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Bridging Digital Politics and Local Action: The Role of Civic Tech in Political Participation

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Date: June 3, 2025

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Abstract

Civic space enclosure has defined the shrinking role of citizen participation in political life. Early optimism of social media as a political tool has not been met and instead can be deteriorating. Civic tech has presented itself as a possible alternative. Research on the technology has typically focused on its design and usage without measuring its impact on policy and decision-making. This thesis explores the role of Decidim, a platform in Barcelona, as a tool for residents to become involved in local politics. Quantitative measures of proposals and their implementation reveal the opportunities available for participation as well as the challenges that go beyond a digital tool. Both measures of engagement and political salience were used to reveal these tensions. How civic tech can escape the prescriptions of connective action is shown through user engagement. However, complexity arises during proposal implementation, which demonstrates the limitations of civic tech. The results highlight how citizens can leverage digital tools for their benefit and provide directions for future research to further explore the power structures within civic spaces.

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1. Introduction

Political participation is foundational to democracy. It encompasses both the essential act of voting as well as more active forms of assembling, deliberating, and advocacy (Pettit, 2012). Civic spaces are what facilitate participation (Malena, 2015). These are not physical locations but rather a place for the production and protection of political rights (Strachwitz & Toepler, 2022). Recently, civic spaces have become scrutinized, mirroring the enclosure and co-optation found within less democratic societies (Sardoč & Deželan, 2025). This has become a topic of intrigue in both politics and academia. Increased political polarization and movement away from neoliberal conceptions of civil society have been pointed to (Roggeband & Krizsán, 2021). However, the relational nature of civil society and the digital turn likewise contribute to the trend.

Civic space enclosure has risen alongside the creation of digital civic spaces, a concept initially promised to ease the physical barriers to participation (Helberger, 2020). However, social media has been the site of the production of these spaces. Initially seen as a political opportunity for citizens, the corporations behind the platforms are swayed by their own political and financial interests (Santini & Carvalho, 2019). Indeed, the potential of a public mechanism through a private tool is inherently problematic and has been rife with challenges. In response, public officials and politically-inclined technologists have attempted alternatives to create strong digital civic spaces. Collectively termed civic tech, it is software designed for civilian use to be informed, hold government accountable, or share political positions that is explicitly built as a digital civic space (Lukensmeyer, 2017). Detractors often construe the technology as tokenizing and myopic in its potential (Dickinson et al., 2019). Thus far, research has failed to demonstrate which is true. The

mapping of their usage and implementation is considerably lower than social media by the public sector.

What the research focuses on is typically civic tech design or descriptive accounts of its usage, creating a gap in the measured impacts of civic tech. As civic space continues to be threatened and social media is insufficient, the role of civic requires further inspection. The following thesis will address this gap in research to provide an explanatory account of the impact of civic tech within decision-making. The following research question will be addressed:

RQ: What is the effect of civic tech usage on political participation?

The question above is broad in scope, however, it reflects the research landscape. Below, the literature review and theoretical framework will focus the research further. In the former, liberal and Marxist notions of civil society are explored and inform how to frame participation. The spread of social media and the civic tech landscape are likewise included. The framework draws on affordance theory, connective action, and Arnstein's ladder of participation to conceptualize and measure the selected case. Decidim, a platform created in Barcelona, was selected as an exemplary case of civic tech, and its particular affordances are used to design the hypotheses. The research design and analysis address how topics and levels of engagement impact the level of participation. Finally, the interpretation and discussion highlight the implications of using the platform, where research can improve on the thesis, and how civic tech can be used by citizens to bolster their levels of participation.

2. Literature Review

2.1 Theoretical Foundations in Civil Society

Civil society is the basis of public and political life. A contested concept, the discourse on civil society centers on what determines a healthy, politically-informed populace (Sardoč & Deželan, 2025; Tzanakis, 2013). Liberal and Marxist perspectives dominate the field, particularly from the latter (Ehrenberg, 2017). Putnam (1994) was instrumental in reintroducing the civil society debate. He argued that a civil society is created through political involvement. Cohen & Arato (1992, p. 19) argue that "cross-cutting cleavages, overlapping memberships of groups, and social mobility" are foundational. The liberal civil society values the right to participative and freedom of association as a buffer to the encroachment of the state (Edwards & Ehrenberg, 2011). In the Marxist tradition, however, positioning civil society as a buffer to the government is problematic.

Politically, Marxists argue that the insulation of civil society from the state threatens depoliticization by accommodating deliberation rather than challenging the legitimacy of the state and capitalism (Chambers, 2020). Liberal civic ideals often become synonymous with capitalist systems, circumscribing what can be produced within civil society. Its ideals of equality and plural voices neglect power relations and structural differences in political ability between classes (Wood, 2017). Simply allowing freedom of association and the right to participate does not preclude a civil society that ensures the same resources for all members (Silagadze et al., 2023). Furthermore, it shifts focus away from structural inequalities towards identity-driven politics, a process that denatures the original intentions of civil society (Appleton, 2019). Coherent Marxist

conceptions have been limited, instead, the arguments are useful in assessing the state of civic spaces, the manifestations of civil society (Tzanakis, 2013).

2.2 The Production and Enclosure of Civic Spaces

Civic spaces are the arenas that allow citizens, civil society organizations (CSOs), and other actors to exercise their political rights (Heidbreder, 2012). Broadly, civic spaces are the "set of conditions that determine the extent to which all members of society [...] can freely, effectively and without discrimination exercise their basic civil rights" (Malena, 2015, p. 14). Importantly, a civic space does not constitute a physical location. Rather, it is the production of discourse, activism, accountability, participation, and community building that serve as civic spaces (Strachwitz & Toepler, 2022). CSOs are instrumental to their success and reflect how civil society can participate in political life by acting as intermediaries or mouthpieces for citizens' interests (Roggeband & Krizsán, 2021). Civic spaces lead to the engagement of citizens regardless of their background and accommodate a plurality of opinions (Meléndez & Martinez-Cosio, 2019). Thus, civic spaces within the West reflect the values of liberal civil society. Increasingly, digital platforms, most notably social media, have become the site of civic spaces. The evolution of these digital civic spaces has been a subject of interest for academics since the turn of the century.

Optimism on the potential for digital civic spaces arose in the early 2010s as movements and revolutions globally leveraged social media for political expression and assembly (Butzlaff, 2020). The construction of civic spaces through social media extended beyond mass demonstrations. At local levels, it is a vehicle for participation and has become instrumental in informing people (Saud et al., 2023). Outside of social media, municipal use of e-government tools for accessible public services has introduced new conveniences and reduced bureaucratic frustration (Shelton, 2018). Digital civic spaces thus replicate traditional civic spaces' production

of civil rights through virtual means. Criticism has more often been generated from the introduction of social media into politics. Indeed, civic spaces, both physical and virtual, have been observed as shrinking (Sardoč & Deželan, 2025). The systematic enclosure of civic spaces has mirrored Marxist concerns of depoliticization and co-optation.

In traditional civic spaces, shrinking occurs through several overlapping trends in the state reasserting political power (Hayes et al., 2017). Many states have restricted the organizational and financial autonomy of CSOs (Strachwitz & Toepler, 2022). Their production of counter-discourses to state narratives is often perceived as a threat, particularly to states already engaging in anti-democratic behavior (Roggeband & Krizsán, 2021). The weakening has occurred concurrently with the creation of government-organized NGOs that mimic the language and structure given by CSOs while adhering to a government's agenda (Hayes et al., 2017). COVID-19 further accelerated enclosure using the pandemic as a means for securitization (Bethke & Wolff, 2020). Using public health rhetoric, protests and demonstrations could be halted or severely restricted (Simsa, 2022). For digital civic spaces, their production was perhaps always threatened.

