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Algorithmic empowerment: A comparative ethnography of two open-source algorithmic platforms – Decide Madrid and vTaiwan

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Abstract

Scholars of critical algorithmic studies, including those from geography, anthropology, science talent search, and communication studies, have begun to consider how algorithmic devices and platforms facilitate democratic practices. In this article, I draw on a comparative ethnography of two alternative open-source algorithmic platforms – Decide Madrid and vTaiwan – to consider how they are dynamically constituted by differing algorithmic–human relationships. I compare how different algorithmic–human relationships empower citizens to influence political decision-making through proposing, commenting, and voting on the urban issues that should receive political resources in Taipei and Madrid. I argue that algorithmic empowerment is an emerging process in which algorithmic–human relationships orient away from limitations and towards conditions of plurality, actionality, and power decentralisation. This argument frames algorithmic empowerment as bringing about empowering conditions that allow (underrepresented) individuals to shape policy-making and consider plural perspectives for political change and action, not as an outcome-driven, binary assessment (i.e. yes/no). This article contributes a novel, situated, and comparative conceptualisation of algorithmic empowerment that moves beyond technological determinism and universalism.

Keywords

Algorithmic empowerment, comparative study, algorithmic orderings, digital participation, machine learning algorithms, participatory democracy

Introduction

Open-source algorithmic platforms[1] that directly involve citizens in political decision-making have sprung up across local, regional, and national governments in Spain, Taiwan, Brazil, and Argentina since 2015 (BBC, 2019). Open-source, a term emerging from the wider Free and Open Source Software (FOSS) movement (Coleman, 2004), centres on an 'ethic of openness' that gives a wide range of people the freedom to access, redeploy and repurpose codes/algorithms through websites such as Github. In this article, I compare two such open-source algorithmic platforms – Decide Madrid and vTaiwan.

Both platforms were developed by civic hackers and activists who participated in urban social movements in Taipei (the Sunflower Movement) and Madrid (15M) that subsequently led to political transformations in the Taiwanese government and Madrid City Council. The two platforms are important examples of open-source software[2] for citizen empowerment (Simon et al., 2017). They understand empowerment practically – enabling citizens to influence political decision-making processes by voting, proposing, or commenting through a website. In Madrid, citizens were given decision-making power over a massive annual budget of 100 million euros, while in Taiwan, citizens got the chance to influence new legislation on emerging digital issues. The emergence of these algorithmic platforms raises an important question: how can new and open-source algorithmic platforms reconstitute

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our political decision-making praxis and further empower citizens?

I argue that algorithmic empowerment is an emerging process in which algorithms work with human actors to (re)orient political decision-making away from limitations (such as majoritarian politics and low participation rates) and towards a more plural, decentralisable, and actionable condition. It does not merely tick the boxes of digital literacy, accessibility, and transparency (the good practices of e-participation). Rather, it generates empowering conditions: citizens (especially the underrepresented) determine the content and outcome of political decision-making, understand plural perspectives, and motivate concrete changes. Here, algorithmic platforms are not understood through the technical definition of strictly defined instructions to process data into a desirable output. They are critically viewed from multiple/different formations and existences (Bucher, 2018: 19; Seaver, 2017) which consist of human–algorithmic relations between (thousands of) users, programmers, data sets, algorithms, and regulations (Kitchin, 2017). Following Bucher and others (Amoore, 2020; Gillespie, 2014), small differences in algorithmic–human relationships make algorithmic platforms more or less empowering for citizens in policy-making.

Drawing from interdisciplinary critical algorithmic studies (inspired by Science and Technology Studies (STS), anthropology, geography, and urban studies), this article empirically and theoretically contributes to current debates on data and empowerment (Baack, 2015; Milan, 2013; Milan and van der Velden, 2016) and on open-source participatory platforms (López, 2016; Royoet al., 2020; Smith and Martín, 2021). This interdisciplinary stance makes three specific and important contributions to broaden current conceptualisations of algorithmic platforms such as control, manipulation, and oppression.

Firstly, this interdisciplinary stance offers a new perspective for analysing the democratic potential of open-source platforms. Some studies have critically examined Decide Madrid and Decidim (a similar platform in Barcelona) from a technopolitical perspective (Smith and Martín, 2021), e-participation indicators (Royo et al., 2020), and the discourse on smart urbanism (Charnock et al., 2021). However, none draws from critical algorithmic studies and empowerment theories, nor do they conduct comparative assessments spanning the Global North and East. This is the first article to deploy the concept of comparative urbanism (Robinson, 2006) in a situated ethnography of two open-source algorithmic platforms (Decide Madrid and vTaiwan). This comparative ethnography effectively allows us to analyse algorithmic platforms beyond the 'universal' account of algorithmic technologies that 'assimilate[s] the heterogeneity of diverse contexts and… gloss[es] over differences and cultural specificities' (Milan and Treré, 2019: 325–326). The comparative ethnography situates these algorithmic platforms within their shared trajectories rooted in urban social movements and differentiates them from other proprietary platforms that do not share their strong democratic claims and designs. It considers open-source algorithmic platforms to be an alternative to the 'usual suspects' – proprietary and profit-oriented algorithmic surveillance devices and social media platforms. This comparative ethnography, therefore, offers an effective model for researchers to better account for diverse types of algorithmic platforms (Bucher, 2018) developed from varying geographies (Ash et al., 2018).

Secondly, drawing from critical algorithmic studies, this comparison pays particular attention to the *different* relationships that algorithms forge with citizens, policymakers, and data to (re)constitute political decision-making processes. Critical algorithmic scholars commonly understand algorithmic platforms to consist of different relationships with various human actors (Bucher, 2018; Crawford, 2016; Kitchin, 2017; Mackenzie, 2017: 10–14). Focusing on algorithmic differences avoids the overgeneralised and technical-deterministic analyses of which STS scholars, sociologists, and anthropologists are wary (Crawford, 2016; Gillespie, 2014; Seaver, 2017: 2). It encourages situated accounts of algorithmic empowerment to identify particular points and moments that constitute a condition for new opportunities (and limitations) in empowering citizens in policy-making.

Finally, empowerment theories are particularly useful to *locate* and *cultivate* the specific points and moments where citizens, especially the underrepresented, can exercise the power of decision-making, consider plural perspectives, and affect changes. Democratic participation is a 'process'. Democratic empowerment (Mouffe, 2005; Young, 2000) should not be measured against the decision-making outcomes or the indicators defining good practices of e-participation such as digital accessibility and literacy (Mossberger et al., 2008), transparency, and other organisational factors (Royo et al., 2020; Wright, 2012). Such indicators tend to reduce the lively and diverse processes of digital participation into a normative, static, and outcome-oriented objective (Isin and Ruppert, 2015).

This article is organised as follows. First, I broadly situate algorithmic platforms within contemporary conversations about power and control, democracy, and empowerment. Second, I explain why and how I conducted a comparative ethnography to study two algorithmic platforms 'in context'. Next, I review both algorithmic platforms' shared urban political trajectories and democratic objectives before explaining how varying human–algorithmic relationships make each platform more or less empowering. Finally, I offer a theory of algorithmic empowerment and suggest two directions for critical algorithmic studies.

Critical algorithmic studies and empowerment theories

Scholars from STS, geography, anthropology, and communication studies have critically investigated how algorithmic

devices and platforms categorise, search, sort, aggregate, and match people, things, and places in everyday practices. Despite different theoretical cultures and traditions, they constitute a common approach for critically studying algorithmic platforms' (e.g. social media platforms) multiple and situated relationships with different human and non-human actors (Bucher, 2018; Gillespie, 2014; Kitchin, 2017; Seaver, 2017). These critical approaches go beyond the technological determinism and fetishism of analysing algorithmic platforms and their effects against technical definitions and features.

