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Designing a General Customisable Interface for Mass Online Deliberation

Bachelorarbeit

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Abstract. While the world is logically growing closer together, some societies are growing apart. The profit orientation of our most important digital social platforms is changing the way, we interact with each other at the expense of constructiveness and meaningful exchange. Towards a general, customizable interface for meaningful and constructive online exchange, this work provides a broad overview of existing tools through a structured literature survey. Many tools offer forms of online deliberation, such as voting, discussion or council monitoring tools and this work argues, that all of the tools should be combined into one platform, where all of their functions can be linked and brought into a larger frame. From the literature review, this broader framework emerges. It arranges groups, subgroups, users, modules (e.g. debate, action planning, voting) and components (e.g. knowledge hub, analysis tools, moderation) conceptually into a structure while leaving much freedom for future finer-grained design. General principles for the development of a prototype are discussed such as the principle of providing all conceivable options and next, a prototype is developed in form of a web application, that shows basic functions such as debates, chats and appointments. Imaginary groups present the user a state in the life of a person that engages in three different groups and shows different use cases in different scenarios. Finally, the implications of the technical implementation and elaborate directions for future work are discussed including an evaluation of the prototype. This thesis tries to serve as a starting point and create a frame for future comprehensive research and development of constructive mass online deliberation.

Table of Contents

1	Introduction	1
2	Background	3
2.1	Action Planning	3
2.2	Argument Mapping	4
2.3	Petition	6
2.4	Participatory Budgeting	7
2.5	Council Monitoring	9
2.6	Knowledge Hub	9
2.7	Voting	10
2.8	Platform Features	11
2.9	Ideation Challenge	11
2.10	Live Event Support	12
3	Related work	13
3.1	Methodology	13
3.2	A Debate's Lifecycle	14
3.3	Debate Layout	14
3.4	Moderation	15
3.5	Funding and Distribution	15
4	Design Implications	17
4.1	The Lifecycle of Groups	18
4.2	Groups and Subgroups	19
4.3	Components	20
4.4	Processes	20
4.5	Modules	22
5	Development of a Prototype	25
6	Discussion	29
6.1	Limitations	29
6.2	Future Work	29
7	Conclusion	30
	Appendix	viii

1 Introduction

In times of increasing globalization, global connectivity is higher than ever before. In 2024, 68 percent of the world's population used the internet, compared to 37 percent in 2014 [1]. This comes with the potential of valuable communication and collaboration, dialogue and exchange. At the same time, societies all over the world are growing apart [2]–[4]. The population of Germany, currently ranked 13th in the democracy index, is having major issues finding consensus as disinformation like fake news and populism are on the rise [2], [5]. The internet, once considered a technology that can potentially unite people, is now driving us apart, as all of today's most important social platforms are profit-driven [2], [6]–[10]. One major consequence is the digital isolation from opposing views through digital filtering, described by two phenomena called “echo chambers” and “filter bubble” [11]–[14].

At the same time, when users interact outside of their chambers or bubbles with users of different beliefs and opinions, these interactions tend to be counterproductive and volatile [15]–[18]. The author assumes that the observed behavior is not the result of an anthropological constant (“that's just how people are”), but is instead largely shaped by the design and functional logic of these digital platforms. Studies suggest, that the design of social platforms has a direct influence on the behavior of users: The concept “code is law” by Lessig asserts that on the internet, the primary source of social norms is encoded within the platforms [19]. Gastil and Davis [7] offer multiple reasons, why the current design of mainstream social platforms is harmful: ”Further, Facebook has shared millions of users' personal information with political manipulators, who used the data to target users with disinformation (“fake news”) to influence the 2016 U.S. presidential election [8], [20]. Commercial Internet companies have been the objects of various other critiques, such as the charge that they promote racism through crude algorithms [21], [22], cause widespread depression and social anxiety among young people [23], undermine social intimacy [24], alter brain chemistry and processes in unhealthy ways [25], and decimate the kind of journalism that is essential to a well-functioning democracy [26]–[28].“

“Deliberation is the careful discussion before decision, and it can be defined as the thorough dialogical assessment of the reasons for and against a measure before a decision is made.”

— Anastasiou et al. [29]

Deliberation has been found to improve accuracy and contentment of a groups decision [30], [31]. And many tools are supporting groups in their day-to-day decision making, all with their own idea of deliberation implemented into code. But for each function such as voting, discussion or ideation, a separate tool is needed and there is no link between them. For the sake of comparability, assessability and testability for researchers, standardization, scalability and consistency for programmers and clarity, accessibility and efficiency for users the author believes, that a common framework is necessary. The desired platform functions as an intelligent hub, that a group can precisely tailor to their specific needs. All conceivable features should be offered for selection and

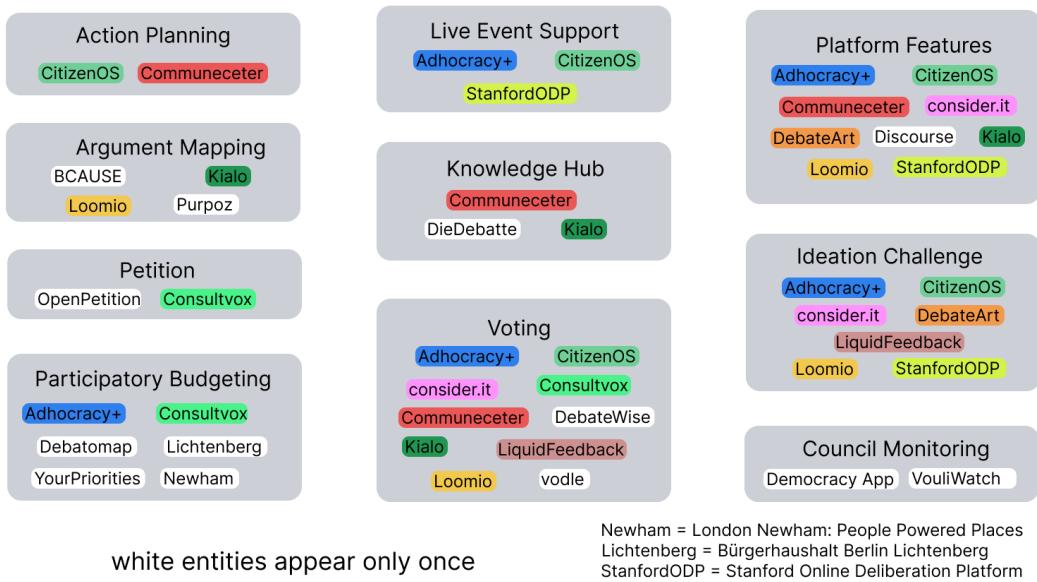
are linked together logically. How a decision is made, is entirely up to the users. Maybe the platform is used for discussion and the decision is made by elected board members in an offline meeting, by the owner of a company or by a parliament as usual. However, groups can even find new ways to consensus through online deliberation. As a result of this interconnection of different features, monitoring features allow any user to create statistics about a groups behavior and draw comprehensive conclusions about questions like "Does our board favor a certain portion of the group?" "Are decisions generally made against a certain fundamental principle that a group expects?". And finally, if such a platform can exist, transparency could drastically improve, decision makers would know what their group expects from them and a group knows whether their leaders act in their interest or not.

Towards an open standard for mass online deliberation, this work will first explore the different ways, deliberation happens in today's online spaces. Relevant tools are analyzed and features are defined, that will need to be included. Secondly, a literature review is conducted to understand the current state of research. It highlights the relevant design aspects and provides the basis for the next step: In the chapter "Design Implications", necessary next steps towards mass online deliberation are discussed and a larger framework is conceptualized as a solid foundation to build future research upon. Resulting from these considerations, a prototype is developed, functioning as a demo version of new form of for social network. Basic functions are displayed as users can explore imaginary examples of online communities. And finally, limitations and possible future work are discussed, concluding with a summary of the key findings and their implications.

2 Background

During the research for this thesis, 24 related and currently active tools were selected for analysis in the following section. Each of these projects focuses on a specific use case or target group and therefore provides a variety of features. To compare them to one another, a set of 10 general features has been identified. Tools not available in English have been translated. The selection of tools was primarily based on the assumed deliberative potential for online communities, and in a second round of filtering, some were taken out because they were either too similar to others or didn't have enough features. Petitioning, for example, is a widely used approach to deliberation; hence, many websites and tools are available for its use. More relevant to this work is the intersection of features, and individual tools could meet up to 5 of the 10 general features. Everything provided by these 24 tools, relevant to online deliberation, is explained in the following section and grouped into the 10 general features. Each feature will be defined, analyzed and put into the context of a broader framework.

Fig. 1: Overview: Features and their Fulfilling Tools



2.1 Action Planning

After a decision has been made, actions are often expected. It is possible that one person or a group is given the responsibility to carry out the consequences of that decision. Tasks may need to be defined and assigned. Tools that meet the expectations for this feature require a feedback function from the execution team to all decision participants. Here, they can share the current status and progress. Two of the analyzed tools meet this definition, though only in basic terms. Fig. 2 shows a screenshot from CitizenOS. The initiator of a discussion can keep the community updated about the measures they take

after the discussion phase, i.e., during the action phase. Further potential improvements to this feature are as follows: To create a feedback loop, users can be allowed to comment and discuss the progress or suggest alternative measures. Different outcomes of a decision can require different approaches. It is possible that the expected action is an ongoing process, something that must be done daily, weekly, monthly, or yearly. The responsible person may change weekly; therefore, a timetable must be created. The execution team may want to discuss the details, requiring a structured debate.

