



HAL
open science

The Future of e-Democracy: Analyzing and Optimizing Citizen Participation Platforms

William Aboucaya, Rafael Angarita, Valerie Issarny

► To cite this version:

William Aboucaya, Rafael Angarita, Valerie Issarny. The Future of e-Democracy: Analyzing and Optimizing Citizen Participation Platforms. UV2024: IEEE 7th International Conference on Universal Village, Oct 2024, Boston, MA, United States. pp.8. hal-04871287

HAL Id: hal-04871287

<https://inria.hal.science/hal-04871287v1>

Submitted on 7 Jan 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

The Future of e-Democracy: Analyzing and Optimizing Citizen Participation Platforms

William Aboucaya
INRIA Paris
ACSS – PSL University
Paris, France
william.aboucaya@dauphine.psl.eu

Rafael Angarita
Sorbonne University
Paris Nanterre University
Paris, France
rafael.angarita@lip6.fr

Valérie Issarny
INRIA Paris
Paris, France
valerie.issarny@inria.fr

Abstract—As e-democracy evolves, online participatory platforms are revolutionizing citizen engagement in public decision-making, enabling unprecedented scale and geographic reach. This study delves into the diverse landscape of these platforms, uncovering their unique objectives and challenges through semi-structured interviews with platform administrators. Our analysis reveals critical areas for improvement, particularly in managing large-scale participation and fostering collaborative citizen contributions. We propose innovative solutions, including leveraging machine learning for efficient processing of voluminous inputs and implementing collaborative editing tools to enhance collective decision-making. These advancements promise to transform e-democracy, making it more inclusive, efficient, and impactful. Our findings offer valuable guidance for platform administrators and designers, paving the way for the next generation of digital civic engagement tools.

Keywords—E-government, collaborative systems, social computing.

I. INTRODUCTION

The concept of e-democracy has emerged as a powerful tool for enhancing citizen participation in public decision-making. According to Baum’s definition [1], citizen participation is the involvement of citizens in public decision making. This practice has gained significant momentum in recent decades, especially at the local scale [2], with notable examples extending to national levels [3]. The advent of online platforms supporting citizen participation has revolutionized the landscape of e-democracy, enabling engagement at unprecedented scales [4] [5]. These platforms transcend geographical barriers, allowing for a diverse and expansive contributor base. They implement a wide range of features designed to facilitate citizen contributions to participatory projects, embodying the rules of participatory processes as defined by organizing institutions.

However, the journey towards effective e-democracy is not without challenges. Ianniello et al. [7] identify that poor quality participatory process design and inadequate citizen collaboration have been major obstacles to successful citizen participation. We have also highlighted design flaws in specific online consultations, leading to measurable biases in citizen contributions [8]. These findings underscore the critical role of well-designed features in the success of e-democracy initiatives.

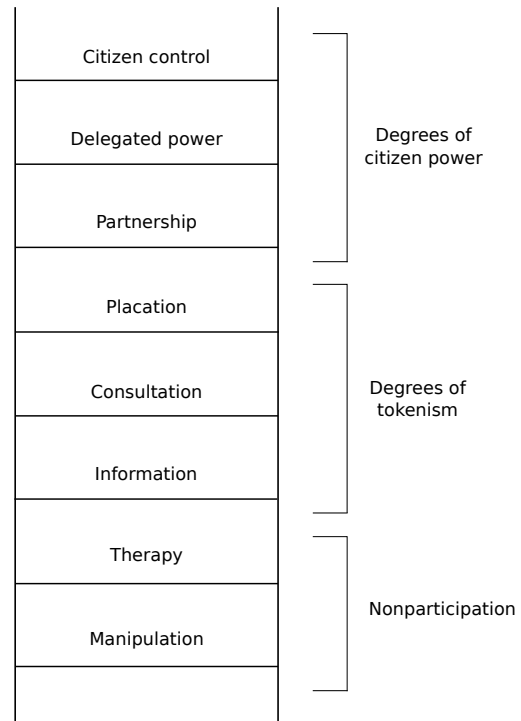


Fig. 1. Arnstein’s ladder of citizen participation [6]

Moreover, the sheer volume of contributions in e-democracy platforms has led to information overflow, a significant challenge for citizens navigating these spaces [9], [10]. To address this, innovative solutions are emerging. Arana-Catania et al. propose leveraging machine learning to mitigate information overflow and enhance the identification of relevant contributions [11].

The objectives of e-democracy platforms vary widely, often characterized using Arnstein’s ladder of citizen participation [6], as shown in Fig. 1). This ladder delineates eight levels of citizen empowerment, but we argue that the type of output expected by the institution offers a more nuanced and practical means of differentiating platform objectives.