One common approach examines the various forms of power that (new) algorithmic systems mobilise, constitute, and reinforce and to what effects. STS scholars and digital sociologists see algorithmic power as generative, hidden in the background, and often unnoticed by those participating in hybrid assemblages of data infrastructures, regulations, and human practices (i.e. ghost labour) (Beer, 2009; Crawford, 2021). They ask what or whose knowledge is rendered 'visible', 'popular', and 'relevant' through algorithmic platforms (Bucher, 2018; Gillespie, 2014). They also consider how algorithmic searching systems embedded within social media facilitate the (in)visibility of information and exert control over our behaviour and identity (Beer, 2013; Cheney-Lippold, 2011). For example, Google's searching algorithms are said to perpetuate 'racialised oppression' and reinforce discriminatory stereotypes of ethnic minorities by placing racialised and sexualised representations of African Americans at the top of search results (Noble, 2018). Geographers understand algorithmic systems to produce and sustain (existing) power and control in neoliberal regimes by actively constituting, sorting, and datafying our everyday lives, bodily movements, and knowledge (Crampton, 2016; Leszczynski, 2016; Sadowski, 2019). In particular, algorithmic surveillance systems extend sovereign power to pre-empt potential risky events (Amoore, 2013) by flagging racialised bodies and actions as dangers to be eliminated (also see Leszczynski, 2016).

In relation to democratic practices

Scholars of critical algorithmic studies have debated whether algorithms manipulate and dampen democratic participation in the Global North and South. On the one hand, geographers see algorithmic systems (e.g. smart sensors, surveillance, and navigation platforms) as monitoring, regulating, and disciplining citizens' behaviours (Amoore, 2013; Gabrys, 2014: 34; Vanolo, 2014). In particular, algorithm-powered social media platforms have remotely manipulated Anglo-Saxon democratic elections, as in the case of Cambridge Analytica and the 2016 United States presidential election (Allen, 2020). Similarly, Noble (2018: 3), a digital sociologist, argued that commercial algorithmic platforms such as Facebook and Google, which prioritise the interests of advertisers, pose 'a threat to democracy'. For instance, they can fabricate and disseminate seemingly important and objective (but actually false or misleading) information to users during national elections.

On the other hand, scholars from digital empowerment and communication fields such as Milan (2013) and Milan and van der Velden (2016) examined the democratic agencies of communication technologies for empowering citizens (though unevenly) to protest against political control and regulation. Activists can harness these technologies to give voice to different groups of citizens in policy-making on communication technologies. As a result, citizens, including disadvantaged communities, can find ways to resist technological commercialisation and/or state censorship (see Rodríguez, 2001 on Latin America). STS scholar Crawford (2016) also argued that algorithmic operations and decisions can be democratised. She understands algorithms as political agents that operate differently and 'at odds with each other'. For example, purpose-designed searching algorithms can enrich democratic deliberation by presenting diverse voices and opinions in search results (Lev-On, 2008).

As Bucher (2018: 19) noted, scholars must resist an 'overly simplistic understanding of what algorithms are and what they can be', especially the binary terms of good and bad. Rather, we should frame algorithms as existing on 'multiple levels' from 'different perspectives'. In particular, machine learning (ML) algorithms' decisions about relevant or trending materials do not follow predefined statistical rules (Munk et al., 2022) because they are subject to context-specific changes in their interactions with incoming data (Gillespie, 2014; Kitchin, 2017). Given the black-boxed nature of ML algorithms, it is more important for critical scholars to observe and differentiate how human actors interact with algorithmic ordering(s) than to understand their computational rules (Amoore, 2019; Crawford, 2021; Kitchin, 2017; Mackenzie, 2017: 436). Algorithms perform *differently* 'in context – in collaboration with data, technologies, people, etc. under varying conditions' (Kitchin, 2017: 25).

Following these critical perspectives on algorithms, I reiterate that algorithmic differences matter, as they can foster or foreclose conditions for giving voices to those who are rejected or ignored in the existing policy-making process. A better understanding of how algorithmic systems *differently* operate allows us to explore various moments when algorithmic–human relationships foreground a distinctive condition for citizen empowerment.

Empowerment

I develop the concept of citizen empowerment from ideas of political/democratic empowerment, which are central to discussions of participatory democracy (Baiocchi and

Ganuza, 2014; Fung, 2006; Fung and Wright, 2001). Political empowerment, while not specifically focusing on the role of algorithms, offers two important aspects: (1) power decentralisation and (2) the ability to make necessary/positive changes and actions in policy-making and wider social-economic life.

The first aspect considers whether the structure and power of decision-making are inclusively decentralised to small (not necessarily coordinated) units of (disadvantaged) citizens to raise concerns for policy-making (Baiocchi and Ganuza, 2014; Fung, 2006; Fung and Wright, 2001). In a participatory democracy, decentralisation involves transferring the decision-making power and its associated structure – often held entirely by the (central) government – to citizens and other local authorities (Baiocchi and Ganuza, 2014: 37). Citizens exercise such power by contributing and implementing their ideas, voices or votes, after which the government executes the proposals. This may indeed imply some level of centralisation (also see 'power devolution' in Fung, 2006); however, the government does not hold *all* the decision-making power. Such efforts reform decision-making structures and practices to integrate popular will and sovereignty into policy-making or local public services.

The second aspect – actionality – considers whether inputs from citizens materialise into positive, concrete actions for social and political change via governmental support and resources (Baiocchi and Ganuza, 2014; Fischer, 2012). In a participatory democracy, political action is not exclusively the domain of citizens themselves (cf. Baack, 2015; Milan, 2013). Together, citizens and the government realise the needs and concerns (of the disadvantaged) within the framework of policy-making and public service (Baiocchi and Ganuza, 2014; Fung, 2006; Fung and Wright, 2001). This goes beyond political will, which merely nods to popular demands; it harnesses the means and capacities to substantiate citizens' concerns in policy-making and public service provision.

However, participatory democracy scholars, highly influenced by Jürgen Habermas, often assume that achieving 'rational consensus' is an a priori for optimised democratic conflict resolution. They rehearse a formulaic understanding of democratic participation 'which theorizes away antagonism and contestation as endemic' and predominately focuses on the conflict-free outcome of decision-making (Young, 2000: 49). To avoid positioning conflict resolution as the ultimate goal of citizen empowerment, I add a third dimension – plurality (Mouffe, 1999, 2005) – to citizen empowerment.

Plural democracy considers 'conflicts (across different identities) [to be] a legitimate form of expression' in realising emancipatory and agnostic democracy (Mouffe, 2005). For Mouffe (1999, 2005), conflicts between different parties or identities – the antagonistic dimensions – constitute democracy and are, therefore, impossible to eradicate. Rather than glossing over conflicts – what Young (2000) calls 'struggles' – democratic participation is viewed *as a process* that empowers citizens by legally recognising the existence of political conflicts and dissent. This requires outreach to include the voices of those not commonly represented by established associations or formal networks (Young, 2000). Plurality in political empowerment does not sidestep the inescapable conflicts of political decision-making but offers 'the recognition and legitimation of conflict and the refusal to suppress it by imposing an authoritarian order' (Mouffe, 1999: 755). Plural empowerment, therefore, emphasises the need to, at the very least, provide different individuals, identities, or underrepresented groups with an institutionalised political forum to express themselves and confront one another.

A comparative ethnography

This study deployed a comparative ethnography to contextualise Decide Madrid and vTaiwan's similar urban political trajectories and differences (e.g. algorithmic orderings, human actions, and political environments). Drawing on comparative tactics from urban studies, I trace 'different variations' of an urban phenomenon (Robinson, 2015) to generate new lines of inquiry (Mcfarlane, 2010; Robinson, 2006). Both algorithmic platforms were born from urban social movements (15M in Madrid and the Sunflower Movement in Taipei) that led to governmental changes in the Taiwanese government and Madrid City Council. These political changes presented an opportunity for Spanish and Taiwanese civic hackers and activists who were previously involved in urban movements to roll out vTaiwan and Decide Madrid to enable citizens to take part in policy-making processes.