The "platformization" of politics through these digital spaces has become a key concern. Private companies' positions as the owners and intermediaries of public fora inform how civil society can be conducted, and what is considered permissible (van Dijck, 2020). Algorithmic decision-making on the priority of a post or comment to appear for a user will inform their perception of a given political event (Halupka, 2016). Platforms also have their own economic and political interests to consider. Platforms extend beyond intermediaries– social media companies are effective political actors in their own right (Ruess et al., 2023). Private interests driving the platform structure encourage control of information and manipulate open deliberation and

engagement (Tornberg & Uitermark, 2020). Thus, exercising participation within digital civic spaces has generated academic interest.

2.3 Contemporary Rifts in Participation Research

Participation is essential for citizens to be involved in political processes. The concept broadly refers to the actions taken by citizens to influence or advocate policy or decision-making within the public sphere (Milbrath, 1981). Political participation demonstrates trust between the state and citizens, diffusing decision-making power (Pettit, 2012). However, the power shift often becomes tokenized to uphold the appearance of democratized governance rather than bringing substantive change (Santini & Carvalho, 2019). Specifically, there is increased accessibility to deliberate concurrently with the elites' capture of decision-making processes (Boulianne, 2020; Butzlaff, 2020). As a result, participation has become associated with the ability to voice opinions without substantively impacting decision-making processes or outcomes (Ansell et al., 2021). Civic spaces and participation are thus mirrors, whereby there is a constant tension between efforts to engage with political life and power structures that resist this engagement. Digital civic spaces, nonetheless, offer their unique challenges to the potency of participation.

Online political participation (OPP) has often been interpreted as a distinct political activity. Traditional participation focused on either institutional activities (voting and contacting politicians) or non-institutional activities (protesting, signing petitions, etc.) (Jeroense & Spierings, 2023). In contrast, OPP is more diffuse in how it manifests. Gibson and Cantijoch (2013) highlight a distinction between active and passive participation. The former refers to online equivalents to traditional participation, such as donating online or contacting a politician digitally. The latter refers to the consumption of media and engaging in discussion, such as commenting on a post.

Passive participation dominates much of the political activity online and is regarded as weaker and less consequential to political outcomes (Theocharis & Lowe, 2016).

Definitions and research on OPP are highly platform-specific, particularly focusing on social media (Ruess et al., 2023). By focusing on the opportunities provided by social media, the results will necessarily be inhibited. As mentioned, social media platforms were not necessarily designed to host digital civic spaces. Furthermore, the companies' private interests limit their use as a political tool. In contrast, civic tech is designed to produce digital civic spaces for more robust and defined opportunities for participation.

2.4 Mapping Civic Tech's History

Civic tech has developed in parallel to social media. Prior to the techno-optimism of social media as a political tool for good, prospects of using the Internet to increase engagement and interest already grew (Delli Carpini, 2000). Visions arose of direct democracy through online deliberative channels to produce a more informed political milieu (White, 1997). As information and communication technology (ICTs) advanced, political platforms for transparency and open deliberation were developed (Boehner & DiSalvo, 2016).

Although much digital activism occurs on social media, this amounts to a diluted form of participation embedded within other discourses and niches (Shelton, 2018). In contrast, civic tech is expressly designed for political activity (Schrock, 2019). Civic tech can be developed from outside government, from within, or later be integrated within public frameworks (Ho, 2022). Civic tech is context-dependent and mission-oriented, meaning one platform or tool may differ from another given a community's needs or an organization's goals (May & Ross, 2018). There is a range of applications for civic tech. Collective action through independently organized campaigns and programs that can be social, such as through environmental cleanup (Cardoso et

al., 2013), or political, through deliberation and advocating for grassroots public policy (Lukensmeyer, 2017). Accountability is a common theme, whereby users act as a watchdog by monitoring and transparently communicating government activities (Banerjee, 2023; Rumbul, 2016). Civic tech, at its simplest, can be a platform to inform citizens of government activities and improve access to public services (Menichinelli et al., 2020). More comprehensive examples allow for discussion, deliberating policy, and involving citizens in decision-making (Skaržauskienė & Mačiulienė, 2020). Civic tech can be understood as a forum, an information medium, or provide the input and output of crowdsourcing campaigns (May & Ross, 2018).

Many civic tech platforms have been implemented at the urban level. The increasing complexity moving up to the regional and national level by coordinating between a large set of actors horizontally and vertically has limited its use (Wilson & Chakraborty, 2019). The physical and social spaces citizens occupy are within their community, common topics include public transport, parks, and public safety (Dickinson et al., 2019; Schrock, 2019). On topics of policy making, a citizen's opinion and contributions play a larger role in decision-making within their municipality (Cardoso et al., 2013).

Advocates of civic tech point to its design as more effectively portraying political opinion and hosting deliberative discourse (Lukensmeyer, 2017). When applied effectively, civic tech can open decision-making processes to a wider audience and transparently disseminate information (Dickinson et al., 2019). Nonetheless, technology does not come without its limits and challenges. Gordon and Lopez (2019) highlight three tensions in civic tech applications worth mentioning: function vs. representation; amplification vs. transformation; and grassroots vs. grasstops. The function versus representation of civic tech refers to the intention of the technology versus how users perceive it. Importantly, civic tech relies on digital solutions to address complex problems

(Boehner & DiSalvo, 2016). Digital arenas for debate can simplify arguments and limit continued political activity relative to physical civic spaces (Shelton, 2018). Additionally, structural inequalities do not escape civic tech. Digital literacy, awareness of a civic tech platform, and the necessary time and resources to use civic tech influence citizen engagement, drawing a relation to existing socioeconomic inequalities (Dickinson et al., 2019). This likewise corresponds to amplification versus transformation. Civic tech that only communicates information without allowing for dialogue produces marginal benefits to the population (Gordon & Lopez, 2019). Nonetheless, the potential for digital arenas to connect and diffuse information highlights their draw (Saud et al., 2023).

Academic debate often surrounds what form civic tech can take and how it is used. However, its effects on its users and the wider community are its ultimate purpose. Questions of whether it is a shift in civic spaces or a continuation in political and civic activity have arisen (Borge et al., 2023). Below is a theoretical framework that conceptualizes the effect of civic tech on political participation. The link emphasizes the complex interplay between user engagement and the limits of digital civic spaces.

3. Theoretical Framework

3.1 Arnstein's Ladder of Participation

The understanding of political participation will be grounded in Arnstein's (1969) ladder of participation. The ladder creates a hierarchy of citizen engagement in political life. The concept takes a relational approach, defining participation as power and the means for citizens to induce reform. The relationality is notable as scholars often overlook the power dynamics that drive decision-making (Wood, 2017). As mentioned, the enclosure and co-optation of civic spaces within the West currently highlights the need to involve conceptions of power in the discourse. The ladder comes with eight "rungs" divided into three tiers: "non-participation", the bottom tier, includes therapy and manipulation; the middle tier is tokenization, whereby, in ascending order, citizens are informed, consulted, or placated; the top tier is citizen power with the rungs partnership, delegated power, and citizenship control. Non-participation is an explicit absence of the ability to participate and instead rests on the ruling political class to educate and mollify the wider public. The middle tier of tokenization refers to hollowed forms of participation (Arnstein, 1969). Similar to Marxist arguments mentioned in the literature review, tokenization may include avenues and opportunities to provide input; however, any meaningful reform is not guaranteed, and the input may be more performative than substantive (Wood, 2017). Finally, the top rungs of citizen power refer to an empowerment through the ability to practically and effectively participate in decision-making (Arnstein, 1967).