This paper aims to advance the field of e-democracy by addressing two critical research questions:

- **RQ1:** What are the different objectives pursued by e-

democracy platform maintainers?

- **RQ2:** How do the features implemented in e-democracy platforms impact the design of citizen participation initiatives?

Through a series of semi-directed interviews with platform administrators and designers, we explore these questions, offering insights into the diverse landscape of e-democracy platforms. Our analysis culminates in recommendations for enhancing both contributor and administrator experiences, with a focus on machine learning-based contribution identification, collaborative editing, and novel features yet to be implemented in e-democracy contexts.

By addressing these critical aspects, we aim to chart a course for the future of e-democracy, empowering citizens and institutions alike to engage more effectively in the digital public sphere.

II. METHODOLOGY

To gain deep insights into the evolving landscape of e-democracy platforms and their specific operational rules, we conducted an in-depth qualitative study. Our approach centered on a series of five semi-directed interviews with key stakeholders in the e-democracy ecosystem, including platform administrators and providers (profiles detailed in Table I). The decision to employ interviews, rather than relying on empirical data from platform contributors, was strategic. Our primary aim was to uncover the core objectives pursued by the organizers of participatory processes (e.g., cities and public institutions) in their e-democracy initiatives. We posit that such crucial information can only be accurately obtained through direct engagement with involved stakeholders. Our interview protocol (outlined in Table II) was carefully designed to probe three key areas: the objectives driving e-democracy initiatives, the functionalities implemented to achieve these goals, and the methods employed to gather and synthesize citizen contributions. This approach allowed us to identify a diverse range of use cases for e-democracy and map the landscape of software tools currently deployed in contemporary platforms.

The strength of our study lies in the diversity and representativeness of our interview panel:

- **Scale and Geography:** Cities ranging from under 100,000 to over 3 million inhabitants, spanning different geographic locations.
- **Platform Purposes:** Varying from collective elaboration of complex urban development projects to neighborhood-level quality of life improvements and citizen-initiated collaborative efforts.
- **Contribution Mechanisms:** A spectrum from simple idea submission to full-scale collective project elaboration.
- **Technical Implementation:** Both bespoke software solutions and established participatory systems (Decidim, CapCollectif, and CONSUL).

Our interviewees represent diverse roles within the e-democracy ecosystem:

- Interviewee #1: Lead platform designer, focusing on citizen-driven feature development.
- Interviewees #2 and #3: Platform administrators, managing day-to-day operations and citizen engagement.
- Interviewee #4: Executive at a platform design company, offering a broad perspective on client objectives across various scales.
- Interviewee #5: Municipal technical advisor, involved in the strategic evolution of e-democracy platforms.

To ensure data quality and ethical compliance, all interviews were conducted via video conferencing, recorded with consent, and meticulously transcribed. Quotes used in this paper have been translated from their original language by the authors. To complement our interview data, we conducted an analysis of active e-democracy consultations on various platforms such as “Citizen consultation Universal income from activity” and “Decidim Barcelona.” We selected these based on their high engagement levels and accessibility at the time of conducting this study. While these platforms provided valuable context, our primary analysis is grounded in the rich, first-hand insights garnered from our interviews. This multi-faceted approach allows us to present a comprehensive and nuanced understanding of the current state and future potential of e-democracy platforms, laying the groundwork for innovative improvements in citizen engagement and digital governance.

III. REVOLUTIONIZING CITIZEN ENGAGEMENT: DIVERSE OBJECTIVES OF E-DEMOCRACY PLATFORMS

Our research uncovered four transformative categories of objectives pursued by e-democracy platform innovators: surveying public opinion, fostering citizen-government dialogue, digitally replicating offline participation groups, and co-constructing projects. All platforms in our study embodying at least two categories, demonstrating the multifaceted nature of modern e-democracy. Table III showcases how these platforms align with these objectives.

A. *Harnessing Collective Intelligence: Surveying Citizens’ Opinions*

Some platforms in our study are designed to tap into the collective intelligence of citizens across various topics. This objective focuses on gathering and synthesizing contributions to provide institutions with insights into public opinion. These platforms typically implement a workflow where citizens respond to multiple-choice questions or concise open-ended prompts (e.g., “How would you transform your neighborhood?” from the Paris Ideés platform). Interviewee #4 describes these platforms:

These are dynamic opinion polls or surveys designed to capture people’s views and potentially correlate them with their situations. The platform allows for data aggregation and analysis, without necessarily focusing on user interactions. The primary goal isn’t to create a collaborative space where participants engage with each other’s opinions, but rather to efficiently gather diverse perspectives.