To compare the two algorithmic platforms, I conducted ethnographic interviewing and participatory observation. Such ethnographic practices offered a situated and empirical understanding of how the two algorithmic platforms were developed – under specific political cultures and communities (Seaver, 2017) – to facilitate political decision-making and strive for participatory democracy. As Seaver (2017: 9) noted, 'only through deep engagement and richly contextual description could the ethnographer distinguish such variety of algorithmic systems'. Combining interviews and participatory observation, I acquired in-depth and in situ accounts of the wider urban political communities and policy-making processes in which the algorithmic platforms were developed and embedded (see |Crawford, 2016, 2021). Such situated accounts avoid reading the two platforms from a preordained position and allow for the contextually specific and dynamic nature of algorithmic platforms. These insights gradually emerged through my interactions with local actors and an exploration into their different relationships with algorithms.

In Taipei, I investigated how vTaiwan's ML algorithms facilitated the decision-making process by analysing digital simulations and visualisations from one public debate about the rideshare company Uber. This included daily monitoring of the algorithm's changes and outputs over 30 days and 25 interviews with users, civic hackers, software engineers, and policymakers in 2017–2018. I was embedded within the cabinet office of the digital ministry in the Taiwanese government and able to conduct a close participatory observation (every day from January to March 2018) to understand how algorithmic outputs are integrated into political decisions and the policy-making process.

In Madrid, I conducted a four-month participatory observation (every day from September to December 2017 and another visit in November 2018) with the Department of Citizen Participation at the Madrid City Council. This entailed 35 interviews with software engineers, researchers, and policymakers, and an online observation of the *propuestas* process (citizen proposals). The ethnographic investigation allowed me to understand how ranking algorithms facilitate political decision-making alongside different human practices and their impacts on citizen empowerment. With limited access to the digital archives of Decide Madrid, I was unable to conduct the same digital simulation and visualisation that I did for vTaiwan. However, interviews with important actors provided the context and materials needed to understand how programmers designed the ranking algorithms and how policymakers from the Madrid City Council made political decisions based on the ranking algorithm's outputs.

As a Taiwanese researcher and native Mandarin speaker, I took extra care when interviewing both Spanish and Taiwanese actors (Tseng, 2021). To ensure the quality of the interview data, I cross-examined key policymakers and programmers at both sites. I repeatedly posed the same questions, differently worded, to key actors over several follow-up interviews (including the return visit to Madrid in 2018). I also interviewed researchers and former project programmers who held different technopolitical ideologies and practices from the Decide Madrid team.

Most interviews with Spanish civic hackers, programmers, and policymakers were conducted in English, using only the Spanish terms directly related to Decide Madrid (which I learned while working as an intern/researcher at the Madrid City Council). These Spanish practitioners are highly educated and quite comfortable conversing in English. My working relationship with the Madrid City Council made them feel like I was part of the team and proved my genuine interest in the Decide Madrid platform. Since I am not a native Spanish speaker, I could not collect a so-called 'authentic' Spanish articulation of Decide Madrid but always double-checked information when unsure about the veracity of interview data.

In Taiwan, I employed the same strategy to interview Taiwanese practitioners, who appreciated my scholarly interest in the platform. In addition to the interviews conducted in Taiwan, I frequently followed up with these informants through Skype or email. My command of Mandarin allowed me to 'dig' further into hidden or obscured connotations of Mandarin terms and expressions. I also took time to translate the exemplar quotes into English, with help from native English speakers, to ensure the original and hidden meanings were not lost in translation.

The similar urban political trajectories of Decide Madrid and vTaiwan: From Spanish/Taiwanese occupy movements to institutionalisation

This section compares Decide Madrid and vTaiwan's similar inception and development trajectories. Both algorithmic platforms were developed and deployed as a result of specific institutional reforms enacted around new ideas of public participation emerging from the Occupy Movements in Madrid (15M/Indignados) and Taipei City (the Sunflower Movement). This shared trajectory demonstrates how an urban place, with a particular political environment and community, can shape the design and development of algorithmic platforms, especially for democratic empowerment (see Milan, 2013). Many smart devices and developments created by international Information Technology companies (such as Cisco and IBM) prioritise profit-making and efficiency over democratic participation. In contrast, Decide Madrid and vTaiwan are considered cutting-edge examples of e-participation (Simon et al., 2017), as they deploy open-source and innovative software and demonstrate a strong commitment to reform decision-making structures by allowing citizens to contribute to policy-making (López, 2016; Tseng, 2022). Unlike in Brazil, where e-participatory platforms have been operating since 2010 (Coleman and Cardoso Sampaio, 2017), both vTaiwan and Decide Madrid are relatively new participatory processes for local citizens.

In 2015, Manuela Carmena and her new political party, Ahora Madrid, took control of the Madrid City Council and created Decide Madrid. The Carmena administration considered itself to be rooted in principles of social justice and democratic empowerment and co-opted many self-identified 'civic hackers' and activists who were involved in the 15M movement (a subset of the Occupy Movement in Madrid). The administration claimed that it was developing a new concept of the smart city, which challenged the neoliberalised, profit-oriented visions previously developed by IBM and Cisco (Pérez et al., 2016: 163; Smith and Martín, 2020).

Decide Madrid is an open-source platform that involves citizens in various political decision processes: (1) debate (*Debates*), (2) citizen proposals (*Propuestas*), (3) votes (*Votaciones*), (4) collaborative processes (*Procesos*), and

(5) the participatory budget (*presupuestos participativos*). Participation in Decide Madrid is limited to residents who are registered with the Madrid City Council and are over 16 years old. As of 2017, there were approximately 300,000 residents registered (Decide Madrid, 2017). In this article, I only discuss two facets of Decide Madrid, the citizen proposal process and the 2016–2017 participatory budget. In both processes, citizens directly propose, support, and vote for the urban issues that matter to them. The Madrid City Council committed itself to holding referenda on any urban issue raised through a citizen proposal that reached the minimum support threshold of 1% of the registered population (27,662 votes). Additionally, approximately 2.5% of the Madrid City Council budget (60 million Euros in 2016 and 100 million Euros in 2017) was made available to fund participatory budget proposals that gained support from a majority of users.

Decide Madrid operates differently from the smart buildings and smart urban development of the Barcelona 22@ digital district (March and Ribera-Fumaz, 2016) and other sensor-driven smart urbanisms (Gabrys, 2014; Kitchin et al.,2015; Leszczynski, 2016). One senior officer in the Madrid City Council characterised IBM's idea of a smart city as having the non-democratic functionalities of a 'control panel'. He supported Madrid's development of the Decide Madrid platform, which empowered citizens to use technology to make decisions in urban policy because, 'the idea is not to have a great control panel [offered by IBM] which shows the location of every public fountain, but to let people decide where to put a new fountain'.[3]

On the other side of the world, in late 2014, the Taiwanese Government in Taipei was under pressure from the Sunflower Movement, a subset of the Occupy Movement, which strongly opposed deeper economic integration with China. In particular, the group opposed a new trade deal, the Cross-Strait Service Trade Agreement, which was seen as a harbinger of political union with China and a non-democratic future for Taiwan. The Sunflower Movement demanded that the conservative KMT-run Taiwanese Government retract its plan to sign the deal and, to this end, conducted various protests, including an occupation of the Taiwanese Parliament in March 2014 (Wang, 2017). The Sunflower Movement also produced a set of wider demands related to the reform of Taiwanese democracy. These included a request to consult the general public on controversial projects, such as the construction of a nuclear power station, and to consult widely on reforming the Taiwanese constitution and the Referendum Act (Ho, 2018). Largely due to the direct action facilitated by digital technologies,[4] the protests successfully pressured the Taiwanese Government to retract its trade deal with China.

The Taiwanese Government witnessed the power of digital technologies in recruiting 'the crowd' to attend demonstrations and disseminate protest-related information.[5] It subsequently attempted to harness this power (and meet the demands of the protestors) through an officially sanctioned algorithmic platform – vTaiwan (Kuan, 2015; O'Flaherty, 2018). vTaiwan was designed by the local Taiwanese civic hacking community (known as 'g0v') on a pre-existing open-source software called Pol.is, which was designed by Pol.is Inc., a start-up in Seattle. Enabled by Pol.is, vTaiwan incorporates ML algorithms to sort and visualise users into 'Opinion Groups'. It identifies similarities in the users' voting patterns to discern (so-called) consensus by calculating the highest agreement rates across Opinion Groups (what I call the calculation of 'Inter-Group Common Opinions'). This background and design, including the ML algorithms, differentiate vTaiwan from other 'populist framings' of urban participation and smart development in Taipei (Chang et al., 2021).