In Arnstein's (1967) conceptualization, she mentions two key limitations. The first is its homogenization of a political class and the general public. This limitation is incorporated in the research due to a similar distinction made between the government and the public, without

considering personal characteristics. The second limitation faces more empirical challenges: the socio-economic obstacles to participation. Given the research design (see Methodology section), this limitation is likewise not captured in the research. Nonetheless, the ladder is well-suited for measuring participation through its hierarchy and sensitivity to political power.

3.2 Competing Conceptions of Civic Tech

As mentioned, civic tech arose during a time of optimism, under the auspices of the "tech for good" movement originating in Silicon Valley (Baack, 2018b). The movement was an altruistic drive to create positive applications for digital technology, aligning closely with technological determinism. The theory argues that technology drives social and political change and arises independently of social motives (Dusek, 2006). The top-down approach limits civic tech usage as it is insensitive to material inequalities within civil society (Aragon et al., 2020). Technological determinists don't consider issues of the necessary material and social resources within design (Schrock, 2019). Thus, the field has moved away from the "tech for good" maxim. Instead, the research will draw from the more deliberative approach of affordance theory.

Affordance theory, originally focused on the potential of an object for its user, and later including the interplay created between user and object (Gibson, 2014; Norman, 1988). Affordances are often understood as a "facilitating condition" to a user or group's desired actions (Leonardi & Vaast, 2017, p. 153). The theory thus occupies a middle ground between determinism and social constructionism (Nagy & Neff, 2015). Originally, affordance theory argued that a user's perception is independent of an object's affordance (McGrenere & Ho, 2000). Digital technology has introduced new considerations. Indeed, unlike physical objects, digital artifacts are more elastic in their use and perception (Zhao et al., 2013).

3.2.1 Imagined Affordances

Norman (1999) introduced the idea of perceived affordances, arguing that earlier conceptions of the theory do not adequately apply to ICTs. Instead, perceived affordances emphasize the perceptions of the user in the human-object relationship (Zhao et al., 2013). Thereby, the design of digital interfaces and platforms can impact how a user will understand the opportunities provided. Civic tech researchers commonly apply an offshoot of the theory: imagined affordances. Nagy and Neff (2015) introduced the theory that broadens the definition of an affordance to include the social-technical considerations within the object to critically examine the interplay. The theory considers user perceptions, the technology's purpose and design, and the designers' intentions (Scarlett & Zeilinger, 2019). Baack (2018a) uses the theory to highlight the created affordances from public government data on a civic tech platform. Users perceive their contributions as facilitating a political agenda through increased transparency and participation that can influence decision-making (Baack, 2018a). Chakraborty (2024) used the theory to demonstrate how the affordance of anonymity on a civic tech platform informed how users posted. The research amends imagined affordance theory to frame civic tech in its designed affordances while sensitive to the socio-technical and socio-political systems it exists within.

Due to its political nature, the affordances of civic tech are mitigated. Indeed, engaging with a civic tech platform presupposes a desire to engage politically, therefore, general use within the citizenry can be difficult (Gordon & Lopez, 2019). Likewise, affordance theory can remain agnostic to crucial socioeconomic and political barriers to civic tech usage (Dickinson et al., 2019; Hennebert et al., 2021). Attempts from practitioners have been made to accommodate these barriers, such as protecting people of lower socioeconomic status by anonymizing criticism and simplifying government data and processes (Corbett & Le Dantec, 2021). Ultimately, these are symptoms of larger systemic issues beyond the scope of research.

The most fitting form of civic tech is a platform. Digital platforms, broadly, are any software that allows for user interactivity and information sharing. Therefore, civic tech platforms are platforms designed for user-government and user-user interaction. Referring to their affordances, they allow for co-creation between citizens, CSOs, and government (Skaržauskienė & Mačiulienė, 2020). Other identified affordances include: deliberation; knowledge sharing between government and citizens; aggregating opinions; and increasing visibility of citizen needs (Karahanna et al., 2018). Specific affordances will be drawn on below in the case selection and methodology sections.

3.3 Theoretical Tensions

Affordance theory provides a useful understanding of civic tech as a digital civic space. In the context of political participation, its value must be qualified by the rise of connective action. The amount of political information available on social media is vast (Tornberg & Uitermark, 2020). Users are more often exposed to political topics, driving interest and engagement with issues, leading to the rise of connective activism (Santini & Carvalho, 2019). Bennett and Segerberg (2012) first conceptualized the act, pointing to two key developments: personalization of political topics and increased communication with a person's social network through digital platforms. The phenomenon has come to define many political movements. Özkula (2021) argues that it has resulted in less robust movements. Indeed, the majority of participants in connective action only participate in online discourse without direct social interaction (Halupka, 2016). Social media, thus, often falls short of an effective civic space (Helberger, 2020). Civic tech presents a possible alternative to social media, avoiding the constraints of connective action while leveraging digital affordances.

The affordances available from digital spaces allow for increased communication, deliberation, and collaboration. Research typically focuses on social media, where the theory was first applied (Bennett & Segerberg, 2012). With civic tech platforms that specifically foster digital civic spaces, the affordances are designed for participation. There is thus a tension between connective action and affordance theory; civic tech affords collaboration, information exchange, and advocacy from users to government. However, by supplanting physical civic spaces where citizens can voice their opinion and permitting passive participation, there are limits. In other words, in the context of Arnstein's ladder, the affordances are an upward force or push towards increased levels of participation; meanwhile, the shortcomings of digital civic spaces as a tool of connective action pull the participation level down the ladder. This contradiction drives research into the viability of participation through civic tech.

These counteracting push-pull forces do not assume inertia in the level of political participation. Rather, civic tech platforms provide an alternative, albeit mitigated, form of political participation through their produced digital civic spaces. Civic tech affords accessibility and aggregates opinion, strengthening citizen participation levels. In contrast, the relationality of participation suggests that citizens' level of decision-making power can be supported or throttled depending on the political salience. Given that affordances are often specific to an object, or in this case, a digital platform, hypotheses focused on the selected platform are appropriate and follow the case selection below. This has precedence in research on OPP, as cases following social media often center on the chosen platform a priori (Ruess et al., 2023).

4. Decidim: The Platform and Its Affordances

As mentioned above, civic tech innovations typically develop at the municipal level due to the high degree of public services provisioned and the opportunity for citizens to more directly interact and co-produce with the municipality (McDonnell, 2020). The research thus focused on an exemplary case study for how civic tech is implemented at the urban level.

Decidim is a platform that was first designed for the municipality of Barcelona. The platform is a product of Spain's 15-M movement that began in 2011, which pushed for democratizing decision-making (Flesher Fominaya & Feenstra, 2023). Alternative forms of democracy and participation envisioned by the movement corresponded with the rise of technical capacities online (Barandiaran et al., 2024). Following the victory of a political party in Barcelona originating from the movement, Decidim was implemented, an institutionalized realization of their desired digital civic space.