TABLE I. INTERVIEWEES AND POPULATIONS REPORTED IN SEPTEMBER 2024

Interviewee #	Profile	City (Population)	Platform
1	Platform administrator and designer	Strasbourg (487 k)	Created in-house
2	Platform administrator	Antibes (74 k)	Decidim
3	Platform administrator	Issy-les-Moulineaux (69 k)	CapCollectif
4	Platform-making company executive	N/A	CapCollectif
5	Technical Advisor	Madrid (3.4 M)	CONSUL

TABLE II. MAIN QUESTIONS FOR THE INTERVIEWS. THE QUESTIONS WERE MODIFIED FOR INTERVIEWEE #4 AS THEIR COMPANY CREATED AND MANAGES MULTIPLE PARTICIPATORY PLATFORMS

#	Question
1	What is the main objective which motivated the creation of your participatory platform?
2	What functionalities have been implemented in your participatory platform?
3	What objective should the different functionalities implemented fulfill?
4	What service of your institution is assigned to the management of your platform? Do you collaborate with an external company?
4'	If you work with an external company, what kind of specifications did you provide? Technical or functional?
5	How do you manage the platform and gather the contributions received?

TABLE III. CATEGORIZATION OF PLATFORMS MAINTAINED BY INTERVIEWEES ACCORDING TO THEIR OBJECTIVES

Interviewee #	Platform Objectives
1	Multiple use-cases in the same platform. All the objectives identified are implemented in at least one use case.
2	Dialogue between the citizen and an institution and creation of geographical communities based on the neighborhood councils system.
3	Surveying citizens' opinions and dialogue between the citizen and an institution. In certain cases, proposals are then transferred to neighborhood councils.
4	Multiple platforms pursuing all the objectives identified.
5	Surveying citizens' opinions, dialogue between the citizen and the municipality and co-construction of projects.

In this model, platform maintainers empower citizens by delegating either the ideation process or the assessment of ideas originating from other contexts (e.g., offline neighborhood councils, municipal departments). Administrators of these platforms often argue that direct citizen collaboration is not always necessary for these specific use cases. Interviewee #1, who manages a versatile platform with multiple participatory goals, explains their nuanced approach:

We strive to tailor the information flow based on the level of citizen involvement and the feedback they receive.

Use cases focused on surveying citizens' opinions are characterized by limited individual feedback and minimal direct involvement in related projects. This objective aligns closely with Arnstein's "consultation" degree of participation, which involves "inviting citizens' opinions" [6]. However, it is important to note the existing challenge that "it offers no assurance that citizen concerns and ideas will be taken into account" – a limitation for e-democracy.

B. Fostering Dynamic Citizen-Institution Dialogue: The Heart of e-Democracy

An objective highlighted by platform administrators is the power to foster meaningful dialogue between individual citizens and institutions. This transformative goal is pursued by all platforms in our panel, underscoring its critical importance. Interviewee #2 cites this objective as their primary motivation for creating an online participatory platform to complement existing offline neighborhood councils. They note that offline

councils "do not give everyone the opportunity to express themselves and stay informed about city-wide developments."

We can break this objective into two sub-objectives: enabling institutions to share information transparently with citizens - aligning with the "information" degree of Arnstein's ladder [6]; and providing citizens with robust channels to offer feedback - similar to the "consultation" degree. These sub-objectives are typically implemented through a two-way vertical workflow, with limited horizontal interaction among citizens. Our interviewees often reference this objective when discussing streamlined issue reporting (e.g., sidewalk maintenance, traffic light malfunctions) or petition hosting systems, where inter-citizen interactions are minimized for efficiency. In situations where input from a single citizen is insufficient, collaboration among contributors becomes invaluable. This approach allows for the nuanced weighting of citizens' opinions based on their unique situations. Interviewee #2 shares an example:

We encountered a situation where some residents reported speeding issues on a street and proposed making it one-way. The mayor insightfully noted that neighborhood council members might have different priorities than the street's actual residents, despite living in the same area. [...] We proactively gathered opinions from the street's residents via direct mail and discovered that their views didn't fully align with the neighborhood council's proposals.

This case highlights a pitfall: without a mechanism for citizens to review and engage with each other's, decisions might be made without considering the perspectives of those

most affected. While institutional intervention can prevent this issue, we argue that a platform allowing citizens to express their viewpoints can provide a more diverse and representative range of feedback, complementing input from neighborhood councils. The dialogue objective extends beyond participatory platforms: Interviewee #3's platform aims to integrate social media feedback into their innovative "Citizen Relationship Management" system. This strategic choice to diversify interaction channels is driven by the observation that "people tend to use any available medium to communicate with the city."

Interestingly, this multi-channel approach is primarily mentioned by our interviewees in the context of citizen-institution dialogue. We posit that while the need for diverse participation channels is most acutely addressed for this objective, its relevance extends to other identified goals in the e-democracy landscape.

