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Pandemic management, citizens and the Indian Smart cities: Reflections from the right to the smart city and the digital divide

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ABSTRACT

The technologically endowed Smart Cities take credit for managing the COVID-19 pandemic more effectively than other urban centers. However, Indian smart cities seemed unprepared for the outbreak, with reported highest cases of death and positivity rates. Thus, it becomes essential to understand why these smart cities could not handle the pandemic despite their technologically advanced infrastructures and the citizen's role in managing it. This paper analyzes the impact of the Smart City Mission (SCM) interventions from a citizen-centric perspective and its influence on pandemic management and citizen inclusivity. The study draws from the right to the smart city framework along with stages of the digital divide. The study conducted a content analysis using secondary sources like published and unpublished papers, policy reports, and news analyses spanning the timeline of 2015-2022. The analysis infers that the lack of initiatives to link marginalized citizens with Information and Communication Technologies (ICTs) through the SCM policy led to the underutilization of the various initiatives launched during the pandemic, deepening the digital divide. The deduction from the analysis highlights that the '*chatur* citizens' act as a *solution by transitioning their formal access to ICTs into effective access enabling the marginalized communities to bridge the divide.*

1. Introduction

1.1. Smart cities and pandemic management

This paper responds to a dearth of research on human-centric factors in the smart city literature by exploring the citizens' roles and responses to pandemic management of Indian smart cities. A smart city is "where investments in traditional infrastructure, social development, and [Information and Communication Technology] ICT fuel sustainable growth and a high quality of life" (Caragliu et al., 2011, p. 70). These smart cities have played an essential role in responding to the COVID-19 city-centric pandemic (McKinley, 2020; Simon, 2020). Literature that highlighted the techno-centric approach claim smart cities to be more integrated and well equipped than other cities in managing the spread of the infection (Costa & Peixoto, 2020; Elavarasan & Pugazhendhi, 2020; Petrović et al., 2021; Shorfuzzaman et al., 2021; Yang & Chong, 2021). Further, scholars have highlighted the importance of digital, informational, and smart technologies in managing the spread of COVID-19 (Bannister & Connolly, 2020; Elavarasan & Pugazhendhi, 2020; Hu & Zheng, 2020; Yang & Chong, 2021). Cities like Bogota, Los Angeles, Amsterdam, Singapore, Oslo, Boston, and Shanghai, which employ smart city policies, among others, have exhibited a comparative advantage in collecting, using, and disseminating critical data enabling the timely detection and contagion mitigation of COVID-19 (Costa & Peixoto, 2020; Jiang, 2021). Similarly, techno-driven approaches like lockdowns, contact tracing, social distancing, and mitigating human movement for managing the COVID-19 were also successful in some Chinese and Western smart cities due to their technological advancement (Kummitha, 2020). Smart cities effectively could contain the human-to-human spread of coronavirus through remote management (see Jaiswal et al., 2020; Whitelaw et al., 2020; Zeng et al., 2020). In contrast to these techno-driven approaches, other scholars have emphasized on factors like the citizens, government, and urban planning as important factors for mitigating the crisis (see Das & Zhang, 2021; Abusaada & Elshater, 2020; Söderström, 2021). Söderström (2021) argues that scholars who emphasize only the technological capabilities of smart cities neglect the role of the state, corporate and human factors that act as catalysts in mitigating pandemics. They also ignore "engaging with local identities and aspirations of a range of stakeholders" (Praharaj & Han, 2019, p. 1). Further, smart cities are biased towards a

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certain section of the population (Basu, 2019; Beretta, 2018; Datta, 2018a; Nugent & Suhail, 2021; Praharaj, 2021; Seta et al., 2015; Shelton & Lodato, 2018; Vanolo, 2014). Specifically, in the Global South context, smart cities have been accused of ignoring the digital divide (see Praharaj, 2021; Tewathia et al., 2020; Yadav & Patel, 2015). Thus, ignoring the human-centric factors such as citizen engagement or inclusion within the smart cities distances scholars from gaining a holistic perspective.