Decidim defines itself as a "public, common, free, and open digital infrastructure for participatory democracy" (Barandiaran et al., 2024). The open-source platform has been configured for many organizations and governments, however, the original implementation in Barcelona will be the subject of analysis. Interestingly, the organization does not consider itself as civic tech, defining itself as a techno-political platform. The differentiation highlights their goals of transforming the political potential of a digital platform beyond information sharing into an intermediary for furthering democratization (Barandiaran et al., 2024). This distinction does not oppose the research; instead, it draws parallels to the conception above of what constitutes a civic tech platform.

Decidim's technical affordances are largely the focus of research. Decidim is structured into "spaces" and "components". Spaces are discrete frameworks that provide different methods

of participation for users. For Decidim Barcelona, these are Assemblies, Participatory Processes, Conferences, and Initiatives (Decidim Barcelona, 2025). Assemblies are spaces for groups to set agendas, vote on proposals, and schedule physical meetings to deliberate. Conferences allow a group to create an event webpage and design the program of the event. Initiatives are a collaborative space for citizens to design, debate, deliberate, and advocate for actions by gathering signatures. Finally, Participatory Processes are the primary space on Decidim, and much of the research will focus on this space. These are projects, participatory budgeting, a collaboration of municipal policies, or anything else that citizens can participate in (Decidim Barcelona, 2025).

Components are tools that can be placed into any of these spaces. These include "meetings, proposals, blogs, debates, static information pages, surveys, results, and comments" (Barandiaran et al., 2024, p. 4). Specific policy goals, citizen initiatives, and deliberative engagement can be placed within the appropriate space via the components.

This structure is what defines the affordances given by Decidim. Decidim's vision is largely aligned with affordance theory; the organization perceives itself as an intermediary for democratizing politics through technical means. As described in the theoretical framework, there are levels of participation. Not all participation on Decidim is equal, and how users make use of the platform's affordances will determine their level of participation. Any post, proposal, comment, or other usage of Decidim implies a degree of participation and is above the bottom tier of non-participation, however, tokenization is a likely byproduct. The implementation of Decidim by the municipality, at a minimum, provides the appearance of incorporating citizens' opinions more in a civic space. Therefore, the goal of the research is to understand if participation in Decidim can facilitate increasing the participation level beyond tokenization.

4.1 Hypotheses

To measure the participation level, two dimensions are considered. First, the saliency of the political issue a user is engaging with. Municipal policy more often reflects citizens' wants and needs than at the national level. Urban planning, culture, and tourism are all topics that are largely designed and discussed at the municipal level, and citizen interests are often solicited (Borges et al., 2023). In contrast, topics of political reform and economic policy confront power dynamics that put citizens at a disadvantage (Lucas, 2022). Thus, less politically salient topics are likely to increase the level of participation on Arnstein's ladder. The second dimension is the level of engagement of users on a topic. As explained in the theoretical framework, connective action can often mitigate political efficacy. Therefore, passive versus active participation will impact the likelihood of a proposal being accepted. In the context of Decidim, passive participation would be considered "supporting" a proposal, similar to liking a post on social media. Commenting would occupy a middle ground, with comments explicitly for or against the proposal being a more active form of participation. Finally, a proposal being approved by an assembly in a meeting is the most active form, signifying collective support. A third consideration in the hypotheses is the level of implementation of a proposal from a participatory process. The approval of a proposal does not necessitate its full implementation. Just because of high citizen participation and approval by the municipality does not ensure a time-sensitive or even complete implementation. The hypotheses below are specific to the affordances of Decidim; however, they are embedded within the expected push-pull tensions of connective action and civic tech participation explained in the theoretical framework.

H_1: Increased engagement on Decidim increases the acceptance rate

H_2: Increased political salience decreases the acceptance rate

H_3: Increased engagement increases the implementation rate

H_4: Increased political salience decreases the implementation rate

5. Methodology

A large-N analysis of platform activity was conducted. Data was downloaded from Decidim Barcelona, last updated on September 24, 2024. Composed of seven datasets, the files were structured around four components from Decidim: proposals, results, meetings, and projects. There were also files including the comments under the components, proposals, results, and meetings. Of these seven files, three were not included in the analysis: projects, results comments, and meetings comments, due to the sparsity of data. The analysis centered on proposals as the main unit of analysis, as it provides a clear, discrete measurement of the success of citizen participation. Proposals are included in the other component files, results correspond to accepted proposals, and meeting data includes proposals on assembly agendas. Following the data cleaning, in total, 31,775 proposals were available for analysis. Associated with the proposals were 18,838 comments and 5,827 results associated with 13,119 proposals.

5.1 Tested Indicators

Political engagement will be measured through three indicators. In ascending levels of active participation are the amount of support (akin to likes on social media), the number of comments on the proposal, and being mentioned in a meeting, a proxy for collective rather than connective action, as it represents action by a physical assembly.

Measuring political salience will be through the topic of a proposal. The data initially included a range of categories for a proposal to be filed under, including user-created or unspecified topics. These were consolidated to six discrete categories during cleaning: human rights and equality; economic development and justice; and public sector and democratic reform are considered more politically salient. In contrast, the topics of health and quality of life;

education; and culture, sports, and tourism are considered less contentious. The topics are not mutually exclusive; they instead reflect the general goals and themes of each proposal.

Regarding acceptance and implementation rate, there are two dependent variables used. Acceptance rate is measured by the status of the proposal. Coded as a binary variable[1], the discrete outcomes of the political salience and levels of engagement can be interpreted. The implementation rate is specific to accepted proposals; the reported progress indicator from the results data reflects this implementation. In the implementation models, the number of proposals identified in an accepted result was used. In all models, the geographic scope of each proposal was used as a random intercept, controlling for geographic variables not measured in the indicators. The categorical variable corresponds to the ten districts in Barcelona, plus a citywide category. Additionally, a supervised Latent Dirichlet Allocation (sLDA) of the comment bodies was included to identify major topics within the comments. As seen in Figure 1, the comments are divided across four topics that were found to focus on issues of community infrastructure, green urbanism, education, and urban mobility. The comment topics are used to determine if the content of the comment impacts acceptance and implementation. Further controls of project budget, implementation duration, and time between proposal and acceptance were initially considered; however, the lack of data made the indicators unfit for robust analysis, often only having a few dozen data points.

[1] Accepted = 1, Rejected or Unreviewed = 0, Evaluating and Withdrawn collectively represent 3.13% of all proposals and were thus removed.