The screenshot shows the 'Plans and updates' section of the CitizenOS platform. At the top, there are dropdown menus for 'Groups' and 'Categories'. Below that, a summary box shows 'Participants: 24' and a 'Manage' button. A 'Notifications' section allows turning on notifications for staying updated. On the right, a 'Voting' section shows 'Ended' status with 21 votes collected, and an 'Action' section shows 2 updates. The main area displays three updates:

- Update #2 Pilot project launching next week**: Posted 'a few seconds ago'. Content: "Next week, we'll be launching a pilot project to test some of the ideas generated in this topic. This will help us learn what works and adjust where necessary. More information will be shared soon!"
- Update #1 Workshop planning in progress**: Posted '2 minutes ago'. Content: "Your voices have been heard, and we've already begun turning your ideas into action. This week, we've taken the first step by planning a workshop to skill up community stakeholder in sustainability strategies. This is just the first step in what promises to be an exciting journey, thank you for participating!"
- Create an update**: A form with fields for 'Title of the update' (containing "How is the decision being put into practice?") and 'Content of the update' (containing "Please provide details, links, etc."). A 'Post an update' button is at the bottom.

Fig. 2: The Action Phase (CitizenOS) [32]

2.2 Argument Mapping

Contrary to a chronologically ordered debate (as seen in typical forums where a new post or comment is always placed on top of the previous one), argument mapping requires the option for users to post a contribution in a visually structured debate format. In the Figures 3,4 and 5, the structure is generally the same, though visualized in different ways. The question needs to be in binary format, a so-called "yes–no" question. Users can give statements for both sides, and other users can respond to these arguments with either agreement or disagreement. Kialo visualizes the discussion in two ways: One is an argument tree (Fig.3) with the main question at the top and respective statements descending from each node. The other is the so-called Sunburst view (Fig.4), with the main question at the center and descending statements moving one layer outward towards the periphery. Agreeing statements are colored green, and disagreeing statements are colored red. This can be misleading if a user interprets all green as agreement with the main question and vice versa, when they actually always relate to the statement from which they descend. Kialo is specifically designed for classroom use and has a limitation

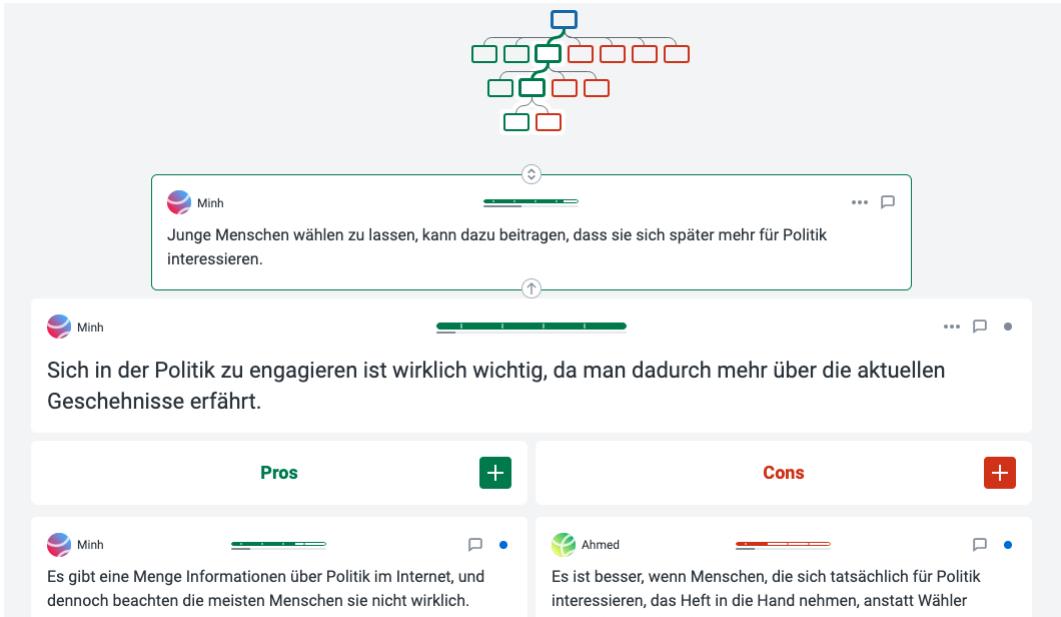


Fig. 3: Tree View (Kialo) [33]

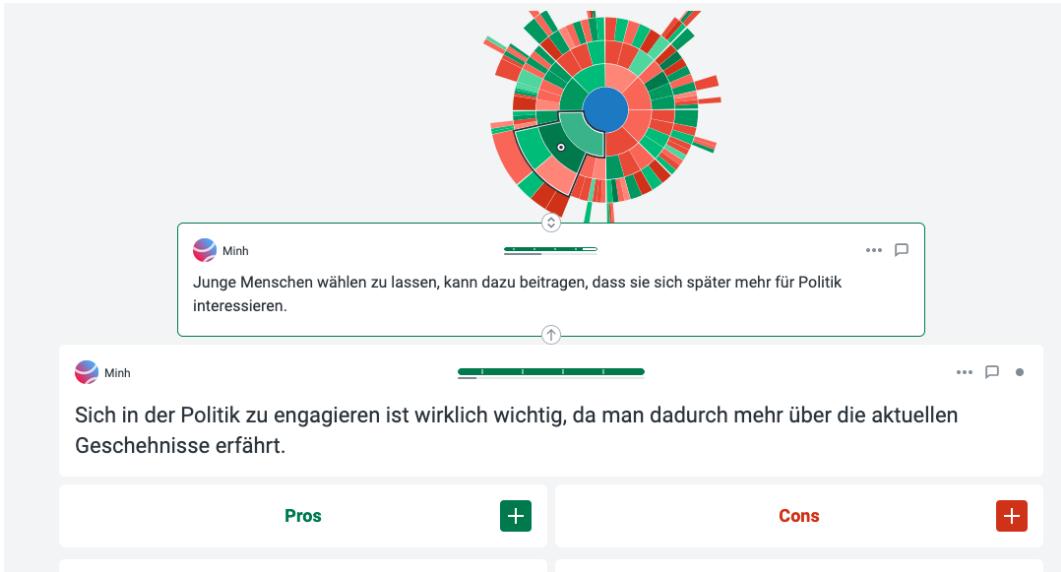


Fig. 4: Sunburst View (Kialo) [33]

on the maximum number of users. It is clear that neither of the visual representations can handle large discussions, such as 60 statements for each side on the first level and 15 for each side of each statement on three subsequent levels. The tool “BCause“, on the other hand, addresses this limitation by presenting a scrollable outline view on the right-hand side (Fig.5). This way, users can easily get an overview of the structure even with high numbers of statements. The internal order is still chronological and does not allow sorting by other features such as relevance or most discussed. Also, both tools lack

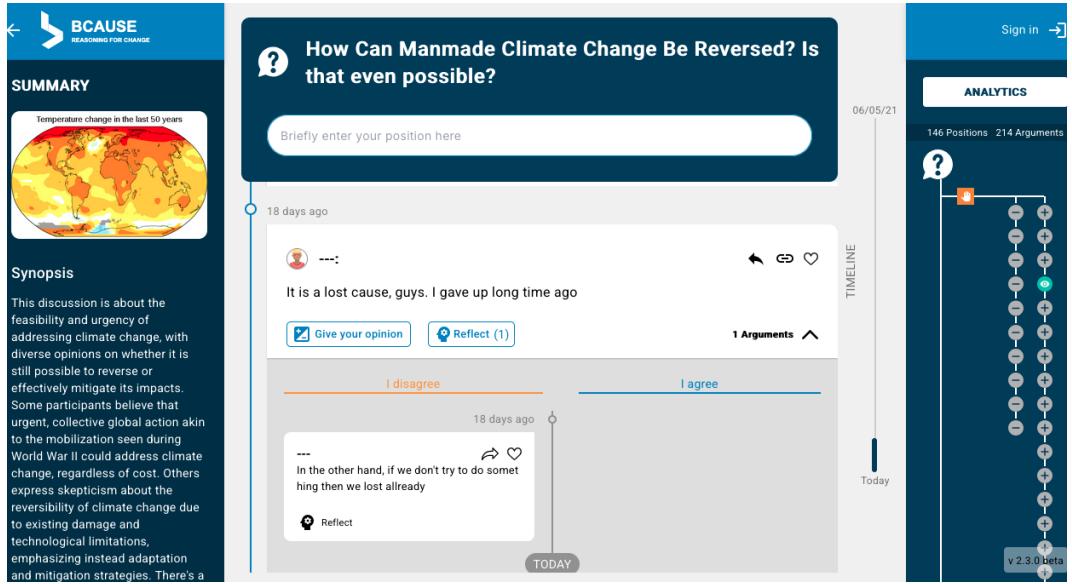


Fig. 5: Outline View (BCause) [34]

a search function or automatic analysis to determine whether a statement has already been made by another user. This would ensure that all arguments are listed no more than once. Also, questions with more than one answer, such as “how much...” or “which of the following 3 candidates...”, cannot be handled by these tools. Other conceivable details could include a slider for 0-100 percentage agreement and different types of statements such as argument, evidence, emotion, opinion, etc. Each group, or even each discussion, might need a special set of rules. Thus, the rules of a discussion should not be fixed but should be defined prior to every new discussion. The set of rules must be communicated to the users and enforced by the tool itself or with the help of moderation. Examples of such variable rules include: “allow/force anonymity; on/off”, “evidence obligatory for every statement; yes/no”, “expression of emotions allowed; yes/no”. Another useful feature could be the integration of statistics from council monitoring about past decisions. This would allow users to quickly analyze past decisions regarding the advantages of a certain prioritized aim or the disadvantages of a specific subgroup. Integrating a Knowledge Hub into a discussion could be helpful for users to easily provide evidence and facts.