In the Indian context, the smart cities that seemed to utilize their technological infrastructure in pandemic management effectively (Kumar et al., 2020) turned out to be "not prepared" to manage the COVID-19 crisis (Press Trust of India [PTI], 2020a, para. 5). Smart cities in India like Delhi, Bengaluru urban, Pune, Thane, Nagpur, Chennai, Nashik, Lucknow, and Kozhikode reported the highest positive cases and deaths (Times of India [TOI], 2021). In Maharashtra, the state recording the highest number of cases in India - smart cities like Thane, Pune, Nagpur, Nashik, Navi Mumbai, Solapur, Aurangabad, and Amravati had some of the highest positivity rates (Bansal, 2021). In India, factors like mobility (see Praharaj & Han, 2022; Kishore et al., 2021) and spatial distribution of population density (Arif & Sengupta, 2021; Bhadra et al., 2021; Asrani et al., 2021) played a substantial role in the surge. Thus, considering these scenarios, only banking on the technological capabilities of smart cities in effective pandemic management poses certain risks. Given this backdrop, we explore how the pandemic IT initiatives in India mitigated and shaped citizen responses to the pandemic.

The paper comprises five sections. The first section explores the position of the citizens within the Smart Cities Mission (SCM) in India. In the next section, we discuss the theoretical framework of the right to the smart city by Kitchin et al. (2019) and Selwyn's (2004) stages of the digital divide to address the objective and describe the methodology adopted in the study. The following section introduces specific pre-pandemic scenarios within the selected smart cities and their role in shaping the citizens' response to managing the pandemic. The fourth section discusses the findings and importance of the study, situating it within the broader discourses, and the final section concludes the study with relevant suggestions.

1.2. Indian Smart Cities Mission and the citizens

Contemporary India is striving toward creating one hundred smart cities through its SCM (Ministry of Urban Development [MoUD], 2015). The SCM advocates community-centric urban governance by curating citizen-centric smart city proposals (Prasad & Alizadeh, 2020). As per the MoUD's (2015) SCM vision statements, the Indian smart cities encompass a "wish list of infrastructure and services" (p. 5) to fulfil citizen's needs and aspirations by providing core infrastructure, a clean and sustainable environment, and quality of life through the application of "Smart Solutions" (p. 5). The SCM also aims to usher "layers of smartness" (MoUD, 2015, p. 5) through smart governance, connected communities, and urban resilience (Prakash, 2019). Thus, from the beginning, the vision of the SCM was citizen-centric. However, various scholars believe there is a distinct difference between the SCM statement and the tangible outcome over the years. Hoelscher (2016) claims that the Indian smart city discourse evolved with a technocentric inclination, with the private sector shaping its evolution. Roy (2016) adds that the smart city initiative is not citizen-inclusive. According to him, it does not follow a democratic city development approach that links ICTs with the marginalized sections of society. Praharaj and Han (2019) further explain that the smart city vision emphasized and valued data and software development, neglecting the local communities and institutional actors. In addition, Datta (2018a) and Smith et al. (2019) explain how such technocentric attempts of the SCM in India have diluted the humanitarian-development prospects. Therefore, scholars found implementing SCM policies coincided with declining citizen-centricity, with a minimum role granted to its citizens, especially the marginalized sections.

1.3. The right to the (smart) city and the digital divide

We have combined the right to the smart city and the digital divide to serve as the theoretical lenses to address the research problem. Kitchin et al. (2019) explained the right to the city as comprising various rights for its citizens like the right to habitation, the right to participation and self-determination, and the right to centrality. It further included a set of interrelated rights such as rights to information, free expression, culture, difference and equality, self-management, public and non-public services, free movement, to occupy public spaces, protect the commons from private ownership, representation, and voting rights among others (Fernandes, 2007). Drawn from concepts of Lefebvre's (1996) centre versus periphery - the framework conceptualizes the centre to include the right to habitation with "the right to difference" (p. 34). When these rights, alongside their add-ons of digital entitlements, are recognized in smart city contexts, they give rise to the right to the "smart" city (Kitchin et al., 2019). This framework counters the top-down approach that rarely addresses issues of social differences in already-existing cities (Datta, 2018a). As social differences are rampant in India, this framework will help us understand the concerns of different sections of its citizens.

