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Digital insurgency: Urban mobilization and grassroots digital knowledge

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Abstract

Technical and digital knowledge creation frequently homogenizes and marginalizes specific groups of people, thereby perpetuating oppressive power structures and utilizing technologies as instruments for top-down uneven urban development. The increased reliance on the flow of data facilitated by digital technologies has often reproduced existing inequalities through invisibility, oversimplification, or incomplete data sets. In contexts of urban informality, invisibility is particularly pervasive in self-built communities that are deemed illegible to and by the state and are subjected to neglect and removals, reinforcing historical patterns of oppression, exclusion, and racism in residents' everyday lives. Similarly, insurgent planning illuminates grassroots efforts challenging systems and structures of oppression to spur change and collective urban rights. In the last few decades, the appropriation of digital tools and resources has allowed communities and movements to redefine their organizing means with digital tools and platforms, producing, expanding, and documenting urban insurgencies. This article puts forward a Digital Insurgency conceptual framework to highlight insurgent processes of knowledge production, organizing, and appropriation of digital and technological means that challenge hegemonic systems of oppression while advocating for collective urban rights. Case studies in São Paulo, Rio de Janeiro, and Fortaleza, Brazil, are analyzed through the proposed framework, considering movements' political foundation, agency, practical

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implementations, utilization of digital and technological tools, and the crafting of counter-hegemonic narratives. The selected cases demonstrate the robust potential of Digital Insurgency in supporting the struggles for urban collective rights and social and spatial justice through grassroots digitalization of urban insurgency.

Keywords
insurgent planning, digital tools, collaborative data, social movements, urban informality

Introduction

Digital and Information and Communication Technologies (ICTs) are ubiquitous in urban life today. Technological advancements contribute to the processes of production and maintenance of urban spaces, including their politics and struggles (Karvonen et al., 2020). Digital platform services like Google and Uber are deeply embedded in urban experiences (Barns, 2019). Often claiming to be all-encompassing, technological, and digital services, data gathering and processing methods tend to disregard the realities of certain types of urban communities, such as self-built communities, creating a "black box of data" (Furtado and Renski, 2019). Available data, such as census data, is generally incomplete or inexistent, inadequately portraying the communities' heterogeneity, socio-spatial realities, and everyday life experiences (Freeman, 2014; Motta, 2019; Ruppert et al., 2017). Despite such challenges, community-based organizations, leaders, and organizers have historically appropriated tools, methods, and technologies to make visible their experiences, build shared identities, and ultimately demand the transformation of their realities (Basile, 2023a; Holston, 2019; Nemer, 2022).

The debate and analysis surrounding the power structures inherent in the application of digital technologies and data production are relatively nascent. Information and Communication Technologies (ICT), digital sensing tools, and crowdsourcing mechanisms necessitate further reflection on how their use and products reproduce and further historical, socio-spatial inequalities. For instance, the growth of the Smart City movement highlights the strengthening interaction between the digital and physical worlds. However, such processes often fail to benefit populations equally, perpetuating a neoliberal development logic (Caragliu et al., 2009). Consequently, smart urbanism exposes communities to anti-democratic and exclusionary processes in the name of a "common good" (Shelton et al., 2015). In contexts of urban informality, technical and digital tools often reinforce historical structural inequalities in residents' everyday lives (Nemer, 2022). This hegemonic status quo concentrates control and knowledge production access in the hands of a few, demanding further debate on how the illusion of participation fails to redistribute power (Shelton and Lodato, 2018).

Insurgent planning was initially conceptualized as the organizing and bottom-up resistance of people and organizations to modernist urban planning, its power disparities, and its detrimental consequences to urban communities while, at the same time,

attempting to transform urban space (Sandercock, 1998). Miraftab (2009) advanced this theorization within the context of neoliberalism, highlighting how urban insurgency arises from grassroots opposition to systems of oppression put forward by predatory economic structures. In this article, we draw from the insurgent planning literature to analyze how grassroots groups use digital means to challenge historical oppressions and invisibility while advancing their agendas for collective urban rights. To do so, we introduce a conceptual framework of Digital Insurgency to explore how bottom-up digital data creation and sharing support historically oppressed communities' efforts to articulate their experiences, needs, and aspirations through digital insurgent means. Digital insurgency translates the appropriation and use of digital tools and resources by grassroots and historically oppressed groups to produce and disseminate bottom-up knowledge documenting and making the invisible visible while claiming urban rights rooted in material and territorial realities.

We use a case study approach to examine three cases of Digital Insurgency in Brazil: a community-led census titled "*Um Olhar Sobre o Poço*" by the Community of Poço da Draga in Fortaleza; a community-led research project, "*De Olho Na Quebrada*" by UNAS Heliópolis in São Paulo; and the "*Painel Unificador Covid-19 nas Favelas*", organized by multiple communities in Rio de Janeiro. Despite a progressive constitution, urban planning efforts in Brazil have historically reproduced social and spatial segregation and exclusion (Friendly and Stiphany, 2019; Klink and Denaldi, 2016). Conversely, grassroots movements have persistently mobilized toward socio-spatial justice and the right to the city (Basile, 2023a; Friendly, 2020). In the last few decades, digital tools and resources have opened new possibilities for grassroots efforts in collective organizing and producing/disseminating counter-hegemonic narratives (Falco et al., 2019; Poets et al., 2023). The Digital Insurgency framework allows for the analysis of how such insurgent practices can subvert the top-down paradigms of decision-making and policy and empower communities through the digital and autonomous production of knowledge and narratives.

The article is organized as follows: first, we delve into the literature on the use of data and technology in urban planning, and insurgent planning, subsequently introducing the conceptual framework of Digital Insurgency. Second, we describe the methods of analysis and the criteria employed for selecting cases and analyzing initiatives. Third, we present our findings and analysis of the cases, followed by a discussion of the findings and the article's contributions. Finally, we reflect upon how digitalization has supported communities in crafting and disseminating counter-hegemonic knowledge and narratives.

Literature review

Urban data and the digital turn

Top-down data generation processes have historically marginalized poor and racialized communities, leading to biased interpretations, simplifications, and applications of data (Freeman, 2014; Taschner, 2001). The hierarchical and opaque nature of these top-down practices obstruct transparency and accountability, particularly concerning the

assumptions embedded within them. This results in information being strategically utilized to reinforce patterns of control that suppress subaltern voices. Such technical and expert knowledge-creation processes frequently inform policies that perpetuate injustices and invisibility (Rosenstrom et al., 2006).