There are two stages in vTaiwan's e-participatory process. First, citizens are invited to become vTaiwan users and express their views on a pre-selected issue by commenting or voting on other comments. The number of participants in vTaiwan ranges from 350 to 2300. This article's case (Uber legislation) attracted 1737 participants, who generated a total of 47,539 votes and 196 comments (Simon et al., 2017: 30).[6] Secondly, after the online consultation results are generated by the vTaiwan platform, a working group of g0v volunteers and contracted Taiwanese government employees identifies stakeholders to invite for a face-to-face consultation with representatives from the Taiwanese government. In this face-to-face meeting, a moderator from g0v presents the results of the online consultation and facilitates a stakeholder consultation. After these two stages of consultation, the Taiwanese government drafts a bill which is then sent to Parliament.

Algorithmic orderings and human action across the two decision-making processes

In this section, I analyse how ranking algorithms (Decide Madrid) and ML algorithms' (vTaiwan) different technical natures and relationships with human actors create differing and partial conditions for empowering citizens in the policy-making process. Both platforms limit democratic potential by rendering a majoritarian politics. However, they generate different empowering possibilities to decentralise decision-making, realise citizens' ideas (Decide Madrid), and momentarily visualise plural perspectives (vTaiwan).

Decide Madrid: (re)ordering majoritarian urban issues

Within media studies, ranking algorithms are understood to configure new modalities of (in)visibility and exercise

disciplinary power by modulating users' emotions and behaviours in online participation (Bucher, 2012; Lomborg et al., 2018). For example, Bucher (2012: 1165) questioned how and through which arrangement and design practices certain political opinions and ideas are made visible. In the context of Decide Madrid, we must understand how the political importance and visibility of an urban issue are not ordered and determined *solely* by algorithms but also by policymakers and programmers. The following discussion illustrates how ranking algorithms, user-generated data, and policymakers within Decide Madrid come together to reinforce and impose a majoritarian ordering on the visibility and political importance of urban issues. In both participatory budgeting and citizen proposals, ranking algorithms prioritise a hierarchical ordering of the given urban issues based on the aggregated number of 'supports' or votes each receives. The number of supports is prioritised over other secondary weightings designed by programmers and the policy advisor of the Decide Madrid team, including the lifespan of citizen proposals and the financial cost for participatory budgeting proposals. For participatory budgeting, the ranking algorithms establish a hierarchical order based on the simple majoritarian number of votes/supports. Due to limited human resources, policymakers can only evaluate the legal and financial feasibility of the top-ranked urban issues. Therefore, the top 50% of urban issues are most likely to be 'upgraded' into the second stage of voting and be funded from the 100 million euro budget.

For citizen proposals, ranking algorithms highlight the top three most supported urban issues in a yellow banner[7] on the user interface of Decide Madrid. Once ranking algorithms hierarchically order three urban issues based on their majoritarian support, it becomes difficult to alter these 'top-ranked' issues. In my four-month online observation of citizen proposals, the ranking algorithms did not significantly change their majoritarian ordering of urban issues. Figures 1 and 2 show that two of the three featured citizen proposals – free transfers within different modes of public transportation and fines for not picking up dog excrement – remained in the yellow banner throughout this period. The ranking algorithms reinforced the rule of simple majoritarianism, which relentlessly highlighted the top-ranked urban issues over minority and conflictual issues (Mouffe, 2005; Young, 2000) such as housing, economic inequality, and improving social care for the

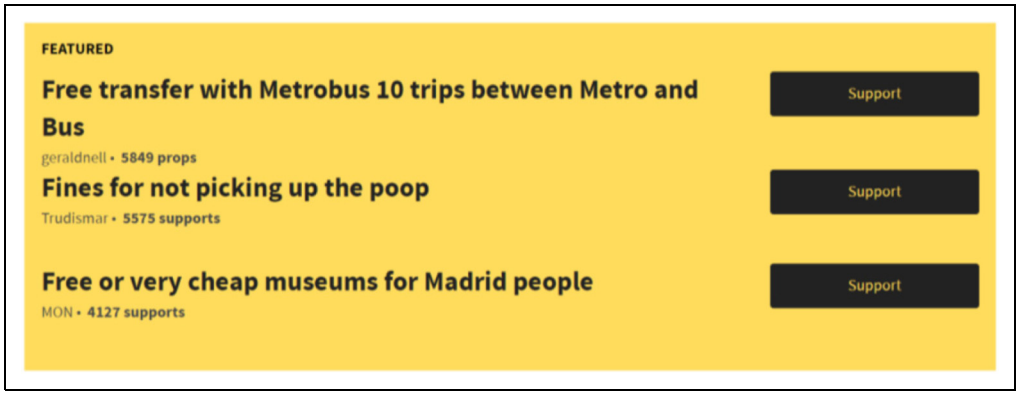

Figure 1. Screenshot of the 'Featured' proposals appearing at the top of Decide Madrid's citizen proposal front page on 3 June 2019.

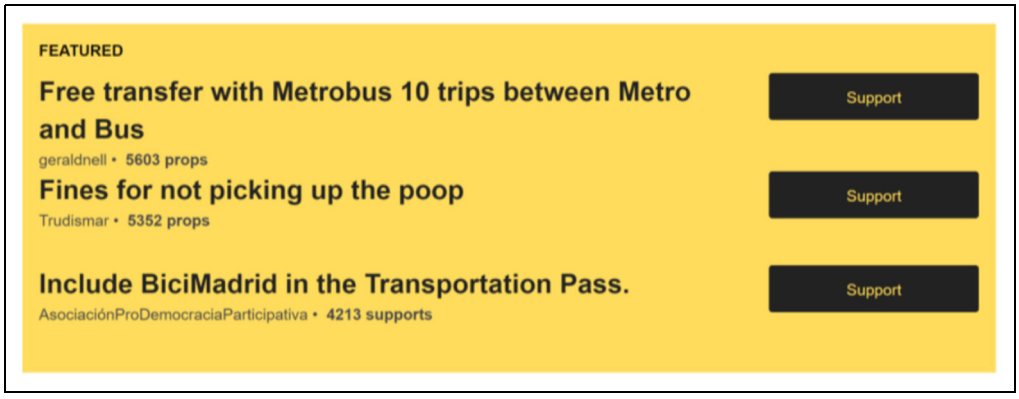

Figure 2. Screenshot of Decide Madrid's 'Featured' proposals on 30 October 2019.

disadvantaged, especially for foreign origin (immigrants and refugees) and Romani people.

The first point of empowerment – actionality – emerged when the Madrid City Council took political and institutional actions to transform citizens' ideas and concerns into new services and infrastructures. Over four years, the Madrid City Council committed to maximising the actionability of citizen proposals that received a majority of votes. Apart from spending 360 million euros on 132 proposals, it created new working groups and allocated significant labour and resources to transform these top-ranked proposals into new public services or infrastructures at the neighbourhood or city scale. This included negotiating between different departments and the authors of the proposal, designating staff to write contracts for outside firms to bid on the projects, as well as using innovative workarounds to bypass significant legal and capacity-related constraints. For example, a senior policymaker for Decide Madrid described how Madrid City Council bought musical instruments for primary schools, despite having no formal power over education[8]:

> One of the proposals was to buy musical instruments for schools and we were not able to do so because it is out of our competencies, but we found a way which was to buy musical instruments for public libraries because libraries are governed by Madrid City Council and then lend them to the schools for free. We found our ways (laugh) and then that worked.[9]

These efforts evidence what Baiocchi and Ganuza (2014: 31) termed the 'important institutional architecture' necessary to protect and actualise (not only endorse) the legitimacy of citizens' ideas within participatory budget proposals (also see Fung, 2006). In several interviews, citizens underscored how these actions help them feel empowered.[10] They want to *see* their inputs transformed into (for example) new municipal nurseries, an animal shelter, a new hospital, day-care centres, housing, and social services for specific vulnerable groups of Spanish citizens such as women suffering from domestic violence, the elderly with chronic illness or disability, and children from low-income families.