However, being developed in the western context, the framework is limiting when analysing the Indian context. A dominant characteristic of Indian smart cities is the digital divide and the existing social differentiation among citizens (Andrade, 2019; Datta, 2018a; Praharaj, 2021; Tewathia et al., 2020). Hence, our understanding of the right of the citizens to the smart city and their role in managing pandemics within them will remain incomplete without referring to multiple dimensions of the digital divide. Therefore, we borrow from Selwyn's (2004) stages of the digital divide focusing on the inequality of opportunities in access to and use of ICT and the direct and indirect outcomes of technological usage. The first stage is formal or theoretical access to ICT and content, focusing on availability. The second stage discusses the effective access to ICTs and their content (which may or may not be meaningful). The third stage includes engagement with ICTs and content having meaningful use with user's choice and control; while the final stage comprises the outcomes and consequences, which might be short, medium, or long-term-visible through productive, political, social, savings, and consumption activity. Selwyn draws from Bourdieu's (1997) concept of capital and concludes that the mediating causes influencing the digital divide include an individual's social, economic, cultural capital, and a subset of technological capital in the digital context. Following Selwyn's analysis, we will investigate the social differences within the digital arena.

2. Materials and methods

The study analyzed secondary data by adopting an exploratory approach encompassing academic publications, government reports and websites, newspapers, and popular articles, filtered from June 25, 2015, when the SCM was launched, till March 2022 - covering two years and two months since the pandemic hit India. Through this timeline, we analyzed SCM initiatives concerning citizens and the pattern of development during the pandemic. We used the academic database Google Scholar with specific keyword searches, like "Smart cities fighting pandemics," "Indian smart cities fighting coronavirus," and "Smart cities mission, Digital India and smart citizenship." The study undertook a systematic review of articles from the Google Scholar database, news articles, and reports presented in a PRISMA flow diagram for reference (see Fig. 1). Out of 183 articles, 83 were initially selected, with additional 59 records from other sources such as websites and citation searches. Finally, we scanned 72 records comprising 24 research articles and 48 news articles, government reports, and website documents by the relevance of their title, abstract and recent year of publication. For news articles, we selected featured keywords like SCM policies, pandemic outbreaks, smart cities, and COVID-19 in the title and their relevance for

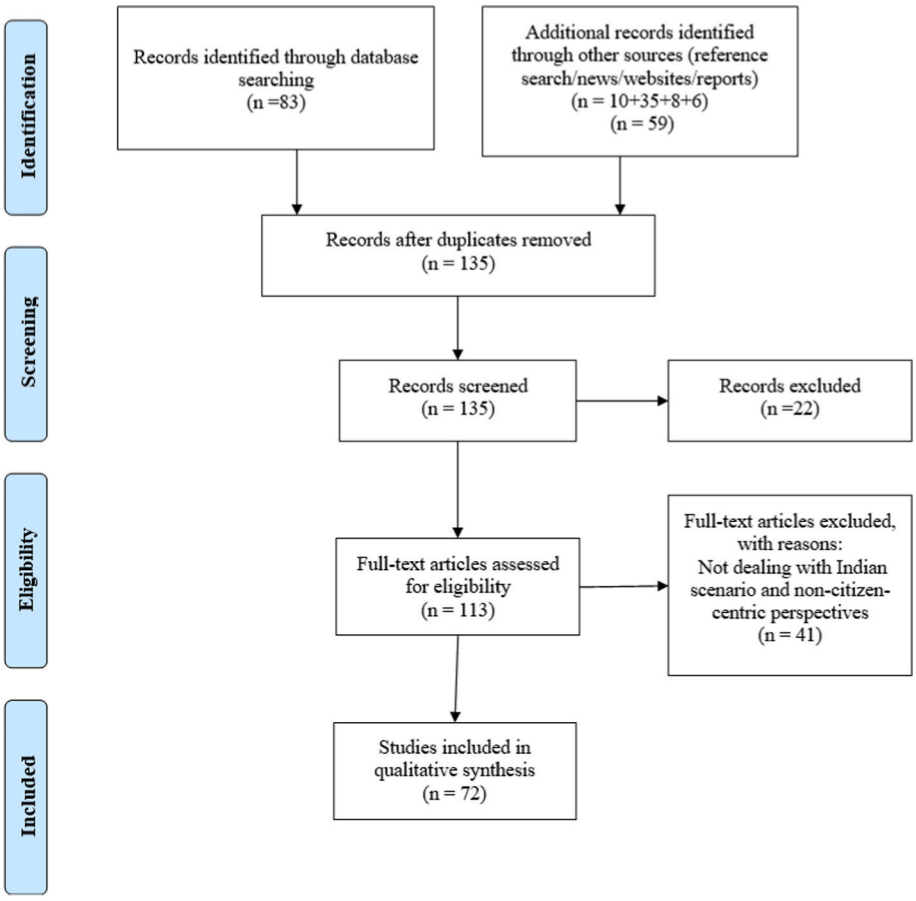

Fig. 1. Showing a PRISMA flow diagram (2009) derived after Moher et al. (2009).

