Evocracy

An Evolutionary Web3 Democracy

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Abstract

Evocracy is a concept for organizing democratic decision-making, which uses modern information technology for this purpose. The goal is to enable high quality decision-making, decentralize decision-making processes, and at the same time ensure as much anonymity and security as possible. At the center of the concept are user-created topics. These define a question or problem statement on which a decision is to be made.

Discussions on a topic are outsourced to small groups. All members of a group work on a collaborative document. Because of the small groups, every idea has a chance to be considered. Based on their topic-specific knowledge and ability to unify ideas, delegates from the groups are elected to higher levels where they again form small groups with other elected delegates. The number of participants and groups is thus reduced from level to level until a single document remains. Through the process, greater consideration is given to those ideas that prove to be reasonable and consensual across multiple groups in discussions. Through this self-organized process, good ideas are selected in an evolutionary sense.

Evocracy is free of explicit authority; all users have equal rights. Every user has the right to propose topics and can participate in any topic. To prevent abuse, a user's location and authenticity are verified in a decentralized manner, i.e., through mutual confirmation and evaluation. However, there is no way to identify users. Each topic is assigned to one of many possible target groups, which can dynamically emerge from the relationships of users' locations, regardless of existing structures (such as states, municipalities, etc.).

Contents

1 Introduction

The Evocracy concept deals with decision-making and therefore aims to enable an efficient legislation. There are two basic problems to be solved:

1. How can we find out if a *topic* is *relevant*?
2. How can we find a good solution for a *topic*?

The approach of Evocracy regarding the first problem is to allow *users* to mark certain *topics* as *relevant*. Further, there are mechanisms enabling that those *participants* who are capable of contributing good content and/or have a high sensitivity regarding the *topic* gain influence during the decision-making process for a given *topic*. The name Evocracy is derived from the evolutionary character of this approach and the grassroots-like contribution of all *participants*. We call the associated open source software OpenEvocracy.

2 Decision-making process

In order to make a decision jointly with many persons, a *topic* will go through different phases, which are explained below.

2.1 Creating and selecting topics (selection stage)

In principle, each *user* has the possibility to create a *topic*. A *topic* is defined by a headline, a description text, and a *target group* (either a *reference group* or *interest group* such as "Berlin", "Germany", "Rockfestival 2020" or "Human Resources Department", or a specific geographic area; see Fig. 3). The type, *reference groups* and/or *interest groups*, depends on the particular use-case of the OpenEvocracy instance. All *users* belonging to the *target group* can participate in the *topic*, thus, they are *potential participants*.

All *users* can contribute their opinions and comments to any *topic*. To promote high standards, *users* can add literature, e.g., scientific studies, to the description of a *topic*. This will allow that other interested *users* can get a differentiated and clear impression of a specific *topic*.

In order to select *topics* for discussion, all *users* have the possibility to judge their *relevance*. For this purpose, two thresholds are defined. These depend on the reference number $N_{\mathrm{ref}} \leq N_{\mathrm{tot}}$, where N_{tot} is the number of all *users* and N_{ref} is the number of the *potential participants*. The number of *users* that have marked a *topic* as *relevant* is denoted by K. A *relevance* vote expires if the *user* has not opened the *topic* for a certain period of time (e.g., 6 months), and does not mark