Despite the digital turn and an increased reliance on the flow of data facilitated by ICTs by urban planners, an equitable and truly participatory diagnosis of existing needs remains elusive (Rajagopalan and Sriram, 2020). Inequalities are often reproduced and sometimes reinforced through the advancements in digital technologies (Irazábal and Jirón, 2021; Odendaal, 2006). For instance, the proposal of smart cities seeks to promote the exchange of information between the state and citizens to foster innovation, governance, and better delivery of urban services (e.g., Angelidou, 2017). Such processes tend to bring private enterprises closer to state institutions, enabling capital accumulation through digital infrastructures and data colonialism (Couldry and Mejias, 2020). At the same time, vulnerable and marginalized people are excluded from the digital network of sensors and devices utilized to interpret the smart city and identify its challenges. This exclusion culminates in biased interpretations of reality through oversimplification or neglecting grassroots communities and movements in knowledge creation and the setting of political agendas (Johnson, 2014). Invisibility becomes even more pronounced in informal, self-built settlements in Global South countries, often deemed illegible and invisible to and by the state (e.g., Albornoz et al., 2019). For instance, the data gap regarding land tenure and housing infrastructure impacts the development of urban policies since the absence of tenure data in self-built communities often justifies authoritarian removals or a lack of public investment (Watson, 2014).

Digital insurgency: forging knowledge to empowerment and justice

Insurgency initially garnered attention as radical planning in John Friedmann's pivotal work, underscoring the significance of social mobilization and the collaborative efforts of planners leveraging their technical skills to collaborate with organized communities and move away from authoritarian state planning (Friedmann, 1987). Subsequent research by Sandercock (1998) expanded on James Holston work on "insurgent citizenship" (Holston, 1998) to theorize the histories of insurgent planning, focused specifically on the organizing and resistance of people and organizations to the paradigm and practices of modernist urban planning. In this context, insurgent planning challenges power disparities in planning processes through "radical, democratic, and multicultural planning in the interstices of power, sometimes in the face of power, and sometimes (although less often) from positions of state power" (Sandercock, 1998, p. 129). More recently, Miraftab (2009) contextualized these principles within neoliberal realities, illustrating how urban insurgency emanates from grassroots initiatives opposing the structured systems of oppression perpetuated by predatory economic structures. While scholars differentiate between radical and insurgent planning, both approaches uphold a dedication to spatial justice, a historicized analysis of oppression, and strategizing liberation within specific contexts (Huq, 2020).

Insurgent planning is embedded in communities' materiality, wherein dwellers create, challenge, and repurpose access to the urban space for alternative uses (Freitas, 2019). Concurrently, the use of tools and techniques (digital or not) has allowed communities to produce, expand, and document grassroots insurgencies. For instance, the New Social Cartography of the Amazon Project (Projeto Nova Cartografia Social da Amazônia - PNCSA) has supported indigenous peoples and communities in the Amazon since 2005 to use social, self-cartography to map and document spatial realities while creating an instrument for strengthening local social movements in Amazon-based cities like Belém and Manaus as well as in other localities throughout Brazil. These experiences have played a pivotal role in shaping communities into active participants in producing data and maps, enhancing their collective influence while showcasing their rich cultural diversity. As a result, these processes have altered the political dynamics between these communities and centers of authority and recognition, positioning them as experts and knowledge producers (Almeida, 2004; da Costa, 2021).

Stiphany (2021) shows how the development of situated data insurgencies serves to illuminate the state's failures in shaping informal settlements' representation and infrastructure development. The term infrastructural insurgencies translates the agency of informal settlements' residents in producing local data-based insurgencies to shape narratives and the future of upgrading (Stiphany, 2021). In Salvador and Recife, communities have employed traditional urban planning tools like development plans—commonly used by real estate developers to capitalize on strategic public investment in land development—to carve out their own spaces. Historically marginalized communities collaborated on neighborhood plans, leveraging hegemonic technologies to generate knowledge and highlight conflicts and often-obscured aspects of the territory (Rebouças et al., 2019). Alternative media and digital knowledge creation bolstered insurgency during the COVID-19 pandemic, especially when informal settlement communities were unable to adhere to public health protocols (e.g., Wilkinson and Contributors, 2020). Grassroots collectives in these communities appropriated digital tools and strategies for disseminating accurate information and recommendations, activating local support and solidarity networks to safeguard residents during the pandemic (e.g., Basile, 2023b). These alternative communication methods became pivotal in counteracting fake news disseminated in countries with negationist, anti-science governments like Brazil (Furtado, 2020).

Social media platforms can empower activists and social movements by providing a medium to magnify their messages, connect with wider audiences, and mobilize support. They can also facilitate the creation of online communities, where members disseminate information, coordinate activities, and formulate collective strategies to achieve their objectives (Furtado and Furtado, 2021). Broadly speaking, Information and Communication Technologies (ICTs) play a pivotal role in actualizing public engagement by involving citizens in collaborative data collection, amplifying the voices of "non-expert" citizens, and challenging the information sovereignty maintained by large private corporations and governmental entities (Patel et al., 2012).

Within the context of informal or self-built communities, grassroots mapping has emerged as a community-led strategy for local data collection, acting as a potent tool that

enables residents to propose solutions and exercise their agency in urban planning processes (Falco et al., 2019; Patel and Baptist, 2012). This practice allows residents to compile community data, often neglected or misinterpreted by state agencies. Self-built communities assume control of digital methodologies to generate data supporting their terms of engagement and advance their objectives, exemplifying the application of ICTs for social justice. Enhancing the visibility of self-built communities through situated data is crucial in securing social and infrastructure improvements (Stiphany, 2021). Digital tools offer opportunities to incorporate information produced by historically oppressed communities to document assets, identify potential developments, and advocate for collective urban rights (Rebouças et al., 2019).