the research. These combined records covered 26 smart cities, including Agra, Ahmedabad, Belagavi, Bengaluru-Urban, Bhopal, Bhubaneswar, Chennai, New Delhi Municipal Corporation (NDMC), Gandhinagar, Guwahati, Indore, Jabalpur, Jalandhar, Kochi, Nashik, Panaji, Pimpri-Chinchwad, Pune, Rachi, Raipur, Rourkela, Shimla, Solapur, Thiruvananthapuram, Varanasi, and Vellore. Our analysis focuses on these selected smart cities.

We used content analysis to analyse the data. It is a method of "making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorf, 2004, p. 18). Since previous research findings and concepts are available on smart cities and citizenship, we used deductive content analysis (Elo & Kyngäs, 2008). Fig. 2 presents the preparation, organization, and reporting phase.

In the preparation phase, we selected citizens as the unit of analysis within the Indian smart cities in pre-pandemic and pandemic scenarios. We organized and represented the data within a structured categorization matrix in the second phase, as shown in Table 1. Then we derived a structured categorization matrix from the theoretical framework of Kitchin et al.'s (2019) right to the smart city and Selwyn's (2004) stages of the digital divide from which we developed the coding. Each category was named using content-characteristic words in the second phase section of Fig. 2. The abstraction process continued until we derived proper categories. Table 1 gives an overview of the categorization and coding matrix used in the research.

3. Analysis

3.1. Consultative inclusivity and citizen participation in smart cities

The degree of citizen inclusivity in the SCM decision-making process becomes fundamental to analyzing citizen participation. The SCM vision statements have acknowledged the necessity of citizen participation through citizen consultations (MoUD, 2015). The MoUD (2015) has deemed the SCM proposals to be "citizen-driven from the beginning" (p. 22), promoting citizen's participation through sections like "Residents Welfare Associations, Tax Payers Associations, Senior Citizens, and Slum Dwellers Associations" (p. 22). Identifying the citizens' prerogatives through these associations was supposed to generate citizen-driven solutions in each state. However, stakeholder inclusivity in citizen consultations in smart cities appeared ambiguous. There have been fake reports of stakeholder consultations and involvement programs in the Urban Local Bodies (ULBs) such as in Ahmedabad, Bhubaneswar, Panaji, and Solapur, and twenty low-income settlements around the NDMC (Housing and Land Rights Network ([HLRN], 2017). These instances indicate the gap in the SCM policy proposition of citizen participation through citizen consultations.

The lack of citizen-inclusive participation in smart cities became a drawback during the pandemic. For instance, the sudden lockdown caused excessive stress on the informal sector, highlighting the absence of premeditated and consultative decision-making (The Hindu, 2020). A reported instance of citizen consultations, although digitally, was found in the case of the Delhi Government regarding Unlock 3.0, where they received 5 lakh suggestions over phones, WhatsApp, and E-mail on relaxing the lockdown (PTI, 2020b). Similar data on citizen inclusion from other smart cities is missing reflecting the dearth of data on citizen participation in decision-making processes. Digital consultations also seem awry in a country where only twenty-four percent of Indians own smartphones (Krishnan, 2019), leading to what Selwyn (2004) pointed out as a stage of the digital divide where individuals have formal or theoretical access to ICTs and their contents. Moreover, just twenty percent of citizens engage effectively (Mint, 2020) as they possess the social, cultural, economic, and digital capital. The pre-pandemic