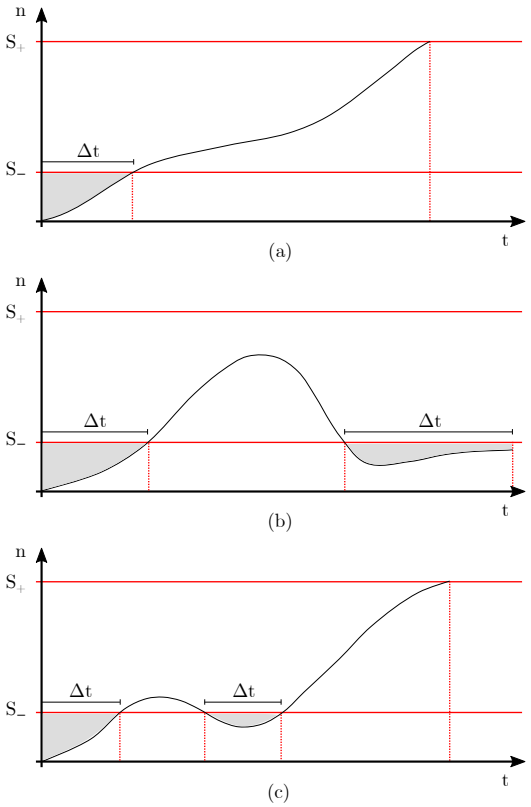

Figure 1: The thresholds for the number of required relevance flags determine when a topic is accepted for discussion. Many different courses are possible, three examples are depicted in this figure: (a) The number of relevance flags increases steadily and eventually exceeds the upper threshold, which leads to a start of the topic discussion. (b) The number of relevance flags initially increases, but then decreases. After being below the lower threshold for time $\Delta t \geq \Delta t_{\text{reject}}$, the topic is discarded. (c) The number of relevance flags initially increases, then temporarily decreases again, is below the lower threshold for a time $\Delta t < \Delta t_{\text{reject}}$, but then increases again until it exceeds the upper threshold. The topic is accepted and the discussion can start.

the *topic* as *relevant* again. If the ratio K/N_{ref} of a *topic* reaches a certain upper threshold, the *topic* is considered *relevant* and the discussion process starts automatically. If K/N_{ref} falls below a lower threshold, the *topic* is considered *irrelevant* and is subsequently removed. This process is called the *selection stage*, examples are shown in Fig. 1.

The thresholds are defined as follows:

- **Upper threshold**: If $K/N_{\text{ref}} \geq S_+$, where S_+ is the upper threshold, the *topic* is considered as *relevant* and the discussion starts.
- **Lower threshold**: If K/N_{ref} stays below the lower threshold S_- for a time period of $\Delta t \geq \Delta t_{\text{reject}}$, the *topic* is rejected. If S_- is crossed "from below" within $\Delta t < \Delta t_{\text{reject}}$, it leads to a reset of Δt, i.e. $\Delta t = 0$.

2.2 Proposals (proposal stage)

When a *topic* has been accepted for discussion, each *user* has the opportunity to write a *proposal* on the *topic*. In addition to detailed solution proposals, simple opinions, wishes or fears can also be conveyed. The *proposal* can only be edited within a time period T_P.

A minimum number of words N_P is required for the *proposal*, which intends to motivate the *participants* to independently think about the *topic* and to engage with the collected literature from the *selection stage*. On the other hand, the minimum number of words should be kept low to allow as many *users* to participate as possible.

The *proposal stage* ends when the aforementioned period T_P has expired. Further editing of the *proposals* is no longer possible after that period. *Proposals* with more than N_P words are accepted as valid. All *users* with valid proposals will become *participants* of the decision process on the given *topic*. They will be notified that they can participate in the following *consensus stage*. All other *users*, who have not reached the minimum number of words N_P or have not created a *proposal*, become *observers* of the decision process. *Observers* can only indirectly influence the following *consensus stage*, for example, through external forums (see below).

2.3 Decision making (consensus stage)

In the first *level* of the *consensus stage*, all *participants* are randomly divided into *groups* of size n_G (e.g., $n_G = 5$). Since joint discussions in large *groups* of possibly several hundreds of *group members* are difficult, it is sensible to form rather small *groups*.

Within a *groups*, *group members* are randomly assigned names and colors. These apply exclusively to a specific *group* and are not gender-specific. In this way, the *group members* have the option to remain anonymous at any time. Nevertheless, they can view the *proposals* of all other *group members*. In addition, an empty *collaborative document* is provided[1], and all *group members* have the permission to write in it. Through communication tools (e.g., chat, forum, scheduling, polls, voting), the *group members* can discuss their positions before recording the results in the *collaborative document*. Ideally, the *group* reaches a consensual solution for the problem. If this is not the case, the *group* is free to record disagreements and uncertainties in the document.