2.3 Petition

Petitions are formal requests from a community or population to their decision makers. Usual online petitions can be supported, and the number of supporters can indicate the degree of importance to the population [35]. Users are able to start a petition or support one. Petitions can be policy recommendations, appeals, or requests and have as recipient the responsible group or person. Tools which offer this feature must meet these requirements. Lots of websites can be found that offer petitions; in this thesis, only one is exemplarily shown. “OpenPetition.de“ works like any known petition tool, with the addition of the individual quorum, as explained later in this subsection. The initiator of

a petition can enter text, images, and external sources to make a request. To support a petition, users submit personal information, for example name, address, and email. Petitions are constitutionally organized by a variety of governments. By law, the German Bundestag is committed to answer any petition that collects 30,000 subscriptions in less than six weeks [36], [37]. But not all municipalities and states have such regulations. In this case, OpenPetition.de sets an individual quorum for each petition depending on the size of population that is affected. A quorum means here the threshold of supporters a petition has to pass to be taken to the competent authority. OpenPetition.de will then send requests to all involved individuals, for example all members of a parliament, and publish their answers online. Fig.6 shows one exemplary outcome of such a quorum.

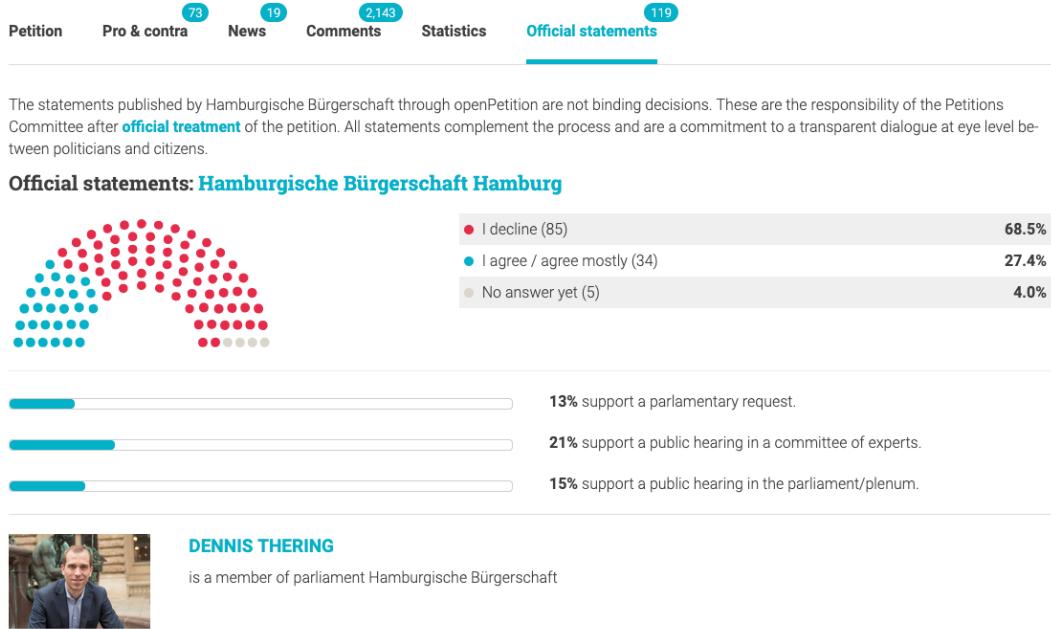


Fig. 6: Results of an Executed Quorum in Hamburg (Openpetition.de) [38]

2.4 Participatory Budgeting

To find out how public money can best be spent to meet people's needs, some platforms offer tools to collect ideas and identify the wishes of the population [39]. To be listed here with this feature, tools must at least offer written requests, an option to see the status of approval of a request, and the actual implementation progress in case a request has been approved. Numerous websites and tools exist that meet this requirement, and a few have been chosen representing different approaches. Bürgerhaushalt Berlin Lichtenberg and Debatomap offer marking ideas on a map and make it possible to initiate mostly minor changes such as adjusting speed limits or reducing noise pollution. The status of approval is updated, and once a request is approved, updates about the completion are provided. Another approach is used by the London-Newham-Project "People Powered Places". Instead of a permanent process, in which different initiatives can be in different phases,

a budget is defined and to be discussed over several months. The whole process spans 10 phases (Fig.7), during which citizens propose projects aligned with shared priorities. In phase 6, the projects can be voted for, and then projects with the most votes are approved until the allocated budget is exhausted. Updates of the implementation are provided, and an evaluation phase precedes the next cycle.

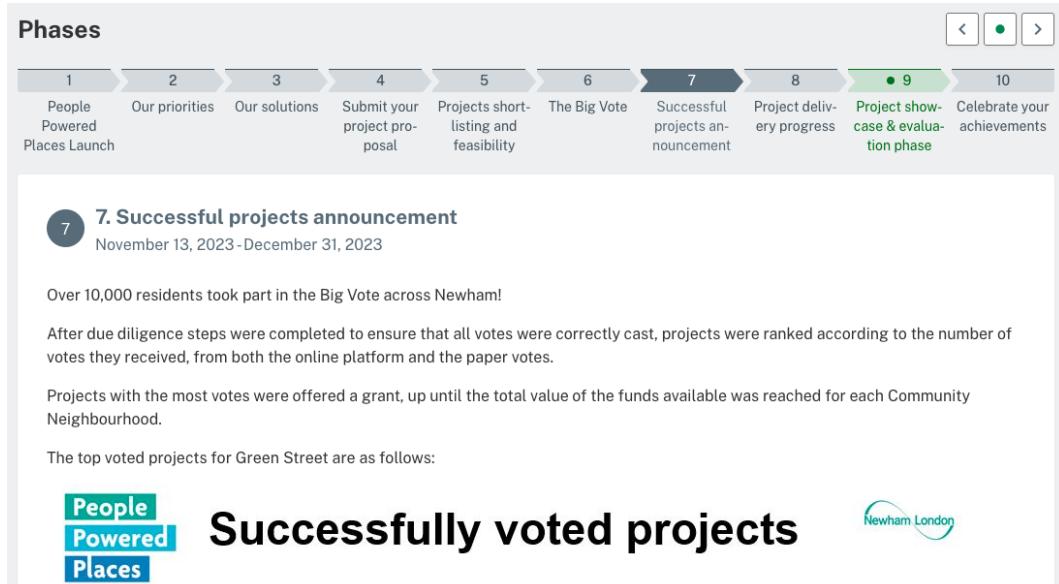


Fig. 7: 10 Phases of London Newham's People Powered Places [40]

2.5 Council Monitoring

Whenever decisions are made in a council or any type of conference, the course of events can be made accessible to the public. This is the minimum requirement for this feature, but some tools offer several options to analyze or discuss decisions. Fig.8 shows the tool “DemocracyApp“, which monitors the German federal parliament, the “Bundestag“. It allows users to gain insight into proposals submitted by German parties, which are

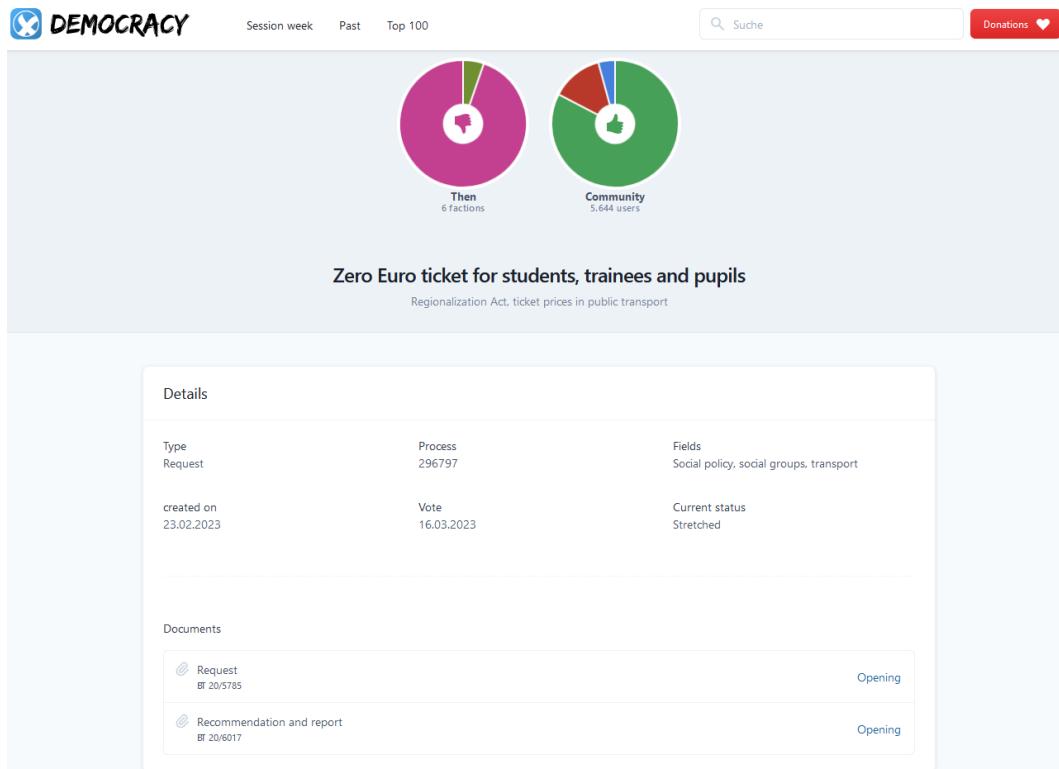


Fig. 8: Monitoring of Parliament Decisions (DemocracyApp) [41]

