
This is an electronic reprint of the original article.
This reprint may differ from the original in pagination and typographic detail.

Palacin, Victoria; McDonald, Samantha; Aragón, Pablo; Nelimarkka, Matti
Configurations of Digital Participatory Budgeting

Published in:
ACM Transactions on Computer-Human Interaction

DOI:
[10.1145/3635144](https://doi.org/10.1145/3635144)

Published: 05/02/2024

Document Version
Publisher's PDF, also known as Version of record

Published under the following license:
CC BY-SA

Please cite the original version:
Palacin, V., McDonald, S., Aragón, P., & Nelimarkka, M. (2024). Configurations of Digital Participatory Budgeting. *ACM Transactions on Computer-Human Interaction*, 31(2), 1-27. Article 28.
<https://doi.org/10.1145/3635144>

This material is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.



Configurations of Digital Participatory Budgeting

VICTORIA PALACIN, University of Helsinki, Finland, and University of Toronto, Digital Curation Institute, Canada

SAMANTHA MCDONALD, University of California Irvine, USA

PABLO ARAGÓN, Universitat Pompeu Fabra, Spain

MATTI NELIMARKKA, University of Helsinki, Finland, and Aalto University, Finland

Participatory budgeting is a democratic innovation increasingly supported by digital platforms. Like any technology, participatory budgeting platforms are not value-free or politically neutral; their design, configuration, and deployment display assumptions and configure participant behaviour. To understand what kinds of configurations occur and what kinds of democratic values they hold, we studied 31 digital participatory budgeting cases in Spain, France, and Finland. These cases were all supported by the same technical platform, DECIDIM, allowing us to focus on the variations in their configurations. We examined the data from these cases and identified 25 different technical configurations and 15 participatory budgeting configurations. The configurations observed in our cases exhibit *individual* and *community-centred* assumptions about expected state-society interactions, as well as *open vs managerial* approaches to participatory budgeting. Based on these findings, we highlight a dilemma for civic technology designers: to what degree should platforms be open to configuration and customisation, and which political values should be enforced by platform design?

CCS Concepts: • **Social and professional topics** → **Government technology policy**; • **Applied computing** → **E-government**; • **Human-centred computing** → **Collaborative and social computing theory, concepts and paradigms**;

Additional Key Words and Phrases: Participatory budgeting, digital platforms, DECIDIM, technical configurations, participatory budgeting configuration

ACM Reference format:

Victoria Palacin, Samantha McDonald, Pablo Aragón, and Matti Nelimarkka. 2024. Configurations of Digital Participatory Budgeting. *ACM Trans. Comput.-Hum. Interact.* 31, 2, Article 28 (February 2024), 28 pages. <https://doi.org/10.1145/3635144>

1 INTRODUCTION

Social computing systems clearly play an important role in civic society. Candidates, elected representatives, and citizens interact via social media services [34, 39, 43, 88], social movements and activist groups use online services to coordinate their efforts [8, 21], and online data collection

This work received funding support from the KONE Foundation.

Authors' addresses: V. Palacin (Corresponding author), University of Helsinki, Unioninkatu 35 (P.O. Box 18), 00014, Helsinki, Finland; e-mail: victoria.palacin@helsinki.fi; S. McDonald, Department of Informatics, Donald Bren School of Information and Computer Sciences, University of California, Irvine, 5019 Donald Bren Hall, Irvine, CA 92697-3440; e-mail: smcdona2@uci.edu; P. Aragón, Department of Information and Communication Technologies, Universitat Pompeu Fabra, Roc Boronat 138, 08018 Barcelona, Spain; e-mail: elaragon@gmail.com; M. Nelimarkka, University of Helsinki, Unioninkatu 35 (P.O. Box 18), 00014, Helsinki, Finland; e-mail: matti.nelimarkka@helsinki.fi.



This work is licensed under a Creative Commons Attribution-ShareAlike International 4.0 License.

© 2024 Copyright held by the owner/author(s).

1073-0516/2024/02-ART28

<https://doi.org/10.1145/3635144>

helps public officials as well as residents understand community issues [9, 44]. Various democratic decision-making procedures operate through social computing systems (for a review, see the work of Nelimarkka [61]). Researchers and developers have worked extensively to develop novel interfaces to support various forms of democratic decision-making [41, 42, 85] and understand users' needs, expectations, and actions throughout these decision-making processes [3]. As a result, we are witnessing a growing interest in platforms that encourage civic participation in democratic decision-making [5]. Indeed, according to the United Nations Department of Economic and Social Affairs [84], more than 80% of countries have already leveraged digital technologies for public governance.

Civic participation, however, is constrained by various factors, regardless of their online/offline setting. For example, the likelihood to vote is inversely related to distance from voting stations [13]. In online settings, access to online services and the skills to use them—the digital divide—is often discussed as a limitation [35]. In addition to these direct limitations, online participation is also limited by the *unintended consequences of platform design and configuration*.

In computer-related fields, CONFIGURATION refers to the specific way hardware or software is arranged to deliver a functionality or to serve a user need. In this study, we use configuration to describe two types of arrangements—technical and socio-technical:

- *Technical configurations* are the arrangements of DECIDIM functional components to support a participatory process, such as proposals or pages (see Figure 5).
- *Participatory budgeting configurations* are the arrangements of steps in a participatory budgeting process. They are setups explicating how citizens are expected and allowed to take part in a participatory process. For example, all participatory budgeting processes with the following three steps—ideas collection, voting, and budgeting—are considered to have the participatory budgeting configuration A. All participatory budgeting configurations are listed in Appendix B.

Authors such as Winner [86] and Nissenbaum [62] have argued for a long time that technology design is inherently political and always embeds value: there are no such things as value-free and neutral digital platforms [27]. Empirical research has broadly shown that individual design choices impact how people use digital technologies, even in the case of political discussion [23, 79, 87]. Furthermore, the design of platforms has received increasing attention from participatory design scholars—identifying forms of tokenism and pseudo-participation in the processes [25, 65]. When it comes to civic technologies, some works have studied the inherent politics and embedded values of tools used to execute democratic decision-making processes [4, 14, 37]. However, civic technology scholarship has fallen short in documenting and examining *technology configuration*—that is, the process of deploying and customizing platform features. Questions on how technology configurations and political values are connected are essential in the case of civic participation, as democracy itself is a contested concept with multiple legitimate meanings [61].

To begin to unravel how technology is configured for civic participation, we focus on several instances of one of the most popular democratic innovations: participatory budgeting [77]. Participatory budgeting is a public policy turned into an institution [67], with rules that frame individual and social interactions aimed at deciding how funds should be allocated. This process calls attention to different parts of the democratic experience, thus allowing multiple legitimate meanings of what is participatory budgeting to emerge. First, participatory budgeting represents direct participation in a very clear way, as people discuss and decide on budgets for their communities [57]. This direct form of participation within a representative system challenges the norms of both democratic and financial structures in government, changing who makes budgeting decisions [24]. Second, participatory budgeting often introduces deliberation as a critical component of

the budgeting process [66]. As proponents of deliberative democracy will note, deliberative environments can improve the legitimacy of decision-making processes by making debate and discussion central to democratic decision-making [2, 18]. By enabling citizens to discuss and deliberate different ideas about government spending, these processes work to increase space for deliberation in government. Last, participatory budgeting transcends different levels and styles of democratic government [24]. Budgeting practices take place on the local, city, regional, and state levels. The diversity of democratic institutions adopting participatory budgeting creates an opportunity for comparative studies [28]. These processes have an important place in the spaces of participatory engagement, and their outputs have a significant impact on the way that governments operate.

Our qualitative study examines configurations of digital participatory budgeting—that is, what is the impact of using certain technical components and process steps to support digital participatory budgeting. To ensure that we do not report different configurations caused by different technologies, we examine participatory budgeting cases powered by a single platform. Therefore, any differences we observe are not caused by differences in logic or availability of features across various platforms. We choose to focus on a widely adopted open source digital platform for participatory democracy: DECIDIM [6]. We study *all* publicly available instances of participatory budgeting processes on this platform. We examine administrators' (i.e., public officials) choices in configuring their DECIDIM instances in different participatory budgeting cases. We describe the range of configurations (RQ1) and discuss how these configurations relate to specific types of civic participation (RQ2).

The article is structured as follows. In Section 2, we review relevant literature on participatory budgeting, democracy, and design as well as technical configurations in the context of civic technology. Following this, in Section 3, we describe the DECIDIM platform, our methods, and data. In Section 4, we present our findings, which (1) show a great degree of diversity in the configurations on the platform, and (2) suggest that these configurations promote different expectations around citizens' role in the democratic decision-making process. These findings help illustrate platform configurations as an undiscussed perspective of civic technology and politics and reflect on how platform developers ought to account for these, presented in Section 5. We conclude the article in Section 6.

2 RELATED WORK

2.1 Participatory Budgeting

Participatory budgeting was conceived as a way to enable “a process of direct, voluntary and universal democracy, where the people can debate and decide on public budgets and policy,” ultimately enabling the citizen to become a “permanent protagonist of public administration” [16]. It originated in the city of Porto Alegre (Brazil) in the late 1980s as a rise in democratisation efforts pushed state officials to institutionalise a participatory budgeting structure at the state and local level [63]. Citizens of Porto Alegre were able to propose, deliberate, and ultimately vote on how a percentage of the local budget was spent on an annual basis [29]. This engagement was done through a representative system in which cities would debate budgets at the regional level and send representatives to a budgeting council to make the final decisions. Those final decisions were then sent to the mayor [66]. As a result of these participatory budgeting processes, the city of Porto Alegre improved its public infrastructure, with a greater amount of public resources invested per person, especially in poorer areas and minority groups [63], and contributed to reducing infant mortality in Brazil [81].

The participatory budgeting structure in Brazil became an example for many, as other towns, cities, and states eagerly adopted the method. Since its development, participatory budgeting has

spread globally, with more than 2,700 governments launching processes of this form [1]. Participatory budgeting has been adopted in institutions in countries such as Argentina, Mexico, Peru, Ecuador, the United States, Canada, Spain, France, Italy, Cameroon, and Sri Lanka [45–47, 68, 71, 80, 83]. In Europe, participatory budgeting initiatives increased by more than 20 times between 2005 and 2012 [76].

Participatory budgeting has shifted from the original model set forth by Porto Alegre. Some cities use decentralised assemblies to collect proposals and provide feedback on their feasibility before voting [66]. In other cases, committees comprising government staff, local volunteers, and community organisers run the events on behalf of the government. In Portugal, there have been three national participatory budgeting processes, demonstrating how participatory budgeting can scale to the national level [24]. Thus, there are different ways to implement participatory budgeting processes.

Since 2001, digital participatory budgeting has become popular, where proposals, discussions, and even voting have taken place through online means [24, 56]. There are multiple possible reasons for this shift. Online participatory engagement reduces geographic barriers to participation, which can broaden the range of people who can participate in the democratic process [49]. Online platforms also relieve some practical organisational issues of real-world engagements, especially for large-scale participatory processes [19]. Budgeting events that take place entirely in person can also be costly and take tremendous manpower to organise and set up, so these online platforms improve both the cost and the flexibility of the arrangements. Matheus et al. [50] and Saldivar et al. [74] highlight five cases of digital participatory budgeting in Latin America. They show how each budgeting instance used different levels of technology as part of the process. Stortone and De Cindio [78] examine case studies of digital participatory budgeting in Italy, demonstrating the potential of online platforms to scale participation. Other online platforms such as DECIDIM, PARTICIPARE, CITIZEN BUDGET.COM, and BIPART have grown to support online participatory structures, and academics are experimenting with new designs to support the budgeting process [36].