C. Empowering Digital Communities: Opinion Groups and Neighborhood Councils

Another objective highlighted by our interviewees is the power to form dynamic groups based on diverse characteristics such as shared interests or geographical proximity. These digital communities serve as incubators for collective proposals. Interviewee #2's platform aims to "digitally replicate the functioning of [their] neighborhood councils", offering citizens the opportunity to join local digital groups and collaboratively shape the development of their areas. However, this focus on traditional group structures can limit the potential for citizens to associate based on other criteria. Interviewee #5 provides insight into this challenge: "In Madrid, citizen participation existed but was primarily offline and oriented towards pre-established groups and associations." Their solution to broaden engagement was "to enable individual citizen participation", though other approaches have been explored, particularly by Interviewee #1's platform:

We have a system to host citizen initiatives on our platform. Let's say I am a citizen, I have an initiative and I want to gather other citizens around my initiative. I can create an "embassy" on the city's participatory platform to find people. The city advertises the initiatives, we present them during a citizen participation council and people can decide that an initiative will be supported by the city.

These platforms aim to foster organic creation of citizen groups based on interests or localities, laying groundwork for collaborative contributions. While not directly corresponding to Arnstein's ladder, this represents a step towards online collaboration in citizen participation, even if interactions often occur outside platforms. Recognizing these groups allows institutions to integrate them into policy-making. Interviewee #1's platform exemplifies this: alongside an official citizen participation council, an independent group formed to "define citizen participation" citywide, hosting events and producing recommendations for the municipality.

D. Pioneering Collaborative Governance: Co-construction of Projects

The most ambitious objective we identify is the potential for citizens and institutions to collaboratively develop projects. This approach varies significantly across platforms, ranging from enabling citizens to propose modifications to institution-conceived projects, to the full-scale collective elaboration of initiatives.

This transformative objective would span the participatory degrees from "consultation" to "partnership" inclusive, as defined by Arnstein [6]. However, our comprehensive analysis did not uncover examples of online co-construction where citizens were granted definitive decision-making power. This positions current implementations primarily within the "consultation" level of Arnstein's ladder, highlighting an exciting opportunity for future innovation. This vertical organization and the goal of empowering citizens to influence institutional projects is eloquently described by Interviewee #4:

The common objective [of our platforms] is to allow the participation of the citizen in public decision making. [...] They do not only aim at being a space for expression but, most importantly, a place where we give visibility to a full cycle of a project in which participation is involved and also where we can organize feedbacks to participants by showing precisely which of their proposals were included or not to the final project.

This objective promotes frequent contributor interactions. Platforms for project co-construction typically allow citizens to engage with others' ideas through comments or revisions. However, our study reveals limited online collaboration tools beyond basic features. Creating topic-specific or neighborhood-focused citizen groups is a step towards acknowledging collaboration. Yet, as noted in Section III-C, in-depth collaboration often occurs outside these platforms. Project co-construction faces information overload challenges, affecting both contributors and administrators. The volume of interactions raises scalability concerns for participatory processes.

While Interviewee #2 and Interviewee #3, who manage smaller platforms without project co-construction features, can manually review all contributions, other interviewees employ more sophisticated methods to synthesize the wealth of input received. Interviewee #1 reveals that they "do a lot of data and natural language processing to help the involved services of the municipality." Facing similar challenges with high-volume, time-sensitive consultations, Interviewee #4's company "is working on a R&D project to use contemporary natural language processing techniques on citizen consultations." Interviewee #5 outlines their innovative approach to addressing this scalability issue:

What we want now is to better take advantage of all this information. Indeed, there is a project [...] for using machine learning techniques to analyze the comments and proposals and other information

in the database to extract patterns, trends, sentiment analysis, visualization and present this information to the different units that manage the topics so they can use them easily, instead of ready and manually processing thousands of contributions so that they can define their politics. [...] So far, we have accumulated a lot of data, but is really difficult to manage it and do something with it.

IV. A CATEGORIZATION OF INNOVATIVE PLATFORMS SHAPING MODERN CITIZEN ENGAGEMENT

We asked interviewees about the functionalities of the platforms they work for, as summarized in Table IV. These platforms can be divided into two categories: “suggestion box”-like and interactive platforms.