then discussed and finally voted on in parliament. These proposals are published by German public institutions, and DemocracyApp collects and presents them in a clear and accessible way. Users can also vote for or against a proposal, and the results are visually compared to the actual parliamentary vote, as shown in the two pie charts in Fig.8. The other analyzed tool, “VouliWatch“, offers even more direct contact with Greek government officials by allowing them to create a profile and make public statements. It also features a highly detailed comparison of Greek party positions on various topics, as well as informal requests to individual officials, which are made public. These requests can include questions, ideas, or suggestions.

2.6 Knowledge Hub

Tools are listed under this feature which offer any form of external information source aggregation. Of the analyzed tools, “Kialo“ is the only one that integrates a basic

implementation of this feature into their discussion section. All external sources can be managed and reviewed in an automatically created list. Fig.9 shows “Die Debatte“, a curated Knowledge Hub led by a German institute in cooperation with a German university. The website is not a platform but rather aims to summarize the public debate around all kinds of topics with the guideline to be strictly scientific and free from opinion. The question of common sensemaking, meaning a tool in which users create knowledge by themselves, like the open-source project “Wikipedia“, is not covered in this work. It can, though, play a crucial role in online deliberation for users to operate from a shared evidence-based foundation.

Children's poverty

Child poverty – That was the debate

Child poverty and coalition agreement: what experts say

Children's poverty in our society

Costs of Climate Change

Costs of Climate Change – That was the debate

The value of climate models

Climate protection is the best adaptation

all contributions

evaluation **society** **politics**

armut **society** **Children**

evaluation **climate change** **economy**

climate change **methods** **economics**

Climate protection **climate change** **farm**

Fig. 9: Collection of Scientific Sources by Topics (Die Debatte) [42]

2.7 Voting

Voting or polling, as one of the most basic methods of decision-making, is implemented in some of the tools. To meet the requirements, users must be able to select from different options in a vote and ultimately see the results. Some tools offer advanced mathematical mechanisms for example to better account for minorities. Votes can be initiated by a specific group or by anyone, and affected users cast their votes. All of the tools operate similarly in this regard. Each user has one vote, and the result is displayed in either relative or absolute numbers. A deadline can be set, and some tools include a comment

section. Typically, voting begins once the discussion phase concludes. Some tools offer priority voting for more than two options, allowing voters to rank options based on agreement, with the tool calculating the most commonly agreed upon options. One tool, designed specifically for voting, features sliders indicating 1-100 percent agreement, rather than a simple yes/no decision [43]. It is based on a mathematical theory that aims to reduce polarization, inequality, the impact of strategic voting, the status quo, and chance, while enhancing the recognition of minorities.

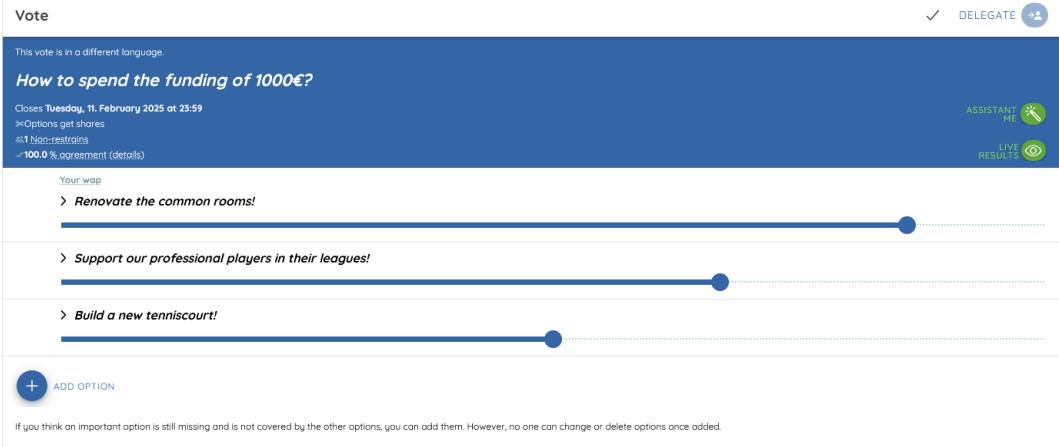


Fig. 10: Voting with Sliders (Vodle) [44]

2.8 Platform Features

These are features like text/voice/video chat, shared documents, calendars, and user profiles. All tools that include at least one of these features are listed here. These features can help with the general organization of a group and generate a communication basis that only indirectly influences the deliberation process. It can though, offer advantages for the direct implementation and monitoring of past decisions, as well as fostering mutual understanding through a high level of transparency, which likely leads to efficiency gains, especially for smaller groups, such as sports clubs and communities.

2.9 Ideation Challenge

To compare ideas as opposing answers to the same question, Ideation Challenges can help organize opposing positions clearly within a discussion. Users can support and discuss ideas. Some tools allow users to collaboratively refine an idea and then vote using a priority voting system to support or oppose the ideas. The tool “Liquid Democracy“ allows users to create a new initiative in response to a given question or problem. Users can agree, disagree, or suggest changes to existing initiatives. After the initiative phase ends, users are asked to submit their priorities for the given initiatives.

The screenshot shows the LiquidFeedback interface. On the left, a sidebar for 'Proposition #386' lists steps: 1. Admission (reached 6), 2. Discussion (29 days 21:25:31 left), 3. Verification (15 days), and 4. Voting (15 days). It also shows a message about being interested in the issue and an option to remove interest. Below this is a section for 'Competing initiatives' stating there are none. On the right, a main panel for 'i402: Picnic area in Liberty park' shows a summary, a rationale (mentioning many parks offer picnic facilities), a draft history (4 entries), and suggestions for improvement (2 entries, one titled 'Trash Cans & Recycle Bins'). A blue thumbs-up icon is visible in the top right corner of the main panel.

Fig. 11: Ideation through Initiatives (LiquidDemocracy) [45]

2.10 Live Event Support

Meetings can be time-consuming and ineffective. To enhance the experience of meetings, such as conferences and roundtable discussions, digital tools offer supporting features. Such tools are listed under "Live Event Support". The "Stanford Online Deliberation Platform" offers a number of tools for online group meetings with 8-15 participants via video chat. It features a live agenda and automated speaker management, where admins set limits on participants' speaking time. "Adhocracy+" allows listeners of in-person meetings to participate in discussions, whether they are in the room or attending via video broadcast. They can ask questions to people in the room, vote for interesting questions, and enable the moderator to ask the most popular ones to the right people. Potential additions to these features include live surveys or voting and the integration of other features, such as the Knowledge Hub or Argument Mapping.

3 Related work

As a relatively young field of research, online deliberation has developed considerably since the 2000s and produced new possibilities for social interaction, but has not yet been made widely accessible to the public, as Gastil and Davies [7] conclude. The fostering of collective intelligence, especially e-deliberation, is now recognized for improving decision accuracy [30], [46], [47]. This chapter provides an overview over the existing research.