When an instance of civic technology is created, someone must *configure* the platform for their use case—this is often left to the public administrators in charge of organising the participatory budgeting. Configuration work includes trivial choices, such as determining a name, a URL, a colour scheme, or background images for this instance. However, configuration work may be more critical: some platforms may allow admins to choose whether any form of commenting is allowed on the platform. A configuration choice would therefore either enable or disable dialogue on the platform. Therefore, the configuration work defines the behaviour of the platform and has clear implications for the participatory process itself. Configuration is a form of software tailoring, earlier seen in the context of aligning a piece of off-the-shelf software with workplace practices [82]. However, whereas tailoring requires some level of software development skills, platform user interfaces often make it easy to customise the platform operations to fit the socio-political practices. These configurations establish affordances and constraints on what citizens can do on these platforms, and what alternative arrangements are possible, but may require active coordination from citizens [54]. As civic participation platforms become increasingly available, exploring the diversity of configurations helps us understand digital participatory budgeting further.

RQ1: What configurations exist in digital participatory budgeting?

2.2 Democracy Is a Designed Process

Public participation aims to ensure that the people have a say on civic issues. This can take place through various processes, most of which we would say are democratic. Held [33] identifies 13 different models of democracy, with differences in who represents the people (direct and

representative models), the role of the economic system in politics (from socialist to capitalist), and so on. In the technology domain, scholars often separate referendum, assembly, and representative models of democratic decision-making [61]: referendum models empower the citizens to make decisions with the idea that the majority makes the decisions, assembly democracy seeks to support discussion and debate as a means of decision-making, and representative models delegate the power of the people to the hands of their delegates. In the case of participatory budgeting, the first two non-delegated models of democracy are more dominant—as they also are for the wider work on e-participation [61].

In human-computer interaction research, extensive work has gone into supporting democratic decision-making in two distinct models: referendum-based democracy, where efforts focus on novel voting interfaces and mechanics, and assembly-based models where work focuses on improving discussion and debate environments [61]. As democracy is diverse, both of these are about supporting democracy, but they operate on different normative foundations. There is a vivid debate on the pros and cons of both forms of democracy [e.g. 31, 59, 72], where the conclusion has been that choosing a model is not an empirical question but a judgment call. Against this reflection, we acknowledge that different types of democracy may exist due to normative positions.

Beyond these different models of democracy, there are significant nuances within models. For example, a traditional target of critique has been that someone needs to make decisions about decision-making—that is, *who* controls *how* decisions are made [7, 10].

Researchers have examined how governments balance the agenda control in e-government projects, and the evidence shows that both managerial (i.e., focused on improving the efficiency of service delivery, maintaining power, and decision-making structures) and participatory (i.e., focused on developing policies in collaboration with the people and redistributing agency and disrupting power structures) orientations are used [17, 69].

The former orientations give the people less say on civic issues, regardless of whether a referendum or an assembly model of democracy is used. Thus, these inner operations of the decision-making process open up an even greater degree of design on democratic processes. These research efforts suggest most deployments of e-participation—including participatory budgeting—continue to follow a strict managerial orientation [53, 75], thus reducing citizens' opportunity to influence the process.

When studying digital tools for democracy, the tool somehow manifests what democracy is—in a particular instance. The tool and its supporting social process need to make choices on how decisions are made and need to choose if dialogue is encouraged or disabled, among various other things. Therefore, like many digital tools, the socio-technical artefact is explicitly or inherently political [86].

To understand the choices made during configurations, we ask the following research question.

RQ2: What types of civic participation do digital participatory budgeting configurations exhibit?

3 CASE, DATA, AND METHODS

In our study, we focus on DECIDIM, a free open source digital platform for participatory democracy. We choose this platform due to its wide adaptation, as DECIDIM has hundreds of instances around the world on a single platform, and configurability, as the platform allows admins to define participatory processes in their instance by choosing which components are used.¹

¹For detailed documentation, see the following URL: <https://docs.decidim.org/en/v0.27/admin/>

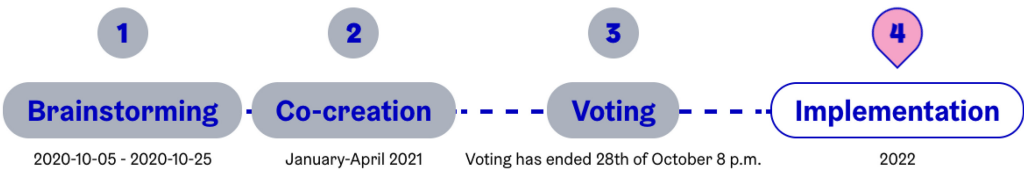


Fig. 1. Organiser-defined timeline of the participatory budgeting process in the DECIDIM instance of Helsinki City Council. Processes in DECIDIM are defined as sequences of steps, in this case: Brainstorming, Co-creation, Voting, and Implementation.

To identify existing differences across the instances (RQ1) and discuss how those differences relate to specific types of civic participation (RQ2), we collected data about how the platform was adapted in several participatory budgeting cases. As all instances are powered by the same platform, differences are not caused by different feature sets, different design logic across platforms, or other differences across platforms.

3.1 Decidim

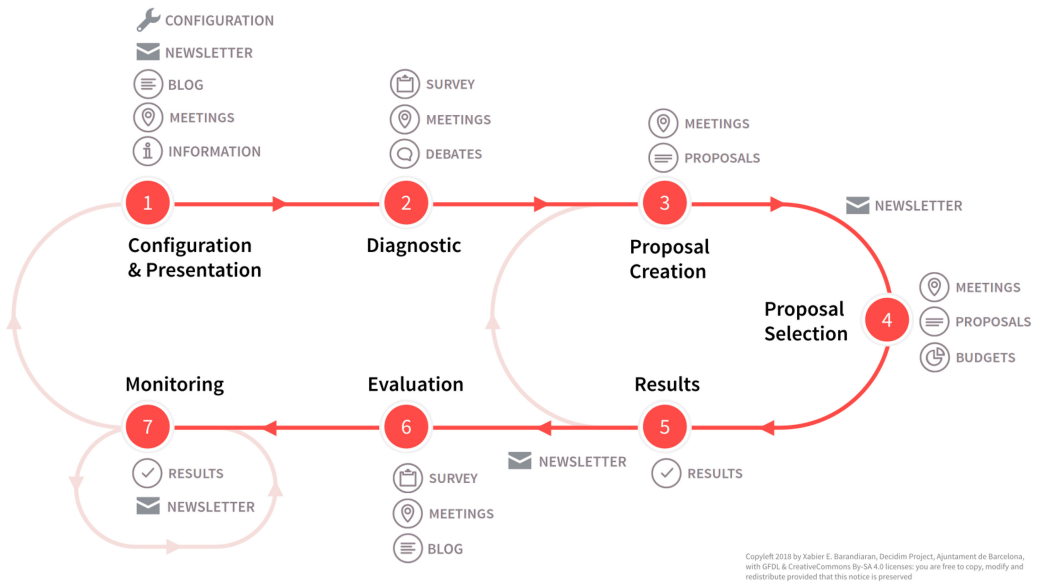
DECIDIM is a digital platform for public institutions and civic organisations to deploy participatory democracy processes. The platform was originally developed for participatory strategic urban planning in Barcelona [6]. However, given the free open source nature of the technological infrastructure, there are active instances all over the world, such as New York City, Mexico City, the Government of Quebec, the French National Assembly, the Italian Government, and the European Commission,² which are administrated by public officials.

DECIDIM supports various use cases for online and offline civic participation, including participatory budgeting. Participatory budgeting seeks to reduce power imbalances in society by empowering citizens to allocate funding directly to citizen-originated proposals on city development [66]. Conceptually, participatory budgeting contains several *steps*: to allow direct allocation of funding, there must be proposals, which may be commented on or edited; some decision-making process (often voting) needs to take place; and potential follow-up on execution and evaluation may take place. DECIDIM allows the site administrators (i.e., public officials) to configure the participatory process: they must choose the name and related components for each time-bounded phase of the process. Users see them as a timeline (see an example of the instance of Helsinki City Council in Figure 1).

Technically, DECIDIM *components* provide features for these phases (e.g., newsletters, surveys, and proposal creation). Through platform configurations, administrators choose which components to use and when they are used in each instance. As Figure 2 illustrates, different components may be used to form the process differently; the White Paper of DECIDIM suggests a seven-step process, from initial information sharing (1) to final monitoring of the results (7) [11]. The diagram also shows how different components (grey in Figure 2) can be used to support the process in each step.

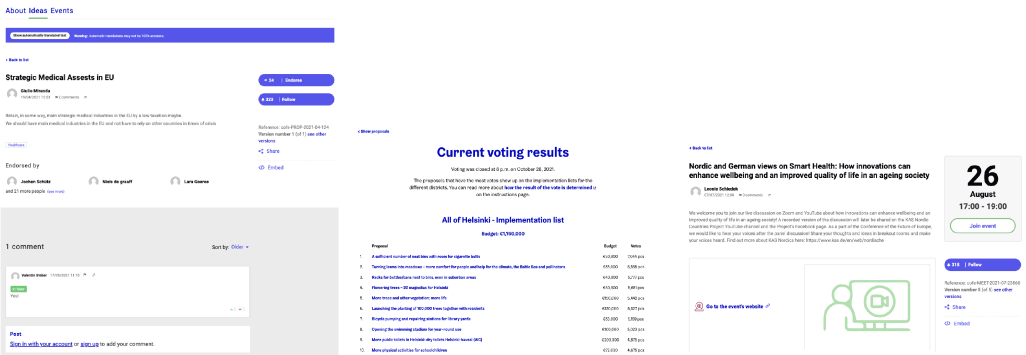
Each instance is configured to make some functionalities and content visible to end users (participants) through components. For example, the component PROPOSAL allows citizens to propose ideas (Figure 3(a)) that can be prioritised through the BUDGET component (see Figure 3(b)). The component MEETING is used to announce physical face-to-face meetings related to the participatory process, such as the generation and discussion of proposals related to citizens with limited digital skills or the provision of help to such citizens (see Figure 3(c)). From the citizen's

²For details, see the following URL: <https://decidim.org/es/usedby/>



Copyright 2019 by Xavier E. Barandiaran, Decidim Project, Ajuntament de Barcelona, with GFDL & Creative Commons By-SA 4.0 licenses; you are free to copy, modify and redistribute provided that this notice is preserved

Fig. 2. Standard participatory process on DECIDIM and its supporting components at different steps. This is the canonical configuration proposed in DECIDIM’s White Paper [11], but the administrators of an instance are able to customise steps and components.



(a) Proposal component from citizen's perspective (b) Budget component from citizen's perspective (c) Meeting component from citizen's perspective

Fig. 3. Screenshots of different components in DECIDIM (instance of Helsinki City Council).

perspective, if some components are not enabled, it impacts how they can act on the platform. For example, if there is just a single BUDGET component for the instance, it is not possible to specially allocate the budget to certain regions or purposes: all proposals compete for the same funding.

Administrators choose which components are used in their instance. The platform has a specific administration interface (Figure 4), where administrators can add new components, organise them in different order, and edit them—for example, set their names, edit the content visible to citizens, and so forth. The ability to add, remove, and configure components is only available to administrator users of each instance. Table 1 summarises all components available for the administrators to begin the configuration work.