A conceptual framework for digital insurgency

Existing works underscore the practices and potential of social movements and communities to produce knowledge and appropriate digital tools to make visible their realities and grassroots epistemologies while, at the same time, challenging biased and incomplete perceptions. Such practices illustrate how groups have claimed tools, spaces, and practices of knowledge production to demand their right to the city and, ultimately, alter their urban realities. To understand the pivotal role of digital tools and spaces in these experiences, we introduce a conceptual framework of Digital Insurgency, which pertains to insurgent processes of grassroots knowledge production, organizing, and appropriation of digital and technological means. *Digital Insurgency aims to achieve political outcomes that contribute to an agenda of community control and self-determination within urban spaces and advocating for urban rights. Digital tools, spaces, and communication methods seek to challenge hegemonic narratives, foster social mobilization, and create unique virtual spaces that empower marginalized communities to affirm their presences, histories, and imaginaries, while inevitably being connected to a larger political strategy based on territorial realities and mobilization*. Figure 1 illustrates the key concepts within the proposed framework.

Digital Insurgency is aligned with grassroots digital urbanism, or the merging of grassroots urban movements efforts with digital platforms, facilitating active citizenship through 'creativity, autonomy, co-creation, and technological sovereignty' while seeking agential control over techno-capitalist development models (Vadiati, 2022, p.5). This process is inherently bottom-up and depends on data produced by grassroots entities using technological tools, which is then manipulated and disseminated in digital form to effect spatial transformation. Insurgent planning revolves around practices, not merely actors. Data is not produced merely as a form of militancy but serves explicit purposes and uses in claiming urban space. Similarly, the proposed Digital Insurgency framework presents a critical approach to the historical monopoly of urban data and knowledge production to make sense of grassroots efforts of digital data production and dissemination to change urban realities. Digital Insurgency can contribute to liberation through advancing epistemologies, methodologies, practices, and propositions that originate from and serve the oppressed. The appropriation of digital technologies by marginalized groups signifies a paradigm shift, challenging the monopoly of such tools from 'expert' hands. This

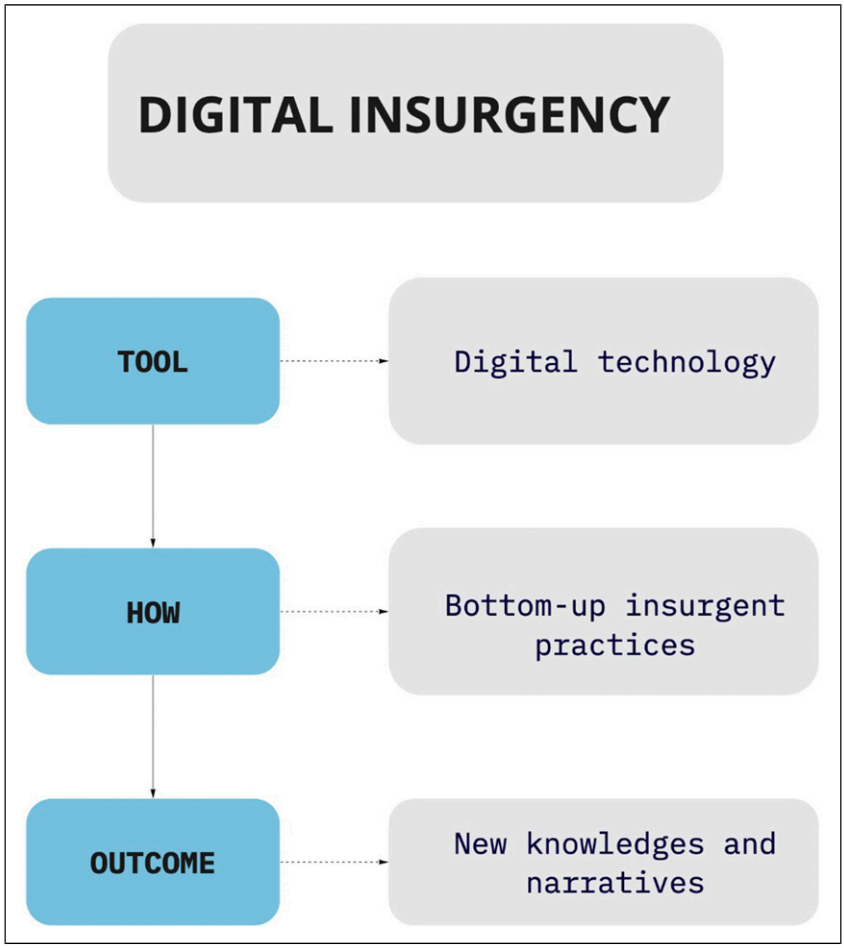

Figure 1. A framework for digital insurgency.

transformative process is bolstered by tools historically used to suppress yet, in this context, forge new protagonists. Drawing from the existing literature (Huq, 2020; Miraftab, 2009; Sandercock, 1998), this framework advances insurgent planning theorizations by qualifying the digital means through which urban insurgency constitutes and advances itself and its agendas.

Digital Insurgency also lies within debates about the digital turn in Southern perspectives on urban technology and media. Understanding the digital turn through southern, postcolonial theories and perspectives illuminates critical and unique processes, experiences, and materialities that can often challenge dominant forms of knowledge and practice (Bhan, 2019; Datta, 2019). This literatures argue that the materialization of digital and technological infrastructures and processes in Global South cities often significantly

differ from the visions articulated by plans and narratives, being heavily determined by context-based practices and politics (e.g., Guma and Monstadt, 2021; Jirón et al., 2021). Similarly, scholars within critical data studies have argued for a research agenda from the South that moves beyond data universalism, embracing plurality, recentering agency, and opening novel data imaginaries (Milan and Treré, 2019). We position Digital Insurgency arising precisely from these debates as a framework to understand how the digitalization of insurgent planning can challenges systems of oppression through practices, spaces, and imaginaries that are territorially placed, action-based, and inevitably political and plural.

Methodology and analysis

This research adopts a case study approach to comprehend the emergence of digital insurgencies within their specific contexts. We selected and assessed initiatives utilizing information and data collection, analysis, and dissemination processes to achieve distinct objectives. We focus on the discourse, operation, and outcomes of urban collectives that garnered support for their work to benefit a community. The proposed theoretical framework of Digital Insurgency was utilized to analyze the cases. We reviewed existing scholarly literature, documents, urban ordinances, searches on social media accounts, local news articles, and secondary data sources. By integrating various geographies and data sources, we aimed to construct a comprehensive overview of strategies developed in a country with continental dimensions and diverse realities and experiences such as Brazil.