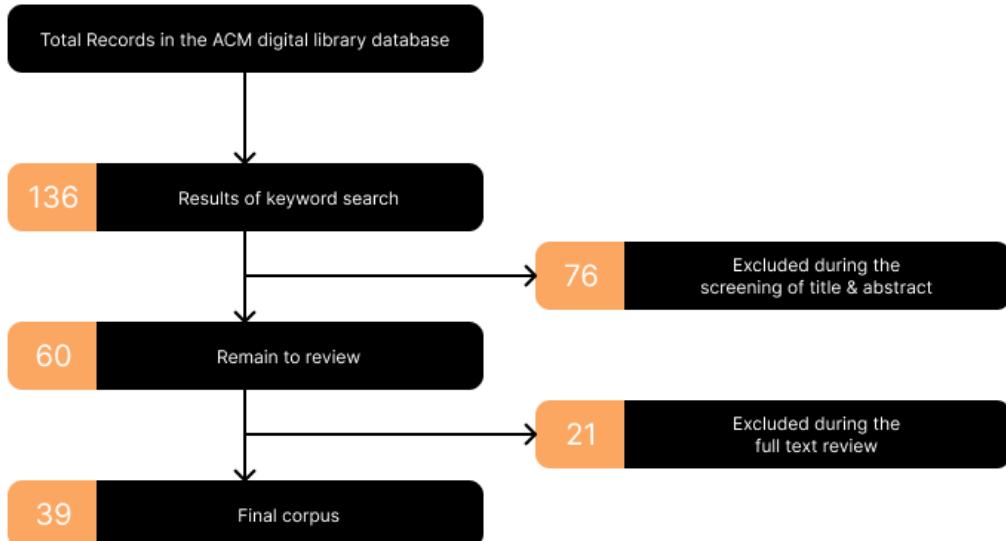
3.1 Methodology

To systematically review relevant papers, the PRISMA [48], [49] method was used, as visualized in Fig. 12. The ACM digital library's output to the keyword had 136 results, which were narrowed down to 39 papers during the process. No other libraries were used, so no removal of duplicates was necessary. The input keyword was:

(“e-deliberation“ OR “online deliberation“) (“interface“ OR “platform“)

The first step of the exclusion criteria involved evaluating the papers' titles. 76 of the 136 papers did not cover the research question or discussed it in a different context. During the screening of the remaining papers, another 21 were excluded because they did not focus on the design but on other features of deliberation platforms. Out of the remaining 39 papers, categories were identified during the review and will be summarized in the following section.

Fig. 12: PRISMA flow chart of the systematic research



3.2 A Debate's Lifecycle

There are many approaches to reaching a decision. These need to be reflected by a decision-making software just as there are rules in day-to-day decision-making in our kitchens, workplaces, or relationships. Not all of these decision-making processes have the same set of rules, and in Mass Online Deliberation, people from diverse backgrounds come together. But who makes these rules in the first place? A rule such as setting anonymity on or off can directly influence the outcome, as users might not want to disclose their opinions publicly. Does a group need to set rules, general aims, and aspirations prior to a debate? Does deliberation start with a common problem or with a common aspiration? All of the screened papers, which deal with these questions [50]–[53] propose a 5-phase deliberation with phases similar to those described by Tian, Cai: “(1) identify public values, (2) develop options, (3) estimate consequences, (4) weigh alternative options, and (5) the decision itself“ [50]. Velikanov [53] discusses the need for a phase zero, in which users submit their “preference profile“, meaning general values or interests and affiliation to communities such as religious, professional, or political. This generates the possibility to further analyze past decisions’ real consequences. Trends in favor of or against a certain subgroup or community can be displayed and general values or aims can be observed throughout past decisions. The opening questions to this subsection could not be entirely answered during the “related work“ section. Thus, possible suggestions will be discussed in the next section “design implications“.

3.3 Debate Layout

To make discussions visually accessible, researchers examine different layout options. In most discussion forums, such as ”Reddit“, comments are sorted by popularity with the most popular comment at the top. Research shows that this sorting distorts debate through a ”rich-get-richer“ mechanism that can suppress less popular opinions, for example the perspective of a minority. It also rewards extreme opinions or offensive language [15]. Argument maps aim to organize discussions with a focus on context. While Shum and Nick Hammond showed in 1994 [54], that Argument Mapping is not accessible by anyone without training, more recent research suggests the opposite [55]–[61]. The use of chatbots to structure and search for arguments was shown to be a useful tool [62]. Frappier et al. [63] provided an analysis of 26 user interfaces for deliberation. They identified three different sections that could be found in any of them and compared the layout to one another. The majority (21 out of 26) used the Topic-Submit-Display sequence, meaning the topic section would always be on top of the page containing a description and general information about the debate. The Submit section follows, providing a text input field and lastly, the debate is visualized in the Display section. Friess and Eilders [64] argued that this sequence, especially the fact, that Submit comes before the Display section, can affect the debate at the expense of constructiveness. This way, the focus is set on individual contributions, while users should be encouraged to interact with each other [63]. Two studies discuss the structure inside the Display section with the same result. Almost all of the tools use either a Pro/Con order forcing users to take a stance before entering a

contribution, or a threaded order, like used in common forums [55], [63]. In this context, epistemic means the collective accumulation and validation of knowledge. It is highlighted as a critical feature of deliberation and is recommended to be integrated into the debate layout [55], [65], [66].

3.4 Moderation

There are many arguments for and against moderation, and different versions of moderation are proposed in the analyzed related work. Advantages of a high level of moderation include the ability to exclude offensive, false, or misleading statements, thereby generally providing validity to a discussion [67]. It also prevents a phenomenon called “crowd buzz” by Velikanov [68], meaning that many users speak without listening to each other. On the other hand, low moderation has its own benefits, and the majority of papers analyzed here suggest keeping moderation as low as possible [67]–[69]. Advantages of low moderation include a higher degree of perceived fairness [67], more input by users, measured by the number of comments [70], and a reduced work effort [71]. Also, self-regulating moderation, where users of the platform moderate each other instead of relying on an external institution, carries the risk of excluding underrepresented minorities [72]. External moderation, on the other hand, increases the level of suspicion among users [73]. Moderation can be further distinguished into two categories: pre- and post-moderation, which involve screening contributions for violations of discussion rules before (pre) or after (post) they are published [71]. Velikanov suggests a mutual pre- and post-moderation with moderators being chosen randomly from among the users for each contribution [68]. Perrault and Zhang propose to keep moderation limited to screening debate for insult and inappropriate behavior [67]. Debate Hub allows moderators to split contributions if it consists of two parts that belong in separate places in the argumentation framework. Moderators can merge contributions that complement each other or move individual ones to another position [55].

3.5 Funding and Distribution

Not many of the selected papers address the distribution and funding of a project of such scale. But those who do, argue against private development and for a large-scale open-source project led by an independent institution and funded with public money [6], [7], [74]. Schuler [6] summarizes the disadvantages of privately developed software for this purpose in five points:

- (1) Profit as Priority: Private social media corporations depend on advertising, and design follows this priority regardless of society’s needs [7]–[9].
- (2) Lack of Transparency: Open-source software is publicly available, and although not everyone can read it, publicly trusted and journalistic institutions can verify details such as privacy and security for the public [75]. For the same reason, the German governmental council for IT planning, “IT-Planungsrat”, suggests the use of OSS [76].
- (3) Data Harvesting: To keep economical power out of democratic decisions, it is crucial to preserve data privacy. As an example: The 2016 presidential election got heavily influenced

by means of social media. Facebook shared millions of users' personal information to conductors of disinformation campaigns [8], [20].

(4) Lack of Public Influence: The interface of a private social tool is designed by few while in an open-source project, anyone can join the initiative and shape the way a platform is made.

(5) Lack of Complexity: As a result of the above four points, social media platforms don't support the complex tasks that benefit deliberation.

4 Design Implications

With the results of chapter two "Background", one requirement will be the inclusion and logical connection of all gathered features inside one platform. This chapter will discuss the necessity of offering all conceivable features to the user's customization. The desired platform is expected to support all described features of chapter two such as "Action Planning", "Debate" or "Voting", provide freedom to order them in any desired way, link them together automatically and provide a coherent structure of arbitrarily many groups, subgroups and members. With the results of the literature survey in chapter three, the author proposes the next step towards a globally applicable standard for mass online deliberation: a top-level framework needs to be developed, meaning a superordinate logical structure and definition of entities such as users, debates and groups and the way they are linked together. This framework could not be identified during the research and is therefore conceptualized in this thesis and to be evaluated in future work. This thesis does include a technical proof-of-concept, but no empirical validation of real-world applicability, which is necessary to assess its impact and usability in diverse contexts. The following theoretical considerations support the relevance of the proposed concept: One general design principle is to offer all possible features identified during this research in order to allow users to customize the tool to their needs. This has two reasons: Firstly, redefining the "best possible" mode for online deliberation is impossible with the limited research conducted so far, if ever. To provide common ground for future development, evaluation, and research, comprehensive analyzing tools, open to any user, need to be featured in the aspired software. The second reason is that groups may have different requirements. One example is the context of culture. The current research is mostly limited to western culture, though cultures vary in deliberation-style all across the world [77]. If a platform is envisioned to foster exchange, debate, and compromise among all humans across cultural, ideological, socio-economic, moral, and geographical distances, which is the desired outcome, it needs to be highly flexible in operation without fragmenting into multiple separate tools. For this reason, modules, components, and rules are suggested from which each group can assemble a platform to reflect their own way of deliberation. Douglas Schuler supports the same concept: "What the space looks like is largely up to them: It could look like a familiar social networking site or it could look entirely different. A large number of templates that provided different formats would be available to them and all of these would be amenable to local customization. (Ideally, this could all be accomplished by any person using the system.)" [6] This principle of providing all conceivable options makes even more design decisions obsolete for now, for all options will be supported by the tool finally and the decision will be up to the user's preference. Further, working towards a common framework in form of an open standard can potentially increase development speed, evaluation quality and therefore the quality of deliberation itself. It allows broad testing in real communities and detailed research, when more researchers use the same framework. Another significant advantage of open-source development is the involvement of the user community, known as "crowd sourcing" [78]. This section aims to conceptualize this framework and will advance from general, broad design decisions to finer-grained, more specific details.

