Approval and participation indexes for a voting process

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In finding the adequate way to prioritize proposals, the Brazilian participation community agreed about an approval index and a participation index. Both practice and literature is constantly handled by the experts involved, and the formalization of such model and indexes seems novel. Also, the relevance of this report is strengthened by the nearby use of these indexes, by the Brazilian General Secretariat of the Republic, to raise and prioritize proposals about public health care in open processes and assist federal public managers.

social participation | recommendation systems | online voting | statistics

Online decision making is a kind of recommendation system with special appeal for online social participation and electronic governments. This poses challenges on the design of such processes regarding validity, security and the adequate indicators. Indeed, the processes themselves vary, and the fact that the ranking indexes presented here seem not to be formalized and published is an evidence that such online decision is very recent phenomena.

The main contribution of this report is the indexes for an online voting process [1, 2, 3] with the following characteristics:

- proposals might be inserted by voters after the voting phase started.
- Voting might be extended as a permanent social participation instance. In other words, voting on and adding new proposals might be open continuously.
- A proposal is presented to a voter one by one as random outcomes of all proposals.
- Each vote might be of one and only type among: "approve", "disapprove" and "indifferent".
- Voters vote without authentication.

This setting requires care about security and validity. Some of which are:

- adequate estimates of threshold for statistical validity of the ranking.
- Keeping the IP address of voters to ease detection of automated and other fraudulent efforts.
- The use of the outcomes from the voting process. This requires probing the survey being conducted and its purposes. The indexes here presented targets the deliverance of indicatives for the Brazilian federal government about the most important health care proposals. Given the unauthenticated voting, the outcomes might be regarded as reference rankings if data is minimally shared and checked for inadequate data entry (such as voting by automated scripts or one persistent participant).

Approval and participation indexes. The approval index α_i and the participation index γ_i of the proposal i was defined as:

$$\begin{aligned} \alpha_i &= \frac{v_i^+ - v_i^-}{\eta_i} \\ \gamma_i &= \frac{v_i^+ + v_i^-}{\eta_i} \end{aligned} \qquad [1]$$

where v_i^+, v_i^- and η_i are approval count, disapproval count and exhibition count, respectively. Note that $\alpha_i \in [-1, 1]$, $\gamma_i \in [0, 1]$, and $v_i^o = \eta_i - v_i^+ - v_i^-$ is the count of the "indifferent" manifestations received by proposal i. Also, such α_i and γ_i indexes are expected, for each proposal i, to be constants plus a sampling estimate error that should be smaller as η_i raises. This error is thought to be acceptable if η_i is above a threshold $\overline{\eta}$ established by the participation community and public managers. As an initial decision, the staff agreed to use $\overline{\eta}$ as to select $10 - 20\%$ of all proposals. A threshold $\overline{\gamma}$ can be used as a required level of engagement for proposals to be relevant, while the threshold $\overline{\alpha}$ is used to classify the outcome as "approved","disapproved" and "clash". More specifically:

$$\begin{aligned} \eta_i > \overline{\eta} \quad &\Rightarrow \quad i \text{ is sampled} \\ \gamma_i > \overline{\gamma} \quad &\Rightarrow \quad i \text{ is relevant} \\ |\alpha_i| \leq \overline{\alpha} \quad &\Rightarrow \quad i \text{ is a clash} \\ \alpha_i > \overline{\alpha} \quad &\Rightarrow \quad i \text{ is approved} \\ -\alpha_i > \overline{\alpha} \quad &\Rightarrow \quad i \text{ is disapproved} \end{aligned} \qquad [2]$$

If a proposal is both sampled and approved, than it is prioritized. The coherent values of $\overline{\alpha_i} = 0.5$ (or $1/3$) and $\overline{\gamma_i} = 0.5$ were chosen as standards of the decision model. These are likely to change with implementation and management.

Selected decision framework examples. Many of the online decision processes conceived and practiced resemble our model and have similar measurements to the α_i and γ_i indexes. This section presents a collection of models more familiar to the Brazilian participatory community, with focus on the mechanisms, not on historical notes.

Pairwise [4] is part of the tackled paradigm: the ranking procedure accepts new proposals while the voting occurs. Even

so, pairwise voting is comparative, voter chooses between two proposals at each vote, and this does not fit proposed procedure.

Appgree software [5] ranks proposals by sampling voters in cycles, each with fewer proposals. This is adequate for a range of decision making cases and showcases statistical estimates utility. The system has a separate proposition phase, and relies on an organized group engagement and user identities, which also does not fit current needs.

Liquid Feedback [6] is a very renowned and bleeding edge solution for collective decision making. It relies on delegating your voting count on specific subjects to other people you know or trust. Therefore, it does not fit current needs. Even so, this framework have precious considerations for our case, such as about ranking and presenting proposals to voters in the most useful ways.

A Brazilian solution, used in diverse software and specially important as the output of a nation-wide decision making need, is the Agora Algorithm [7]. It presents a decision procedure in phases (agenda proposition, deliberations proposition and commenting, voting) with resolution outcomes. Although coherent, this framework requires authentication and might need experimentation and tuning so to achieve the desired use with more than dozens or a few hundreds of participants.

There is a number of other solutions for online collaborative prioritization, such as IdeaScale, Kidling, or any flavor of an Analytic Hierarchy Process (AHP). Authors hope to better formalize possible solutions (and found implementations), maybe through recommender systems theory [8].

Discussion

These are the best estimates the researchers designed, suitable for current needs and not found (yet) in literature. The following questions should be answered in near future:

- Are there more adequate measures for ranking proposals in the given setting?
- What are strong and weak aspects of the approach for collective recommendation?
- What thresholds will be the choice of community and will they be adjusted in time?
- Are there really no previous formalized solution to this problem in the exact setting? If there is, what comparisons can we make on design and outcomes?
- To which extent will participation community and public managers legitimize this approach?

Most importantly, this report is being delivered to the civil society and scientific community for consideration. Given the large number of possibilities for the collective ranking procedure, and the proliferation of solutions, research efforts might aim the organization of such procedures.

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