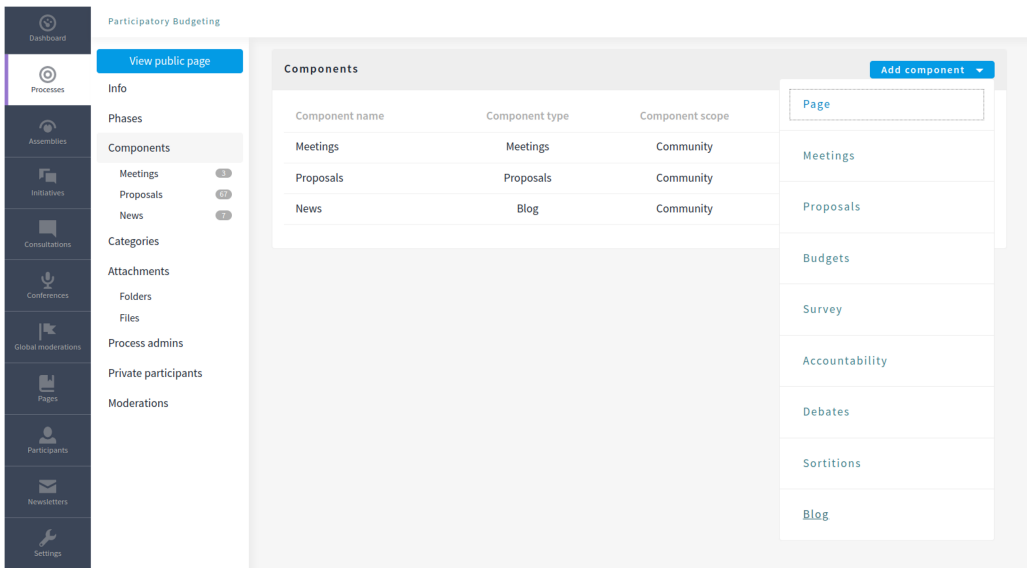


Fig. 4. Screenshot of the administrators' interface for configuring the platform through choosing used components (generic instance).

3.2 Data

There are currently hundreds of participatory instances of DECIDIM. Among them, we initially identified those that hosted participatory budgeting processes between 2016 and 2020, and whose data were available through the GraphQL Application Programming Interface (API).³ We then collected the component configurations and related metadata from these instances.⁴ Our data consists of each technical component used in the participatory budgeting instances, information on its content and functionality, and the time frame when it was active for citizens. To ensure that we analysed completed participatory budgeting instances, we only considered those in which the final step concluded before January 2021 (see Appendix A). This led us to work with a sample of 31 participatory budgeting instances, all geographically located in Europe (Spain $n = 24$, France $n = 6$, and Finland $n = 1$).

Note that given the exploratory nature of this study, we do not focus on what factors may contribute to any observed variance; we open this avenue for future work later.

3.3 Methods

The main goal of this study is to learn more about the implications of configurations for digital participatory budgeting. Since this question required an in-depth explanation of an ongoing socio-technical phenomenon, we opted to take an inductive exploratory approach (observe, recognise patterns, construct theory/explanation) [12]. The 31 participatory budgeting instances were analysed by two independent coders using two rounds of qualitative analysis (thematic classification and axial coding) [15, 70].

³<https://docs.decidim.org/en/develop/api/>

⁴An example of a participatory budgeting instance is found at the following URL: <https://omastadi.hel.fi/processes/osbu-2019>. More details about all the instances can be found in Appendix A.

Table 1. Components on DECIDIM

| Component name | Function |
|----------------|---|
| PROPOSALS | A page listing ideas posted and prioritised by participants. Proposals have a description and a discussion space, as well as an automatic search of potential similar proposals or relationships between the proposals. Administration may accept or reject proposals. |
| BUDGETS | List of proposals (often resulting from the Proposals component) including specific prioritisation features based on money allocation by participants. |
| DEBATES | Space to allow administrators to open questions or discussions about specific topics defined by the administrators or the participants. |
| MEETINGS | Calendar for face-to-face events related to the participatory budgeting process, such as gatherings to discuss proposals, information-sharing sessions, or meetings where people could get support to use the platform. Each meeting provides additional features like notes, comments, or the opportunity to indicate which proposals were addressed in the corresponding event. |
| PAGES/INFO | General-purpose page for static information. They allow for open HTML content, including video, images, and rich text, which allow additional customisation and display of content. |
| PLANS | Component to allow citizens to collaborate on proposals before they are voted on: a plan is a more mature version of a proposal. This step allows participants to develop a more specific plan to allow better estimation of the total cost of the proposed actions for the budgeting stage. |
| ACCOUNTABILITY | Component to allow monitoring of the participatory budgeting process: funded plans are transformed into projects and indicators are used on the current implementation stage of the project (ranging from 0% to 100%). An accountability page includes details on the project, such as its costs and plans and other documents related to the project, as well as allowing comments on the project. |
| RESULTS | Informative page to provide official responses to proposals including the reason for rejection or acceptance and the result in which the proposal has been accepted. |
| SURVEYS | Component to create a questionnaire for participants. |
| BLOG | Component to publish posts or news on a participatory space. |
| NEWSLETTER | Delivery of newsletters by e-mail to all the participants of the instance or of a specific space. |
| CONFIGURATION | Component for administrators to configure settings of a participatory space. |

Administrators of an instance can add as many of these components to any participatory process.

While independently conducting their analysis, they met regularly to discuss findings and refine their codes. Finally, the results were discussed among the entire research team, including researchers who had not performed data analysis, to ensure the reliability of the analysis work. We have chosen to provide various illustrative examples of the coding work on our work (see Table 2) to increase openness.

Phase 1: Understanding Technical Configurations. We first examine the technical configuration and the deployment of DECIDIM components (see all components in Table 1), based on observed log data from all instances. To explore the diverse approach in deployment, we use a heatmap to visualise the number of components of each kind deployed in each participatory budgeting instance.

Unlike purpose-built components, the PAGES component could be used to display any content. Therefore, we could not determine its purpose in the same way that we could understand the purposes of these components. Instead, we translated 48 PAGE titles into English.⁵ Following this, we conducted an inductive thematic classification of these titles to identify similar functions. For

⁵Members of the research team are fluent in Spanish, Catalan, French, Finnish, and English, allowing for data translation.

Table 2. Categories of Steps

| Description | Axial code | Examples | Count |
|---|-------------------|--|-------|
| 1. PROCESS OUTREACH, public announcement of the participatory budgeting process through virtual and physical happenings | Neutral | Introduction, proposals, the launch of the participatory budget | 14 |
| 2. PARTICIPATORY PROPOSALS PREPARATION, step at which proposal preparation support is provided to the people via workshops, online webinars, and public assemblies | Community-centred | Workshops with the proposers, district council meeting, participatory proposals preparation | 3 |
| 3. IDEAS COLLECTION, step at which people publicly share their ideas as a participatory budgeting proposal | Neutral | Supports collection, call for ideas, proposals phase | 33 |
| 4. ADMISSIBILITY ASSESSMENT, step at which proposals are evaluated in regard to their alignment with the city mission or the process' rules | Managerial | Admissibility assessment, admissible ideas | 2 |
| 5. FEASIBILITY ANALYSIS, technical and expert feasibility assessment of the initial proposals | Managerial | Technical validation, project feasibility, technical phase: evaluation | 26 |
| 6. PARTICIPATORY PROPOSALS PRIORITISATION, step at which the collected proposals are publicly prioritised between participants and decision-makers | Community-centred | Participatory assembly for prioritisation, proposal workshops | 3 |
| 7. PROPOSAL PRIORITISATION, step at which the proposals and their implementation are prioritised by the decision-makers and experts without the involvement of the public | Managerial | Prioritisation, technical phase, budgeting the most voted | 2 |
| 8. FINALIST ANNOUNCEMENT, announcement of finalist proposals; these are voted on in the next step | Neutral | Presentation of finalist proposals, final proposals for voting, locate your favourite projects | 6 |
| 9. VOTING, a step at which ideas or proposals are voted on by the public | Neutral | Voting proposals, voting phase, vote for 3 ideas | 39 |
| 10. RESULTS, public announcement of the projects selected for implementation | Neutral | The winning projects, definitive results, Return | 33 |
| 11. ADMINISTRATIVE APPROVAL, step post participatory budgeting process where the selected projects go through municipal approval before being implemented | Managerial | Approval in the municipal plenary session | 1 |
| 12. PROCESS FEEDBACK, public evaluation of the process by the participants | Neutral | Process evaluation, What have we learned from building the city? | 3 |
| 13. OUTCOMES, public reporting of the participatory budgeting process and its impact | Neutral | Final report and communication of results, project execution, winning projects implementation | 8 |

The 13 categories result from an axial coding work examining the impact of each step group on the participatory budgeting process (i.e., neutral, community-centred, managerial).

example, pages with titles *Final Results*, *Execution state*, or *Evaluations* were seen to indicate one purpose of PAGE. This allowed us to determine the functions of the pages.

Phase 2: Understanding the Function of Steps. To move forward and explore the social process supported through technology, we inductively examined the time-bounded procedural steps

(i.e., process outreach or voting; see all steps in Table 2) in the participatory budgeting instance. We analysed these steps inductively following a thematic classification [22, 51].

Each of the components mapped in *Phase 1* can be used at different steps of the process. For example, participants could be asked first to discuss ideas using the DEBATE component to develop proposals using the PROPOSALS component, followed by voting and displaying the results via the RESULTS component, followed by participants monitoring the progress of projects with high voting numbers via the ACCOUNTABILITY component. These components could also be arranged differently, thus creating a different participatory process. For example, the DEBATE component could be used between the PROPOSALS and RESULTS components to invite participants to discuss and deliberate on ideas. The arrangement of components into *steps* therefore impacts how the participatory process is presented to citizens on the platform.

Our data included 173 steps from the 31 participatory budgeting instances. Their administration-defined names include ‘launch of the participatory budget,’ ‘Technical validation,’ and ‘vote for 3 ideas’ (see the *Examples* column in Table 2 for more examples from the data). We translated all step names and descriptions into English, followed by an inductive grouping of the content [22, 51]. During the inductive coding, we examined their similarity to the functions they served. For example, steps with the names ‘Voting proposals,’ ‘voting phase,’ and ‘vote for 3 ideas’ all focus on voting—which emerged as one category of steps.

Phase 3: Understanding How Configurations and Steps Impact the Democracy of the Process. After the initial coding to understand the function of each step and producing steps’ categorisations, we conducted an additional coding on these 13 categories to understand how configurations impact the democracy of the process (RQ2). This stage corresponds to axial coding work [58]. We grouped step categories following more conceptual considerations on democracy and citizens’ role in it (see Section 2.2). We were sensitised to examining the citizen’s role in the democracy—budgeting claims to improve citizen empowerment [24] and work on democratic innovations that have focused on this question as well [17, 26, 69]. Similarly, different models of democracy focus differently on the role of discussion and dialogue in debate in the democratic process: assembly-based models claim that they are essential for democracy, whereas other models, especially referendum-based ones, do not consider this to be the case. Therefore, although we conducted axial coding on the data, we cannot claim to work from a *tabula rasa*: we adapted existing concepts to help us.

4 RESULTS

We first present the results of examining the technical configuration of participatory budgeting on DECIDIM, followed by an analysis of the intended social roles of components, and explaining the 13 categories of steps. Following this, we analyse the participatory budgeting processes as an assemblage of technical components and social functions; using these, we identify various configurations of participation that emerge from our analysis work.

4.1 RQ1: Technical Configurations of Participatory Budgeting

We observed that different cases used extremely different numbers of technical components. Figure 5 visually shows the diversity through the heatmap of the use of components (in rows) of each case (in columns). There were 25 different configurations in total (i.e., 25 unique columns on the heatmap). This speaks both to a high degree of customisation by organisers to make the platform work according to their specific needs and to the degree of customisability provided by DECIDIM as a platform.

Understandably, the PROPOSAL component was used in almost all participatory budgeting cases. This is a core component in participatory processes, as it allows citizens to propose ideas. The

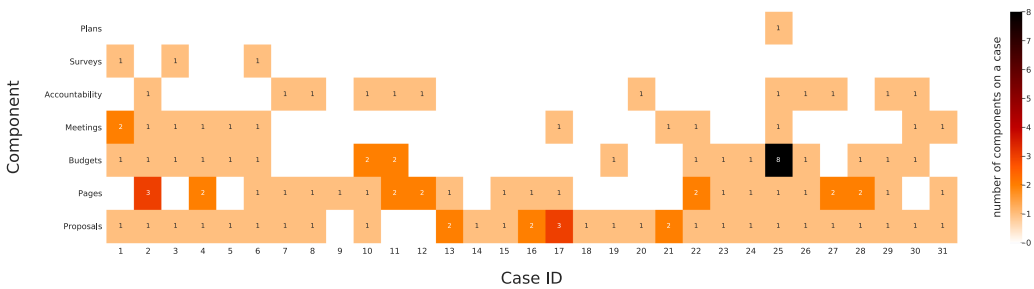


Fig. 5. Heatmap of technical configurations across the 31 cases through examining the number of each type of component used in each participatory budgeting case (the darker the cell, the greater the number of components of the type indicated in the row of the case indicated in the column). The heterogeneity observed among the columns expresses the existing diversity of component types among participatory budgeting cases.