A. “Suggestion box”-like Platforms

“Suggestion box”-like platforms are platforms where the functionalities are designed for sending of proposals from the citizens to the organizing entity in a vertical workflow. They allow little to no interaction between contributors. The content produced by contributors is generally an answer to an open-ended question or a proposal with few details in a “idea collection” phase. A large part of the synthesis work is done by agents of the institution. Interviewee #3 describes the process for their platform:

A first examination is done by the service focused on relations with users and neighborhood councils. Then, the proposal is sent to the most relevant service [of the institution] which will look in detail at potential elements provided and make a complementary examination, i.e. look for additional data to make an estimate of the needed budget and analyze the related problems. [...] Finally, the investigation file is sent to neighborhood councils, municipal officials, etc.

The interactive dimension is limited since contributors cannot interact with one another’s contributions using comments or other text-based contributions. The means of interaction are limited to the ability to signify one’s interest in a proposal by following it or voting for it. To justify this choice of a restrictive workflow, Interviewee #3 states that “the objective is mainly to facilitate the use [of the platform] and to let contributors freely present projects.” This choice of workflow is also common when the objective of the platform is to signal simple issues –Interviewee #1 states that they use this workflow for their “potholes and dog mess signaling tool.” Furthermore, the lack of interaction functionalities can be related with the concern for misconduct. Interviewee #2 supports this hypothesis by stating that their city “didn’t want a platform working like a social network, i.e. with the possibility for people to remain anonymous when they submit a proposal or a comment.” Moreover, Interviewee #4 indicates that their participatory platforms are explicitly designed to limit interactions and justifies their decision as follows:

Participatory platforms also aim [...] at avoiding the pitfall of forums. When we started our company, the most common means of participation were forums organized by news sites at the end of their articles. Many of these websites removed this feature because their moderation rate was extremely high and as soon as there were interactions, three people were monopolizing the conversation, talking only to each other and, after a maximum of ten messages, insulting each other.

Administrators of these platforms mentioned neighborhood councils more frequently than other interviewees. Interviewee #2 states that the designers of the platform they maintain designed it to mimic the workflow of offline neighborhood councils. Interviewee #3 indicates that the proposals submitted by contributors are reviewed by a neighborhood council before evaluation by the institution. These connections with offline equivalents of participatory platforms can be one of the reasons why platforms implement little to no means for interaction between citizens, since neighborhood councils are constituted of small groups of citizens without any interaction workflow implemented by the city.

B. Interactive Platforms

Interactive are designed to allow contributors to interact with one another’s contributions in a horizontal workflow. The platforms we have studied also implement a vertical workflow to allow the organizing institution to gather contributions and publish replies. These platforms generally implement the three following forms of contributions:

- User A submits an initial contribution, detailed or vague, to the platform.
- User B comments on a contribution formerly submitted by User A.
- User B votes for, against, or neutrally, on A’s contribution.

These platforms tend to implement the “idea collection,” “proposals development,” and “deliberation and voting” phases identified in [12]. They allow users to have an impact on a project beyond the “suggestion box”-like platforms. Interviewee #1 states that in their consultation platform, they mainly act to inform citizens of their impact on the project, giving them in certain cases a wide scope of action in the synthesis process:

We are the guarantors of the proper organization of the consultation, i.e. we have to include the citizen in the project as strongly as possible, to make them understand what questions we are asking, to let them know their degree of implication in the final decision, and to ensure that they receive at least some feedback by the end of the consultation.

As stated in Section III-D, interactive platforms tend to be used when the objective is to co-construct a project. Interviewee #4, whose company produces participatory platforms using different functional modules, confirms this by saying that modules allowing more in-depth interaction between

TABLE IV. FUNCTIONALITIES OF PLATFORMS MAINTAINED BY INTERVIEWEES

Interviewee #	Platform Functionalities
1	Multiple use cases in the same platform. Participation is implemented both with and without interaction between citizens.
2	Participation without interaction between citizens inside the platform.
3	Participation without interaction between citizens.
4	Multiple platforms both with and without interaction between citizens.
5	Multiple use cases in the same platform. Participation is implemented both with and without interaction between citizens.

contributors (e.g., the possibility to submit a modified version of another user’s contribution) are implemented in a platform only “if they want to produce a structured, problematized and contradictory thought process to identify points of consensus and dissensus concerning a given topic.” Interactive features also tend to be implemented when the number of contributors is high, like national-scale consultations (e.g., the Universal Activity Income consultation in France) or participatory platforms for large cities, as shown in Table IV. This tendency may be explained by the need for a wide enough audience to make use of such features.

Finally, collaboration means are limited in comparison with state-of-the-art online collaborative systems. The only example of collaborative features found in the platforms of our panel is the possibility to create contributions derived from another contributor’s own contribution. However, most features for collaborative editing of contributions are not implemented, therefore forcing to use external tools to produce common contributions as mentioned in Section III-C.