4.1 The Lifecycle of Groups

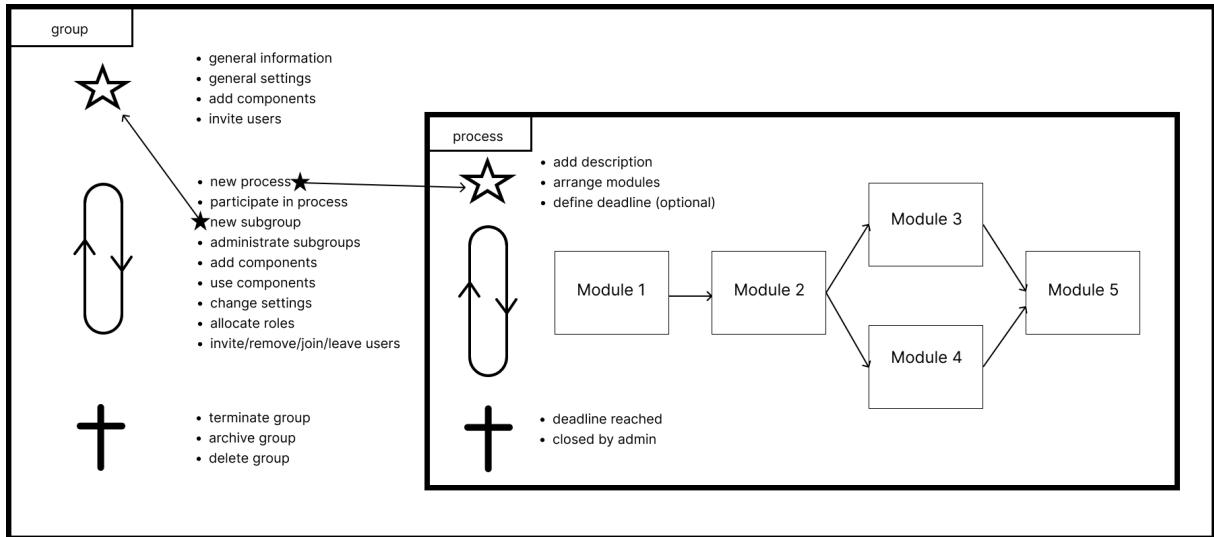


Fig. 13: Groups and Processes

To chronologically structure a deliberation group, three phases are described in the following subsections: (1) Initialization, (2) Operation, and (3) Termination.

(1) Every deliberation group starts with Initialization: The group is given a name and some additional information, general settings are adjusted and finally, users get invited. The way users get invited can differ and is chosen by the initiator: A public group can be entered with or without a password, a private group is joined by a general or personal invitation link. A general invitation link is one that anyone can use and that can be used multiple times. A personal invitation link can be used only once. If the initiator wants to prepare names and more profile information for each user, database integration can be very helpful for creating many profiles and invitation links at once. If the database includes the users' email addresses, the platform offers automated, personal invitations. Once the initialization is done, the group proceeds to the operation phase. (2) Here, the actual deliberation takes place with all its debates, decisions, and monitoring. This phase has its own chronological structure, and processes usually can't run sequentially, unlike in the other two phases. Possible actions of the operation phase are such: create new process, participate in process, create new subgroup, administrate subgroups, add/remove components, use components, change general settings/rules, allocate roles and invite/remove/join/leave users.

(3) As defined in the settings, every user permitted to do so can terminate, archive, or delete the group. Terminate means that only special roles can submit content to the platform; anyone else can only browse all saved and accessible content but cannot input anymore. When deleting the group, it will be taken offline with the option to save it as an archive. If this option is chosen, all users are notified and given the option to create their own archive as well.

4.2 Groups and Subgroups

Every subgroup is a new group, and creating one will initiate the described three-phase procedure for a group. Thus, every subgroup can have more subgroups on its own. Members of a group can access components, processes, and modules of every group that it descends from. If a group's visibility is set to "public", this relation also applies in reverse. Other possible visibility settings include "only results", "only info and members", "private", and "invisible". The group that a subgroup A descends from is called A's parent group. A potentially helpful feature could be federalization: The rights to contribute to a debate are reduced to one representative or delegation of a subgroup. This way, large groups of perhaps national or global scale can form groups with internal deliberation, each having one informed and trained representative or delegation. This way, interests of, for example, all children, all Muslims, or all self-employed individuals can be summarized before being brought to the next level of deliberation. With a platform like this, it would be effortless to monitor the consequences in terms of the number of negatively or positively affected people.

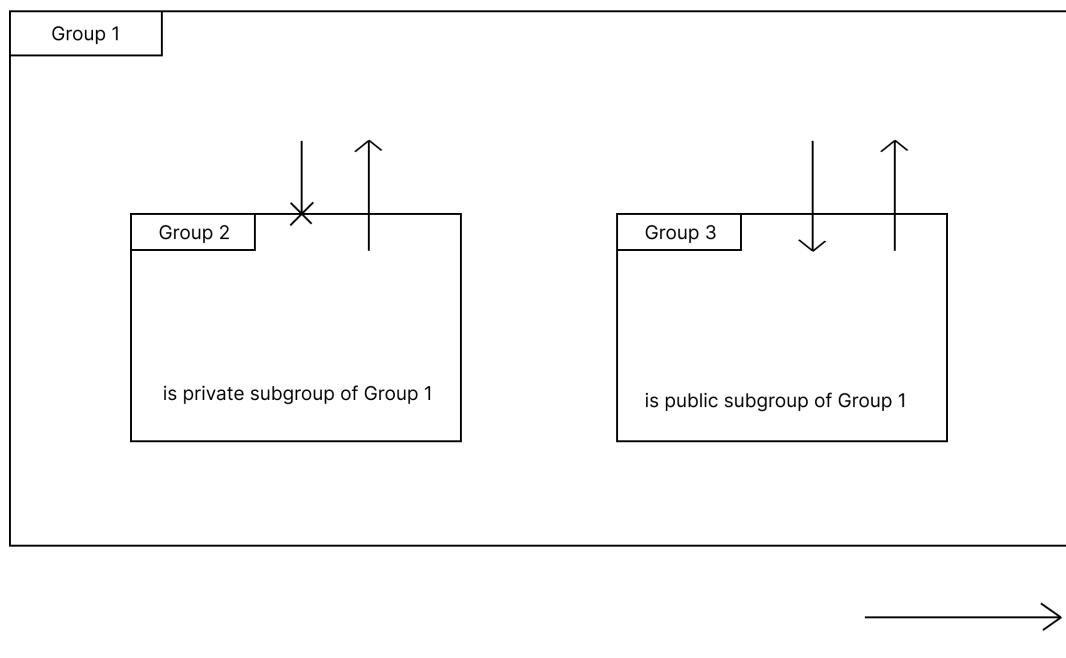


Fig. 14: Groups and Subgroups

4.3 Components

Features that are always available and not linked to individual processes are defined as Components. There are optional and mandatory Components and some are inherited by parent groups, meaning only the root group can integrate these components. Some components are exclusive for each group and any group can integrate them.

Analysis Tools is a mandatory, exclusive component that allows each user to create statistics and charts based on the group's data. Users can share their statistics or use predefined sets to visually analyze their group's decision behavior. A configurable dashboard can be set to show one's most relevant information and is updated in real-time. This way, users have the opportunity to explore questions like "How many of the past decisions have been made in favor of one subgroup or one objection?" or "How often do our decision makers follow the common advice?" and monitor them.

The **Knowledge Hub** is an optional component that gets inherited by the root group. Reliable knowledge is generated here, which can be used as evidence in the debate. How it can be designed is not part of this thesis and should be researched in future work.

Platform Features is an optional, exclusive component that includes features like text/voice/video chat, shared documents, calendar, and user profiles. These features can be used individually or as an integration into modules. **Principles** is an optional, exclusive component that allows collective identification, verification, and prioritization of principles such as fairness, sustainability, growth, and productivity. These principles are monitored and tracked, and responsible persons can be assigned.

4.4 Processes

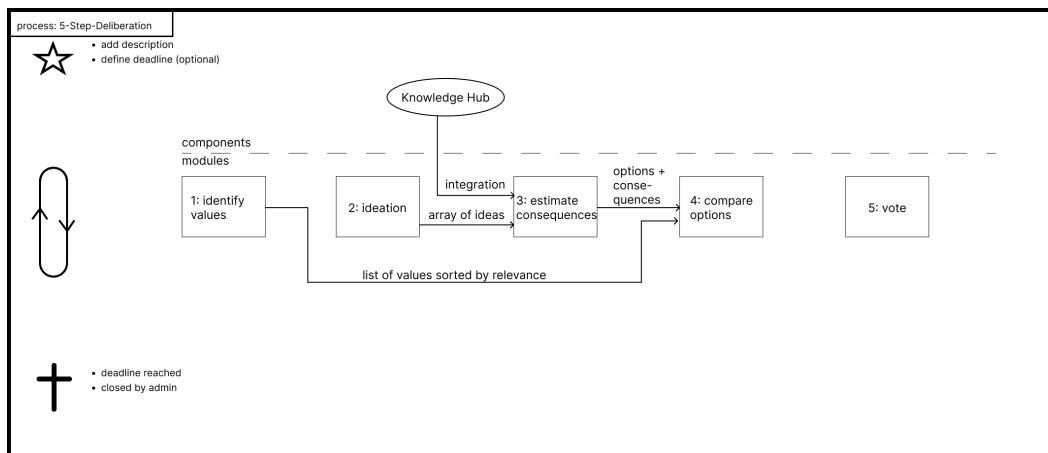


Fig. 15: 5-Step-Deliberation as an Example for a Process

As described in section 3.2 'A Debate's Lifecycle', a debate can consist of multiple phases. All of the screened papers which deal with this question propose a 5-Step-Deliberation with the phases "(1) identify public values, (2) develop options, (3) estimate consequences, (4) weigh alternative options, and (5) the decision itself." [50]–[53] And

thus, it needs to be available. But it could also be useful to open up this structure and make it customizable to fit to the group and the needs of any particular debate. As an example: a vote can require only one phase if the discussion has already taken place in person and the distribution of resources in a company can have more than five phases and span over a long period of time. In the desired platform, these phases will be represented by modules, which can be arranged into processes with a parallel or sequential temporal order. A process can be initialized by any permitted user, depending on the settings. It requires general information such as a name, a purpose, and a selection and arrangement of modules, each with a deadline and individual input, as described in section 4.5 “Modules”. There are modules that need input from other modules or components and thus can be put into context with each other. There are predefined processes, called “Templates”, available for choice, for example a five-step deliberation as discussed in Related Work/Debate Layout. A process ends when the defined deadline is reached or an admin closes it.