Our analysis concentrates on how the selected groups were formed, their main objectives, the characteristics of their Digital Insurgency process, their contributors (identities, organizations, public or private institutions, networks), and their overall impacts. These insights are crucial for comprehending the advancement of agendas and actions. This descriptive analysis enables us to understand groups' intentions in promoting local autonomy and the level of empowerment and agency to address specific issues. Additionally, we qualify strategies used according to the criteria established in the proposed theoretical framework for Digital Insurgency, using three inherent features of insurgent planning presented by Huq (2020):

- The initiative is grounded in political society, a social space that goes beyond civil society, the economy, and the state, creating a counter-power that challenges the power or legitimacy of participatory institutions, representative democracy, and the free market to impose collective demands on the State. This social space arises from deeply rooted societal inequalities and injustices and is expressed through self-organizing, collective direct action, contestation, and emancipatory politics.
- The initiative emanates from the agency of historically marginalized and oppressed social groups. Huq argues that "IP practices are grounded in the oppressed social group's epistemic privilege or epistemic advantages (…) knowledges and ways of knowing that professional planners cannot directly access" (Huq, 2020, p.381). Similarly, Digital Insurgency mobilizes the agency of oppressed social groups to make visible historical and current realities of oppression.

- The initiative propels its agenda forward through collective and material practices that are embodied and encompass specific subjectivities. These are counter-hegemonic, transgressive, and imaginative (Miraftab, 2009, 2017).

We also introduce our features to incorporate the digital and technological processes and outcomes embedded in each initiative:

- The initiative employs technological or digital platforms or tools, creating digital spaces to produce, analyze, or share knowledge (such as podcasts, apps, blogs, social media, maps, etc.). Technological and digital means play a key role in the collective efforts and practices in any specific moment of collective and transgressive actions.
- The initiative generates technological or digital counter-hegemonic knowledge, narratives, claims, or imaginative realities.

Such analysis can assist us in understanding the use of digital technology's impact on shaping organizing strategies, tactics, narratives, agency, subjectivities, and decision-making processes in efforts to advance collective urban rights. It is important to note the complexity and multifaceted nature of these processes. While this conceptual framework might not represent all the complexities embedded in these histories and processes, it is a useful tool for grasping questions of how and why the use of digital tools by historically oppressed groups shapes and reshapes community organizing for change toward the right to the city. Ultimately, practitioners and scholars can utilize our analysis and proposed framework as a tool and a methodological approach to interpret, support, and advance insurgent and transformative data production and digitalization practices and projects in historically oppressed communities.

Selection criteria and case consideration

The primary criteria for case selection necessitated that initiatives originate from groups or movements in urban environments, particularly those historically marginalized and excluded from political and urban decision-making, such as residents of informal, self-built settlements or minority communities. Furthermore, these initiatives must generate counter-narratives or produce specific, tangible knowledge, which could manifest in various formats, including new datasets, images, videos, maps, or reports. Given our framework's emphasis on digital mediums, chosen initiatives must employ digital, ICT, or technological tools to produce, analyze, or disseminate content.

Additionally, we evaluated the cases based on their affiliations with external institutions and degree of formalization. The selected cases exhibit varied levels of institutional structure, such as possessing a non-profit status or receiving government support, provided that such funding and external assistance do not suppress political discourse and critique of structural inequalities. Therefore, while the level of formalization is not a criterion for selection, it becomes a criterion for exclusion if it diminishes the groups' autonomy and decision-making power. Lastly, our roles as researchers and observers,

enriched by profound knowledge and connections within these distinct cultural, geographic, and social contexts, informed our selection process. We present an analysis of three Brazilian initiatives using existing published scholarship, publicly available information, and secondary data sources: Community-led census, "Um Olhar Sobre o Poço"- Community of Poço da Draga, in Fortaleza, CE; community-led research, "De Olho Na Quebrada," UNAS Heliópolis, São Paulo, SP; and the "Painel Unificador Covid-19 nas Favelas", Rio de Janeiro, RJ.

Findings

This section presents the findings of our analysis of each initiative. In each subsection, we briefly describe the history and motivations of each initiative, their work and collaborators, goals, strategies, and impacts. Below, we present the overall details of each initiative in a comparative table (see Table 1).

Community-led census in Poço da Draga's self-built settlement

Poço da Draga, established circa 1907, is a self-built community nestled in a sought-after waterfront location in Fortaleza, persistently resisting both gentrification and government displacement threats (Gomes and Lira, 2020). Fortaleza, once ranked by the UN as the fifth most unequal city worldwide, continues to grapple with disparities stemming from economic development strategies that funnel investments into tourist-centric and affluent areas. The residents of Poço da Draga, situated in one of these neighborhoods, find themselves in the crosshairs of real estate speculation and potential displacement. Over time, urban projects have utilized narratives of urban development and infrastructure enhancement to reshape the settlement and its surroundings to cater to tourists (Oliveira, 2018).

In 2016, local planning authorities devised urbanization plans for Poço da Draga, utilizing extant institutional data to gauge project impacts. Upon publicizing these plans, some residents identified discrepancies, noting that the official census seemingly underestimated the number of homes and inhabitants in the community (Maximo, 2019). Residents perceived this data inaccuracy as a governmental strategy to undermine their tenure rights and depict Poço da Draga as a fragile and precarious settlement by government officials (Gomes, 2019).

In retaliation, residents formed a collective, Pro-Poço, and mobilized to conduct a community census titled "Um Olhar Sobre o Poço" (A Look at the Poço). The initiators of the community census aimed to accurately represent the community and utilize this localized learning process to help residents acknowledge their collective contributions and values. While the census aimed to accurately account for the actual number of homes, residents, and families, organizers also developed it to gain deeper insights into their reality and identity (Gomes, 2019). The survey encompassed questions about inhabitants, community history, educational attainment, employment, tenure status, relationships to sporting activities and the waterfront, and perceptions of the redevelopment project (Maximo, 2019). By sharing their stories and utilizing data to illustrate their reality,

Table 1. Description of each initiative.