V. STRATEGIES TO ELEVATE AND OPTIMIZE E-PARTICIPATION PLATFORMS

The analysis of interviews proposed in Section III and Section IV allow us to identify two axes to differentiate participatory platforms: the objectives pursued and the presence of features for interaction between citizens. These interviews also allow us to highlight flaws in some of the categories of participatory platforms. Based on pre-existing works, we propose means to solve the aforementioned flaws. We summarize these solutions in Table V.

A. Collaborative Systems

The lack of collaboration features in participatory platforms hinders the development of well-developed, common contributions. Implementing collaborative editing could reduce information overflow by merging similar contributions and increase participation by fostering deliberation among contributors. A key consideration for implementing collaborative editing is whether to use a synchronous or asynchronous system. Synchronous systems, like Google Docs and EtherPad, share changes instantly. Asynchronous systems, such as Version Control Systems (e.g., Git, Subversion) and wikis (e.g., Wikimedia), allow users to control when they share and receive contributions. We propose two approaches to enhance online citizen participation through collaborative editing:

- Using asynchronous collaborative editing features, contributors can alter one another’s contributions to produce revised versions and to merge several proposals.

These features are partially implemented in certain platforms (e.g., *République Numérique* or *Citizen consultation Universal income from activity*) but they lack the tools implemented by contemporary asynchronous editing systems (e.g., VCSs, wikis) like the merging or the labeling of different versions of a document. The choice of asynchronous over synchronous editing is motivated by the possibility to keep track of revisions and to prevent issues such as vandalism [13] and edit wars [15]. Asynchronous editing tends to be implemented when contributors have a high level of computer literacy (e.g., collaborative software development, wiki-based information sharing) and remain little used by the general public. To reduce this issue, certain activist communities such as Art+Feminism [26] organize group training sessions to teach the use of platforms of this type, but the use of synchronous editing systems can also be seen as a solution to this issue.

- Participatory platforms can also leverage synchronous collaborative editing (e.g., its ease of use or the possibility to do joint writing) to allow users to collaboratively create a common proposal. As shown in [18], synchronous editing applications give users new means of collaboration using recognizable and specific patterns of work. However, the direct sharing of contributions to a document can also be the source of inconveniences for users, from the complexity induced by collaboration rules of a group to the difficulty to share contributions when they are yet not finished and do not fully represent the ideas their authors want to share [19]. We recommend to implement synchronous collaboration only in contexts where contributors share the same objective. Such features are not implemented in contemporary citizen participation platforms.

B. Natural Language Processing for Large-scale Processing of Contributions

We highlight the risks induced by large volumes of contributions in citizen participation platforms, especially concerning the difficulty for platform administrators to produce an accurate summary of a high number of contributions, as shown in Section III-D. Previous papers have also identified the risk of information overflow for citizens when the number of contributions published is too high to identify relevant contributions [9], [10]. These issues should be given particularly high importance in cases where the objective is the co-construction of a project between citizens and an institutions. Automation of certain tasks using Natural Language Processing (NLP) can

TABLE V. SUMMARY OF THE IDENTIFIED ISSUES AND SOLUTIONS

Issue	Proposed Solution	Sources
Lack of means for collaboration	Asynchronous collaborative editing in cases where approval of new changes to a proposal is needed and where vandalism or edit wars are major concerns.	[13], [14], [15], [16]
	Synchronous collaborative editing in cases where contributors share the same objective, i.e., vandalism and edit wars are minor concerns.	[17], [18], [19], [20]
Information overflow in large scale participation	Automated tag generation using NLP to help filter contributions and recommend the most relevant contributions for a given user.	[11], [21], [22]
	Automated summarization of large sets of contributions by identifying the most relevant contributions and arguments for a given topic.	[11], [23], [24], [25]

address the aforementioned risks. We identify the following use cases:

- **Contribution tagging:** It will allow contributors to easily identify the most relevant contributions based on their topics of interest. Platforms administrators will also be able to filter contributions focused on a given topic. Contribution tagging can also be used to recommend relevant contributions to a user based on topical similarity (e.g., based the contribution they are currently reading). Dynamic identification of the most relevant tag words can be done using TF-IDF [22]. However, topical clustering of contributions and contributors can also be done using machine learning-based algorithms such as LDA [21] to probabilistically assess the relevance of each contribution for a given topic. The two aforementioned methods have been experimentally implemented for the Decide Madrid platform [11]. Additionally, more recent methods leveraging pre-trained language models, for example zero-shot text classification, could be used to produce tags in contexts where traditional approaches are not relevant due to the number of contributions or when the tags are pre-defined.
- **Contribution summarization:** Given a large set of contributions on a given topic, contributors would like to know the most frequent arguments or the most relevant contributions. Using cosine similarity of sentence vectors such as SBERT [27], we can produce a network of sentences from all the comments of an initial proposal and apply the PageRank [24] algorithm to produce a summary of the most relevant remarks to this proposal [11]. However, other techniques such as argument mining can be leveraged to produce a collection of arguments about a given contribution or topic [23], [25].