Writing the joint *proposal* in the *collaborative document* is accompanied by an evaluation process. The *group members* evaluate each other and themselves according to three criteria:

[1]It is a future goal that the *collaborative document* is initially filled with a proposal template automatically generated by a machine learning algorithm, based on the previous *proposals* of all *group members*. This algorithm should be optimized as the number of *topics* increases.

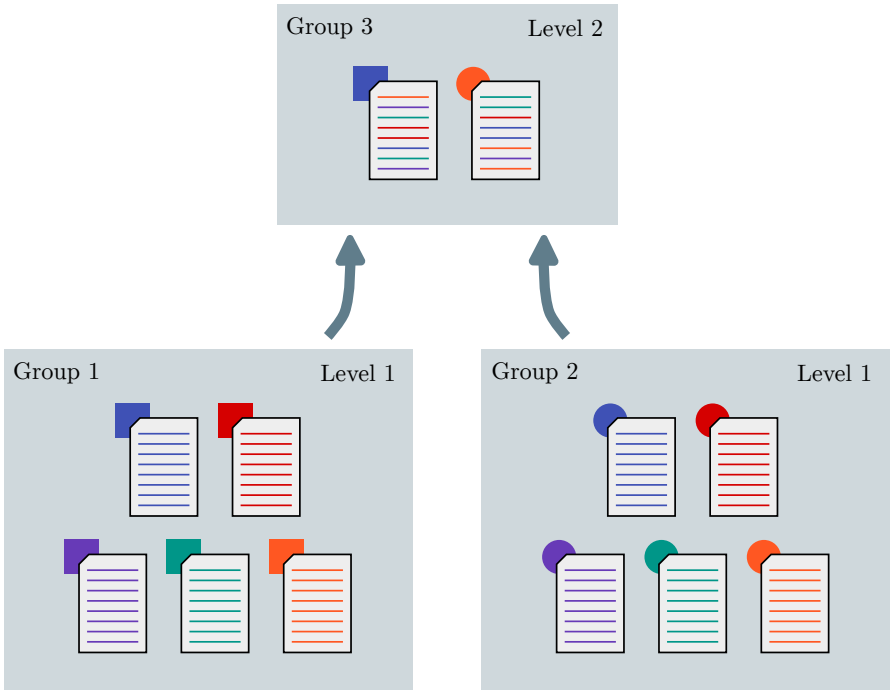

Figure 2: The evolutionary principle of the Evocracy concept. The colored squares depict members of group 1, colored circles members of group 2 and the colored lines in the documents depict their proposals. Each group develops a common proposal, which shall be conveyed to the next level by an elected delegate. Thereby, good ideas from earlier groups are transferred to groups of later levels. Likewise, users with high skills are more likely to enter later levels.

- **Cooperativeness**: How well does the *group member* cooperate? Is the person able to make compromises? Is the *group member* interested in comprehending all positions and not categorically excluding any? Does the person have the ability to find a new perspective for different positions that will gain higher acceptance?
- **Knowledge in the area of the topic**: Has the *group member* the ability to argue based on facts? Is the person well prepared for the *topic*? Can the person deal with the *topic* in a differentiated manner?
- **Invested time**: Is the *group member* regularly available? Does the *group member* continuously participate in the discussion and writing process? Does the *group member* respond promptly to discussions in the chat and/or in the forum?

Just as the *proposals* in the previous stage, the *collaborative document* of a *group* in a certain *level* of the *consensus stage* can again only be edited for a limited amount of time. After this time expires, the evaluation process is automatically finalized, resulting in a *delegate* being designated to represent the *group*. All other *group members* become *observers* and can no longer influence the process directly.

The elected *delegates* are again randomly assigned to *groups* of size n_G, provided with a new *collaborative document*, and are randomly assigned new names and colors. The *consensus stage* thus reaches a new *level*. The process continues until a single *group* remains at last which elaborates the final document for the *topic*.