Name and location of initiative	Actors or groups involved	Initiative	Level of institutional ties	Digital Outcomes Produced
"Um olhar Sobre o Poço", Fortaleza, Brazil, 2018	Residents from community of *Poço da Draga* led by organization "Pro-Poço"	Create a community led census to survey all households and present a reliable account of the local reality to counter official misleading government enumerations	Support from a local private University. Students and researchers helped create survey questions and conduct fieldwork	Maps with GIS technology and a digital database with census data
De olho Na Quebrada, UNAS Heliópolis, São Paulo, Brazil	Young residents from the Heliópolis favela, as part of UNAS, a community-led organization	Show the potentialities and assets of Heliópolis through the narrative and voices of residents (going beyond the focus on vulnerabilities and absences)	Support from national and international non-profit organizations and funders	Reports with qualitative and quantitative data and analysis collected online, and maps produced with free geospatial software about the pandemic and its impacts in the Heliópolis communities shared through social media
Painel Unificador COVID-19 nas Favelas do Rio de Janeiro	Catalytic communities. Plus - Coletivo Conexões Periféricas-RP; Dicionário de Favelas Marielle Franco; Fala Roça, Fiocruz Mulheres de Frente, observatório de Favelas, Redes da Maré	To collect and circulate data about Covid-19 in favelas, so that residents could organize themselves and have a reliable tool to request aid from public agencies	Support from different grassroots groups, State research Foundation (FIOCRUZ) and NGOs	Data collection in loco about contagion and deaths using online GIS technology. Data is updated every two weeks and available for public consultation on the internet or in the app

residents aimed to construct a counter-narrative of resistance that challenges prevalent narratives of violence and marginality (Gomes and Lira, 2020).

Residents sought institutional support from students and researchers at the School of Architecture and Urbanism of a local university, who assisted in structuring the data collection method, refining survey questions, and collecting data over approximately three months during weekends. Although the census was rooted in grassroots origins, community members embraced dialogue with the university to lend legitimacy to their product as a technical artifact (Gomes, 2019). Nonetheless, the census predominantly relied on the agency of community members to select research questions and originated from residents' desire to bolster their identity.

"Um Olhar Sobre o Poço" shared certain characteristics with traditional government censuses but also sought to distinguish itself from official data that, in their view, stigmatized Poço da Draga. Their community census served as both a political tool and process, not confined to a predefined "official" geographic boundary; instead, it leaned on grounded knowledge to define block groups for data collection. Residents selected variables of analysis that could provide key information and advance the community's goals, which involved a level of community participation (Phelan, 2006). The digital aspect of the census emerged in how data was stored, analyzed, and disseminated. The survey content was uploaded to a georeferenced database using open-source GIS software and analyzed to produce technical content in map format. Residents believed that appropriating digital tools, typically utilized by experts, was vital to ensure a level of legitimacy for the information produced. The ultimate aim was to create a digital platform to host the data and be updated by local youth, engaging them with local issues and contributing positively (Gomes, 2019).

The census revealed that Poço da Draga was home to nearly 1,800 people (40% above the official municipal number), with 77% reporting a strong connection to the beach and 89% emphasizing that the neighborhood's identity is tied to the waterfront. Residents utilized this data to underscore their connection to the waterfront as a locus for entertainment and work and the substantial number of people impacted by the impending redevelopment and resettlement projects (Silvia and Braga, 2019). To disseminate the results, residents organized an exhibition showcasing the maps in affluent city neighborhoods, displaying their rich history and right to the city. They also held community viewing events where they projected the maps on community walls, sparking discussions among attendees about local assets.

The Poço da Draga census illustrates how community-based data produced through digital tools can "strengthen the community with consistent information, produced by the residents themselves, in contrast to the divergent official data, such as those raised by the Institute for Brazilian Geography and Statistic and by the municipality (Nogueira, 2019, p. 15, translated by authors)." By presenting consistent data, residents aimed to provide relevant arguments for the community to resist frequent removal risks and guide public policies in their favor (Nogueira, 2019). This case translates the Digital Insurgency framework through the application of technology and digital tools in the production of data and knowledge about the community by the community. Poço da Draga residents occupy a political social location in how this community has historically suffered from

real estate and gentrification pressures of removal as well as state neglect. The process and product of a community-based and led census challenge official hegemonic and harmful narratives, bringing forth the residents' agency, stories, and experiences to narrate and represent their community in decision-making processes. The institutional assistance of the local university was important in supporting their efforts and furthering the legitimacy of the products to government agencies. Such support did not negate the centrality of the residents in these processes, rather it provided needed technical assistance in the access and usage of the necessary technology. Such tools allowed for the creation of community-produced data and knowledge. Consequently, these processes led to the strengthening of place attachment, valuing local culture and history, and delineating place-based narratives about themselves and their community in the struggles against removal.

Analyzing the impacts of the COVID-19 pandemic in a favela - UNAS Heliópolis

The Heliópolis favela in the city of São Paulo was first established in 1967 by families who were displaced from a favela in Vila Prudente. Initially, Heliópolis was spatially fragmented, with groups of houses spread across a very large piece of land. Each conglomeration of houses and families was considered a *núcleo*, a core community with its own community leader. In 1978, a commission of leaders and residents from the *núcleos* came together to form UNAS - *União de Núcleos, Associações dos Moradores de Heliópolis e Região* (Union of Nuclei, Associations of Residents of Heliópolis and Region), a community-led non-profit organization dedicated to fighting for the communities' right to housing and land ownership. The organization has worked on a multitude of actions, programs, and advocacy to improve the lives of Heliópolis' residents through education, culture, social assistance, sports, human rights, supporting youth, entrepreneurship, and grassroots organizing (Stiphany, 2021).

In 2020, when the COVID-19 pandemic spread through Brazil, President Jair Bolsonaro refused to acknowledge its severity and the virus' risks to people and communities, ignoring public health recommendations while concealing data on the spread and mortality of the virus (da Luz Scherf et al., 2021; Ortega and Orsini, 2020). Similarly, recommendations to stay at home and practice physical distancing ignored the socio-economic and spatial realities of favelas in which residents often cannot work from home or stop working nor isolate themselves from others. Facing the threats of COVID-19, unemployment, and food insecurity, community-based organizations throughout Brazil took action to protect their communities. Partnering with the non-profit and private sectors, these initiatives collected donations and distributed food, created campaigns to educate residents about the pandemic, its risks, and what to do, and gathered and disseminated data about the spread and impacts of the pandemic in their communities (Basile, 2023b; Friendly, 2022).