VI. THREATS TO VALIDITY

A potential limitation is the sample size of interviews. However, the diverse range of platforms managed by our interviewees—varying in objectives, functionalities, and contributor base size—allows us to capture a broad spectrum of practices. We consider our interview set sufficiently diverse to represent contemporary online citizen participation platforms. Non-European platforms we identified were either inactive (e.g., Argentina’s *Partido de la Red* using DemocracyOS) or too similar to platforms already in our panel (e.g., New York City’s Decidim-based participatory budgeting platform).

VII. CONCLUSION: CHARTING THE FUTURE OF DIGITAL DEMOCRACY

This study presents a comprehensive analysis of online citizen participation platforms, based on semi-directed interviews with key stakeholders. We propose a novel classification of participatory platforms along two axes: intended outputs and interactive features, and we identify crucial challenges for platforms aiming at large-scale co-construction and collective contributions. To address these challenges, we propose leveraging state-of-the-art technologies, particularly collaborative editing and natural language processing to deal with high volumes of contributors while enabling elevated degrees of participation.

As a final note, the proliferation of large language models (LLMs) in online participatory platforms presents significant risks that warrant careful consideration. These models can potentially be misused to generate misleading or false information at scale, thereby undermining the integrity of online discussions and collaborative efforts [28]. There are also concerns about the amplification of biases present in training data, which could exacerbate existing inequalities and skew online discourse [29]. Furthermore, the ease of generating human-like text may lead to a flood of low-quality or artificially inflated content, diluting the value of genuine human contributions [30]. As these technologies become more widespread, platform designers and policymakers must implement robust safeguards to mitigate these risks while harnessing the potential benefits of LLMs.

As we advance e-democracy, this research provides a roadmap for optimizing citizen participation platforms. By embracing innovation, addressing challenges, and centering stakeholder needs, we can unlock e-democracy’s full potential, fostering more inclusive, responsive, and effective governance for the future.

ACKNOWLEDGMENT

The authors express their sincere gratitude to all the interviewees who generously contributed their time, expertise, and invaluable insights to this study. Their willingness to share their experiences and perspectives on citizen participation platforms has been instrumental in shaping the findings and recommendations presented in this paper.

REFERENCES

- [1] H. Baum, “Citizen participation,” in *International Encyclopedia of the Social & Behavioral Sciences*, N. J. Smelser and P. B. Baltes, Eds. Oxford: Pergamon, 2001, pp. 1840 – 1846.