Decide Madrid also fosters a decentralisation of decision-making power to citizens and local authorities via the Madrid City Council's efforts to create new participatory regulations, working groups, advertisement infrastructures (e.g. buses, banners, and digital bulletins), and district-based sites for informing and reaching out to citizens. Decision-making power, which was historically centralised and reserved for politicians, public officers, and neighbourhood associations, is now (unevenly) *redistributed* to citizens who determine the content and result of policy-making by proposing and voting on urban issues (see Baiocchi and Ganuza, 2014; Fung, 2006). For citizens, determining urban policies and plans with their votes is an unprecedented and undeniable experience of empowerment.[11] Interviewee Vincent, a resident of Madrid City, was passionate and excited to vote on symbolic urban projects (e.g. Plaza de España's renovation) and district-based proposals: 'this is the first time that I see how my voice has brought a difference to what Madrid city will be looking like'.[12] Citizen Maria was initially sceptical of the Madrid City Council's use of voting as a means for decision-making; however, she thinks it is better to have a chance to influence policy-making than to have none.[13]

For digital democracy studies, the *uneven* distribution of decision-making power is inherent to any e-participatory platform where networked and digitally competent citizens gain advantages over those with fewer resources to campaign for their proposals via digital/social means (Bright et al., 2020; Koc-Michalska and Lilleker, 2017; Wright, 2012). This issue is apparent in Decide Madrid where some citizens (often part of social associations) can better mobilise voters to support their proposals via Twitter, Facebook Groups, or WhatsApp groups (Tseng, 2022). Networked citizens who reinforce the majoritarian ordering have excluded controversial and minority issues about immigrants and refugees, who are less represented by established organisations and networks than Spanish victims of domestic violence or sexism, for example. Here, the problem is not majoritarian ordering *per se*, but rather how majoritarian ordering becomes the *main* way of deciding and justifying urban issues. Such algorithmic ordering exemplifies 'the aggregating model' (Fung and Wright, 2001; Young, 2000: 19–20) through which 'the preferences held by the majority wins the policy battle'.

Additionally, by using majoritarian rule instead of public deliberation or alternative methods of algorithmic ordering, Decide Madrid has configured weak grounds to justify its decision-making process and outcomes. As Young (2000: 20) stated, 'preference orderings when aggregated may yield a different ordering than those the individuals hold singly'. In eliminating minority urban issues with little explanation as to their 'unworthiness', Decide Madrid forecloses the democratic possibility of discussing and debating plural urban issues. Algorithmic orderings must always exclude some information in their calculation; however, a more empowering technique would allow algorithmic ordering to work with human practices to represent plural and conflicting voices in decision-making (Mouffe, 2005; Young, 2000).

vTaiwan: Algorithmic/human (re)orderings of the Uber issue

Like Decide Madrid, vTaiwan reinforces majoritarian politics, but through different means. vTaiwan's ML algorithms

do not create a single majoritarian ordering of urban issues. Rather, they can potentially present and visualise controversial and plural perspectives by 'transforming' (Mackenzie, 2017) the existing perspectives based on new voting patterns. However, this opportunity was lost as ML algorithms stabilised into the binary framings and human actors (moderators and policymakers) discarded the algorithmically sorted controversial perspectives later in the decision-making process.

Algorithmic reordering of urban issues: Conflicts and plurality. ML algorithms, including the principal component analysis and K-means clustering algorithms[14] used by vTaiwan, search for generalised patterns in the input data (Mackenzie, 2017: 81). ML algorithms' pattern-searching is subject to micro-transformations as the input data changes and accumulates. They renew, adjust, and generate new styles of ordering/categorising the data (also see Amoore, 2020; Kitchin, 2017).

vTaiwan's ML algorithms categorise 'majoritarian views' and 'different perspectives' across Opinion Groups (groups composed of different users sharing similar voting patterns). These are (re)ordered *in relation to* contextually unfolding user-generated data and human moderators.[15] ML algorithms configure bespoke rules for individual cases based on the users' (changing) voting patterns. They learn to find and classify the patterns and similarities in thousands of votes, allowing the algorithms to split users into different Opinion Groups. From here, the algorithms visualise which perspectives matter *within* and *between* different Opinion Groups (what I call Intra-Group and Inter-Group Common Opinions). With every algorithmic calculation, ML algorithms adapt their rules to generate 'the best' outputs based on 'environmental' changes. This includes the changing numbers of votes and comments generated by users in real-time (which can range from a few to more than 100 votes and comments) and the ML algorithm's self-generative nature (see Kitchin, 2017: 21; Figure 3).

Shifts in the algorithmic outputs (due to incoming user-generated data) catalyse algorithmic reordering. By examining a specific case, we can better understand how ML algorithms not only *reclassified* users into different Opinion Groups based on changes in their voting patterns, but also *renew*ed perspectives on the urban issue. The following case study tracks an urban issue about the rideshare service Uber listed on the vTaiwan-Pol.is platform from 15 July to 15 August 2015. From 15 to 17 July 2015, new data, including 22 new comments about Uber and hundreds of new votes from 93 new vTaiwan users. The ML algorithms first grouped users into four Opinion Groups – 'taxi', 'Uber', 'government', and 'user' (on 15 July) and later reduced the number of Opinion Groups to two – 'anti-Uber' and 'pro-Uber' (from 17 July). Before regrouping the users, the algorithmic reordering highlighted an important Inter-Group Common Opinion (that 'taxi and Uber drivers should be able to work for different taxi companies').

This reordering offered an important chance for a *new* and *different* perspective on the Uber issue to be heard within the policymaking process – in this case, an emerging concern about both Uber and taxi drivers' livelihoods being threatened by the (il)legalisation of the Uber corporation. As algorithms respond to incoming data such as new votes or user comments, the perspectives deemed important can change. By the end of the consultation process, the ML algorithms had winnowed four Opinion Groups down to two and highlighted the binary, conflicting perspectives (Intra-Group Common Opinions) that received majority support from users within each Opinion Group. As displayed in Table 1, Opinion Group A was represented as an anti-Uber perspective because it focused on Uber's illegal status and potential risks to passengers, Uber drivers, and its threat to the livelihoods of taxi drivers. In contrast, Opinion Group B represented a pro-Uber stance that did not mention the legal and safety concerns over Uber as a mode of transportation.

A point of empowerment occurs when ML algorithms identify plural viewpoints (in response to incoming user data) for participants to consider in political decision-making. In the case of the Uber legalisation, this moment occurred when the concern for drivers' livelihoods was foregrounded as a controversy before being reframed into 'pro and anti-Uber' sentiments. In this fleeting moment, citizens were given the chance to take a step back and reflect upon the plural perspectives, or what Mouffe (1999: 756) called the 'between real alternatives' – do Uber and taxi drivers' right to work matter more than the binary framing of Uber's legalisation in Taiwan? For Mouffe (1999: 756), 'plural democracy needs to make room for dissent and for the institutions through which it can be manifested'. Similarly, Shin, a vTaiwan user, felt most empowered when she could 'learn different viewpoints for the Uber case in the first and second days of the consultation, which I would never know without taking part in vTaiwan'.

However, not every participant witnessed or remembered this moment, as many joined the vTaiwan platform later in the consultation. To fully foreground plural empowerment, moderators and policymakers must identify the moment of plural perspectives and enable citizens to reflect upon the moment, explore alternative framings of the issue, and debate whose/which framing is at stake. Otherwise, citizens are quickly drawn into the algorithmically sorted binary framing as the ML stabilises.