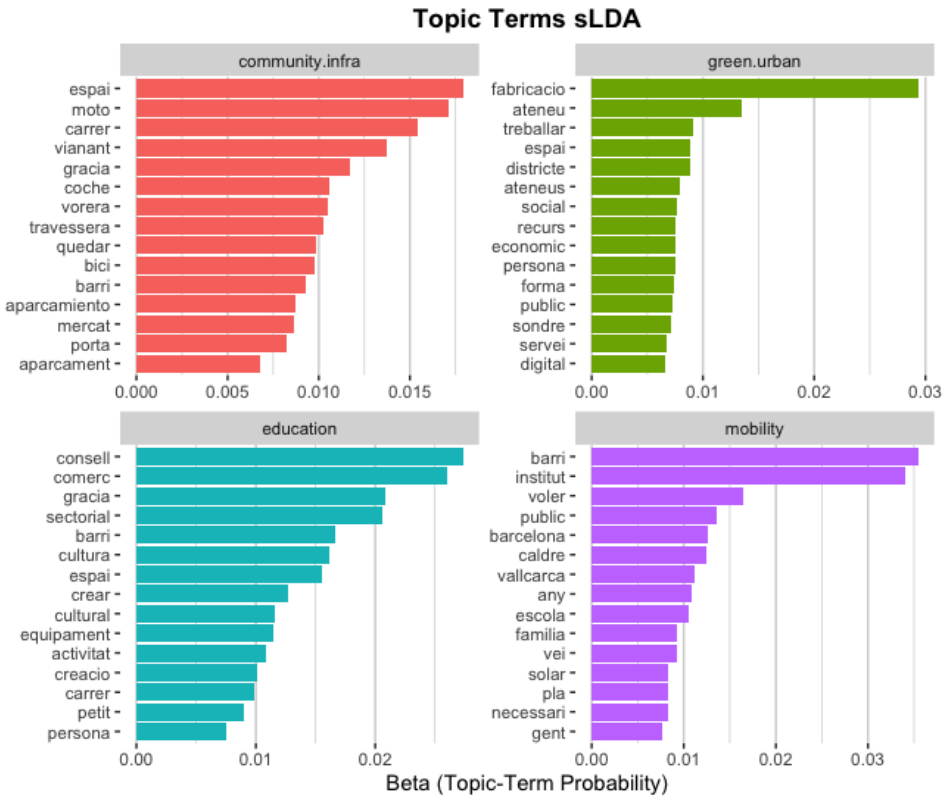

Figure 1. Topic Terms of Proposal Comments

5.2 Model Selection

To account for interpretability and comparability without diminishing explanatory power, two types of regression models were used. To test the acceptance hypotheses, a mixed-effects logistic regression was run for each. Status was coded as a binary variable, which allowed for an interpretable measure of how much engagement or salience affects the log-odds of acceptance. A logit-link was used to help indicate the log-odds of acceptance given a unit change in engagement or salience. As mentioned, scope was used as a random intercept combining both fixed and random effects in the model to account for district-level heterogeneity. Interpreting the data is thus facilitated by the design.

For the implementation models, a beta regression was used. By bounding progress, initially on a 1-100 scale, to be between zero and one, the beta regression can account for heteroskedasticity

as progress can often fall at the extremes rather than the interstitial periods. Likewise, scope is used as a random intercept to account for district clustering. For all regression models, salience and engagement were tested with and without controls, and finally in a combined model using all available indicators. It should be noted that in the salience tests, the first category coded (human rights and equality) is dropped from the predictor variables and included in the intercept coefficient. The other categories are measured relative to this level. Appendix I includes a list of the probabilities of acceptance or implementation for reference.

Alongside the regression models, a gradient boosted model (GBM) was tested for all indicators in the implementation and acceptance models. GBMs lack as much interpretability, however, their predictive power emphasizes what drives acceptance and implementation of proposals. The results will be used to bolster the analysis and highlight the roles of engagement and salience.

6. Analysis

Table 1. Mixed-Effect Logistic Regressions of Acceptance by Engagement and Salience

	Engagement		Salience		Combined Model
(Intercept)	−.2158***	−.1630***	.2638+	.3136*	.0378
	(.0171)	(.0347)	(.1459)	(.1473)	(.1084)
supports	1.1905***	1.1238***			.9362***
	(.0156)	(.0253)			(.0474)
comments.total	.1342***	.1268***			.4261***
	(.0137)	(.0192)			(.0441)
meeting.mention	.7923***	.7973***			.6517***
	(.0147)	(.0228)			(.0328)
community.infra		.0947***		.1044**	.0882*
		(.0265)		(.0387)	(.0356)
green.urban		1.2679**		1.3384***	1.0048***
		(.0265)		(.5351)	(.1549)
education		.0618**		.0618*	.0424
		(.0230)		(.0275)	(.0270)
mobility		.0763**		.0796*	.0600+
		(.0247)		(.0331)	(.0313)
category.idhealth and quality of life			.5178***	.5147***	.4507***
			(.0812)	(.0814)	(.0668)
category.ideducation			.0589	.0564	−.0478
			(.0823)	(.0826)	(.0677)
category.idculture sports and tourism			−.2249**	−.2160**	−.1995***
			(.0690)	(.0692)	(.0554)
category.ideconomic development and justice			.3926***	.3957***	.5287***
			(.0753)	(.0755)	(.0617)
category.idhousing, urban planning, mobility			.0369	.0526	.0118
			(.0640)	(.0642)	(.0501)
category.idpublic sector and democratic reform			−.1571+	−.1585+	−.0811
			(.0849)	(.0851)	(.0704)
Num.Obs.	24236	24236	19228	19228	19228
SD (Intercept scope.id)	.4506	.4493	.4420	.4395	.4485
R^2 Marg.	.344	.547	.014	.491	.534
R^2 Cond.	.382	.573	.070	.519	.561
MSE	.2133	.2125	.2189	.2174	.2036
AUC	.7125	.7150	.6509	.6573	.7163

Significance levels at .1+, .05, .01**, .001****

Table 2. Mixed-Effect Beta Regressions of Implementation by Engagement and Salience

	Engagement		Salience		Combined Model
(Intercept)	2.2076***	2.2826***	2.3311***	2.3543***	2.3831***
	(.0582)	(.0618)	(.0735)	(.0750)	(.0770)
supports	.0014	−.0051			-.0007
	(.0104)	(.0103)			(.0003)
comments.total	-.0040	.0013			.0014
	(.0127)	(.0127)			(.0028)
meeting.mention1	−.0467+	−.0490*			−.0501*
	(.0239)	(.0239)			(.0245)
proposals.total		−.0044***		−.0030***	−.0030***
		(.0005)		(.0005)	(.0005)
community.infra		.0036		.0031	.0029
		(.0067)		(.0069)	(.0069)
green.urban		-.0028		−.0016	−.0022
		(.0065)		(.0065)	(.0065)
education		-.0039		-.0042	−.0045
		(.0069)		(.0070)	(.0070)
category.idhealth and quality of life			−.3634***	−.3132***	−.3141***
			(.0517)	(.0526)	(.0526)
category.ideducation			−.0869	−.0759	−.0870
			(.0623)	(.0623)	(.0625)
category.idculture sports and tourism			−.1037*	−.0812	−.0906+
			(.0514)	(.0516)	(.0518)
category.ideconomic development and justice			.3009***	.3140***	.3087***
			(.0543)	(.0544)	(.0544)
category.idhousing, urban planning, mobility			−.2319***	−.1997***	−.2146***
			(.0470)	(.0474)	(.0480)
category.idpublic sector and democratic reform			.1381**	.1630**	.1506**
			(.0577)	(.0579)	(.0582)
Num.Obs.	8250	8250	8119	8119	8119
SD (Intercept scope.id)	.1774	.1878	.1894	.1954	.1972
R2 Marg.	.009	.158	.380	.404	.406
R2 Cond.	.508	.609	.716	.737	.741
AIC	−35714.1	−35773.5	−35297.3	−35318.6	−35317.3
BIC	−35672.0	−35703.3	−35234.3	−35220.6	−35198.2
ICC	.5	.5	.5	.6	.6
RMSE	.15	.15	.15	.15	.15
MSE	.0233	.0233	.0225	.0227	.0227

Significance levels at .1+, .05, .01**, .001****

6.1 Acceptance Models

Alongside the beta coefficients and the standard errors in parentheses are additional results that include the marginal and conditional R^2s, the former only considers the fixed effects (i.e., without scope), the latter includes the random effect intercepts, both show the explanatory power of the models. The mean squared error (MSE) and the area under the curve (AUC) indicate the predictive power of the models.