- [2] H. L. Mees, C. J. Uittenbroek, D. L. Hegger, and P. P. Driessen, "From citizen participation to government participation: An exploration of the roles of local governments in community initiatives for climate change adaptation in the netherlands," *Environmental Policy and Governance*, vol. 29, no. 3, pp. 198–208, 2019.
- [3] R. Falanga, "The national participatory budget in portugal: Opportunities and challenges for scaling up citizen participation in policymaking," *Hope for democracy: 30 years of participatory budgeting worldwide*, pp. 447–466, 2018.
- [4] P. Aragón *et al.*, "Deliberative platform design: The case study of the online discussions in decidim barcelona," in *Social Informatics: 9th International Conference, SocInfo 2017, Oxford, UK, September 13-15, 2017, Proceedings, Part II 9*. Springer, 2017, pp. 277–287.
- [5] V. Laurent, R. Badouard, C. Mabi, C. Méadel, and G. Sire, "Les outils numériques gouvernementaux au service de la loi: Le design de la plateforme république numérique," *Terminal. Technologie de l'information, culture & société*, no. 122, 2018.
- [6] S. R. Arnstein, "A ladder of citizen participation," *Journal of the American Institute of Planners*, vol. 35, no. 4, pp. 216–224, 1969.
- [7] M. Ianniello, S. Iacuzzi, P. Fedele, and L. Brusati, "Obstacles and solutions on the ladder of citizen participation: a systematic review," *Public Management Review*, vol. 21, no. 1, pp. 21–46, 2019.
- [8] W. Aboucaya, R. Angarita, and V. Issarny, "Detecting Obstacles to Collaboration in an Online Participatory Democracy Platform: A Use-case Driven Analysis," in *FairWare '22 - International Workshop on Equitable Data and Technology*, Pittsburgh, PA, United States, May 2022.
- [9] K. Chen and T. Aitamurto, "Barriers for crowd's impact in crowdsourced policymaking: Civic data overload and filter hierarchy," *International Public Management Journal*, vol. 22, no. 1, pp. 99–126, 2019.
- [10] O. Perez, "Complexity, information overload, and online deliberation," *ISJLP*, vol. 5, p. 43, 2008.
- [11] M. Arana-Catania *et al.*, "Citizen participation and machine learning for a better democracy," *Digit. Gov.: Res. Pract.*, vol. 2, no. 3, Jul. 2021.
- [12] C. Parra, C. Rohaut, M. Maeckelbergh, V. Issarny, and J. Holston, "Expanding the design space of ict for participatory budgeting," in *Proceedings of the 8th International Conference on Communities and Technologies*, ser. C&T '17. New York, NY, USA: Association for Computing Machinery, 2017, pp. 213–221.
- [13] B. T. Adler, L. de Alfaro, S. M. Mola-Velasco, P. Rosso, and A. G. West, "Wikipedia vandalism detection: Combining natural language, metadata, and reputation features," in *Computational Linguistics and Intelligent Text Processing*, A. Gelbukh, Ed. Berlin, Heidelberg: Springer Berlin Heidelberg, 2011, pp. 277–288.
- [14] W. A. Nagel, *Subversion Version Control: Using the Subversion Version Control System in Development Projects*. Prentice Hall Professional Technical Reference, 2005, vol. 14.
- [15] R. Sumi, T. Yasserli, A. Rung, A. Kornai, and J. Kertesz, "Edit wars in wikipedia," in *2011 IEEE Third International Conference on Privacy, Security, Risk and Trust and 2011 IEEE Third International Conference on Social Computing*, 2011, pp. 724–727.
- [16] L. Torvalds and J. Hamano, "Git: Fast version control system," 2010. [Online]. Available: <https://git-scm.com>
- [17] L. André, S. Martin, G. Oster, and C.-L. Ignat, "Supporting adaptable granularity of changes for massive-scale collaborative editing," in *9th IEEE International Conference on Collaborative Computing: Networking, Applications and Worksharing*, 2013, pp. 50–59.
- [18] J. S. Olson, D. Wang, G. M. Olson, and J. Zhang, "How people write together now: Beginning the investigation with advanced undergraduates in a project course," *ACM Transactions on Computer-Human Interaction (TOCHI)*, vol. 24, no. 1, pp. 1–40, 2017.
- [19] D. Wang, H. Tan, and T. Lu, "Why users do not want to write together when they are writing together: Users' rationales for today's collaborative writing practices," *Proceedings of the ACM on Human-Computer Interaction*, vol. 1, Dec. 2017.
- [20] S. Weiss, P. Urso, and P. Molli, "Logoot: A scalable optimistic replication algorithm for collaborative editing on p2p networks," in *2009 29th IEEE International Conference on Distributed Computing Systems*, 2009, pp. 404–412.
- [21] D. M. Blei, A. Y. Ng, M. I. Jordan, and J. Lafferty, "Latent dirichlet allocation," *Journal of Machine Learning Research*, vol. 3, pp. 993–1022, Jan. 2003.
- [22] K. Sparck Jones, "A statistical interpretation of term specificity and its application in retrieval," *Journal of Documentation*, vol. 28, no. 1, pp. 11–21, Jan. 1972.
- [23] J. Lawrence and C. Reed, "Argument Mining: A Survey," *Computational Linguistics*, vol. 45, no. 4, pp. 765–818, Jan. 2020.
- [24] L. Page, S. Brin, R. Motwani, and T. Winograd, "The pagerank citation ranking: Bringing order to the web." Stanford InfoLab, Technical Report 1999-66, Nov. 1999.
- [25] A. Segura-Tinoco, Ó. G. Borzdynski, and I. Cantador, "An argument-based search framework: Implementation on a spanish corpus in the e-participation domain." 2022.
- [26] "Art+Feminism," Jul. 2024. [Online]. Available: <https://artandfeminism.org/>
- [27] N. Reimers and I. Gurevych, "Sentence-BERT: Sentence embeddings using Siamese BERT-networks," in *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP)*. Hong Kong, China: Association for Computational Linguistics, Nov. 2019, pp. 3982–3992.
- [28] R. Zellers *et al.*, "Defending against neural fake news," in *Advances in Neural Information Processing Systems*, vol. 32, 2019.
- [29] E. M. Bender, T. Gebru, A. McMillan-Major, and S. Shmitchell, "On the dangers of stochastic parrots: Can language models be too big?" in *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency*, 2021, pp. 610–623.
- [30] S. Kreps, R. M. McCain, and M. Brundage, "All the news that's fit to fabricate: Ai-generated text as a tool of media misinformation," *Journal of Experimental Political Science*, vol. 9, no. 1, pp. 104–117, 2022.