UNAS mobilized in various ways to support and protect the Heliópolis communities during the COVID-19 pandemic. Their actions included distributing food, masks, and other hygiene products, raising awareness, and debunking misinformation through social media. One of the projects, *De Olho Na Quebrada* (loosely translated as "Keeping an Eye on the Quebrada"), collected, analyzed, mapped data, and disseminated findings and

conclusions about the spread and multiple impacts of the COVID-19 pandemic in the Heliópolis communities. This project is a collective of youth from Heliópolis focused on learning and sharing their communities' potentialities, realities, and histories from their own perspectives and voices. The project was created in 2018 with the support of national and international non-profit organizations and funders to redefine the harmful stereotypes and narratives about the Heliópolis favela spread by the media and government. In the group's Instagram account, they share their motivations to start doing this work:

> We realize that our quebrada is inaccurately represented by the media and official statistics. An example of this is the fact that the total number of inhabitants indicated by the census does not match our reality. This divergence from official data hinders the development of public policies suited to the community's needs. Uncomfortable with this situation, we formed "De Olho na Quebrada" and worked on two main fronts: recovering memories and collecting data. (De Olho na Quebrada, 2022, translated by the authors).

During the COVID-19 pandemic, *De Olho Na Quebrada* collective focused on understanding the spatial distribution of COVID-19 cases and deaths in Heliópolis, and its underlying effects on the community. Their reports highlighted that there was no data about the COVID-19 pandemic in favelas and that residents were vulnerable to the disease and misinformation. They collected data about the experiences of residents of Heliópolis favela through online forms and shared the results in PDF reports on the UNAS website and multiple social media platforms for dissemination. The reports comprised qualitative and quantitative analysis, including graphs, percentages, word clouds, quotes, and maps. They used QGIS, a free geospatial software, to make maps from the community data and other sources to understand where COVID-19 cases were concentrated within the favela in relation to housing density and surrounding neighborhoods. In their first released report, the collective explained their aims and intentions for the work:

> The Observatory *De Olho na Quebrada* is a collective formed by six young people from Heliopolis. Our objective is to show the potential of Heliópolis based on the narrative of the residents themselves. We realized that our territory is not well presented by the media and official data. This is clear at the current moment. There is no data on the spread of coronavirus in our favela and other peripheral territories. As a result, people are even more vulnerable, not only to the virus but also to fake news that is being shared, especially in WhatsApp groups. The objective of this research is to understand the impacts of coronavirus and thus provide relevant information to the population. (De Olho na Quebrada, 2020, translated by the authors).

Some research topics included people's awareness and understanding of the pandemic and public health recommendations, and how it impacted income and health, showing how existing vulnerabilities were furthered due to loss of income. In their reports, they emphasized the urgent need for government agencies to collect and share specific data from vulnerable territories to ensure community organizations and residents would be able to protect themselves. Other topics encompassed food security, access to the internet,

impacts on those who work with art and culture, impacts on women's lives, mental health, and others. *De Olho Na Quebrada* collective also investigated the distribution and impact of the support provided by UNAS across Heliópolis.

De Olho Na Quebrada collective proposition and work challenge hegemonic narratives of stigma and marginalization about favelas by elevating their voices, histories, and narratives of their communities. Such efforts come from a unique political space and epistemic positioning of favelas in challenging historical and oppressive assumptions, images, and processes of knowledge-making and urban planning. The initiative empowers their communities to produce and disseminate knowledge and narratives based on their perspectives and everyday experiences. During the COVID-19 pandemic, their efforts sought to protect their communities from further spread of the virus and misinformation while at the same time providing necessary data to understand the pandemic's impacts and support residents through other UNAS initiatives (e.g., food distribution). Their efforts demonstrate the agency of these communities in producing counter-narratives and empowering themselves through digitally produced data and analysis to change their realities in the face of a public health emergency. Similarly, by taking responsibility for conducting research, producing, and disseminating data through digital tools, and creating knowledge and digital products, *De Olho Na Quebrada* shows its power and counternarratives created from the favela's epistemologies and ways of living through insurgent digital praxis. The nature and work of *De Olho Na Quebrada* encompass Digital Insurgencies in its appropriation of digital means to produce and disseminate bottom-up knowledge, actions that have historically been associated with or performed by outsider specialists or providers, to make visible the communities' territorial and every day realities while, at the same time, demanding resources and the means through which actualize their collective rights.

Collaborative mapping in Rio de Janeiro: "Painel Unificador COVID-19 nas Favelas"

Favela residents in Rio de Janeiro faced significant public security and sanitary crises, burdened by increasing police incursions and homicide rates, as well as the COVID-19 outbreak in March 2020. Official data often insufficiently depicted the reality of violence and COVID-19 in these territories, reflecting favelas' overall invisibility to the state. Brazilian favelas commonly experienced government neglect, with underreporting of coronavirus cases affecting the entire country but especially critical in peripheral areas and vulnerable communities. Grassroots groups, public institutes, and national and international NGOs initiated digital collaborative platforms to address inadequate data on violence and COVID-19 in Rio de Janeiro's favelas. However, many of these platforms lacked adequate data to determine where the need was most urgent.

To fill this gap, the "Painel Unificador COVID-19 nas Favelas" was collectively created as an insurgent form of data collection to help local groups and public officials understand what was happening in these vulnerable areas. The platform, an initiative of *Comunidades Catalisadoras* (Catalytic Communities) in partnership with 24 favela-

based collectives and allies NGOs, public agencies, community organizations, and research institutes, including FIOCRUZ (Osvaldo Cruz Foundation), collected and disseminated online data about Covid-19 cases and deaths in Rio de Janeiro's favelas, addressing the lack of adequate testing and reliable public health data. This effort also included a collaborative mapping initiative, using mobile apps to gather information, send alerts, and produce reports and statistics for favela residents about COVID-19. This app created counter-narratives that assisted them in obtaining support, care, and mutual aid. The dashboard was a response to a context of sanitary crisis, state neglect, and insufficient data about the pandemic in favelas.

Theresa Williamson, a city planner and founding executive director of Catalytic Communities (CatComm), explained that the idea of launching the dashboard emerged from reports of COVID-19 cases in several communities during collective meetings, noticing that public data did not specify the number of cases and deaths in each specific favela. Similarly, the group also noticed a movement of favela leaders and organizers collecting their own data. CatComm, which had significant experience advocating for favela dwellers' equal citizenship, together with a group of favela leaders, advocates, and other institutions, realized that there was a sub-notification of cases in favelas, and Covid-related deaths were growing but not officially being identified as Covid-19. This discrepancy posed various problems for residents and families, such as burial restrictions, fear of stigmatization, reluctance to get tested, and lack of official confirmation. Consequently, public health officials and local groups faced additional challenges preventing or mitigating the pandemic's effects in favela territories.