For the engagement models, the engagement indicators were statistically significant. Increases in support (1.1905, $p < .001$; 1.1238, $p < .001$), comments (.1342, $p < .001$; .1268, $p < .001$), and meeting mentions (.7923, $p < .001$; .7973, $p < .001$) all increase the odds of a proposal's acceptance. The comment topics were likewise significant (community infrastructure = .0947, $p < .001$; green urbanism = 1.2679, $p < .001$; education = .0618, $p < .01$; mobility = .0763, $p < .01$). Their inclusion did not impact the engagement coefficient significance or the predictive power of the model; the MSE decreased from .2133 to .2125 and the AUC increased from .7125 to .7150. The topics did improve the model fit. The marginal R^2 (.344; .547) and conditional R^2 both increased (.382; .573).

Salience models are weaker in explaining the odds of a proposal's acceptance. Just testing the category indicator, the marginal R^2 (.014) and the conditional R^2 (.070) are very low. The category levels are mixed in effect; in both models, the categories of health (.5178, $p < .001$; .5147, $p < .001$) and economic development (.3926, $p < .001$; .3957, $p < .001$) have a relative positive effect on the log-odds of acceptance that is highly significant. The topics of culture, sports, and tourism (-.2249, $p < .01$; -.2160, $p < .01$) and public sector reform (-.1571, $p < .1$, -.1585, $p < .1$) have a relative negative effect on the log-odds of proposal acceptance. The comment topics provide moderate variance explanations (cond. $R^2 = .491$; marg. $R^2 = .519$). This highlights the high level

of influence that the comment topics have on the models; in each model, each topic has a significant positive effect.

In the combined model, the significant indicators keep their direction of effect. The engagement indicators have a high effect on the log-odds of acceptance, and topics of health and economic justice likewise have a strong positive relationship with the log-odds of acceptance. The marginal (.534) and conditional (.561) R^2 are relatively high, showing a moderately low explanatory power. Additionally, the MSE (.2036) is at its lowest, and the AUC (.7164) is at its highest. Finally, the scope-level random intercept remains stable, showing between-district heterogeneity. Figure 2 highlights this variance as city-wide (Barcelona) proposals have a positive effect on acceptance, while, for example, proposals in Sarria-Sant Gervasi have a noticeably diminishing effect on acceptance rate.

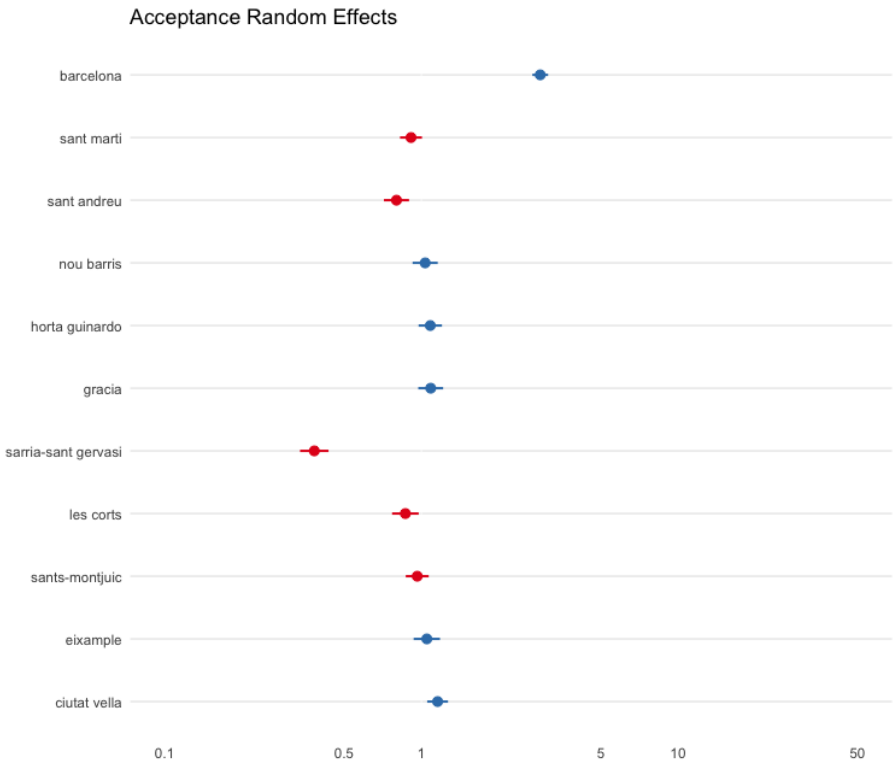

Figure 2. Scope Random Effects in Combined Acceptance Model

6.2 Implementation Models

The engagement predictors show no effect on the rate of implementation of a proposal, although meeting mentions has a small negative effect on implementation (-.0467, $p < .1$; -.0490, $p < .05$; -.0501, $p<.05$). The engagement models also have low explanatory power in their marginal R^2s (.009, .158). The conditional R^2 is noticeably higher from the scope random intercepts (.508, .608). In contrast to the acceptance models, the comment topics have no significance to the rate of implementation across all five models. The number of proposals has a robust negative effect across all the tested models (−.0044, −.0030, −.0030; $p <.001$).

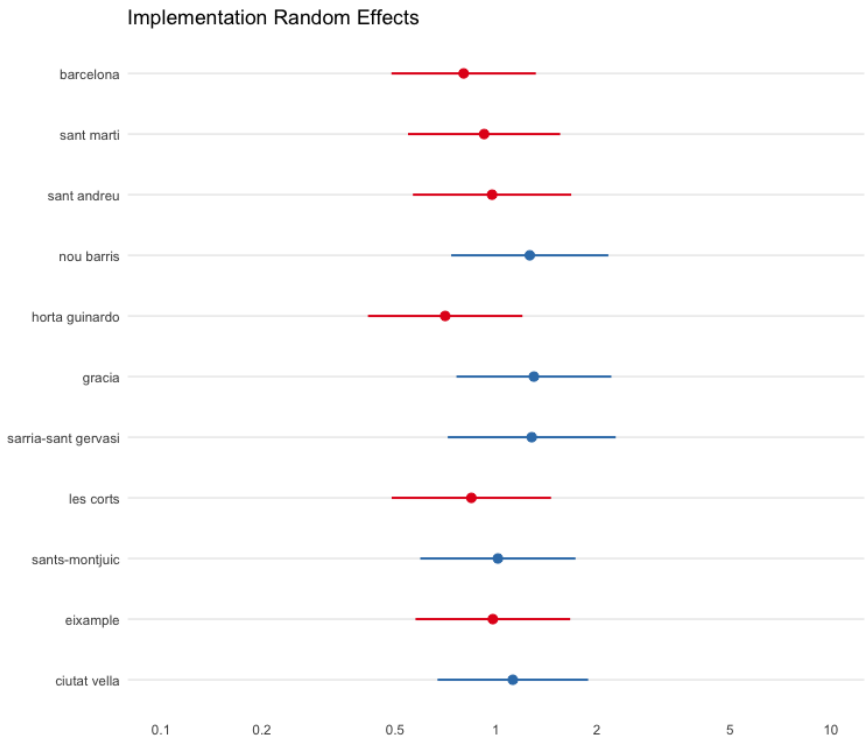

Figure 3. Scope Random Effects in Combined Implementation Model

In the three models measuring salience, health, and quality of life (-.3634, -.3132, -.3141; $p <.001$) and urban policy (-.2319, -.1997, -.2146; $p < .001$) both have significant relative negative effects on implementation. Culture, sports, and tourism have significance in models 3 (-.1037) and 5 (-.0906). Economic development (.3009, .3140, .3087; $p <.001$) and public sector reform (.1381,

p <.05; .1630, .1506; p <.01) have significant relative positive effects on implementation. The explained variance is also comparatively high in the salience and combined models (marg. R^2 = .380, .404, .406; cond. R^2 = .716, .737, .741). Figure 3 shows the random effects by district; the confidence levels are visibly broad but demonstrate the geographic variance in implementation rates. The MSEs are comparatively lower, suggesting strong predictive power (.0227, .0227, .0226).