PROPOSAL component is only missing in three cases, which suggests that either proposals were generated out of DECIDIM or, most likely, the component was deployed and removed once the participatory process was over.

In 16 cases, both the PROPOSAL component and BUDGET were used in conjunction, thus linking proposals directly with restrictions related to available funding. However, 12 cases did not use the BUDGET component together with the PROPOSAL COMPONENT, suggesting that either their funding limits were not as explicit or strict as in other cases, or that the component was not directly used to ensure that voted proposals did not spend more funding than was available. We also highlight that case 25 (i.e., the 2019 Helsinki participatory budgeting process) used eight BUDGET components. This is because funding was allocated to administrative districts within the city: thus, each district had its own BUDGET component. Other cases have concentrated activity on a single BUDGET component while also enabling a geographical filter for citizens to retrieve content about their specific districts, thus not forcing funding on certain districts.

The third most used component was PAGE, a general-purpose static container of information. The PAGE component was used in 24 cases. DECIDIM encourages organisers to use PAGES to publish general information such as frequently asked questions and organisation information. Six instances developed more than one PAGE, using no more than three to present additional information.

As PAGE was a general container, we conducted a thematic classification of PAGES by reviewing the content of each PAGE to see what kinds of information each process chose to publish. We found that in the majority of cases, the PAGE component was used instead of platform-provided components. Although DECIDIM has a component called ACCOUNTABILITY to display results and follow the implementation of the projects, most PAGES ($n = 21$) were classified by organisers under the title *Results* (in each of their native languages)—that is, those result pages provided information on the final votes of each budgeting process and the list of winning projects. In only one case was PAGE used to show the outcomes of the budgeting processes and demonstrate the implementation of the projects. It appears that either the ACCOUNTABILITY component did not meet the needs of budgeting processes or there was a lack of awareness of the different component options. Either way, most budgeting processes chose the general-purpose PAGE components to display results instead. Based on the data, less than half of the cases ($n = 12$) used the ACCOUNTABILITY component to increase the openness and monitorability of the results.

Beyond replacing the ACCOUNTABILITY component, PAGES were used for various information disclosure tasks. Two cases used PAGES to describe the budgeting process. One case used PAGES to

present the outcomes of a survey used to evaluate the participatory budgeting process, another one to provide a calendar of the process, and one case used PAGES to provide a list of rejected budgeting proposals. Thus, we see variety in the information displayed on the PAGE component.

Finally, our data show that some components were rarely or never used (see Table 1 for all available components) in the 31 participatory budgeting cases. We found no cases where DEBATE was used to support discussion and debate between citizens. Even while each proposal had its own discussion space through the PROPOSAL component, the DEBATE would have provided a higher-level discussion space for more overarching topics that were not focused on a single proposal. Similarly, our data has no cases with the RESULTS component, although, as we note, PAGE was often used as a replacement for this special-purpose component.

4.2 RQ1: From Technical Components to Understanding the Participatory Process through Steps

While analysis of the technical components already demonstrates diversity in participatory budgeting, they only serve to support a social process. For example, project idea collection uses PROPOSALS and voting takes place through the BUDGET component. However, some social processes do not have a one-to-one mapping into components. For example, final results could be shown on a PAGE (as in our analysis)—or with the purpose-built ACCOUNTABILITY component. Therefore, additional analysis of the social processes supported with DECIDIM speaks of its diversity (RQ1).

On DECIDIM, public officials with administrator rights on an instance define any participatory budgeting process as a time-bound step (as shown in Figure 1). We collected the timelines from all instances and identified a total of 173 different steps with organiser-defined names and timeframes. Such steps included the idea collection, voting, and result publication mentioned previously. We also identified steps that served the more specific needs of each instance, such as admissibility assessment, where public officials examined which proposals can move forward in the context of the participatory budgeting process. For example, some cities have a rule explicating that these projects can only fund fixed-term services and operations, and thus not lead to permanent staff hires.

To further understand these 173 steps, we conducted an axial coding [70] to examine what impact each of the steps' categories had on their respective participatory budgeting processes (RQ2), shown in the *Axial code* column of Table 2. This classification resulted in 13 categories of steps grouped by their level of managerial or participatory impact, according to the theories of Chadwick and May [17] and Reddick [69]. Table 2 contains examples of step names from our data to illustrate the categorisation. Unsurprisingly, the most common steps were idea collection, voting, and results. These steps are fundamental elements in any participatory budgeting process. Many participatory budgeting projects also used feasibility analysis to assess whether the proposed projects could be executed and had a specific step for public outreach to initialise the participatory budgeting process. The sixth and seventh most common steps were reporting to citizens on the outcomes of the process and announcements of finalists for voting, explicitly used in less than a third of the instances. The remaining six steps were used in a fairly small number of instances, often in one to three instances.

For example, steps PARTICIPATORY PROPOSAL PRIORITISATION and PROPOSAL PRIORITISATION both seek to decrease the number of proposals before the voting. However, they work in fundamentally different ways: the former focuses on inviting the citizens to collaborate to prioritise proposals (often through in-person gatherings), whereas the latter gives the power to prioritise to city administration and experts—the public is *not* involved. The latter is therefore a *managerial step*: it narrows citizens' opportunities to influence the outcome of the participatory budgeting process—and increases administrations' influence. The former is as a *community-centred step*: it

Table 3. Participatory Budgeting Configurations

| Step | Configurations | | | | | | | | | | | | | | |
|--|----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| Process outreach | | ✓ | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Participatory proposals preparation | | | | | | | ✓ | ✓ | | | | | | | ✓ |
| Ideas collection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Admissibility assessment | | | | | | ✓ | | | | | | | | | |
| Feasibility analysis | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Participatory proposals prioritisation | | | | | | | ✓ | ✓ | | | | | | | ✓ |
| Proposals prioritisation | | | | | | | | | | | | ✓ | ✓ | | |
| Finalists announcement | | | ✓ | | ✓ | ✓ | | | ✓ | | | | | | |
| Voting | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Results | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Administrative approval | | | | | | | | | | | | ✓ | | | |
| Process feedback | | | | | | | | | | ✓ | ✓ | | | | |
| Outcomes | | | | | ✓ | ✓ | | ✓ | | | ✓ | | ✓ | ✓ | ✓ |
| Number of cases | 4 | 1 | 1 | 8 | 1 | 1 | 2 | 1 | 6 | 1 | 1 | 1 | 1 | 1 | 1 |

Each column corresponds to a unique configuration, defined by the steps categories a process contains. For further details, see figures in Appendixes A and B.

emphasises discussion and even deliberation among the participants. We emphasise the difference, as many steps in participatory budgeting are ultimately individual. For example, voting is an activity where each participant can—and is expected to—vote directly for projects they find relevant and think should be funded. In addition to managerial and community-centred steps, we found neutral steps—that is, preparatory and communication steps where information is disclosed to the public or input from them is expected.

As Table 2 shows, the most common steps are neutral: voting, results, and idea collection did not include community-centred or managerial orientations. The fourth most common step was a managerial step: feasibility analyses allowed city administration to filter the proposals before they were voted on (used in 26 of 31 instances studied). Other similar managerial steps include administrative approval, proposal prioritisation, and admissibility assessment, all of which are related to managed processes. Community-centred steps are less common in participatory budgeting cases of this study, thereby providing citizens with limited opportunities for discussion and deliberation.

4.3 RQ2: The Configurations of Participatory Budgeting as a Combination of Components and Steps

The analysis of components and steps in isolation does not reflect configurations of the participatory budgeting process, as they are assemblages of steps. Across all 31 participatory budgeting processes, the average number of steps was 5. When examining the step categories involved in each process, we distinguished 15 different configurations of participation (see Appendix B for details)—that is, ways to arrange the participatory process using technical components and participatory budgeting steps. We label them as configurations A through O for clarity. Table 3 shows which steps were in use (further detailed in Appendixes A and B).

For instance, Figure 1 (the benchmark process used in DECIDIM’s documentation) is a process with a combination of community-centred and managerial steps, and therefore it corresponds to configuration G (see Appendix C). In contrast, configuration A represents a simple participation process: idea collection, followed by voting followed by results (visually illustrated in Figure 6(a)). Configuration D was the most common configuration, representing almost one-third of the data.

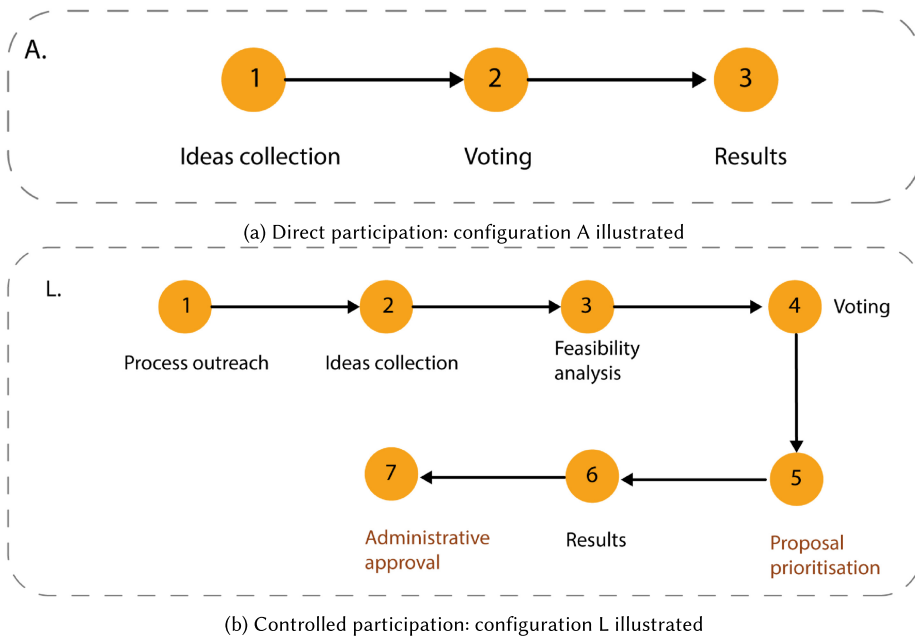


Fig. 6. Examples of directed and controlled participation configurations. The difference between them is that the latter involves at least one managerial step (see brown labelled steps).

In contrast to configuration A, this configuration includes managerial steps such as feasibility analysis (see Figure 7(a)). Therefore, it is a more managed configuration.

Managerial configurations were not uncommon: we observed that a clear majority of instances ($n = 25$) used configurations with control steps. Configuration L (see Figure 6(b)) is an illustrative example of that, with a total of three different steps that were used to filter and confirm the outcomes of participatory budgeting: feasibility analysis, proposal prioritisation, and administrative approval of the outcomes. Therefore, it is clear that participatory budgeting instances with these forms of configurations are not based exclusively on principles of direct democracy, but represent a hybrid form of citizen participation and a managerial intervention of public officials and experts.

It is possible to configure a participatory budgeting instance without administrative managerial moderation. Configuration A is an exemplary case of such a process (see Figure 6(a)): after the idea collection, voting follows and results are based on the voting results alone. Non-moderated participation is also present in configurations B and H. In total, they account for 19% ($n = 6$) of all instances.

Another stark difference in configurations is the presence of community-centred participation. Participatory budgeting was designed primarily as an individual activity: there are no steps focused on peer interaction, feedback, or co-creation of new ideas. Configuration D (Figure 7(a)) illustrates such a configuration: individuals (or potentially citizen-organised groups) submit ideas and then participants vote on which ideas should be implemented. In total, 77% ($n = 24$) processes had an individual paradigm for participatory budgeting.