Human interventions on algorithmically sorted conflicts. Unlike Decide Madrid, vTaiwan's algorithmic outputs were curated by policymakers, moderators, and stakeholders during the policy-making process. 'Human intervention' denotes the ways in which policymakers and moderators *filter out* the conflictual perspectives prioritised

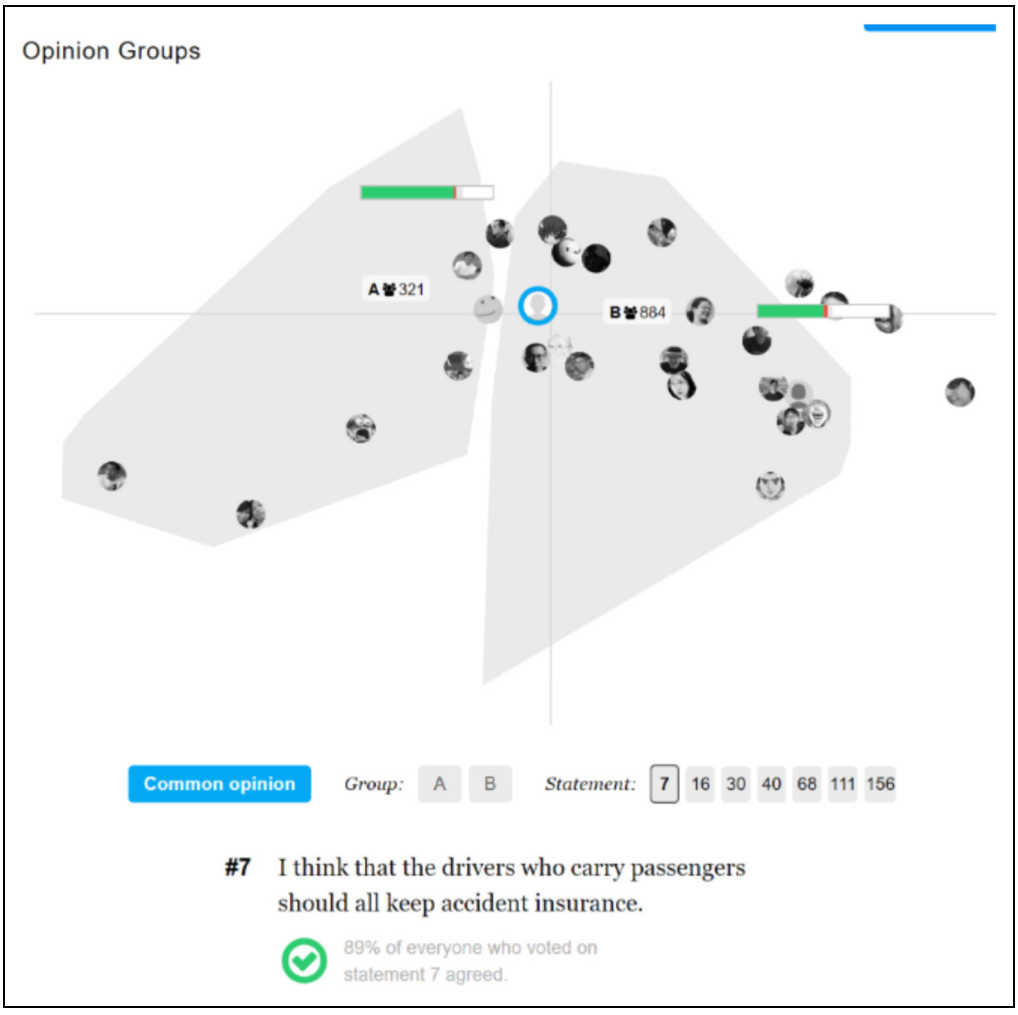

Figure 3. Screenshot of the vTaiwan UI showing a visualisation of two Opinion Groups (in grey clusters) and a majoritarian view during the Uber consultation (source: http://pol.is/3phdex2kjf, access 6 January 2019).

Table 1. Anti- and pro-Uber perspectives from the two opinion groups.

	Opinion group A	Opinion group B
Intra-Group Common Opinion 1	Uber should be an illegal business, as it threatens the livelihoods of existing taxi drivers and jeopardises the safety of the public	Uber offers a win–win service for both passengers and drivers
Intra-Group Common Opinion 2	The Taiwanese government should intervene to control illegal Uber cars; Uber drivers should be covered by insurance	It does not matter if Uber is an illegal mode of transportation; Uber is not a risky mode of transportation
Intra-Group Common Opinion 3	Uber should be made to register as a transportation business [not a software business] and pay tax to the local government	Uber is preferable to a conventional taxi since it is of better quality than a taxi

by the algorithmic outputs. This significantly forecloses the possibility of empowering citizens in political decision-making; the chance to transform controversial/antagonistic perspectives into 'agonistic potential' via discussion was lost (lMouffe, 1999, 2005).

In interviews, two vTaiwan consultation moderators explained how they glossed over the antagonisms between the pro- and anti-Uber factions. They presented stakeholders with a simplified set of bullet points derived from the Inter-Group Common Opinions and represented

it as 'consensus'. This turned vTaiwan's algorithmic ordering into another instance of simple majoritarian rule. One contract worker who summarised vTaiwan results in preparation for the face-to-face consultation explained that the divergent Intra-Group Common Opinions were not to be presented in the consultation:

> I won't put the opinions from the minority group [Intra-Group Common Opinions] into the presentation… there are loads of discussion which will be deleted during the translation from data exported from Pol.is to the presentation in the face to face consultation.[16]

A second moderator confirmed that algorithmically sorted minority opinions were eliminated for the face-to-face consultation. She only presented discussion topics that were commonly held between different Opinion Groups and did not emphasise the conflictual nature of the 'different perspectives' identified by the ML:

> If it is a comment that nobody agrees on, like a negative consensus, then maybe it's just a really bad idea. I don't actually present those…a majority of people disagree with that. I shouldn't, strictly speaking, show it in the presentation, minority groups do get representation, but not those minority comments that are ignored by everybody.[17]

After the face-to-face consultation, the Ministry of Transport (MoT) incorporated the expressed views into draft legislation to revise the Transportation Act. The MoT *chose* to emphasise the anti-Uber (majority) strands of the consensus, as indicated by a press release calling for legislation that would require Uber to 'pay tax, take insurance, take control' (Ministry of Transportation and Communications, 2017). This position clearly ignored the conflicting viewpoints on Uber indicated within the Intra-Group Common Opinions.

This act of bureaucratic evasion resulted in a series of protests between Uber drivers and taxi drivers, which spilled onto the streets of Taipei City during 2018–2019 (Strom News, 2019; Technews, 2019). The ongoing conflict between pro- and anti-Uber sentiments demonstrates a limitation for empowering citizens. vTaiwan's policymakers and moderators predominately focused on Uber's (il)legal status and prevented multiple actors (taxi drivers, Uber drivers, and users) from reframing the pro-/anti-Uber conversation into a pluralist issue. Governmental actions squandered the ML's plural empowerment potential (Mouffe, 1999, 2005). The protests, reinstating taxi, and Uber drivers' different and conflicting concerns for policy-making, reject the consensus-driven participatory democracy facilitated by the Taiwanese government and civic hacking community.

Conceptualising algorithmic empowerment through differences

Comparative analysis foregrounds how human–algorithmic relationships can create different and partial conditions of algorithmic empowerment. This comparative study highlights how such differences can positively impact citizen empowerment in urban policy-making, despite shared limitations (e.g. majoritarian politics, uneven power distribution, and low participation rates). Algorithmic empowerment cultivates and amplifies the algorithmically mediated condition(s) that enable (underrepresented) citizens to exercise power over policy-making, consider plural perspectives, and make improvements on issues concerning them. This conceptualisation does not ignore the aforementioned limitations in both platforms, nor does it attempt to attribute any empowering condition solely to the 'right' algorithmic ordering. Algorithmic empowerment is not a binary assessment of yes/no but a process of eliminating limitations and fostering the condition(s) of empowerment. While each platform has its own limitation(s), they both present a distinctive condition for further consolidating and improving decision-making for citizen empowerment. Decide Madrid's ranking algorithms work with policymakers to decentralise existing structures and decision-making to citizens (though unevenly) and to support and actualise their concerns (though based on majoritarianism) into projects or services that offer tangible improvements to everyday and social life. vTaiwan's ML algorithmic orderings offered different participants (e.g. taxi drivers, Uber drivers, and users) an important, rare (if brief) opportunity to consider plural perspectives beyond a simple focus on conflict management and resolution.