2.3.1 Forums

Observers have no write access to the *collaborative documents* within the *groups*. However, they can view the documents at any time. In addition to the *collaborative document*, each *group* has a forum where all *users* can participate. Within a forum, specific parts of text in the *collaborative document* of the *group* can be referenced.

Through the forum, the *members* of the respective *group* have the opportunity to be inspired by and respond to external suggestions from *observers* at any time, while their work within the *group* is kept separate.

Some advantages of using forums to involve all *users* to the discussion process of a *topic* are:

- All *users*, including those who did not submit a *proposal* at the beginning, can contribute ideas, wishes or criticism. Ideas that were lost in the course of the process can be put forward again.
- A transfer of ideas between different *groups* is enabled. Decisions are thus optimized not only vertically between *levels*, but also horizontally between the *groups* within one *level*.
- *Participants* from previous *levels* can inform the *members* of the current *group* about changed behavior of their *delegate* and thus indirectly influence the further evaluation of the *delegate*.

2.3.2 Degree of consensus

At the end of the last *level* of the *consensus stage*, a vote on the final document takes place. Thereby, the extent to which all of the original *participants* of a *topic* agree with the final result is examined. The percentage of agreement is called the *degree of consensus*.

Regardless of the *degree of consensus*, the final document that has been developed through the stages remains in place. If a majority of the *participants* are not satisfied with the final result, however, *participants* may decide to re-create the *topic* such that it has a chance to be discussed and developed again.

2.4 Cleanup of topics

It is intended that some contents of a completed topic are endowed with an expiration date and are thus deleted after a certain time. First, after a time t_{df} after the termination of the *topic*, the forums within the *groups* are deleted. Next, after a time $t_{\mathrm{dg}} > t_{\mathrm{df}}$, the entire *groups* will be deleted. The final document remains, as does important metadata, such as statistics about the number of *groups*, group sizes, levels, contributions, as well as the number of votes for and against the final document.

The purpose of partly deleting the topic-related data is to reduce the load on the infrastructure and, for data protection reasons, to store only as much data as is absolutely necessary.

3 Locations and reference groups

The *locations* and the membership for *reference groups* are controlled by a so-called web of trust. This entails that *users* confirm several *locations* (residences or whereabouts) for each other.

3.1 Verification of locations

Each user can choose several *locations* (residences or whereabouts). In order to get a new *location* verified, the software first determines the coordinates of the current position (e.g., via GPS or Galileo) and suggests the *user*'s nearest *location*. If the *user* has not yet selected a *location*, they can either use the coordinates of the current position directly as the new *location*, or modify them as desired. The selected *location* is confirmed by other *users*, hereafter referred to as reviewers. The farther away the *user*'s location is from a reviewer's closest verified *location*, the lower is the weight of the reviewer's confirmation value. The sum of the weighted confirmation values must exceed a certain threshold for a *user*'s *location* to be verified.

A confirmation has the value 1 if the *location* of the *users* and the reviewer is identical, and it has the value 0 if the *locations* of both are on the exact opposite sides of the earth. The weighting function between these two points is nonlinear. The threshold for the verification of a *location* should be set relatively high to reduce the action of bots and to motivate *users* to choose their *locations* deliberately.

Every confirmation of a *location* by a reviewer is stored in a list, which is visible to all *users*. A confirmation expires after a certain period of time (e.g., 2 years), but can be reactivated without personal contact by mutual confirmation. Analogously to a friend request in social networks, the reactivation must be initiated manually by one of the two *users* involved. A reactivation should be

possible well before the confirmation expires (e.g., after 1 year), and once it becomes possible, the software will indicate this. The reactivation process should be very easy. Optionally, for example, for time-limited events, the expiration time for a confirmation can be chosen lower than the default value.