We observed that the platform also supported more community-centred approaches towards participatory budgeting. For example, configuration H (see Figure 7(b)) includes community-centred steps: collaborative proposal preparation and participatory proposal prioritisation, steps where citizens are invited to work together to improve proposals. These are defined by the

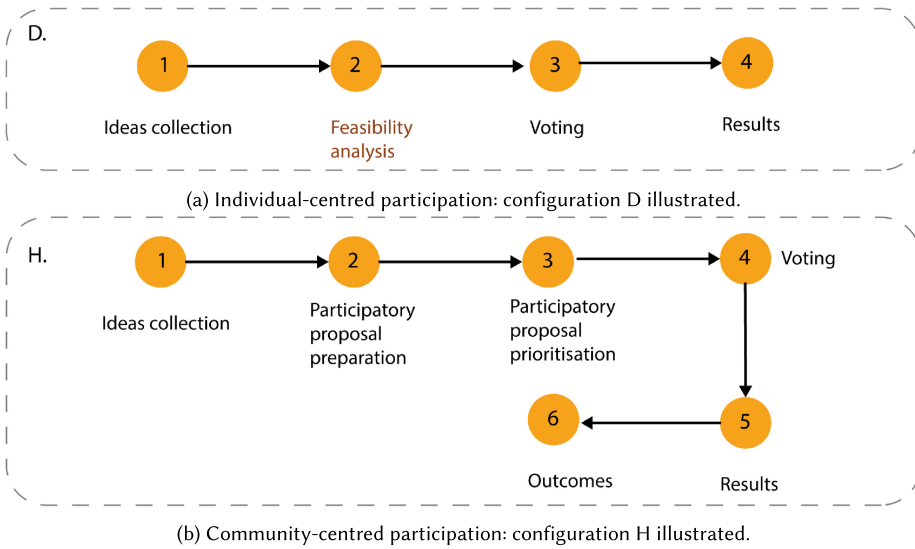


Fig. 7. Examples of individual-centred and community-centred participation configurations. The difference between them is that the latter involves at least one community-centred step.

administration and therefore set an expectation for collaborative and even deliberative work. However, a minority of cases involved community-centred steps ($n = 7$).

To summarise, we identified 15 different participatory budgeting configurations. When exploring these configurations, we focused on the prominence of different step categories in them: we observed that managerial steps were present in most configurations and similarly observed that collaborative work was not configured to these processes. To illustrate this, we position the 15 different configurations in a two-dimensional model (Figure 8): the horizontal axis captures configurations with any managerial steps, and the vertical axis focuses on the use of community-centred steps. This illustrates briefly the opportunities to move from open and individually oriented processes (e.g., configurations A and B) to other variations of democracy by using specific steps.

5 DISCUSSION

Our study has examined configurations of participation in digital participatory budgeting using data from several cases on DECIDIM, an open source platform for participatory democracy. We have discovered a great diversity of configurations. Across all publicly available cases ($n = 31$), we identified 25 different technical configurations of the platform. Similarly, we identified 15 different participatory budgeting configurations—that is, socio-technical setups explicating how citizens are expected and allowed to take part in participatory budgeting. Therefore, we conclude that, even within a single platform, there are many configurations of digital participatory budgeting (RQ1).

Our findings suggest the need to customise participatory budgeting for various local settings. We observe that these configurations can present more community-centred or more individual-centred approaches to participation. Similarly, a dimension focused on open or managed forms of participation could be extracted. We conclude that these dimensions also touch on key aspects of how democracy functions. Therefore, configurations also have implications for democracy. We began to unpack these implications first by discussing the role of the administrators, followed by a more careful analysis of the participatory budgeting processes and their configuration through technology.

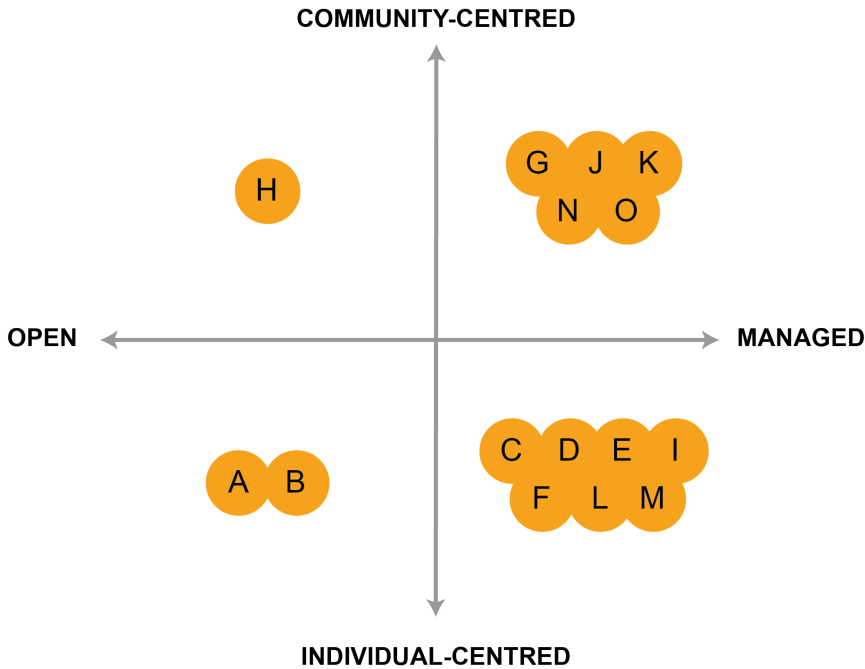


Fig. 8. Design space for participatory budgeting processes based on our axially coded steps. Most cases are presented in the right quadrants, as they usually involve management measures.

5.1 Administrators Stand between the Platform and Citizens

As our study focused on cases from the same platform, the high diversity of configurations is not the result of cases powered by different technologies and their affordances. Our cases exhibited 25 different technical configurations (i.e., choices of the components used), and with those components and steps, we were able to identify 15 different socio-technical configurations (which we call *participatory budgeting configurations*). Therefore, it seems that each group of administrators set up their participatory budgeting process in a specific manner. Our study cannot speak for their reasons for doing so: these may include the resources to execute participatory budgeting, concerns about a suitable process in the local socio-political context, level of understanding of the features provided by DECIDIM, influence from configurations of previous participatory budgeting processes, and so forth.

For digital civic engagement research, we highlight an important set of actors in the deployment process: public administrators (i.e., the individuals who configure participatory budgeting through technology). This insight adds to ongoing works on public administration and information technology [38, 40, 64]: administrators stand between technology developers and citizens. Even though they do not choose which features (in the case of DECIDIM, components) are built, they influence citizens' experience of civic engagement. As we show, the different configurations of participation included instances that adapted participatory democracy ideals, instances that preferred direct participation forms, and various degrees of administrative oversight and control over the outcomes—all within the same platform. Therefore, it would be false to say that administrators simply use civic engagement platforms, rather they make decisions on how they are used. We continue our discussion by asking how administrators configure participation via technical platforms. Based on this, we problematise the openness of democratic processes in online

environments due to the role of socio-technical configurations. We seek to highlight how politics relate to the technology configurations.

5.2 The Power to Configure Democracy

The cases of our study all represented some form of participatory budgeting—but with great variety, demonstrating how those who administer these platforms have *power over* civic participation, similar to those who set up the agenda and procedures in town hall meetings [10]. What is not on the platform cannot happen on the platform—it may be supported through workarounds that require active work from citizens to organise and maintain [55]. Given the diversity of technical and process configurations, DECIDIM is elastic and allows a broad range of online and offline interactions for participatory budgeting. We show that civic technology platforms enable different models of democracy and different degrees of citizen control. This shows that administrators shape democracy-enhancing technologies through design, deployment, and configuration. As a result, civic technology platforms may amplify some power structures and political practices, whether pre-existing ones or new forms.

Each platform instance can result in different executions, outputs, and ultimately democratic impacts. For example, we observed that managed interactions were most common on DECIDIM. Our study shows that this does not have to be the default: we observed a range of interactions of open and community-centred nature [17, 69]. We do not have an answer as to why public officials seem to prefer controlled orientations: this is not possible by observing the configurations alone. Rather, our observation highlights the role that public officials play in choosing how civic technology platforms enact democracy. Following Winner [86], we highlight that these choices have political implications—made intentionally or incidentally.

Similarly, we observed a divergence in the community orientation between scholars' normative descriptions of participatory budgeting and practitioners' work on it (i.e., public administrators). Scholars emphasised the importance of community and dialogue in participatory budgeting [73, 74]. Such works idealise participatory budgeting as a deliberative avenue of debate and discussion. However, we show that several cases demonstrated few deliberative traits, but most platforms presented a referendum-based model of democracy for participatory budgeting. This suggests a discrepancy between scholars' ideas about participatory budgeting and the practitioners' operationalisation of participatory budgeting. The divergence is not due to the civic technology platforms. We were able to identify seven instances that applied community-centred approaches with DECIDIM. Furthermore, purposely designed components such as DEBATE afford such community-centred interaction, but this component was not used in any of the observed cases. Therefore, the divergence between normative ideals and practitioners' actions opens up a new avenue for research. This discrepancy calls us to focus more on practitioners' configuration and other enactment work to understand what role the platforms play (and do not play) in online democracy.

Our highlight on the role of civic technology platform configuration speaks to an ongoing discussion on the importance of design and its effect on the political outputs of online platforms. For example, McDonald and Mazmanian [52] investigated the material structures of citizen data in U.S. congressional offices, highlighting how the design of the database systems inside congressional offices affects how representatives view their relationship with constituents. Similarly, Grön and Nelimarkka [30] have highlighted how political parties have strong conflicting ideology-based perspectives on how to design social media interfaces to reduce political polarisation. Liste and Sørensen [48] moved the debate to identify how municipal websites define citizens' role: they are clients if only opening hours and information on available services are available—but they can be citizens if the websites help them to engage in the shaping of the public services. Together these

authors suggest that design impacts democracy, but they focus on higher-level system and user interface designs, and therefore critique those who design the platforms, including their motivations, values, and ideologies. Our study expands this by noting the importance of *configuration* as a stage of platform deployment, thus opening up the deployment work for critique.

What *is* participatory budgeting is still open for negotiation. Or, in the case of DECIDIM, it is *open for configuration*: when deploying DECIDIM, administrators must establish how participatory budgeting takes place on the platform. These configurations speak to the core of democracy: they state how citizens are expected to behave in the decision-making process and how decisions are formed. This is a critical topic for all scholars who design and study participatory budgeting, and digital forms of democracy more broadly. For example, the individual-focused orientation of participatory budgeting instances gives users an individual role in society rather than encouraging them to reflect on their positions based on collective feedback. This configuration pushes citizens to see participation as a direct vote rather than as social inclusion and emancipation [57]. The government-led process similarly gives citizens the role of making choices within the boundaries defined by the government, thus potentially limiting the empowering impact of participatory democracy. At the same time, participatory budgeting is promoted as a direct mechanism for civic engagement [77].

5.3 Openness in Online Democracy

Citizen-driven democratic processes are expected to be open: citizens must be able to scrutinise how decision-making is conducted [77]. Our findings indicate that several participatory budgeting instances did not use the full potential of the platform to enhance openness.

First, our analysis showed that only a minority of studied instances used components designed to allow citizens to monitor and follow up how funding from participatory budgeting is used [32, 50]. Participatory budgeting aims to empower citizens to allocate funding to projects. Therefore, there should be evidence within each instance that funds were used to support the chosen projects. This is not due to unfamiliarity with the platform: we observed that the specially built monitoring component (ACCOUNTABILITY) was used in less than half of our instances. Instead, it appeared that the general-purpose PAGE component was used to communicate the outcomes to citizens. However, even when it was used to communicate the voting results, only one instance used it to publish information on projects' outcomes. Our analysis of the steps in participatory budgeting instances also showed that nearly half of the instances did not provide a step for OUTCOMES.