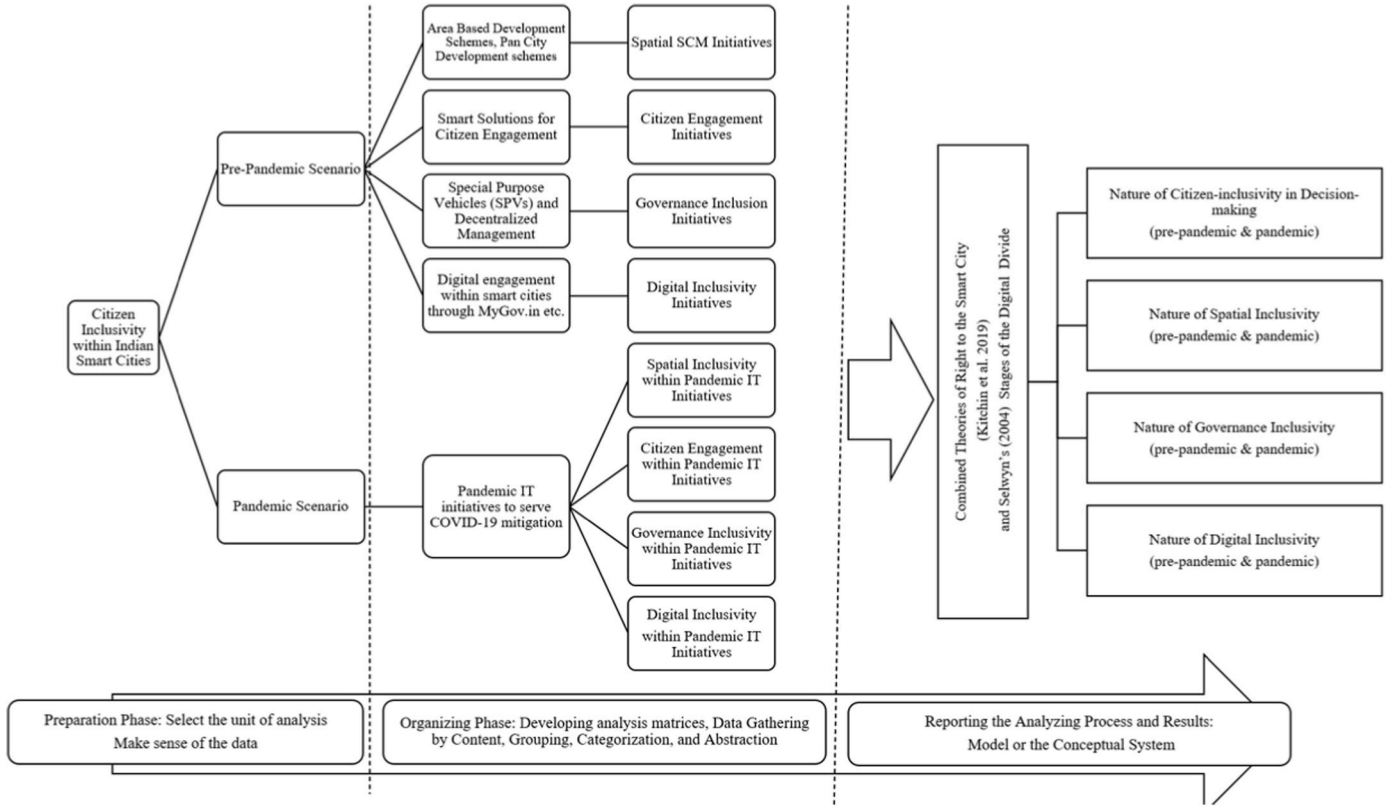

Fig. 2. Showing the phases of the deductive content analysis and the processes followed in the current research.
Source: Created by the authors

Table 1
Categorization and coding matrix.

Categorization and coding Matrix								
Impact of the Smart City Mission (SCM) interventions from a citizen-centric perspective and its influence on pandemic management and citizen inclusivity								
Categories	Pre-pandemic Scenario				Pandemic Scenario			
	Area Based Development Schemes, Pan City Development schemes	Smart Solutions for Citizen Engagement	Special Purpose Vehicles (SPVs) and Decentralized Management	Digital engagement within smart cities through MyGov.in etc.	Pandemic IT initiatives to serve COVID-19 mitigation			
Coded groups for analysis	Spatial SCM Initiatives	Citizen Engagement Initiatives	Governance Inclusion Initiatives	Digital Inclusivity Initiatives	Spatial Inclusivity within Pandemic IT Initiatives	Citizen Engagement within Pandemic IT Initiatives	Governance Inclusivity within Pandemic IT Initiatives	Digital Inclusivity within Pandemic IT Initiatives

non-inclusivity was enhanced by the digital initiatives available during the pandemic, pushing the socio-economically vulnerable to experience the digital dimension of exclusion, as indicated by Datta et al. (2021). Therefore, in Indian smart cities, considering the digital divide is essential, as providing digital solutions to include the citizens in decision-making during a crisis like the pandemic can further elevate the divide.