4.5 Modules

When creating a new process, users get to choose from a list of modules. On a visual interface, they are arranged in sequence. This is a list of all conceivable modules gathered, as explained in the following section:

- Problem/Objective Definition Modules:
 - Identify Problems/Objectives/Values
 - Validate Problems/Objectives/Values
 - Prioritize Problems/Objectives/Values
- Debate Modules:
 - Pro/Contra Discussion
 - Open Discussion
 - Ideation Challenge
 - Estimate Consequences
 - Compare Options
- Live Support Modules:
 - Live Event (online/face-to-face)
 - Breakout Rooms/Small rounds
 - Minipublic/Deliberative Polls
 - Chatroom (Text/Voice/Video)
- Decision Modules:
 - Vote
 - Prioritize
 - External Decision + Statement
- Action Modules:
 - Feedback from Execution Team
 - Task Assignment
- Other Modules:
 - Evaluation
 - Brainstorming
 - Survey
 - Petition
 - Announcement

This list of features results from the analysis of several tools in the "Background" section as well as the "Related Work" section and summarizes all gathered and imaginable features that tools can possibly provide. As discussed in the beginning of this section, any of these could be a possible gain for some group. This eliminates the necessity of discussing every single one, leaving the selection of modules to each groups' decision and to be assessed in future work. The first group of modules, as defined similarly by various related sources [50]–[53], aims to identify, evaluate and prioritize aims or problems. This way, a community is given the opportunity to first agree on a direction that later leads the selection of topics and guides through future debates. For the Debate Modules, again, all gathered modes of debate as discovered in the "Background" section, are listed. The next category, Live Event Support summarizes all gathered tools to digitally support in-person-deliberation as in meetings, roundtable discussions, panel discussions, video conferences etc. The modules Breakout Rooms and Minipublic have the feature of dividing the group into smaller portions as described later in this abstract. Decision Modules allow groups to finally vote or prioritize discussed options or let the decision making group such as a board, management or leadership team to announce their decision along with a statement as justification. The next category, action modules, are of organizational nature and aim to simplify the communication effort when making steps forward as a unified group. Leaving five modules summarized under "Other Modules": Evaluation as the opportunity to discuss the effectiveness of past decisions, Brainstorming as the informal way of collecting ideas and comment them in place. Survey and Petition integrate known forms of deliberation and finally the Announcement, providing the opportunity for leaders of groups to share recent information with their group members outside of a debate or process.

As discussed in section 3.3 "Debate Layout", the debate modules have different design principles for different use-cases. Some common designs like Reddit's sort-by-popularity approach have been identified as harmful for diversity. For some questions, like technical ones, the easiest solution could be easily voted and displayed this way and seems to be a legitimate way of deliberation. Again, all possible designs should be available to the users. This way, different approaches can be compared in future work aiming to be able to provide reliable recommendations for all kinds of use-cases at some point.

With the given Modules, processes can be customized for all kinds of cases, for example, a five-step deliberation with no defined problem as a starting point but a collective definition and prioritization of objectives, followed by an ideation phase that takes all objectives into consideration rather than one specific problem.

Two of the modules, Minipublic and Breakoutrooms, require the group to be divided. Minipublic is a common procedure for offline deliberation and means that a smaller group represents the whole [79]–[81]. A selection of participants is made manually, randomly, or automatically based on certain features of the participants. This way, it can be ensured that critical groups of people are not over- or underrepresented. When choosing Minipublic as a module, either an existing subgroup can be chosen or a new, temporary subgroup is initiated, that gets closed again right when the module is closed. Inside the subgroup, a process is initiated whose modules can have relations to those in the main process. This way, nested processes are possible. Breakoutrooms consist of modules that

are only editable by a part of the group. No relations can be made to outside modules and thus, no subgroup is needed. Both, Minipublics and Breakoutrooms, can be public or private in terms of visibility.

Some of the modules may require map support: identify problems/objectives, open discussion, ideation challenge, estimate consequences, feedback from the execution team, task assignment, brainstorming, announcement. Many tools covered in section “Background” feature maps, thus they need to be optionally available as much as possible.

The integration of components can be crucial for some modules. Analysis Tools, as well as the Knowledge Hub, are options as inputs for: validate problems, all debate modules, chatroom, external decision and statement, evaluation. Platform Features can be used by: ideation challenge, live event, chatroom, feedback from the execution team, task assignment, brainstorming, evaluation.

5 Development of a Prototype

This study aims to develop a web app that demonstrates the feasibility of novel collaboration platforms, including mass open online deliberation. All design implications from chapter four are considered. The web app is expected to either implement these concepts directly, demonstrate their potential, or lay the groundwork for future implementation. This means, all of the proposed features need to be possible to implement with the given framework, even if for this work, implementing each one would be too much. To create an immersive experience for users of this prototype, a realistic storyline is presented using three groups with different contexts: A sports club, a municipality, and a housing community. The users assume the role of a small-town citizen, enter their name at the start, and engage in a fictional story that explores collaboration methods in large groups.

Several tools were utilized to create this prototype. The project began with the “PingPanda” Next.js template by GitHub user “joschan21” [82]. From here, the general design was defined, and then the individual pages were built. All pages are written in TypeScript using JavaScript syntax. The mockup data is entirely in TypeScript and includes more than ten files which contain all the exemplary data used for chats, debates, appointments, and so on in the web app. Users are asked to type in a name, which is memorized using a context file. After that, they are directed into the platform, where they can freely explore all content. The Large Language Model “Claude 3.5 Sonnet” assisted in generating the layout and logic of the pages. Pages were styled using Tailwind. The mockup content is spread across several files as it spans many thousand lines of code. Also here, the LLM helped with the quick generation of content based on prewritten storylines and more parameters. The tool is not fully optimized for mobile devices yet, but current development allows for future optimization without major changes. The component “Modal” allows a common way to present a menu to mobile users. Icons are provided by the “Lucide React” library.

Overall, the web app aims to showcase common UI design concepts and ensure intuitive interaction, despite the complexity of the underlying logic. This can be addressed by implementing help-buttons, one of many features planned for future development. All about the prototype such as the source code and a finished deployment of the webapp can be found on GitHub on this link:

https://github.com/fritte-MOOD/prototype_1



Welcome back, Robin

You are living in the small town of **Rochefort**,
are an executive member of the local **Sports Club** and
live in a community housing project named **Marin Quarter**.

Park Sports Club RF

122 Users, 7 Subgroups

You are an Admin and a Moderator.

[Explore Example →](#)

Municipality of Rochefort

14,840 Users, 53 Subgroups

You are a User.

[Explore Example →](#)

Marin Quarter Community

98 Users, 14 Subgroups

You are a Moderator.