In the context of a sanitary crisis, state neglect, and insufficient data, the process of Digital Insurgency of the "Painel Unificador COVID-19 nas Favelas" came together through collective, grassroots, and place-based mobilization. Through citizen surveys and a network of favela mobilizers, organizations, and communicators, the dashboard collected and presented data and maps for each favela using the Zone of Influence of Postal Address Codes (CEPs) methodology. The platform used the ArcGIS software to map cases and has a privacy policy to protect informants. Data was updated every two weeks and collected in two ways: a) confirmed cases and deaths counted using a Postal Address Code (ZIP); b) data reported directly by favela residents, including local mobilizers, organizations, and communicators. In the absence of tests, the platform used alternative methods to measure highly suspicious cases based on medical diagnosis or symptom observation (Figure 2).

In a video developed in partnership with LabJaca as part of a campaign to publicize the dashboard, one of the members of the group developing the dashboard explained its process of creation:

> We mobilized through CatComm with a collective of communities and other institutions from different favelas and peripheral regions to be able to do it for ourselves. This mobilization happens as it has always happened, whether in the mutirão to break a slab or in the mutirão to get water. We are doing this the same way in the context of the pandemic. (Heliodoro, 2020, 1:18, translated by the authors).

Figure 2. Print screen of the dashboard showing the geolocated and interactive total number of confirmed deaths and cases.

Mutirão is a Portuguese word that loosely translates to "collective effort" and implies collective mobilization to achieve a specific end based on mutual aid and collective support. *Mutirão* has historically been practiced in favelas, peripheral locations, and by social movements in Brazil for housing construction and infrastructure development and to support various needs of community members. This quote illustrates the collective nature of the work of developing the dashboard and how such processes are not new in Brazilian favelas but rather historically intrinsic to mutual aid and mobilization within these territories. In the same video, an organizer and leader from the *Projeto Mulheres de Frente* (Front Women Project) in São João de Meriti, also part of the dashboard collective and who worked as a local reporter in her community, made clear the importance of being territorially based to connect with residents and collect the necessary data:

> From the moment I can, I have the availability to enter a mother's house, enter the house of a favelado relative, make this connection, and ask them to fill in that information. Often, the internet does not reach the favela, we know that. When it arrives, it arrives precariously. So, this articulation needs to be done with several arms. (Carvalho, 2020, 2:19, translated by the authors).

The work of local organizers and leaders in collecting and reporting data was vital to reach residents who would not necessarily be able to self-report due to difficulties with lack of internet access or connectivity. When self-reported cases were possible, residents assessed their symptoms and were later categorized into low, medium, and high-risk groups. The dashboard displayed medium and high-risk cases. The "Painel Unificador

COVID-19 nas Favelas" provided information on usage, case reporting, and more. The Technical Note no 1, released on December 10, 2020, explains the objectives and methodology aiming to contribute to preventing and mitigating Covid-19 in Rio de Janeiro's favelas:

> The main objective was to contribute to the process of preventing and mitigating COVID-19 in the favelas of Rio de Janeiro so that residents can have more data on the presence and scope of the disease in their communities, organize themselves, and have another tool to request support from the competent bodies" (Gracie and Scofano, 2020).

Overall, the "Painel Unificador COVID-19 nas Favelas" monitored 72 favelas and complexes in the Metropolitan Region of Rio de Janeiro (185 individual favelas). The dashboard and its development process relied on collective, bottom-up, territorially based mobilization and knowledge, grounded in political society that goes beyond the limitations of civil society and the state. They used online platforms and GIS technology to process and share the data collected to build awareness of the unequal effects of the pandemic in favelas, advocate for policies tailored to their realities, and inform their own mutual aid and supportive efforts in their communities. In doing so, they imposed specific demands on the State, making visible the limitations of "official" data collection efforts. In this case, digitization was a critical means to strategically aggregate, visualize, and share data (that would not have otherwise been collected) through a digital platform to demand public action. This was also a crowdsourcing platform in which residents themselves engaged in the production of the necessary datasets. Ultimately, these efforts relied on the agency and efforts of historically marginalized communities to produce needed knowledge about their realities during a public health emergency, making visible the unequal and racialized nature of the spread of the COVID-19 virus throughout the city. The final products and processes were only possible due to the collective nature of this initiative that brings forward historical traditions of mobilization and mutual aid embedded in these communities. The "Painel Unificador COVID-19 nas Favelas" constitutes Digital Insurgencies in how groups grounded in the realities of favela communities used digital tools and products to create and share knowledge from the ground up. This work aimed at documenting and making visible the realities of favela residents during the COVID-19 pandemic while advocating for needed policies and resources.

Discussion

The cases analyzed showcase grassroots efforts in creating and appropriating digital spaces and tools to confront stigmatized narratives and center grassroots voices in confronting historical dispossession. *Poço da Draga* community, led by the organization "Pro-Poço," developed a community-led census through digital tools in a political process to challenge hegemonic narratives of removal and advance the community's goals through data and analysis, local history, and place attachment. *De Olho Na Quebrada* used the digital to collect, analyze, and disseminate the Heliópolis communities' untold histories and residents' perspectives and experiences while facing the COVID-19

pandemic. Similarly, the "Painel Unificador COVID-19 nas Favelas" combined grassroots efforts and organizing to digitally search and display COVID-19 cases and deaths in Rio de Janeiro's favelas to monitor the spread of the pandemic in the face of insufficient testing and inadequate public data. By promoting access to data, residents created protective measures to safeguard residents and communities.

While there is diversity in the contexts, goals, levels of institutionalization, and achieved products or processes, all analyzed initiatives put forward grassroots narratives, values, and proposals created by community-led groups through various digital means. These practices are epistemologically grounded on these communities' realities and experiences, centering residents' perspectives. They bring visibility to their communities' realities and illuminate the complexities beyond typical stereotypes of marginalized communities in Brazil. As insurgent practices, they enact direct action through self-organization and autonomous politics in their fight for social, material, and discursive justice (see Table 2) (Huq, 2020). The work done in each case demonstrates practices of digital insurgency as they create new digital spaces and appropriate existing ones through knowledge-making and dissemination to make claims about narratives, discourse, and material gains. Such created digital spaces assert visibility by producing and sharing grassroots-rooted data, maps, and narratives that open paths for reinterpretations of histories and processes of urban space-making beyond "official" hegemonic accounts. While they are characterized as digital practices, they are simultaneously and inevitably tied to the material realities and bodily experiences of those creating such narratives.