If a *user*'s *location* has not had confirmations for a certain period of time (e.g., for 3 months), then the *location* will be deleted automatically. A *user* can only have a certain number (e.g., 1 or 2) of new, unverified *locations* in addition to their already verified *location*. If the *user* wishes to choose additional *locations*, the previously selected *locations* must first be verified or the *user* must wait until a *location* is expired. This aims to prevent misuse of the *location* functionality, especially concerning bots.

3.2 Verification of reference groups

Each *user* can be a member of different *reference groups* (indicated by hashtags). To become part of a *reference group*, the *user* selects a verified *location* (if no *location* has been verified yet, joining a *reference groups* is not possible). The program will then suggest potentially relevant *reference groups* for the *user*, i.e., *reference groups* that are in geographic proximity. The *user* can then pick *reference groups* and get them confirmed by other *users* (see below for more details of this procedure). It is also possible to create a new *reference group*. The *locations* of all *users* that have received confirmation for a given *reference group* define the geographic extent of the *reference group*. This manifests itself in a density distribution to which all confirmed *locations* of the *reference group* contribute (as described below, confirmations are weighted by the confirming *user*'s distance to the associated *location*).

The confirmation of a *reference group* by one *user* for another *user* has to happen with respect to a specific *location*. This *location* must be selected by the *user* who wants to receive the confirmation. All confirmations received for a certain *reference group* are weighted with the density distribution of the *reference group* at the selected *location*, and then summed up. The confirmations for a *reference group* may be distributed over the different *locations* held by a *user*. A *reference group* is considered verified for this *user* if the sum of the weighted confirmations has exceeded a certain threshold S_{g}.

Confirmations of *reference groups* have an expiration date, analogously to the confirmations of a *location*. To avoid the effort for collecting confirmations, especially, for multiple *reference groups*, the threshold S_{g} should be set rather low.

3.3 Additional remarks

The number of confirmations for *locations* and *reference groups* that a *users* can provide for other users within a certain period of time (e.g., per week) is limited. Unused confirmations expire when this time has elapsed. In the next period, the same fixed number of confirmations is available, i.e. the number of possible confirmations is not cumulative.

The spatial extents of *reference groups* may overlap. For example, the extent of the *reference group* "#hamburg" would presumably be a subset of the extent of the *reference group* "#germany", and the extent of the *reference group* "#formele" of an event in Berlin is likely a subset of the extent of the *reference group* "#berlin".

A *topic* may be related to multiple *reference groups*. If there are two competitive *reference groups*, for example, "#gottingen" and "#goettingen", both can be added to the *topic*. In this case, all groups of *users* are merged and selected in an unambiguous manner.

4 Decentralization

4.1 Technical decentralization

In our vision, OpenEvocracy will be fully realized as a Web3 application, with the related data stored in a traceable and transparent way. In the long run, OpenEvocracy shall be designed in a way that no central nodes are used, in order to prevent that processes can possibly be manipulated by server operators. Thereby, powerful institutions such as countries or tech companies can not directly interfere with the network architecture and thus with the decision-making processes of OpenEvocracy, which will serve to ensure trust in the system.

Distributed Ledger Technology (DLT), e.g., in the form of a blockchain will be used to implement the decentralized data storage. Potential DLTs that may be used are Ethereum (ethereum.org), Polkadot (polkadot.network), EOS (eos.io), or DFINITY (dfinity.org). These technologies ensure that the data stored is valid. That means, data is stored only following the algorithm, which does not allow manipulation as by a central server operator. However, not all DLTs enable the storage of larger amounts of data. For decentralized storage of data and databases, the InterPlanetary File System (IPFS; ipfs.io) with OrbitDB (github.com/orbitdb) can be used. Further, only a few DLT projects currently support the decentralized provisioning of frontends. A fully decentralized software will therefore consist of a combination of different technologies and possibly even depends on new developments in the field of decentralized technology.

Note that as explained in section 3, the verification of *locations* and *reference groups* is performed

via a web of trust, where trust is shared among *users* in a decentralized manner.