These issues do not inherently mean that there was a lack of citizen impact on the budgeting process. Governing agencies and organisations often have few resources or little incentive to provide follow-through, especially when working with large-scale forms of participation [60]. It can take a long time to explain to the public what ideas were selected, which ideas have been funded, and what has developed based on those funds. Depending on the scale of the project, the final outputs of those projects can take years to develop. Thus, a lack of evidence of final outcomes may be a result of shortcomings and disclosure of final budgeting outcomes rather than a lack of actual impact on society. However, openness is a core principle of democratic operations, and we therefore invite scholars to consider how to enhance it better through these tools (we discuss this further in the next section).

The second threat to openness was indications of removed data in some of the instances, making it impossible to evaluate the process afterwards. In three instances, we did not observe any use of the PROPOSAL component, and in two of them, it remains unclear to us as external observers how proposals were collected for voting: it may have happened on the platform and removed afterwards or in some off-platform procedure. If the PROPOSAL component was used in these instances, the component was removed from the platform before our data collection. As technically this is not

required to hide or remove the data (as many other instances demonstrate), these instances are outliers. It is not only we as researchers who do not have access to this data but also citizens who need access to this historical data to reflect on and audit the participatory budgeting process.

Due to these two perspectives of lacking openness, it is unclear if these participatory budgeting instances redistributed power to individuals in the communities. Our results suggest that the participatory process is not complete: although citizens are allowed to participate, the outcomes and record-keeping of the process are not clear. Regardless of intent, the lack of follow-through inside many of these budgeting processes is a concern for the openness of governments implementing these processes. Recent studies have suggested a trend towards *pseudo-participation* where participatory structures give the illusion of participation, but they are not fully participatory [65]. As a consequence, further work is needed to investigate the final impact of participatory budgeting and what motives and interactions citizens and administrators have.

5.4 The Politics of Design of Civic Technologies

Our findings illustrate the diversity of digital participatory budgeting, both in technical and social terms. This echoes the core finding of decades of computer-supported collaboration research (e.g., [82]): software tools are technically and socially *tailored* to support local expectations in organisations. Researchers have highlighted that organisational social and power relations impact the tailoring process: organisational politics is an important part of information systems, where different needs and conflicting perspectives are put together.

However, participatory budgeting and other systems for civic purposes are not like traditional organisational systems when it comes to tailoring and power conflicts. Civic platforms are used not only by an organisation and its employees but also by the public. This is a different relationship, driven by much stronger normative ideas of good democracy and active citizenship. HCI and CSCW communities have been familiar with this idea—for example, DiSalvo [20] states that technologies for collective political action must be designed with pluralistic design approaches. Although this goal aligns with democratic ideals, our research pushes back with a critical idea: ultimately, a small group of people needs to choose which platforms are used, how they are configured for use, and how the socio-technical process for participation is organised. A power imbalance creeps into these stages of the socio-technical system, similar to what political scientists observed while examining agenda-setting processes in town halls [10]. Our case has demonstrated a clear distinction between administrators (configuring DECIDIM) and citizens (using DECIDIM to propose ideas and allocate budgets).

What these findings point to is an important perspective for civic design work: the more a civic platform offers a variety of features and configurations for democratic processes, the more those processes can be shaped to the preferences and capacities of those who initiate them. Designers often want to provide users with the opportunity to uniquely customise their experiences for their needs, but such customisation can lead to different interpretations of ‘democracy,’ and, as we showed earlier, different degrees of openness—a core democratic value. Therefore, our question brings up a concrete design challenge for all platforms related to democracy and politics: to what degree should they allow tailoring to serve the wishes and expectations of administrators, or should platforms have a strong normative stance on what is ‘democracy’ and how it should be enacted via the platform? What are the values—if any—that platform developers should enforce on all instances and users? There is, of course, no one answer to this philosophical question; recall that there is no one *correct* form of democracy in the literature [33], and scholars emphasise different core values of it, such as inclusiveness, openness, and efficiency [77]. Scholars are even debating which normative stances on democracy are most important [e.g., 31, 72]. Our research indicates that tailoring opportunities may lead to increasing variation in how democratic processes are

interpreted and executed, and designers—and researchers—should be careful to understand how this impacts democracy and wider society.

5.5 Limitations and Future Work

We only observed the technical aspects of participatory budgeting on DECIDIM. This means that we have no data about the underlying rationales for the various configurations: they may be due to constraints on knowledge, resources (e.g., not having personnel to moderate discussions), or constraints set by politicians or a regulatory framework. Similarly, different views of democracy and participatory budgeting as well as political realities may play into the configuration. Our research is the first step in understanding the role played by platforms and their configurations in civic technology. Future work should follow more closely the process of configuration: interviews or ethnographic observations can help us understand the underlying motivations and beliefs and how those are formulated on the platform, and understand the role of the platform in the assemblage of systems and practices forming the participatory process. More fundamentally, our study demonstrates a blue ocean for research activity: HCI and CSCW scholars can move from studying citizens' perspectives and experiences of democracy to understanding the (technologically maintained) structures of participation and democracy.

Another limitation of our study is the small number of instances examined. However, at the time of this study, the 31 instances were *all* the publicly available DECIDIM instances fitting our selection criteria: there was no more data to be collected and analysed. However, the current data does not allow detailed exploration of cultural factors related to configurations: the majority of instances were in one country (i.e., Spain). Potentially, some differences in how democracy is organised relate to political systems or socio-cultural factors, both potential candidates for further work if some participatory budgeting platforms become more widely adopted. However, this does not change the core message of our study: there are differences in how democratic innovations are configured on the platform.

However, our study has developed a framework and terminology to move forward in a more systematic analysis and examine which factors impact the chosen democratic process. Future work may use the steps and process descriptions we present as a deductive coding strategy, and more closely examine how differences in the political system or socio-cultural context (or other relevant factors) impact the implementation of participatory budgeting through a technology-mediated platform. Similarly, a more careful analysis of the administrators, their beliefs, values, and even ideologies is merited, as our study identifies them as critical actors in platformed civic engagement. This type of research would require more extensive data collection, including interviews and observational studies. Our research serves as a starting point for further comparative research to tease out the reasons for our variations.

Finally, as with all inductive research approaches, the classifications that emerged are based on research teams' interpretations. We have illustrated the categories with examples to open up the process and increase overall transparency. Similarly, our team has discussed categorisations to improve and clarify descriptions and ensure mutual agreement on categories. However, future work to systematise the coding approach and examine its suitability for other platforms would be valuable in understanding how digital platforms aid in participatory budgeting.

6 CONCLUSION

We have studied the technical and social configurations of 31 participatory budgeting cases in Europe. Overall, we have observed a high degree of customisation: in total, we identified 25 unique technical configurations and 15 different participatory budgeting configurations. The diversity of participatory budgeting components integrated in each case sheds light on the numerous ways in

which participatory budgeting can be implemented, even using the same technology, with most participatory budgeting processes being designed as individual-centred. There does not appear to be one ‘optimal’ way for budgeting to take place, not even on the same platform with the same choice of components. Furthermore, we observe instances of limited openness that have been facilitated by configurations, as there was little use of follow-through components inside many of these budgeting processes. Our findings highlight how the configuration is about making politics: they impact citizens’ roles, and some common configurations can even counter the core values of participatory budgeting. Therefore, we caution developers of civic technology platforms: it should be carefully considered which elements of democracy should be available to customise government configurations and which are so essential to democracy that they should be enforced by design.

APPENDICES

A PARTICIPATORY BUDGETING CASES

The cases in Table 4 represent the participatory budgeting processes analysed in this study. A complete list of processes—including those that did not meet the selection criteria—can be downloaded and reused from <https://github.com/elaragon/decidimpb>

Table 4. Participatory Budgeting Processes

| ID | Instance URL | Location | Country |
|----|---|-----------------------|---------|
| 1 | https://decidim-calaf.diba.cat/processes/pressupostosparticipatiuscalaf2020 | Calaf | Spain |
| 2 | https://decidim.calafell.cat/processes/pressupostos-participatius-2020 | Calafell | Spain |
| 3 | https://participa.gavaciatat.cat/processes/Participaccio | Gavà | Spain |
| 4 | https://www.decidimmataro.cat/processes/trtyrt | Mataró | Spain |
| 5 | https://decidim-montmelo.diba.cat/processes/pressupostosparticipatius | Montmeló | Spain |
| 6 | https://palamos-decidim.ddgi.cat/processes/pressupost2019 | Palamós | Spain |
| 7 | https://decidim.sabadell.cat/processes/pressupostsbd | Sabadell | Spain |
| 8 | https://decidim.sabadell.cat/processes/construintsbd | Sabadell | Spain |
| 9 | https://decidim.sabadell.cat/processes/construintsbd17 | Sabadell | Spain |
| 10 | https://participa.santboi.cat/processes/pressupost2019 | Sant Boi | Spain |
| 11 | https://decidim.santcugat.cat/processes/pressupostparticipatiu | Sant Cugat del Vallès | Spain |
| 12 | https://decidim.santcugat.cat/processes/Edicio2016-17 | Sant Cugat del Vallès | Spain |
| 13 | https://decidim.santcugat.cat/processes/decidimlafloresta2019 | Sant Cugat del Vallès | Spain |
| 14 | https://decidim.santcugat.cat/processes/consellbarrimirasol2019 | Sant Cugat del Vallès | Spain |
| 15 | https://decidim.santcugat.cat/processes/consellbarrimirasol | Sant Cugat del Vallès | Spain |
| 16 | https://decidim.santcugat.cat/processes/consellbarrilafloresta | Sant Cugat del Vallès | Spain |
| 17 | https://decidim.sencelles.cat/processes/pressupostos2020 | Sencelles | Spain |
| 18 | https://decidim-latorre.diba.cat/processes/pressupostosparticipatius2019-2020 | Torre de Claramunt | Spain |
| 19 | https://decidim-vacarisses.diba.cat/processes/pressupostos-participatius-19 | Vacarisses | Spain |
| 20 | https://decidim-vic.diba.cat/processes/merma2020 | Vic | Spain |
| 21 | https://decidim-viladecans.diba.cat/processes/pressupostosparticipatius2019 | Viladecans | Spain |
| 22 | http://participa.vilanova.cat/processes/pressupostosparticipatius2017 | Vilanova i la Geltrú | Spain |
| 23 | http://participa.vilanova.cat/processes/pressupostosparticipatius2018 | Vilanova i la Geltrú | Spain |
| 24 | http://participa.vilanova.cat/processes/pressupostosparticipatius2019 | Vilanova i la Geltrú | Spain |
| 25 | https://omastadi.hel.fi/processes/osbu-2019 | Helsinki | Finland |
| 26 | https://ecrivons.angers.fr/processes/BP2018 | Angers | France |
| 27 | https://atelierdevosidees.loiret.fr/processes/etangdelavallee | Loiret | France |
| 28 | https://atelierdevosidees.loiret.fr/processes/budgetcollegiens | Loiret | France |
| 29 | https://atelierdevosidees.loiret.fr/processes/budget-participatif-des-parcs | Loiret | France |
| 30 | https://budgetparticipatif.saintjeandebraye.fr/processes/bp | Saint-Jean de Braye | France |
| 31 | https://budgetparticipatif.saintjeandebraye.fr/processes/bp2019-2020 | Saint-Jean de Braye | France |

B CASES AND CONFIGURATIONS

Table 5 summarises the configurations of all analysed cases.

