd, turning the crowd against voting, not trusting the outcomes, and rendering this crucial crowd preference mechanism as ineffective.

To obtain the benefits of the crowd, a voting model must be both intelligent and flexible to account for each unique voting context and voter behaviors.

Voting in the Innovation Context

The dynamics of voting in the innovation context also mandate flexible and intelligent voting models – to get vibrant, broad and representative voting occurring, to respect and account for social norms in the enterprise, to provide appropriate granularity for decision-making, to maintain engagement and trust in the voting mechanism.

In social innovation systems where the crowd is collaborating and creating ideas that solve key business challenges, voting is a key element. Voting in this context helps to filter and rank the ideas according to the crowd wisdom, enabling those ideas with the most support from the crowd to bubble up to the top for further consideration. In this context, several voting behaviors emerge, and correspondingly various voting mechanisms need to be in place for accurate and optimal outcomes.

UP/DOWN VOTING

FOR SIMPLE ENGAGEMENT WITH VOTING.

The simplest mechanism for voting is to enable a voter to express a like or dislike for any/all ideas. With this mechanism, all users have the ability to rate an idea as they engage with it, providing a very simple like or dislike vote. This is the most commonly used mechanism, and the simplicity of the action (choosing like or dislike) makes it appealing as it removes any barrier to participation. We know that users have only a certain mental budget to invest in ratings, and the more work each decision entails, the fewer decisions the system gets.

Even this simple mechanism becomes a barrier when the pool of ideas grows large. Voting behaviors at scale show us that votes per idea, as well as votes given by a voter, and votes received by an idea creator, all follow the power law [2]. That is, most ideas, voters, and creators have/give/receive very few votes, with only a small percentage of the ideas/votes/creators getting a large number of votes. This can be seen in the long tail curve of typical votes per set of ideas shown at the left.

This is an outcome of the distributed attention that is a given when the volume of ideas is large and growing. It also shows that we typically see some herd behavior at scale. Thus up/down voting is a good rudimentary voting mechanism, but needs to go much farther at scale.

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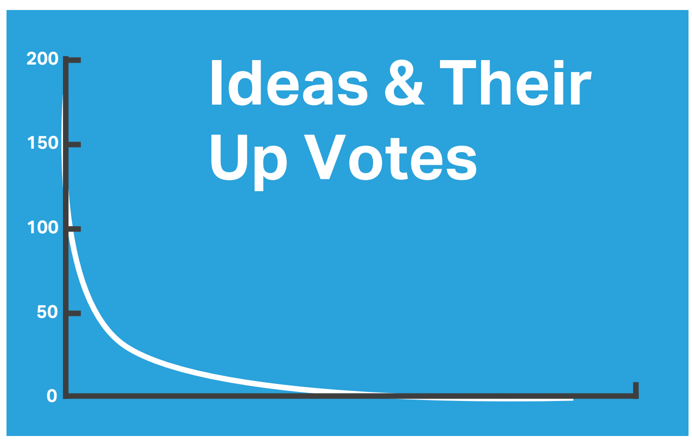


ONLY UP VOTING

TO RESPECT CULTURAL NORMS YET STILL ENABLE

One way to address the cognitive and scaling challenge of distributed attention that occurs as the volume of ideas grows, is to simplify the voting even further – by only allowing a 'like' or up vote. You'll recognize this model from Facebook®. Indeed we know that in the social enterprise setting, down voting is not particularly heavily used even when enabled. We also know that down voting is considered culturally inappropriate in various global contexts. We find a 6:1 ratio of up to down votes on average in the innovation context. Thus it is a natural option for such contexts to allow only up voting. However, while this model may match more closely the cultural norms of the enterprise, and it slightly lightens the cognitive load for the user, in essence the scaling difficulties remain as the pool of ideas gets large - one's attention still tends to be divided across that pool of ideas, and is typically still focused on only a few.

STAR RATINGS

TO ELICIT THE VOTING GRANULARITY NEEDED FOR THE DECISION-MAKING CONTEXT AT HAND.

For situations that require more granular voting feedback than simply the up/down provides, a star rating or other rating scale is appropriate. Star ratings encourage people to think more carefully about their choice, and provide a finer-grained opinion (bad, ok, good, very good, excellent, for instance). Places where you have likely seen star ratings are on Amazon® and IMDb.com. With star ratings, one of the key challenges is making clear what the rating scale signifies - so that there is consistency in the interpretation that leads to an accurate aggregate view. Star ratings also suffer from the challenge of distribution of attention as with up/down votes.