These cases, as efforts in knowledge creation, also represent a shift in who can acquire such skills, generate, and disseminate these types of knowledge and products, and depict realities that extend beyond Western paradigms rooted in modernity and rationality. While these groups and organizations employ tools (e.g., social media platforms owned by US corporations) created by and integral to oppressive Western systems and paradigms, the digital domains and knowledge they generate and perpetuate are firmly grounded in their unique contexts and alternative propositions. They actively promote their practices, narratives, and viewpoints regarding their identity, way of life, and collective values. Their work is ingrained in local histories and realities, challenging oppressive and said universal practices of knowledge production and decision-making. Acknowledging and embracing the leadership of these community members and organizations requires re-thinking the urban planner's roles in processes of change and transformation. As argued by Ugarte (2014), such a movement involves ethical, discursive, and structural changes in developing plural planning cultures and practices that respond to local contexts and communities.

The two empirical case studies focused on the governance of the pandemic, the UNAS Heliópolis work and the "Painel Unificador COVID-19 nas Favelas", reveal a compelling focus on communities that ingeniously formulated strategies to counteract scientific negationism, especially when confronted with authoritarian governments that displayed a blatant unwillingness to enforce protective measures amidst COVID-19. This aspect becomes particularly salient given the subsequent evidence, which was already suspected during the pandemic, that individuals in dispossessed communities were disproportionately affected by the spread of the disease and its

Table 2. Analysis of each initiative's Digital Insurgency.

Name and location of initiative	Um Olhar Sobre o Poço, Fortaleza, Brazil, 2018	De Olho Na Quebrada, UNAS Heliópolis, São Paulo, Brazil	Painel Unificador COVID-19 nas Favelas do Rio de Janeiro
Is the initiative grounded in political society?	Counter official misleading government census and devaluation of tenure rights	Counter hegemonic narratives of deficit and criminalization to highlight the communities' assets and potential to push for public policy	Highlight the government's lack of action and critique lack of transparency
Does the initiative rely on the agency of marginalized social groups?	Developed and led by a collective at the community of Poço da Draga with support from students and researchers	Developed and led by youth at the Heliópolis favela	Developed by several non-profits in partnership with 24 favela-based collectives
Does the initiative have a practical aspect?	Use of data to build place attachment *within* the community to strengthen their claims for permanence	Supporting mutual aid work during the pandemic at the Heliópolis favela	Support COVID-19 preventative actions and community support in favelas
Does the initiative apply technological platforms and create digital spaces to produce or share knowledge (such as podcasts, apps, blogs, social media, maps, etc)?	Maps with GIS technology and a digital database with census data	Online surveys for data collection, maps produced with free geospatial software, findings shared through social media	Data processing and mapping with online GIS technology. Data is updated every two weeks and available for public consultation on the internet or in the app
Does the initiative produce counter-hegemonic narratives and action?	Make government officials and civil society learn about the community and their attachment to place	Challenge stigmas and stereotypes while producing empowering counter-narratives of memory and current experiences	Raise awareness of the fact that the pandemic was most damaging to favela residents

underlying effects (Fahlberg et al., 2023). Through their grassroots initiatives, communities sought not only to navigate the perilous landscape of the pandemic but also to counterbalance the pervasive misinformation and lack of actionable guidance from their governments. By leveraging digital platforms and technologies, they forged alternative pathways for disseminating accurate information, fostering a collective

spirit, and mobilizing resources, thereby asserting their agency and self-determination amidst a global health crisis. Overall, the three examined cases underscore the potential of Digital Insurgency in grassroots movements for social and spatial justice, achieved through territorially based, community-controlled digital data creation and dissemination.

Conclusion

In examining the cases through the lens of insurgency, our objective is to underscore the essence of the practices undertaken and their significance within the Brazilian milieu. Despite notable strides in socioeconomic mobility, participatory governance, progressive social and urban policies, and robust grassroots mobilization, Brazil remains one of the world's most unequal nations. These inequalities, which are racialized and gendered, are intricately woven into the fabric of urban space production. In this context, urban planning initiatives often fail to address the pervasive patterns of social exclusion and spatial segregation that characterize Brazilian cities. We posit that these case studies demonstrate how digital means were leveraged and adapted to promote grassroots understanding of space-making and knowledge production in Brazil.

Historically, grassroots and community-based initiatives in favelas have staunchly affirmed their presence and agency as city inhabitants and developers, striving to counteract persistent inequalities and injustices. The initiatives discussed in this context further detail such efforts, and communities and residents understand and illuminate the diverse lived experiences emerging from such extensive histories and ties to the territories they have shaped over time. Overall, we introduce the framework of Digital Insurgency to analyze initiatives that seek to drive action through community leadership and technology. While the cases discussed here represent an initial study using the proposed framework, they are constrained as they are all situated within the Brazilian context of favelas and expansive urban areas. Further empirical and theoretical explorations of Digital Insurgency, grassroots knowledge production, and technological appropriation/creation in the Global South are essential to deepen our understanding of the histories and realities of historically oppressed urban communities as interpreted and narrated by residents through digitalization, as well as the applicability and potential of the framework in enhancing our knowledge of these practices.

Overall, this article contributes to scholarship on insurgent planning and southern theories on urban technology, data, and the urban digital turn by developing a conceptual and theoretical framework for critically analyzing realities and processes of digitalization of insurgent planning. The nature of the examples, which embrace plural efforts rooted in subaltern geographies, translates the production of non-hegemonic forms of knowledge-making and praxis through digital means and products. Digital Insurgency offers a lens to engage with questions on the digitalization of insurgent urbanisms while bringing communities' political agency, rootedness, materialities, and pluralities to the forefront. The framework can thus serve to navigate the myriad ways communities produce, analyze, share data, and craft digital spaces to narrate and represent their stories, realities,

and experiences to instigate change anchored in community perspectives and materialities.

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