4.2 Content-related decentralization

Upon the installation of OpenEvocracy, some parameters of the system can be set initially. Many other parameters, so-called *runtime parameters* (thresholds, processing time for the phases of a *topic*, group size, etc.), are chosen democratically and decentrally at system runtime by all *users*. A location parameter (e.g., the mean) of the chosen value from all *users* is used as a dynamic *runtime parameter*. Unlike in centrally organized networks, there are no user roles in OpenEvocracy. At the time of their registration in the system, all *users* have the same permissions. However, for which *runtime parameters* a *user* can propose values depends on the user's karma (see below).

The *author* of a *topic* assigns a certain region, i.e., a geographic coordinate with a certain radius or a *reference group*, to the *topic*. *Users* who are verified within this reference range (see section 3) have the possibility to participate in the *topic*. They are the N_{ref} *potential participants*. This explicitly enables to discuss *topics* independent of existing social structures (e.g., independently of country borders).

5 User account and social network

5.1 Anonymous user account

Any real person can create a user account, which consists of an e-mail address and a password. It is not possible to add pictures, a username, or other personal data beyond the mentioned.

When accounts are thus anonymous, bots and trolls can become a huge issue. Also, decision processes might be deliberately manipulated by one and the same person with multiple *user* accounts. Therefore, *users* have a karma value K which helps other *users* to assess the authenticity of a *user* account. The karma value is composed of various sub-values. These sub-values include reputation (e.g., the balance of upvotes and downvotes on *user* posts), trust (e.g., size of user's social network and degree of isolation), and position confirmations (e.g., number of confirmed *locations*, number of confirmed *reference groups*). Depending on the global karma value or on sub-values, *users* are granted or revoked certain permissions (e.g., to create *topics*, or to downvote comments). If the global karma value falls below a certain threshold $K < K_{\text{ban}}$, the *user* is assumed to be fake and blocking measures are initiated.

In order to prevent the creation of fake accounts even before they can be registered, *users* are only admitted to the network via invitations, where each *user* is only allowed to cast a certain number

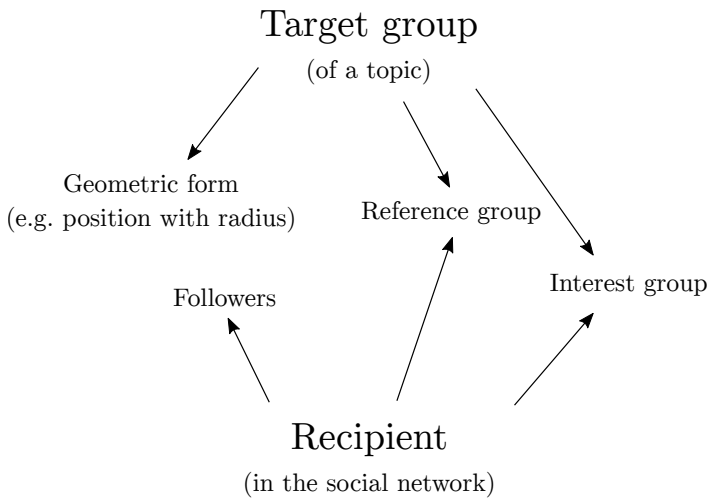

Figure 3: Possible types of target groups (in relation to topics) and recipient groups (in relation to posts in the social network).

of invitations (e.g., 1) per period of time (e.g., per week).

5.2 Social network

Users can connect with each other in order to find interesting *topics*, gather content-related inspiration, and share news. A piece of information sent by a *user* to their social network will be called a *post*. A *post* can be restricted to a *reference group* (see above), an *interest group* and/or to so-called *followers* (see Fig. 3). *Followers* and *interest groups* are described below.

Users who are interested in the *posts* of other *users* may follow them; they are then called a *follower*. The *follower* relationship is unidirectional, i.e., it does not require mutual acknowledgment, and it is anonymous. *Users* thus have the opportunity to learn about the activity of other *users* through a timeline of *posts*. This will provide them with potentially *relevant topics* and general information.