3.2. Consultative inclusivity of citizens within smart city governance

Consultative inclusivity also examines the citizen's participation in smart city governance. The SCM has allocated smart city management and implementation to the Special Purpose Vehicles (SPVs), comprising corporate bodies executing functions that the ULBs cannot perform (Anand et al., 2018). As per the mission statements, the SPVs plan, appraise, approve, release funds, manage and implement smart city development projects (MoUD, 2015). The SPV board represents the federal and state government, the ULBs, along with private equity holders as per the Company's Act (2013), defeating the purpose of democratically elected public participation, as corporate participation within the SPV can shape the city development according to private desires (Das, 2020). Further, in many cities, SPVs are "run by State bureaucrats, side-lining elected urban bodies, and local interests" (The Hindu, 2018). Housing and Land Rights Network (HLRN), an independent organization in India that works on housing and land rights for the marginalized sections, conducted a study focusing on analyzing 60 smart city proposals. This study reckoned the SCM's validity and development model through a human rights lens to assess housing provisions for the economically weaker sections, announced in the first, fast-track, and second-round smart city selections from January to September 2016. The analysis inferred that corporatization had expanded private sector interests in many cities in India. Cities such as

Bhopal, Guwahati, Jabalpur, and Varanasi, catered to the private sector's interests while internal problems within SPVs delayed policy implementations, as was reported in Belagavi or Chennai (HLRN, 2017). These issues caused negligence towards citizens' needs, resulting in minimum or no citizen participation or representation, as seen in Pune and Nashik (HLRN, 2017). Similarly, Sinha (2019) also described public meetings held in Bengaluru and Kochi by SPVs as "not legally binding on the project implementing agencies (SPVs)" (para. 5), culminating in the ignorance of most citizens' demands and suggestions. Prasad et al. (2021) also infer from their assessment of the multi-scalar governance model of smart cities Bhubaneswar, Pune, and Chennai that the SPVs function in a non-democratic way, which highlights poor collaborative governance and subsequent depletion of the representational powers of the local governments.

Effective pandemic management needs active community participation and decentralized management (Marston et al., 2020), which became formidable in most smart cities due to disempowered ULBs and bureaucratic SPV management. Such lapses, for instance, were witnessed in Panaji, Goa, which failed to manage the lockdowns due to centralized administrative collapse (The Economic Times Government, 2021). The mismanaged local governance system with controvertible citizen participation made certain sections of the citizens face the consequences during the pandemic. The existent bureaucratic SPV administration further resulted in an ignored public health sector. The SPV allocations were just one percent of the smart city fund allocation, i.e., 69 out of 5000 healthcare infrastructure projects, amounting to 2112 crores, disempowering the already understaffed municipal corporations or the local bodies in handling the pandemic crisis (Idiculla, 2020).

Apart from the failures mentioned earlier, we found successful examples of decentralized management with citizen participation within the smart cities in Kerala (e.g., Kochi) and Odisha (e.g., Bhubaneswar). Kochi practiced community-level COVID-19 management of testing and contact tracing, forming functional datasets from multiple sources, and creating a blended data environment (Gupte, 2021). The Kerala model of a decentralized "robust healthcare system and a participatory mode of governance or social democracy" (Chathukulam & Tharamangalam, 2021, p. 9) helped oversee the first two COVID-19 waves resulting in the lowest number of cases and fatality ratio. During overwhelming cases across India (late April 2020), Kerala's fatality ratio was 0.5% compared to the national average of 1.3% (Mcgregor & Mukherji, 2021). For the first hundred days (March 11-June 19, 2020), when India reported 4,74, 391 cases, Kerala reported only 3603 cases; and when the total COVID-19 cases per hundred thousand were thirty for India, it was eleven for Kerala (Israelsen & Malji, 2021). As per Chathukulam and Tharamangalam (2021), a proactive interventionist state, with social mobilization, public participation, and a state-society synergy, helped in the successful management of COVID-19 in Kerala. Such social mobilization through the women self-help group (SHGs) Kudumbashree in Kerala helped the community kitchens, provided meals, and formed 1.9 lakh WhatsApp groups with 22 lakh neighborhood groups (NHGs) to impart safety awareness during lockdowns (World Health Organization [WHO], 2020).