6.3 Predictive Power

Table 3. Gradient Boosted Models Predictor Variable Importance

Model	Predictor	Relative Influence %
Acceptance	supports	38.8234
	scope.id	29.3597
	category.id	13.3373
	meeting.mention	9.3579
	comments.total	8.2109
	education	.3793
	green.urban	.1993
	mobility	.1807
	community.infra	.1514
Implementation	proposals.total	31.0852
	scope.id	23.4535
	category.id	18.2526
	supports	14.4884
	meeting.mention	3.7210
	comments.total	3.5181
	mobility	1.9796
	education	1.6128
	green.urban	1.1673
	community.infra	.7214

Table 3 shows the variable importance of all the tested indicators in both model groups. As shown by the difference between the marginal and conditional R^2, scope has a high degree of importance in predicting acceptance (29.3597%) and implementation (23.4535%). Support (38.8234%) has a high level of variable importance for acceptance as well. The category of the proposal is third in importance in both GBMs (13.3373%; 18.2526%). Additionally, the number of total proposals within an implemented result has a high level of importance (31.085%). Notably,

the comment topics are at the bottom of both models, in contrast to the significance shown in the acceptance regression models.

7. Interpretation

The results provide robust and nuanced insights into how proposals on Decidim are engaged with, what the topic of a proposal implies, and the effects on the likelihood of acceptance and the rate of implementation. Concerning the results in Table 1, engagement methods demonstrated a highly significant effect on the probability of a proposal being accepted by the municipality. Interestingly, proposal support demonstrated the largest effect of the engagement predictors, suggesting the importance of even the most passive acts of OPP, as the number of comments had a noticeably smaller effect. Each of the comment topics showed a positive effect, showing that the substance of a comment helps with the outcome of a proposal. The promising predictive power calculated in the MSE and AUC, alongside moderate explained variance, leads to rejecting the null hypothesis. Active engagement with proposals on the platform contributes to their success in the municipality. None of the models has a considerably high level of variance explained by the predictors. The lack of available controls from the readily available data is partially to blame, but what the models do display is that the geographic scope of a proposal impacts both its result and implementation. Whether this is due to administrative differences or inequalities is unclear.

In contrast, the salience of a proposal topic had mixed results. Although topics in health and public sector reform (albeit with small significance) had expected effects on the likelihood of acceptance given their salience, culture, sports, and tourism, and economic development both had unexpected significant effects. The negative effect in culture, sports, and tourism highlights the backlash Barcelonans have had on over-tourism and the delayed responses from the municipal government (Ramos & Mundet, 2021). In contrast, Barcelona is also a center of the degrowth movement that calls for radical economic and social reform in response to capitalism and climate

change. The municipality is sympathetic to these causes, and it may reflect the positive rate of acceptance (Martínez Alonso, 2022). Interestingly, urban policy, also an important facet of degrowth, did not have a significant effect. The poor model fit by proposal category limits the insight available in the relationship. Although hypothesis two cannot be rejected, the insights suggest further dynamics to analyze within Barcelonan politics. Figure 4 shows proposal outcome by category. From visual analysis, the frequency of approved public sector reform proposals has decreased over time, however, there is a high degree of variance across the categories in terms of approval frequency.

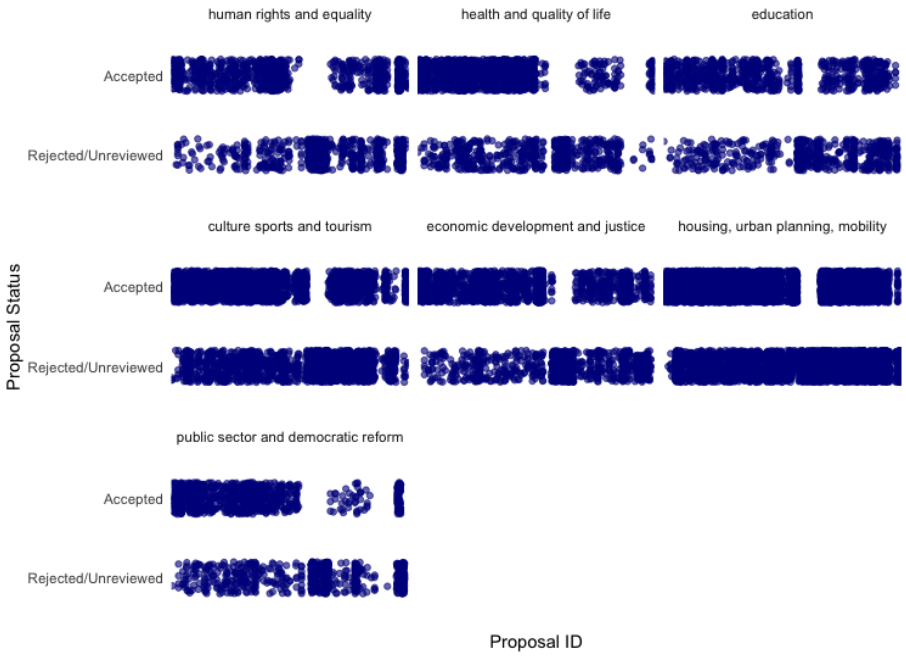

Figure 4. Proposal Status by Proposal Category

The implementation models showed an inverse relationship in terms of significance and model fit. Levels of engagement with a proposal before its acceptance did not improve the odds of implementation. Interestingly, a proposal approved in a meeting by an assembly has a small but significant negative effect on implementation progress. What leads to this dynamic is unclear, however, it may signal the public's desire to begin implementing a proposal if the municipality

has been slow. Interestingly, proposal topics on health and public sector reform were flipped in the direction of effect and remained significant. Health moved from positive to negative in its relative effect, and public sector reform moved from negative to positive. Concerning the former, proposals concerning health may contain technically complex solutions, such as improving water and air quality, which drag down the implementation rate. In the case of the latter, Decidim was created in response to pressure for more open government and democratizing decision-making. Therefore, many users may be using the platform for these proposals with varying degrees of quality. Alternatively, the municipality may be selective in diffusing decision-making power or reforming the public sector, but there is an expectation that accepted proposals will be implemented. Figure 5 decomposes the implementation level by category, showing that topics in health, urban policy, and public sector reform have more variance in implementation level, pointing to the complexity these proposals may include. The results of the proposal category do