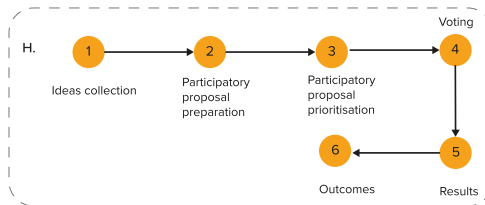
Table 5. Configurations and Cases

| Configuration | Case IDs | Total |
|---------------|------------------------------|-------|
| A | 13, 14, 15, 16 | 4 |
| B | 19 | 1 |
| C | 5 | 1 |
| D | 1, 3, 10, 22, 23, 27, 28, 29 | 8 |
| E | 24 | 1 |
| F | 26 | 1 |
| G | 6, 25 | 2 |
| H | 12 | 1 |
| I | 2, 7, 18, 20, 30, 31 | 6 |
| J | 8 | 1 |
| K | 9 | 1 |
| L | 17 | 1 |
| M | 4 | 1 |
| N | 21 | 1 |
| O | 11 | 1 |

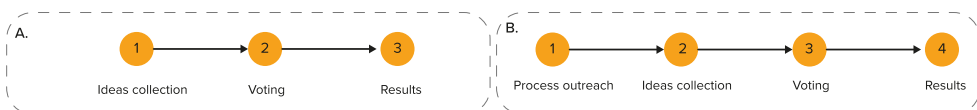
C PARTICIPATORY BUDGETING CONFIGURATIONS

The following illustrations contain the 15 participatory budgeting configurations that we have identified.

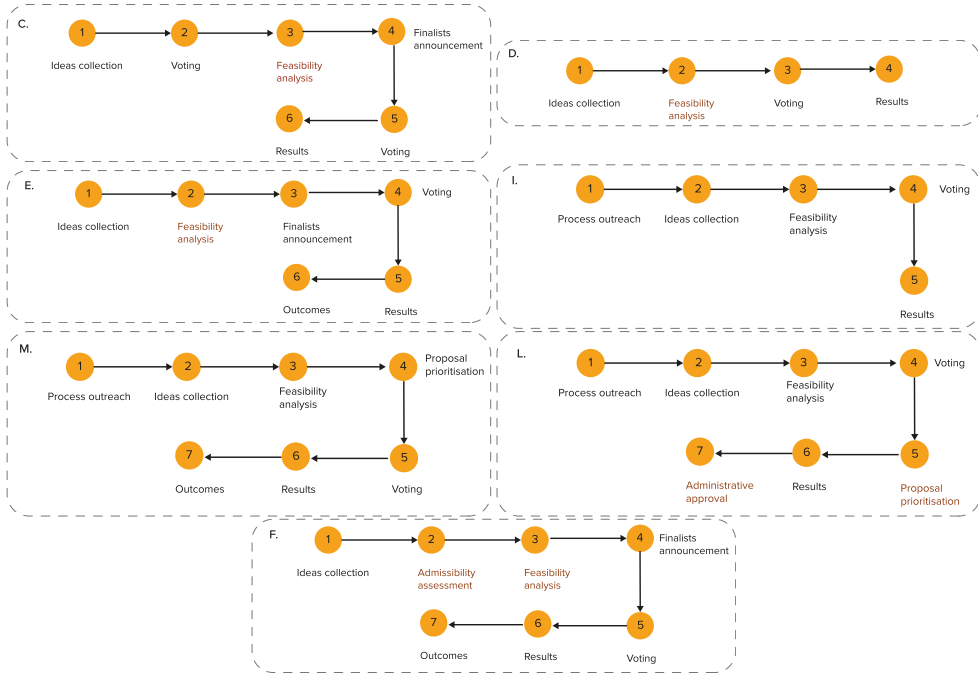
Community-Centred and Open



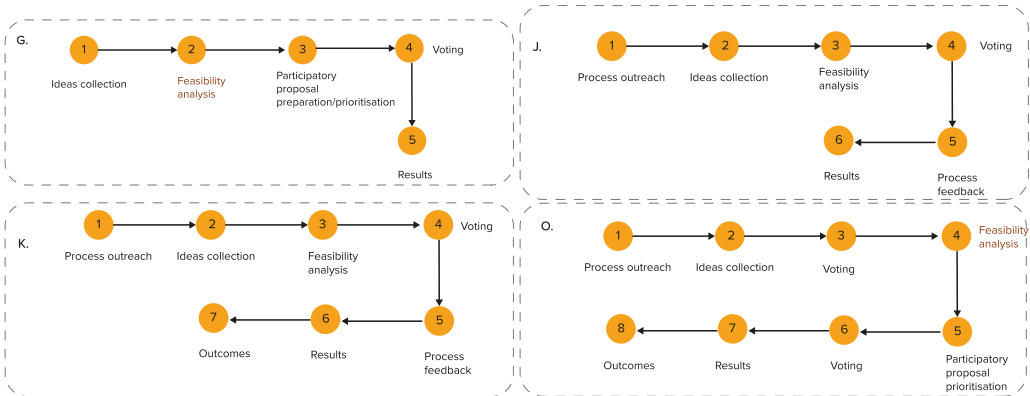
Individual-Oriented and Open



Individual-Oriented and Controlled



Community-Centred and Controlled



ACKNOWLEDGMENTS

We thank Rosa Borge Bravo for her invitation to present the preliminary results of this work at the CNSC Seminar series, which provided us with valuable feedback to improve this study, including suggestions by Sara Suárez Gonzalo. We would also like to extend our gratitude to the Helsinki Social Computing Group for their consistent support in improving this work.

REFERENCES

- [1] Rebecca Abers, Robin King, Daniely Votto, and Igor Brandão. 2018. Porto Alegre: Participatory budgeting and the challenge of sustaining transformative change. *World Resources Institute*. Retrieved December 23, 2023 from <https://www.wri.org/research/porto-alegre-participatory-budgeting-and-challenge-sustaining-transformative-change>
- [2] Bruce Ackerman and James S. Fishkin. 2008. *Deliberation Day*. Yale University Press, New Haven, CT.
- [3] Tanja Aitamurto and Jorge Saldivar. 2017. Motivating participation in crowdsourced policymaking. *Proceedings of the ACM on Human-Computer Interaction* 1, CSCW (2017), 1–22. <https://doi.org/10.1145/3134653>
- [4] Pablo Aragón. 2019. *Characterizing Online Participation in Civic Technologies*. Ph.D. Dissertation. Universitat Pompeu Fabra.
- [5] Pablo Aragon, Adriana Alvarado Garcia, Christopher A. Le Dantec, Claudia Flores-Saviaga, and Jorge Saldivar. 2020. Civic technologies: Research, practice and open challenges. In *Conference Companion Publication of the 2020 on Computer Supported Cooperative Work and Social Computing (CSCW '20 Companion)*. ACM, New York, NY, 537–545. <https://doi.org/10.1145/3406865.3430888>
- [6] Pablo Aragón, Andreas Kaltenbrunner, Antonio Calleja-López, Andrés Pereira, Arnau Monterde, Xabier E. Barandiaran, and Vicenç Gómez. 2017. Deliberative platform design: The case study of the online discussions in Decidim Barcelona. In *Proceedings of the International Conference on Social Informatics*. 277–287.
- [7] Sherry R. Arnstein. 1969. A ladder of citizen participation. *Journal of the American Institute of Planner* 35, 4 (1969), 216–224.
- [8] Mariam Asad and Christopher A. Le Dantec. 2015. Illegitimate civic participation. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '15)*. 1694–1703. <https://doi.org/10.1145/2675133.2675156>
- [9] Mariam Asad and Christopher A. Le Dantec. 2017. Tap the “Make This Public” button. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17)*. ACM, New York, NY, 6304–6316. <https://doi.org/10.1145/3025453.3026034>
- [10] Peter Bachrach and Morton S. Baratz. 1962. Two faces of power. *American Political Science Review* 56, 4 (1962), 947–952. <https://doi.org/10.2307/1952796>
- [11] Xabier E. Barandiaran, Antonio Calleja-López, and A. Monterde. 2019. *Decidim: Political and Technopolitical Networks for Participatory Democracy*. White Paper. Decidim Project.
- [12] H. Russell Bernard. 2013. *Social Research Methods: Qualitative and Quantitative Approaches* (2nd ed.). SAGE Publications.
- [13] Yosef Bhatti. 2012. Distance and voting: Evidence from Danish municipalities. *Scandinavian Political Studies* 35, 2 (2012), 141–158. <http://doi.wiley.com/10.1111/j.1467-9477.2011.00283.x>
- [14] Kirsten Boehner and Carl DiSalvo. 2016. Data, design and civics: An exploratory study of civic tech. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. 2970–2981.
- [15] Richard E. Boyatzis. 1998. *Transforming Qualitative Information: Thematic Analysis and Code Development*. SAGE Publications.
- [16] Yves Cabannes and Global Campaign on Urban Governance. 2004. *72 Frequently Asked Questions about Participatory Budgeting*. UN-HABITAT.
- [17] Andrew Chadwick and Christopher May. 2003. Interaction between states and citizens in the age of the Internet: “E-Government” in the United States, Britain, and the European Union. *Governance* 16, 2 (2003), 271–300.
- [18] Simone Chambers. 2003. Deliberative democratic theory. *Annual Review of Political Science* 6, 1 (2003), 307–326.
- [19] Nelson Dias. 2018. *Hope for Democracy: 30 Years of Participatory Budgeting Worldwide*. Epic Books et Oficina.
- [20] Carl DiSalvo. 2009. Design and the construction of publics. *Design Issues* 25, 1 (2009), 48–63. <https://doi.org/10.1162/desi.2009.25.1.48>
- [21] Sheena L. Erete. 2015. Engaging around neighborhood issues. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '15)*. 1590–1601. <https://doi.org/10.1145/2675133.2675182>
- [22] Christen Erlingsson and Petra Brysiewicz. 2017. A hands-on guide to doing content analysis. *African Journal of Emergency Medicine* 7, 3 (2017), 93–99.
- [23] Katharina Esau, Dennis Friess, and Christiane Eilders. 2017. Design matters! An empirical analysis of online deliberation on different news platforms. *Policy and Internet* 9, 3 (2017), 321–342. <https://doi.org/10.1002/poi3.154>
- [24] Roberto Falanga. 2018. The national participatory budget in Portugal: Opportunities and challenges for scaling up citizen participation in policymaking. In *Hope for Democracy: 30 Years of Participatory Budgeting Worldwide*, N. Dias (Ed.). Epic Books et Oficina, 447–466.
- [25] Alexandre Apsan Frediani, M. A. Fench, and Isis Nunez Ferrera. 2011. *Change by Design: Building Communities through Participatory Design*. Urban Culture Press.
- [26] Archon Fung. 2006. Varieties of participation in complex governance. *Public Administration Review* 66, s1 (2006), 66–75. <https://doi.org/10.1111/j.1540-6210.2006.00667.x>