Conclusion: Algorithmic (dis) empowerment

This article compared how two algorithmic platforms, Decide Madrid and vTaiwan, reconstitute the political decision-making process. I reviewed their shared trajectories, algorithmic ordering methods, and relations with human actors to develop a new, comparative, and situated conceptualisation of algorithmic platforms as differently and partially empowering. I argue that algorithmic empowerment is not determined by the outcome of algorithmically facilitated decision-making, nor a yes/no assessment of the predefined indicators of e-participation. Rather, it is an ongoing and dynamic process that brings about empowering conditions that allow (underrepresented) individuals to shape policy-making (decentralisation), and consider plural perspectives (plurality) for political changes and actions (actionality). Algorithmic empowerment is not beholden to preordained, technocratic indicators – it works through the tension(s) between openings and limitations of empowerment and considers dynamic human–

algorithmic relationships across the place. It recognises the distinctive direction of each platform (rather than merely identifying the problems of disempowerment) towards better empowering citizens in policy-making.

This comparative conceptualisation of algorithmic empowerment offers new ways for critical algorithmic scholars to understand how algorithms can empower citizens in policy-making. The concept, grounded in an extensive comparative ethnography, moves beyond the most-studied (and critiqued) platforms to consider alternative open-source algorithmic platforms such as Decide Madrid and vTaiwan. Rather than lumping them in with proprietary platforms, the comparative ethnography reveals their distinctive trajectories emerging from urban social movements and reformed governments. This avoids reproducing a universal account of algorithmic technologies, with no consideration for varying geographies, cultures, and relationships (Milan and Treré, 2019). The comparative method also moves beyond techno-determinism and fetishism (see Crawford, 2016; Gillespie, 2014), to critically examine how different places and relationships entwined with or within algorithmic platforms empower citizens in policy-making. It frames algorithmic platforms as 'the more unassuming means by which we are progressively put *in place*' (Allen, 2020: 412, my emphasis).

Future critical research on algorithmic empowerment should attend to two directions: comparison and urban politics. Scholars should compare the places and spaces (beyond the Global North) in which new or different algorithmic platforms are developed and implemented to (re) constitute policy-making praxis for citizens. A comparison across different geolocations and platforms can revise, reorient, and expand our current understanding of new political possibilities and practices afforded by innovative algorithmic technologies beyond the Anglosphere. A comparative study helps to explore, accommodate, and theorise differences (e.g. geographies, cultures, and algorithmic–human relationships) to orient the current understanding of algorithmic empowerment towards multiplicity. This reinforces Amoore's (2013, 2020) commitments to locate the moments and spaces where algorithmic platforms open previously unknown opportunities and, in particular, to uncover multiple points of resistance and emergent political possibilities for empowering citizens in policy-making.

Another important, but less theorised, dimension is the role of urban politics in sustaining and delimiting the conditions for algorithmic empowerment. Decide Madrid and vTaiwan's democratic potentials were engendered by reformed governments after massive social protests in Madrid and Taipei. However, their potential faltered after subsequent political changes in the Taiwanese and Spanish administrations. Decide Madrid was defunded after the Carmena Administration lost to the conservative Popular Party in 2019, but its participatory budgeting was recently revived after gaining political and financial support from the new ruling party in 2021. Similarly, the Taiwanese government has recently supported another participatory platform called Join, leaving vTaiwan with few resources to conduct new political participation projects.

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Notes

1. The term *algorithmic platform* describes Decide Madrid and vTaiwan's websites (neither has a mobile application option) that are constituted by different algorithmic–human relationships. Algorithmic *devices* refer to a wider range of electronic equipment (e.g. sensors, computers, mobile phones, and biometrics).
2. Programmers from vTaiwan and Decide Madrid are required to publish their coding and algorithms on the website GitHub under a GNU Affero General Public License v3.0.
3. Interview was conducted on 19 June 2017 in English.
4. Such as Hackpad, Google Maps, Facebook, and other platforms that enable collective action.
5. Interview took place on 22 March 2018 in Mandarin.
6. This participation rate is not representative of Taiwan's 22 million citizens. Yet, for civic hackers, what matters is to get a range of diverse opinions on the given issue, rather than having a high participation rate.
7. The use of a yellow banner is a common tactic in UI design, and focuses users' attention on important messages.
8. Education and transportation policies are strictly governed by the Regional Government of Madrid (not the *Ayuntamiento de Madrid* – the Madrid City Council). This presented significant implementation challenges.
9. Interview was conducted in 19 June 2017 in English.
10. Short interview with Maria, Vincent, Chez, and Olivia were conducted between 1 December and 10 December 2012 in English.
11. According to four short interviews with citizens; see Footnote 9.
12. Interview was conducted in 17 December 2016 in English.
13. Interview was conducted in 10 December 2016 in English.

14. The statistical formulas of these two algorithms can be found in Github's repositories via https://github.com/compdemocracy/.
15. Human moderators modify or delete comments containing elements of misinformation or trolling.
16. Interview was conducted on 26 February 2018 in Mandarin.
17. Interview was conducted on 19 January 2018 in Mandarin.

References

Allen J (2020) Power's quiet reach and why it should exercise us. *Space and Polity* 24(3): 408–413.

Amoore L (2013) *The Politics of Possibility: Risk and Security Beyond Probability*. Durham and London: Duke University Press.

Amoore L (2019) Doubt and the algorithm: On the partial accounts of machine learning. *Theory, Culture and Society* 36(6): 147–169.

Amoore L (2020) *Cloud Ethics*. Durham and London: Duke University Press.

Ash J, Kitchin R and Leszczynski A (2018) Digital turn, digital geographies? *Progress in Human Geography* 42(1): 25–43.

Baack S (2015) Datafication and empowerment : How the open data movement re-articulates notions of democracy, participation, and journalism. *Big Data & Society* 2(2): 1–11.

Baiocchi G and Ganuza E (2014) Participatory budgeting as if emancipation mattered. *Politics & Society* 42(1): 29–50.

BBC (2019) The digital activist taking politicians out of Madrid politics. Available at: https://www.bbc.co.uk/news/world-europe-46799768 (accessed 30 July 2019).

Beer D (2009) Power through the algorithm? Participatory web cultures and the technological unconscious. *New Media and Society* 11(6): 985–1002.

Beer D (2013) *Popular Culture and New Media: The Politics of Circulation*. Hampshire, UK: Palgrave Macmillan.

Bright J, Bermudez S, Pilet J-B, et al. (2020) Power users in online democracy: Their origins and impact. *Information Communication and Society* 23(13): 1838–1853.

Bucher T (2012) "Want to be on the top?" Algorithmic power and the threat of invisibility on Facebook. *New Media and Society* 14(7): 1164–1180.

Bucher T (2018) *If…then: Algorithmic Power and Politics*. New York: Oxford University Press.

Chang ICC, Jou SC and Chung MK (2021) Provincialising smart urbanism in Taipei: The smart city as a strategy for urban regime transition. *Urban Studies* 58(3): 559–580.

Charnock G, March H and Ribera-Fumaz R (2021) From smart to rebel city? Worlding, provincialising and the Barcelona model. *Urban Studies* 58(3): 581–600.

Cheney-Lippold J (2011) A new algorithmic identity: Soft biopolitics and the modulation of control. *Theory, Culture & Society* 28(6): 164–181.

Coleman G (2004) The political agnosticism of free and open source software and the inadvertent politics of contrast. *Anthropological Quarterly* 77(3): 507–519.

Coleman S and Cardoso Sampaio R (2017) Sustaining a democratic innovation: A study of three e-participatory budgets in Belo Horizonte. *Information Communication and Society* 20(5): 754–769.

Crampton JW (2016) Assemblage of the vertical: Commercial drones and algorithmic life. *Geographica Helvetica* 71(2): 137–146.