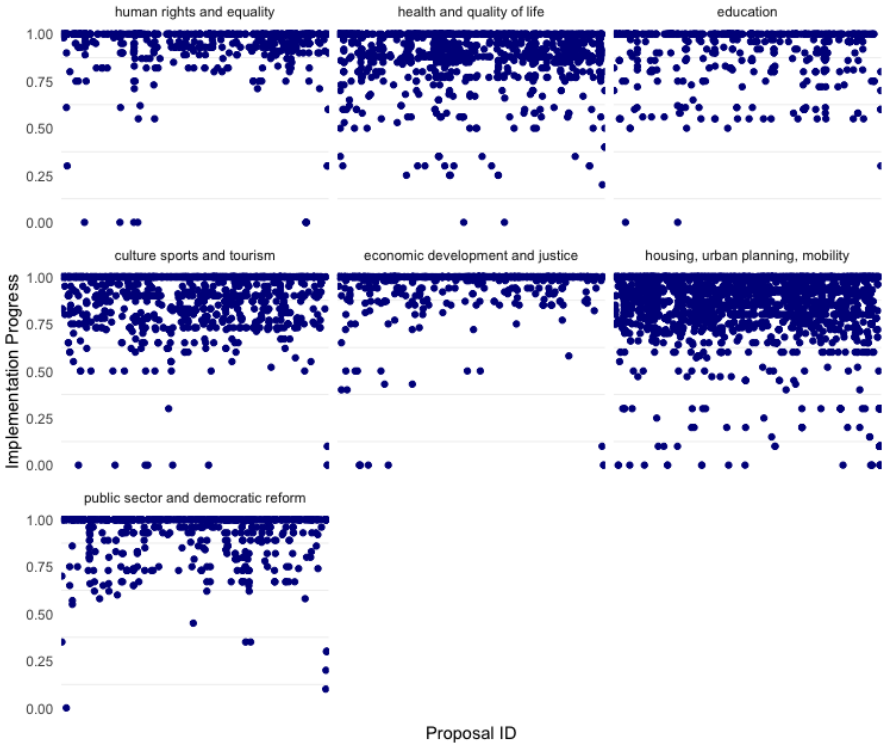

Figure 5. Implementation Progress by Proposal Category

not necessarily follow expectations, as housing and urban policy are comparatively low in implementation, and economic development is comparatively high. Rejecting the null of hypothesis four cannot confidently be done as trends of political salience are not seen in the results. Nonetheless, the outcome of these tests is revealing of the dynamics within implementation.

The results indicate that collective usage of the platform improves the result of a citizen proposal; however, once a proposal has been accepted, the topic of the policy determines the rate of implementation, and prior user engagement becomes irrelevant. The evolution of what influences a proposal's approval and implementation suggests there are subtler influences not captured by the broad metrics available in a dataset. In other words, the power structures within civic spaces are not decisively displayed in the data, but this does not preclude their existence. Indeed, the importance of user engagement with the introduction of a proposal suggests a utility in citizen action, connective or collective. Furthermore, the divisions in implementation by category may represent a rift between residents and the government. The implications of these results are explored further in the discussion below.

8. Discussion and Conclusion

Arnstein's ladder is not a quantitative measure, nonetheless, the typology can be linked to the results above. Concerning engagement, the affordances of Decidim as a tool to aggregate opinions and facilitate deliberation are demonstrated. Furthermore, Decidim facilitates collective action by coordinating assemblies for residents to be politically engaged offline. As a result, Decidim is a tool that can push participation up the ladder and can go beyond tokenization. Citizens can directly influence decision-making and are supported in their efforts by tools of monitoring proposal implementation. However, participation still faces barriers that cannot be solved by commenting under a proposal. The topic of a proposal, as well as unmeasured confounding variables, impede action taken on a proposal following its approval. The results above only hint towards the challenges in implementing a proposal, both administrative and structural. Nonetheless, the fact that engagement is limited in its overall impact points to a downward push on Arnstein's ladder from political institutions that go beyond the affordances of civic tech. Participation through Decidim thus straddles the line between placation and partnership.

The research implies that civic tech has a place within civil society. A deliberative and meaningful digital civic space can produce increased participation from citizens. Nonetheless, the results are not comprehensive. Decidim is an exemplary case; Barcelona is a center for many political movements, and Decidim is demonstrative of civic tech implementation; however, the wider popularity and spread of civic tech platforms remains sparse. Instead, Decidim represents the potential that civic tech must facilitate participation. Concerning quantitative measures, additional controls can improve measures of implementation. The lack of a time indicator to better assess the rate of implementation impedes the analysis. Likewise, the sLDA of the comments essentially reflected proposal categories. Tuning to a sentiment analysis instead may procure more

useful measures to consider. Furthermore, the structural inequalities within an urban environment were not measured. Controlling for geographic economic differences within the city or, alternatively, qualitative interviews, can highlight these challenges. Additionally, institutionalized power does not easily appear in quantitative measures. How Decidim acts as a foil to the municipality within political discourse may be viable to reveal the subtleties within civic relations.

The affordances provided by Decidim to Barcelonans are evident. Usage of the platform supports aggregating opinions, promoting deliberation, and facilitating discussion within physical assemblies. The challenges present in raising the level of participation are likewise suggested and indicate political tensions within civic spaces. Decidim is not the answer to wider political trends, nor should it be deemed as such. Thus, platform usage alone does not ameliorate challenges in civic space enclosure. The platform serves as an intermediary for active citizen engagement within their community alongside other forms of participation. Digitally, it presents itself as a more substantive alternative to connective action online. Its scope may be centered on local issues rather than the global challenges presented on social media, but this reflects where citizens can most influence decision-making. The deliberation and political motives that led to Decidim highlight the utility of digital civic spaces and how participation can be produced through both collective and connective action.

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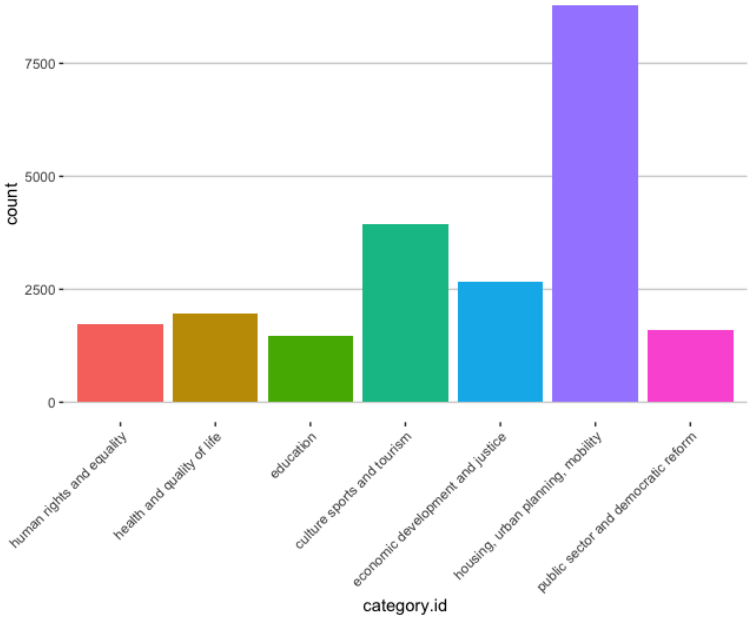
Appendix I



Proposals by Category

Probabilities of Acceptance and Implementation by Category

Category	Acceptance	Acceptance + Topics	Implementation	Implementation + Topics	Combined Acceptance	Combined Implementation
human rights and equality	.5656	.5905	.9083	.9084	.6220	.9088
health and quality of life	.6860	.7069	.8787	.8787	.7209	.8792
education	.5800	.6040	.9017	.9018	.6107	.9013
culture, sports, tourism	.5097	.5374	.9014	.9014	.5741	.9010
economic development and justice	.6585	.6817	.9313	.9314	.7363	.9314
housing, urban planning, mobility	.5746	.6031	.8903	.8903	.6248	.8894
public sector and democratic reform	.5266	.5517	.9210	.9211	.6028	.9206