Users who share some common interest may join in so-called *interest groups*, whose members are called *comrades*. An *interest group* can be founded by any *user* and does not require a unique name. The founding *user* is automatically the administrator of the *interest group* who can grant other *users* access. The administrator can also rename or delete the *interest group*, or grant other *users* administrator permissions. An *interest group* can be assigned to a *topic* as its *target group*, which will allow only the *comrades* of an *interest group* to join the discussion as *potential participants* of the *topic*. Such *topics* are referred to as *closed topics*. In addition, for further exchange and discussion a forum will be available. Through this, *comrades* of an *interest group*

have the opportunity to notify each other about potentially *relevant topics*, jointly prepare new *topics*, and coordinate unified action in public *topics*.

6 Appendix

Reference group	**Interest group**
Organized decentrally	Organized centrally
Can be a recipient for *posts* in the social network	Can be a recipient for *posts* in the social network
Can be a *target group* for *topics*	Can be a *target group* for *topics*
Topics can be assigned to it, these *topics* are labeled *open*	*Topics* can be assigned to it, these *topics* are labeled *closed*
Open, i.e., in principle accessible for all *users*	*Closed*, i.e., only accessible for *users* with permission
Unmanaged; there is no administrator, a *reference group* can "emerge and fade"	*Managed*; administrators decide about adding new *comrades*, granting administrator permission and deleting/renaming the *interest group*
Decentralized verification by other *users* via algorithm	*Centralized verification* by administrator(s)
Name is unique, "#berlin" can exist only once	*Name is not unique*, "Berlin" can exist multiple times, only ID is unique

Table 1: Difference between *reference groups* and *interest groups*.

Glossary

author User who created a specific topic. 12

collaborative document Document that is edited by all members of a group collaboratively. 6–8

comrade User who is part of a specific interest group. 13, 15

consensus stage Stage of a topic in which participants of the topic are assigned to groups to collaboratively work on a solution; it consists of several consecutive levels; takes place after proposal stage. 6–8

degree of consensus Value representing how many participants of a topic approve the final document of the decision process. 8

delegate Elected representative of a group; enters the next level of the consensus stage. 7, 8

follower User who is interested in the activity of another user, which may entail following that user's posts. 13

group Participants are assigned to different groups for each level of the consensus stage (the last level features a single group). 6–9

group member Person who has been assigned to a specific group in the consensus stage. 6–8

interest group Group for a specific purpose that is organized in a centralized manner. 4, 13, 15

level Substage of the consensus stage; the number of levels is determined by the number of participants and the targeted size of the groups. 6–8

location One of several possible residences of a user; is verified if a sufficient number of other users has confirmed it; a verified location is necessary to enter a reference group and related topics. 9–12

observer User who has not submitted a proposal or who has submitted an invalid proposal for a topic (if the proposal is valid, the user is a participant). 6–8

participant User who has submitted a valid proposal for a topic (any user is an observer otherwise). 4, 6, 8

post Piece of content that a user sends out to their followers, a reference group, and/or an interest group. 13, 15

potential participant User who has the permission to submit a proposal for a specific topic (also see ‘target group’). 4, 12, 13

proposal An individual solution approach written by a user for a specific topic. 6–8

proposal stage Stage of a topic in which proposals can be submitted; takes place after selection stage and before consensus stage. 6

reference group Group for a specific purpose that is organized in a decentralized manner (e.g., considering geographic regions). 4, 9–13, 15

relevance Value that users assign to a topic to cause its launch, depending on a threshold of relevance that has to be reached. 4, 5, 13, 14

runtime parameter Parameter that changes the behavior of the software; is chosen democratically and in a decentralized manner by users. 12

selection stage Stage of a topic in which users can mark the topic as relevant; leads to the decision if a topic shall be discussed or not; takes place before proposal stage. 5, 6

target group Group of users that has the permission to write a proposal for a specific topic (also see ‘potential participant’). 4, 13, 15

topic Statement of a problem that is to be discussed and for which a solution is sought through a democratic decision process. 4–9, 11–15

user Person who is registered in a running instance of OpenEvocracy. 4, 6, 8–13, 15