REVIEWS

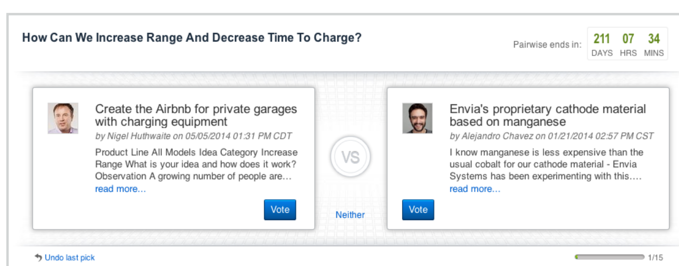
TO ENABLE RANKING AGAINST A CONTEXT-SPECIFIC SET OF CRITERIA.

Reviews are appropriate when the ranking or evaluation criteria are highly context-specific, and there are many separate facets per idea to consider. Reviews are typically a more timeconsuming method and thus useful for a smaller set of ideas. An example of the review mechanism that you've likely seen is on TripAdvisor®. In the innovation context, reviews are often used with a group of experts to rank the final ideas according to a set of criteria important to the business process at hand.

PAIRWISE

TO ENABLE ENGAGEMENT WITH VOTING AT SCALE, PROVIDE DISTRIBUTION OF VOTES, AND PREVENT INCONSISTENCIES.

Pairwise voting is a special type of voting that enables processing your votes on items in pairs. Thus, rather than browsing through a list of ideas, and choosing a few to vote upon, the system takes you through a simple and quick voting sequence between a set of ideas, and you express your preference of one over the other as you see each pair. It is an engaging way to encourage voting and idea discovery. You may have encountered a very rudimentary version of pairwise voting via the "Hot or Not" game, and on YouTube Slam. Our approach to intelligent pairwise voting eliminates the herding behaviors that result in the power law of voting, where everyone sees and votes on the same ideas (e.g. those on the leaderboard). Instead, the system selects the ideas to present to each user in an intelligent way that ensures the pool of ideas gets equal face-time and vote opportunities across the entire crowd of users.



This nicely distributed set of votes across the pool of ideas then serves as a solid basis for aggregating into the overall view of which ideas are most preferred by the pairwisevoting crowd. The intelligent approach to computing the ranking based on these votes is to compute the Wilson Score for each idea3. Wilson's algorithm is a model that is ideal for ranking situations where preference / voting information is not necessarily 100% complete – as in the pairwise situation, since each user may or may not fully complete their pairwise voting sequence across all possible pairs. You'll have encountered Wilson's algorithm if you use Reddit - the Reddit comment ranking is accomplished via Wilson scores.

Wilson's algorithm treats the votes seen thus far as a sample, to arrive at a probable score given the current voting evidence. As the amount of voting increases, the confidence in the score also increases, providing a way to get an aggregate opinion through all stages of the voting process. In addition, the Wilson's algorithm typically generates a unique Wilson score for each idea - enabling a true 1 to n ranking of the ideas. The alternative voting mechanisms (up/down, up, star) often generate the same 'rating' for several ideas, making those approaches less distinctive in a ranking scenario.

Behavioral Benefits with Pairwise

In addition to the engaging nature of pairwise and the sound ranking mechanism it provides when coupled with Wilson's algorithm, we've seen several additional positive behavioral changes in the crowd when pairwise voting is used. Increased engagement (2x or even 3x the volume of people actively participating in voting), a decrease in number of "bystanders" (those visiting but not voting), decreased effort to review/filter/select the ideas (more evenly spread across the entire crowd), and increased participation in the innovation process overall (9% increase in # users participating in ideation).

Thus not only does the pairwise approach provide an engaging and scalable voting mechanism, it results in several beneficial crowd behaviors, further augmenting positive innovation results.

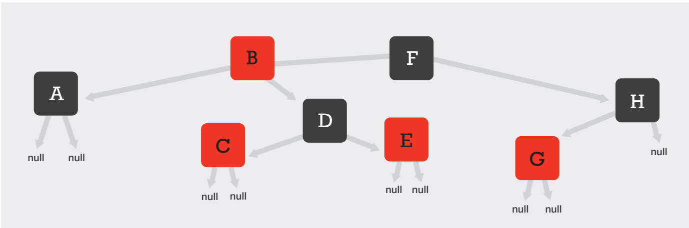
Special Considerations for Pairwise at Scale

Even with the robust pairwise approach to voting, care must be taken to ensure the simple and fun experience continues to elicit engagement as the number of ideas grows.