[Explore Example →](#)

Fig. 16: The Dashboard

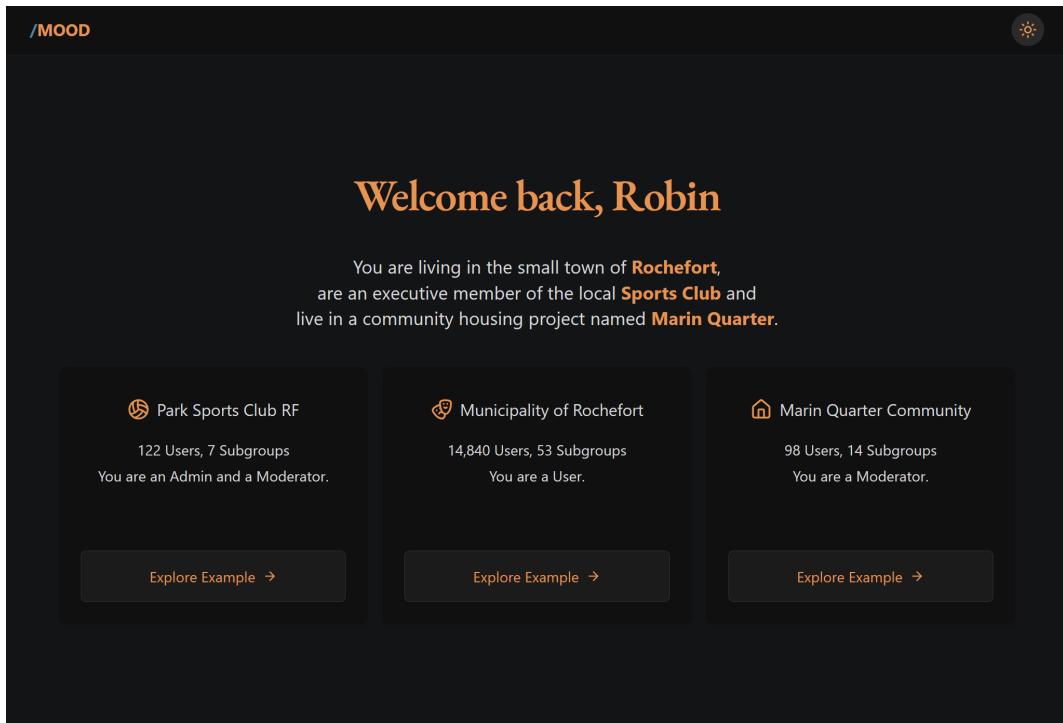


Fig. 17: The Dashboard (Dark Mode)

The screenshot shows the MOOD platform interface. On the left, a sidebar lists various navigation options: Main, About, Debate (which is selected), Organize, Calendar, Tasks, Messages, Documents, Components, Knowledge Hub, Analysis Tools, Moderate, Administrate, and Profile. The main content area displays three discussion cards:

- Executive Committee**: A purple card titled "Membership Fee Structure Review". It discusses the need to review and potentially adjust the membership fee structure due to rising costs. It was created today at 09:00 and is due May 26, 2025, 20:00. It includes tabs for Ideation, Estimate, Estimate, and Announcement.
- Rochefort**: A red card titled "2025 Participatory Budgeting Challenge". It announces the challenge for community projects proposed and chosen by citizens. It was created today at 09:00 and is due Jun 18, 2025, 23:59. It includes tabs for Ideation, Estimate, Prioritize, and Announcement.
- Marin Quarter**: A green card titled "Parties in the Communal Area". It discusses the rules for using the communal area for parties and gatherings. It states: "We need to discuss and decide on the rules for using the communal area for parties and gatherings."

Fig. 18: Finding Discussions

The screenshot shows the MOOD platform interface with a dark theme. On the left, a sidebar lists various navigation options: Main, About, Debate (which is selected), Organize, Calendar, Tasks, Messages, Documents, Components, Knowledge Hub, Analysis Tools, Moderate, Administrate, and Profile. In the center, a modal window titled "Filter Groups" is open, listing several group categories with checkboxes. The categories include All Park Club, All Rochefort, All Marin Quarter, and other sub-groups like Park Club, Executive Committee, etc. At the bottom of the modal are "Activate All" and "Deactivate All" buttons. In the background, a discussion card for "Rochefort's Annual Meeting of Sports Clubs" is visible, titled "Park Club". It discusses the opportunity to host the annual meeting and the need to discuss best practices and fees. It was created today at 09:00 and is due Jun 2, 2025, 20:00.

Fig. 19: The Group Filter

The screenshot shows the 'Ideation' module of a participatory budgeting platform. At the top, there's a navigation bar with 'My Groups >' and 'Settings'. Below it, a sidebar contains links like Main, About, Debate, Organize, Calendar, Tasks, Messages, Documents, Components, Knowledge Hub, Analysis Tools, Moderate, Administrate, and Profile. The main content area has a title '2025 Participatory Budgeting Challenge' and a message from the city. It shows a project titled 'Community Solar Panel Installation' with a description, status (Active), due date (Jun 18, 2025, 23:59), and creation details. A progress bar indicates 93% completion. Another project, 'Youth Center Renovation and Expansion', is also listed with a 93% completion bar. A 'Prioritize' button is visible at the bottom of the page.

Fig. 20: Ideation Module

The screenshot shows the 'Prioritize' module of the platform. The top navigation and sidebar are identical to Fig. 20. The main content area has a title '2025 Participatory Budgeting Challenge' and a message from the city. It shows a 'Prioritize' button in the navigation bar. Below, a 'Prioritize Module' section with a 'Project Prioritization' heading. It states that community-sourced budget estimates are being used to prioritize projects based on importance. It notes a total budget of 200,000€. A 'Results after 17059 submitted votes:' section lists three projects with their estimated costs and completion percentages:

- Youth Center Renovation and Expansion (Estimated: 120,000€)**: 93%
- Community Solar Panel Installation (Estimated: 80,000€)**: 87%
- Affordable Housing Initiative (Estimated: 180,000€)**: 86%

Fig. 21: Prioritize Module

6 Discussion

6.1 Limitations

Over the course of this research, the objective was to create a platform that integrates all forms of participation and deliberation. To pursue this, some new concepts had to be developed, especially the general framework of a deliberation platform. Although a theoretical justification is given in section four, this work does not include empirical validation or real-world testing. Further, most of the background and related work used for this thesis originate in a western context. But different cultures may expect different feature sets from such a platform. [83] Opening the feature set to the user's customization enables new forms of development across diverse cultures, rather than offering a single, predefined mode of deliberation. Another problem not yet addressed, is the objectivity, which is expected from the user. Apart from the exchange of facts and arguments empathy, mutual understanding and the portraying of different perspectives are important aspects of deliberation and need to be fostered in such a platform. A possible way to implement this into a platform would be to label contributions as argument, opinion, fact, feeling or perspective to visualize a discussion from different angles. [77] The risk of manipulating public opinion has not been addressed in this thesis will need special attention and concepts to counter issues like polarization, populism, and misinformation.

6.2 Future Work

This work is only a starting point for a broad development of mass online deliberation. It leaves for future research the concept of the Knowledge Hub, a place where citizens generate validated, reliable facts as a base for discussion and decision making. This will play a crucial role in the success of mass online deliberation. Further, empirical studies need to be conducted with real groups in real situations for the improvement of two aspects. Firstly, the user interface needs to be validated and although it leaves lots of space for user's customization, it's simplicity, clarity, accessibility and efficiency needs to be improved and validated. Ideally, any person using the system needs to be capable of using all features without prior training and understand it's functionality at first glance. Secondly, the constructiveness of a platform needs to be assessed relative to it's encoded rules. Different types of moderation, debate layout, the structure of different processes need to be compared in the context of the group and evaluated by aspects like constructiveness, fairness and efficiency. Over time, recommended feature sets for different environments can be assembled and a new group could be guided through the process of rule creation by a comprehensive and conversational questionnaire.

As for the prototype, lots of features are left for development and might not be included in this prototype anymore. They are still necessities for an implementation of a mature final product: The product needs to be available on all platforms: mobile, tablet, laptop, desktop both as a standalone application and as a web app. It is possible, that the framework can serve as a valuable extension to existing platforms like Nextcloud or Moodle. Functionalities for administration, moderation, process creation, profiles,

documents and more are not included in the prototype. On-hover information for groups, users, processes or goals could be helpful for the interaction. To quickly navigate the platform, a search function could be implemented to find e.g. chats, users or processes quickly. Another helpful feature could be the integration of a Wikipage to provide technical information and help users to operate the platform. Graphical illustrations can be helpful visualizing the group structure, debates and statistics. And finally, the prototype does not provide any form of interaction. Users can't send messages, submit comments or accept an appointment.

7 Conclusion

During this work, an overview is given over the current state of research about online deliberation with focus on scalability. The first important step was defined as the conception of a broad framework, that shall provide structure for groups, subgroups, modules, processes and components while leaving as much freedom as possible for future finer-grained development. In the chapter "Background", possible modules were defined as to be taken into consideration for the concept of this framework. As a general approach, all conceivable features should be included in the desired platform to leave the customization up to the user or admin of a group. Also for a group's rules and moderation, everything that could be of use in any way should be provided as an option and can bear the opportunity for comparable, comprehensive empirical research in the future. This framework was conceptualized and encoded into a web-app prototype. Apart from the platform's development, the importance of an open and free distribution was summarized in chapter four, as discussed in the reviewed related work. Its has not been discussed further in this work. Another limitation is the "westernized" background and related work utilized as a basis for this research. The resulting design implications leave a number of aspects to future work and are to be understood as laying the groundwork for future research and practical development as well as a call for the development of an open standard for mass online deliberation to be developed further, available to anyone and customizable to every group's individual needs.

"That brings us to what we believe is a fourth stage. "Episode IV" represents a "new hope" in the e-democracy saga. This includes a search for powerful counterweights to the economic power of commercial digital media."

Gastil & Davies[7]

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Appendix

Selbständigkeitserklärung

Ich erkläre hiermit, dass ich die vorliegende Arbeit selbständig verfasst und noch nicht für andere Prüfungen eingereicht habe. Sämtliche Quellen einschließlich Internetquellen, die unverändert oder abgewandelt wiedergegeben werden, insbesondere Quellen für Texte, Grafiken, Tabellen und Bilder, sind als solche kenntlich gemacht. Mir ist bekannt, dass bei Verstößen gegen diese Grundsätze ein Verfahren wegen Täuschungsversuchs bzw. Täuschung eingeleitet wird.

Berlin, den 17. Juni 2025