- [27] Tarleton Gillespie. 2010. The politics of ‘platforms.’ *New Media and Society* 12, 3 (2010), 347–364. <https://doi.org/10.1177/1461444809342738>
- [28] Hollie Russon Gilman. 2020. Calls to ‘Defund the Police’ Could Transform Public Budgeting as We Know It. Retrieved December 17, 2021 from <https://www.newamerica.org/weekly/defund-the-police-could-spark-a-revolution-in-public-budgeting/>
- [29] Benjamin Goldfrank. 2007. Lessons from Latin American experience in participatory budgeting. *Participatory Budgeting* 143 (2007), 91–126.
- [30] Kirsikka Grön and Matti Nelimarkka. 2020. Party politics, values and the design of social media services. *Proceedings of the ACM on Human-Computer Interaction* 4, CSCW2 (2020), 1–29. <https://doi.org/10.1145/3415175>
- [31] Amy Gutmann and Dennis Thompson. 2004. *Why Deliberative Democracy*. Princeton University Press, Princeton, NJ.
- [32] Baogang He. 2011. Civic engagement through participatory budgeting in China: Three different logics at work. *Public Administration and Development* 31, 2 (2011), 122–133.
- [33] David Held. 2006. *Models of Democracy*. Stanford University Press, Stanford, CA.
- [34] Libby Hemphill and Andrew J. Roback. 2014. Tweet acts: How constituents lobby congress via Twitter. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW ’14)*. ACM, New York, NY, 1200–1210. <https://doi.org/10.1145/2531602.2531735>
- [35] Matthew Hindman. 2009. *The Myth of Digital Democracy*. Princeton University Press, Princeton, NY. <http://www.loc.gov/catdir/toc/fy0904/2008005147.html>
- [36] James Holston, Valérie Issarny, and Cristhian Parra. 2016. Engineering software assemblies for participatory democracy: The participatory budgeting use case. In *Proceedings of the 2016 IEEE/ACM 38th International Conference on Software Engineering Companion (ICSE-C ’16)*. IEEE, Los Alamitos, CA, 573–582.
- [37] Youyang Hou. 2016. Understand the design and implementation of civic technologies in public organizations. In *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion*. 147–150.
- [38] Gabriella Jansson and Gissur Ó Erlingsson. 2014. More e-government, less street-level bureaucracy? On legitimacy and the human side of public administration. *Journal of Information Technology & Politics* 11, 3 (2014), 291–308. <https://doi.org/10.1080/19331681.2014.908155>
- [39] Andreas Jungherr. 2016. Twitter use in election campaigns: A systematic literature review. *Journal of Information Technology & Politics* 13, 1 (2016), 72–91. <https://doi.org/10.1080/19331681.2015.1132401>
- [40] Naveena Karusala, Jennifer Wilson, Phebe Vayanos, and Eric Rice. 2019. Street-level realities of data practices in homeless services provision. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–23. <https://doi.org/10.1145/3359286>
- [41] Juho Kim, Eun-young Ko, Jonghyuk Jung, Chang Won Lee, Nam Wook Kim, and Jihee Kim. 2015. Factful: Engaging taxpayers in the public discussion of a government budget. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI ’15)*. ACM, New York, NY, 2843–2852. <https://doi.org/10.1145/2702123.2702352>
- [42] Travis Kriplean, Jonathan Morgan, Deen Freelon, Alan Borning, and Lance Bennett. 2012. Supporting reflective public thought with ConsiderIt. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work (CSCW ’12)*. ACM, New York, NY, 265–274. <https://doi.org/10.1145/2145204.2145249>
- [43] Huyen T. Le, G. R. Boynton, Yelena Mejova, Zubair Shafiq, and Padmini Srinivasan. 2017. Revisiting the American voter on Twitter. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI ’17)*. ACM, New York, NY, 4507–4519. <https://doi.org/10.1145/3025453.3025543>
- [44] Christopher A. Le Dantec, Mariam Asad, Aditi Misra, and Kari E. Watkins. 2015. Planning with crowdsourced data. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW ’15)*. ACM, New York, NY, 1717–1727. <https://doi.org/10.1145/2675133.2675212>
- [45] Josh Lerner. 2011. Participatory budgeting: Building community agreement around tough budget decisions. *National Civic Review* 100, 2 (2011), 30–35.
- [46] Josh Lerner and Daniel Schugurensky. 2007. Who learns what in participatory democracy? Participatory budgeting in Rosario, Argentina. In *Democratic Practices as Learning Opportunities*. Brill Sense, 85–100.
- [47] Josh Lerner and Donata Secondo. 2012. By the people, for the people: Participatory budgeting from the bottom up in North America. *Journal of Public Deliberation* 8, 2 (2012), 1–2.
- [48] Lucía Liste and Knut H. Sørensen. 2015. Consumer, client or citizen? How Norwegian local governments domesticate website technology and configure their users. *Information, Communication & Society* 18, 7 (7 2015), 733–746. <https://doi.org/10.1080/1369118X.2014.993678>
- [49] Helen Margetts, Peter John, Scott Hale, and Taha Yasseri. 2015. *Political Turbulence: How Social Media Shape Collective Action*. Princeton University Press, Princeton, NJ.

- [50] Ricardo Matheus, Manuella M. Ribeiro, José Carlos Vaz, and Cesar A. de Souza. 2010. Case studies of digital participatory budgeting in Latin America: Models for citizen engagement. In *Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance*. 31–36.
- [51] Philipp Mayring. 2004. Qualitative content analysis. *Companion to Qualitative Research* 1, 2 (2004), 159–176.
- [52] Samantha McDonald and Melissa Mazmanian. 2019. Information materialities of citizen communication in the US Congress. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–20.
- [53] Rony Medaglia. 2012. eParticipation research: Moving characterization forward (2006–2011). *Government Information Quarterly* 29, 3 (2012), 346–360.
- [54] Maria Menendez-Blanco and Pernille Bjørn. 2022. Designing digital participatory budgeting platforms: Urban biking activism in Madrid. *Computer Supported Cooperative Work* 31, 4 (2022), 567–601.
- [55] Maria Menendez-Blanco and Pernille Bjørn. 2022. Designing digital participatory budgeting platforms: Urban biking activism in Madrid. *Computer Supported Cooperative Work* 31, 4 (2022), 567–601.
- [56] Françoise Montambeault. 2019. “It was once a radical democratic proposal”: Theories of gradual institutional change in Brazilian participatory budgeting. *Latin American Politics and Society* 61, 1 (2019), 29–53.
- [57] Françoise Montambeault and Camille Goirand. 2016. Between collective action and individual appropriation: The informal dimensions of participatory budgeting in Recife, Brazil. *Politics and Society* 44, 1 (2016), 143–171. <https://doi.org/10.1177/0032329215617467>
- [58] Michael J. Muller and Sandra Kogan. 2010. Grounded theory method in HCI and CSCW. *Cambridge: IBM Center for Social Software* 28, 2 (2010), 1–46.
- [59] Diana C. Mutz. 2008. Is deliberative democracy a falsifiable theory? *Annual Review of Political Science* 11, 1 (2008), 521–538. <https://doi.org/10.1146/annurev.polisci.11.081306.070308>
- [60] John Nalbandian, Robert O’Neill Jr., J. Michael Wilkes, and Amanda Kaufman. 2013. Contemporary challenges in local government: Evolving roles and responsibilities, structures, and processes. *Public Administration Review* 73, 4 (2013), 567–574.
- [61] Matti Nelimarkka. 2019. A review of research on participation in democratic decision-making presented at SIGCHI conferences: Toward an improved trading zone between political science and HCI. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–29. <https://doi.org/10.1145/3359241>
- [62] Helen Nissenbaum. 2005. Values in technical design. In *Encyclopedia of Science, Technology, and Ethics*, Carl Mitcham (Ed.). MacMillan, New York, NY, lxvi–lxx.
- [63] Andreas Novy and Bernhard Leubolt. 2005. Participatory budgeting in Porto Alegre: Social innovation and the dialectical relationship of state and civil society. *Urban Studies* 42, 11 (2005), 2023–2036.
- [64] Juho Pääkkönen, Matti Nelimarkka, Jesse Haapoja, and Airi Lampinen. 2020. Bureaucracy as a lens for analyzing and designing algorithmic systems. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, 1–14. <https://doi.org/10.1145/3313831.3376780>
- [65] Victoria Palacin, Matti Nelimarkka, Pedro Reynolds-Cuellar, and Christoph Becker. 2020. The design of pseudo-participation. In *Proceedings of the 16th Participatory Design Conference 2020—Participation(s) Otherwise*, Vol. 2. ACM, New York, NY, 40–44. <https://doi.org/10.1145/3384772.3385141>
- [66] Cristhian Parra, Christelle Rohaut, Marianne Maeckelbergh, Valerie Issarny, and James Holston. 2017. Expanding the design space of ICT for participatory budgeting. In *Proceedings of the 8th International Conference on Communities and Technologies*. 213–221.
- [67] Paul Pierson. 2006. Public policies as institutions. In *Rethinking Political Institutions: The Art of the State*, Ian Shapiro, Stephen Skowronek, and Daniel Galvin (Eds.). NYU Press, 114–131.
- [68] Elizabeth Pinnington, Josh Lerner, and Daniel Schugurensky. 2009. Participatory budgeting in North America: The case of Guelph, Canada. *Journal of Public Budgeting, Accounting & Financial Management* 21, 3 (2009), 455–484.
- [69] Christopher G. Reddick. 2011. Citizen interaction and e-government: Evidence for the managerial, consultative, and participatory models. *Transforming Government: People, Process and Policy* 5, 2 (2011), 167–184.
- [70] K. Andrew R. Richards and Michael A. Hemphill. 2018. A practical guide to collaborative qualitative data analysis. *Journal of Teaching in Physical Education* 37, 2 (2018), 225–231.
- [71] Hollie Russon Gilman and Brian Wampler. 2019. The difference in design: Participatory budgeting in Brazil and the United States. *Journal of Public Deliberation* 15, 1 (2019), 1–7.
- [72] David M. Ryfe. 2005. Does deliberative democracy work? *Annual Review of Political Science* 8, 1 (2005), 49–71. <https://doi.org/10.1146/annurev.polisci.8.032904.154633>
- [73] Kidjie Saguin. 2018. Why the poor do not benefit from community-driven development: Lessons from participatory budgeting. *World Development* 112 (2018), 220–232.
- [74] Jorge Saldívar, Cristhian Parra, Marcelo Alcaraz, Rebeca Arteta, and Luca Cernuzzi. 2019. Civic technology for social innovation. *Computer Supported Cooperative Work* 28, 1 (2019), 169–207.

- [75] Alex Santamaría-Philco, José H. Canós Cerdá, and M. Carmen Penadés Gramaje. 2019. Advances in e-Participation: A perspective of last years. *IEEE Access* 7 (2019), 155894–155916.
- [76] Gianluca Sguero. 2016. *Participatory Budgeting: An Innovative Approach*. European Parliament.
- [77] Graham Smith. 2009. *Democratic Innovations: Designing Institutions for Citizen Participation*. Cambridge University Press, Cambridge, UK.
- [78] Stefano Stortone and Fiorella De Cindio. 2015. Hybrid participatory budgeting: Local democratic practices in the digital era. In *Citizen's Right to the Digital City*. Springer, 177–197.
- [79] Kim Strandberg. 2015. Designing for democracy? An experimental study comparing the outcomes of citizen discussions in online forums with those of online discussions in a forum designed according to deliberative principles. *European Political Science Review* 7, 3 (2015), 451–474. <https://doi.org/10.1017/S1755773914000265>
- [80] Andres Temblador. 2020. *Participatory Budgeting in Long Beach, Ca: A People's Budget in Progress*. California State University, Long Beach, CA.
- [81] Michael Touchton and Brian Wampler. 2020. Public engagement for public health: Participatory budgeting, targeted social programmes, and infant mortality in Brazil. *Development in Practice* 30, 5 (2020), 681–686.
- [82] Randall H. Trigg and Susanne Bødker. 1994. From implementation to design. In *Proceedings of the 1994 ACM Conference on Computer Supported Cooperative Work (CSCW '94)*. ACM, New York, NY, 45–54. <https://doi.org/10.1145/192844.192869>
- [83] UN-Habitat. 2004. *72 Frequently Asked Questions about Participatory Budget*. Urban Governance Toolkit Series. UN-Habitat.
- [84] United Nations Department of Economic and Social Affairs. 2020. *E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development*. Technical Report. Department of Economic and Social Affairs, United Nations.
- [85] Nina Valkanova, Robert Walter, Andrew Vande Moere, and Jörg Müller. 2014. MyPosition: Sparking civic discourse by a public interactive poll visualization. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work and Social Computing*. ACM, New York, NY, 1323–1332. <https://doi.org/10.1145/2531602.2531639>
- [86] Langdon Winner. 1985. Do artifacts have politics? In *The Social Shaping of Technology*, Donald MacKenzie and Judy Wajcman (Eds.). Open University Press, Buckingham, UK, 26–38.
- [87] Scott Wright and John Street. 2007. Democracy, deliberation and design: The case of online discussion forums. *New Media & Society* 9, 5 (2007), 849–869. <https://doi.org/10.1177/1461444807081230>
- [88] Amy X. Zhang and Scott Counts. 2015. Modeling ideology and predicting policy change with social media. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15)*. ACM, New York, NY, 2603–2612. <https://doi.org/10.1145/2702123.2702193>

Received 7 May 2022; revised 2 October 2023; accepted 5 November 2023