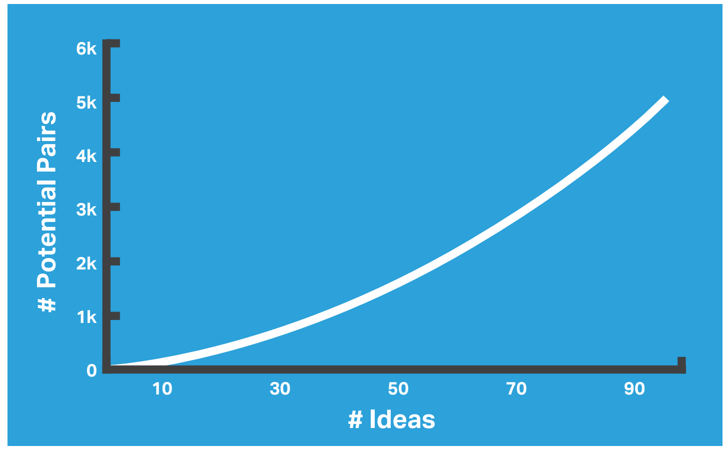
As the number of ideas grows, the possible pairings across those ideas grows quickly as well, as can be seen in the quadratic curve as shown to the left.

In order to enable this desirable pairwise approach to be viably used for every scenario as # ideas scales drastically upwards (as is typical in the large enterprise scenario), a new approach for selecting the pairs to view is desirable, which reduces the number of pairs such that each user does not need to see or vote through all possible pairings in order to have voted completely.

We have developed a unique approach to this, based on a special instance of a binary search tree known as a red-black tree, where each node in the tree is an idea, and has a color, either red or black. The coloring helps the tree to stay balanced, so that one branch does not get inordinately longer than another branch. This in turn, along with the way to navigate the tree and insert ideas as votes are given, ensures that the number of pairings that must be accomplished for complete voting is greatly reduced, as can be seen in the table below. This enables pairwise voting to be used across a broad range of voting scenarios, enabling its engagement and behavioral benefits to be gained across many diverse contexts.



# Ideas in the System	# Comparisons per Idea	
	Quadratic	Loglinear
100	99	6
1,000	999	10
10,000	9,999	13



Considering Voter Dynamics

In each of the voting mechanisms described here, in reality each vote should not be just taken at face value. To be truly accurate and responsive to the context at hand, each vote should be modulated by additional factors: is the individual giving the vote someone that typically can accurately spot the best ideas, is the voter typically sincere in their voting or sometimes colludes for personal benefit, do the voter's contributions in this context typically do well, and so forth. Spigit accounts for these dynamics by including reputation as a modulator for each vote, in essence generating an 'effective vote' from the 'actual vote' that encompasses each of these important aspects to result in a more accurate overall crowd opinion.

Summary

Voting in social and collaborative systems is a key way to elicit crowd reaction and preference. As the system scales, various voting behaviors, limitations, and needs emerge that must be accounted for in order to ensure the voting mechanism accurately portrays the collective opinion of the crowd. We have presented here a key set of these aspects: the power law behavior of voting caused by distributed attention, the appropriate granularity of voting information, the cultural voting norms of the organization and region, the engagement and productivity impact of the voting mechanism, and modulating each vote according to contextual factors. An effective voting model must be flexible and intelligent enough to recognize and adapt to these behaviors, such that the resulting aggregated crowd opinion accurately represents the collective voice of that group's knowledge.

	Stars	Like/Dislike	Like	Reviews	Pairwise
Simple to use and understand		✓	✓		✓
Rates against varied criteria	Can do			✓	Can do
Scales viably to large #s of ideas					✓
Guarantees1-n ranking					✓
Discourages herd behavior					✓
Examples	Amazon (/5) IMDb (/10)	YouTube	Facebook	TripAdvisor	YouTube Slam Hot or Not

REFERENCES

[1] Surowiecki, "The Wisdom of Crowds: Why the Many are Smarter than the Few and How Collective Intelligence Shapes Business, Economies, Societies, and Nations", Brown Publishing, 2004

[2] Power Law, Wikipedia, https://en.wikipedia.org/wiki/Power_law

[3] Miller E., "How Not To Sort By Average Rating", http://www.evanmiller.org/how-not-to-sort-by-average-rating.html, 2009.

Spigit was founded to help companies unleash the power of their employees, partners, and customers to drive innovation. Spigit is the leading software for crowdsourced innovation, and is used by leading companies in systems integration, financial services, insurance, pharmaceutical, healthcare, technology, and more, including IBM, Capgemini, Citibank, and Pfizer. Spigit's 4.5M users from 150+ countries have generated over $1B in increased revenue from their enterprise innovation programs. Spigit is a wholly owned subsidiary of Mindjet, and is headquartered in San Francisco with offices throughout the U.S., U.K., France, Germany, and Australia.

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