Crawford K (2016) Can an algorithm be agonistic? Ten scenes from life in calculated publics. *Science Technology and Human Values* 41(1): 77–92.

Crawford K (2021) *Atlas of AI*. New Haven and London: Yale University Press.

Decide Madrid (2017) Decide Madrid. Available at: https://decide.madrid.es/vota?locale=es (accessed 7 March 2017).

Fischer F (2012) Participatory governance: From theory to practice. In: Levi-Faur D (ed.) *The Oxford Handbook of Governance*. Oxford, UK: Oxford University Press, pp. 457–471.

Fung A (2006) *Empowered Participation : Reinventing Urban Democracy*. Cambridge, MA: Princeton University Press.

Fung A and Wright EO (2001) Deepening democracy: Innovations in empowered participatory governance. *Politics & Society* 29(1): 5–41.

Gabrys J (2014) Programming environments: Environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space* 32(1): 30–48.

Gillespie T (2014) The relevance of algorithms. In: Gillespie T, Boczkowski P and Foot K (eds) *Media Technologies: Essays on Communication, Materiality, and Society*. Cambridge, MA, London: The MIT Press, pp. 167–194.

Ho MS (2018) From mobilization to improvisation: The lessons from Taiwan's 2014 sunflower movement. *Social Movement Studies* 17(2): 189–202.

Isin E and Ruppert E (2015) *Being Digital Citizens*. London, UK: Rowman & Littlefield International.

Kitchin R (2017) Thinking critically about and researching algorithms. *Journal Information, Communication & Society* 20(1): 14–29..

Kitchin R, Lauriault TP and McArdle G (2015) Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science* 2(1): 6–28.

Koc-Michalska K and Lilleker D (2017) Digital politics: Mobilization, engagement, and participation. *Political Communication* 34(1): 1–5.

Kuan C-M (2015) Reflections on policy-making from Chung-Ming Kuan, TedXTalks. Available at: https://www.youtube.com/watch?v=UtxgzPhrlDM (accessed 23 October 2018).

Leszczynski A (2016) Speculative futures: Cities, data, and governance beyond smart urbanism. *Environment and Planning A* 48(9): 1691–1708.

Lev-On A (2008) The democratizing effects of search engine use: On chance exposures and organizational hubs. In: Spink A and Zimmer M (eds) *Web Search*. Berlin and Heidelberg: Springer, pp. 135–149.

Lomborg S, Thylstrup NB and Schwartz J (2018) The temporal flows of self-tracking: Checking in, moving on, staying hooked. *New Media and Society* 20(12): 4590–4607.

López G (2016) Decide Madrid's legacy: Source code and support for more and more eParticipation portals in Spain, epractice.eu. Available at: https://joinup.ec.europa.eu/collection/egovernment/document/decide-madrids-legacy-source-code-and-support-more-and-more-eparticipation-portals-spain (accessed 9 September 2019).

Lynch CR (2020) Contesting digital futures : Urban politics, alternative economies, and the movement for technological sovereignty in Barcelona. *Antipode* 52(3): 660–680.

Mackenzie A (2017) *Machine Learners: Archaeology of a Data Practice*. Cambridge, MA, London: The MIT Press.

March H and Ribera-Fumaz R (2016) Smart contradictions: The politics of making Barcelona a self-sufficient city. *European Urban and Regional Studies* 23(4): 816–830.

Mcfarlane C (2010) The comparative city: Knowledge, learning, urbanism. *International Journal of Urban and Regional Research* 34(4): 725–742.

Milan S (2013) *Social Movements and Their Technologies*. New York and Basingstoke: Palgrave Macmillan.

Milan S and Treré E (2019) Big data from the South(s): Beyond data universalism. *Television and New Media* 20(4): 319–335.

Milan S and van der Velden L (2016) The alternative epistemologies of data activism. *Digital Culture & Society* 2(2): 57–74.

Ministry of Transportation and Communications (2017) Impose legal regulation on Uber. Available at: https://www.motc.gov.tw/ch/home.jsp?id=14&parentpath=0&per;2C2&mcustomize=news_view.jsp&dataserno=201702100004&aplistdn=ou=data,ou=news,ou=chinese,ou=ap_root,o=motc,c=tw&toolsflag=Y&imgfolder=img&per;2Fstandard (accessed 1 September 2019).

Mossberger K, Tolbert CJ and McNeal RS (2008) *Digital Citizenship: The Internet, Society, and Participation*. Hong Kong: The MIT Press.

Mouffe C (1999) Deliberative democracy or agonistic pluralism? *Social Research* 66(3): 745–758.

Mouffe C (2005) *On the Political*. New York, Abingdon: Routledge.

Munk AK, Olesen AG and Jacomy M (2022) The thick machine: Anthropological AI between explanation and explication. *Big Data and Society* 9: 1.

Noble SU (2018) *Algorithms of Oppression*. New York: New York University Press.

O'Flaherty K (2018) Taiwan's revolutionary hackers are forking the government, Wired. Available at: https://www.wired.co.uk/article/taiwan-sunflower-revolution-audrey-tang-g0v (accessed 1 September 2019).

Pasquale F (2015) *The Black Box Society, The Black Box Society*. Cambridge, MA, London: Harvard University Press.

Pérez JMG, González RCL and Mantiñán MJP (2016) The economic crisis and vulnerability in the Spanish cities: Urban governance challenges. *Procedia – Social and Behavioral Sciences* 223: 160–166.

Robinson J (2006) Ordinary cities: Between modernity and development, Ordinary Cities: Between Modernity and Development. Available at: http://www.scopus.com/inward/record.url?eid=2-s2.0-84917098178&partnerID=40&md5=2902326ff66c8f92c4a11124d15fa753.

Robinson J (2015) Thinking cities through elsewhere: Comparative tactics for a more global urban studies. *Progress in Human Geography* 40(1): 1–27.

Rodríguez C (2001) *Fissures in the Mediascape: An International Study of Citizens' Media*. Cresskill: Hampton Press.

Royo S, Pina V and Garcia-Rayado J (2020) Decide Madrid: A critical analysis of an award-winning e-participation initiative. *Sustainability* 12: 4.

Sadowski J (2019) When data is capital: Datafication, accumulation, and extraction. *Big Data and Society* 6(1): 1–12.

Seaver N (2017) Algorithms as culture : Some tactics for the ethnography of algorithmic systems. *Big Data & Society* 4(2): 1–12.

Simon J, et al. (2017) NESTA digital democracy: The tools transforming political engagement. London. Available at: https://www.nesta.org.uk/report/digital-democracythetools-transforming-political-engagement/.

Smith A and Martín PP (2021) Going beyond the smart city? Implementing technopolitical platforms for urban democracy in Madrid and Barcelona. *Journal of Urban Technology* 28(1–2): 311–330.

Strom News (2019) Taxi drivers protest against Uber. Available at: https://www.storm.mg/article/897140 (accessed 1 October 2019).

Technews (2019) Uber protest against the revised Transportation Act: Invalid? Available at: https://technews.tw/2019/04/24/uber-invalid-protest/ (accessed 12 October 2019).

Tseng Y (2021) Doing ethnography with a dual positionality: Experiences in Spanish and Taiwanese governmental institutions. In Ajebon MO, Kwong CYM and Astorga de Ita D (eds) *Navigating the Field*. Cham: Springer Nature, pp. 91–100.

Tseng Y (2022) Rethinking gamified democracy as frictional : A comparative examination of the Decide Madrid and vTaiwan platforms. *Social & Cultural Geography*. Advance online publication. doi: 10.1080/14649365.2022.2055779.

Vanolo A (2014) Smartmentality: The smart city as disciplinary strategy. *Urban Studies* 51(5): 883–898.

Wang CM (2017) "The future that belongs to us": Affective politics, neoliberalism and the sunflower movement. *International Journal of Cultural Studies* 20(2): 177–192.

Wright S (2012) Assessing (e-) democratic innovations : "Democratic Goods" and Downing Street E-petitions. *Journal of Information Technology & Politics* 9(4): 453–470.

Young IM (2000) *Inclusion and Democracy*. New York: Oxford University Press.