Another example is the decentralized opensource GitHub tech node "Corona Safe Network," which helped in collaborative analysis, functioning, and decision-making during the crisis (Datta et al., 2021). Likewise, smart city Bhubaneswar exhibited decentralized management by collaborating with tech activists and local grocery stores for doorstep deliveries to vulnerable populations (Patel, 2020). Here we find that citizens had effective access and had meaningful usage of the ICTs. As Selwyn (2004) pointed out, we find these citizens could move to the third stage of the digital divide by engaging with ICTs and their content, ushering to its meaningful use. Hence, decentralized local governance with stakeholder alliance between the skillful users and the marginalized sections proves to be a beneficial strategy in pandemic management, as evident from these cases.

The decentralized administration conducted through ICTs during the pandemic created intermediary citizens who reflect the characteristics of Datta's (2018a) '*chatur* citizenry,' participating through what Andrade (2019) suggested as modes of 'street-smart' and resourceful bottom-up ways. These citizens comprise community volunteers of Kochi, who used WhatsApp and their limited training to expedite information sharing, fight misinformation, gain public buy-in, and monitor the outbreak's movement in a common language across multiple stakeholders and marginalized people (Gupte, 2021). At the same time, as discussed earlier, the women-run SHG Kudumbashree in Kerala acted as a reference point for solving information issues through neighborhood WhatsApp groups (Gupte, 2021). Similarly, local *COVID-Sachetak Committees* (Awareness creation committees) and *Pragati Sathis* (development peer leaders) in Bhubaneswar undertook awareness and identification of symptomatic cases in slums. Also, they provided COVID health kits to slum dwellers, helping them download the Sachetak application at ground level (OMMCOM NEWS, 2020). We can conceptualize such informal yet active participation as realizing the '*chatur* citizenry' as Datta (2018a) mentioned, who utilized their physical and digital resources to make functional contributions by participating in the pseudo-digital domain. Once '*chatur* citizens,' as visualized by Datta (2018a), have formal access to digital resources, they can transition into the effective access stage of Selwyn and become resourceful in creating meaningful engagement among the marginalized citizens.

3.3. Spatial inclusivity of citizens in the smart city

Scholars have indicated the creation of core-periphery through the SCM's Area Based Development (ABD) scheme in Indian smart cities. According to Anand et al. (2018), the ABD scheme created centers of concentrated infrastructural development, which enhanced already developed areas. However, at the two-year mark of the launch of the SCM, the assessment of HLRN highlighted that the ABD served only twenty-two percent of the urban population (HLRN, 2017). For instance, the NDMC, the wealthiest municipality in the country, is chosen to become a smart city, whereas other localities, even within Delhi, lack basic infrastructural services (HLRN, 2017). These zones of potent growth became the "new cores of informational affluence" (Shaw & Graham, 2017, p. 911), while the rest of the city became the peripheries receiving the remainder of the SCM funds giving rise to differentiated development zones.

These smart enclave cores expelled the low-income communities and subaltern sections into peripheries through forced evictions, home demolitions, land-grabbing, and slum clearances, as witnessed in Delhi (NDMC), Indore, Bhopal, Bhubaneswar or Dharamshala among others (Dey, 2018; HLRN, 2017). According to Praharaj (2021), the area-based approach seemed to be exclusionary-as only five percent of the city area is catered to while denying services to nine out of ten people. These digitally participative and socially included "elite localities" seemed to further the digital divides (Praharaj, 2021, p. 212). Hence, these area-based approaches of the smart cities enhanced the existing spatial and digital exclusions, entrapping the peripheral into the vicious cycle of formal ICT-access-based digital divide.

During the pandemic, the spatial exclusion of the marginalized created a mismanaged COVID-19 situation within informal settlements and slums. The Indian Council of Medical Research (ICMR) calculated the risk of spread of COVID-19 to be 1.09 times higher in urban areas and 1.89 times higher in urban slums than in rural areas (Perappadan, 2020). As the urban slums and informal settlements lacked hygiene, proper infrastructure, and planning, slum dwellers had a dearth of primary access to public health amenities, making the COVID-19 management within these areas in smart cities problematic (Auerbach & Thachil, 2021; Mukherjee & Sen, 2020). For example, the Bengaluru slum Devarajeevanahalli (DJ Halli), considered the 'Dharavi of Bengaluru,' reflected a high seroprevalence of COVID-19 infection, where every reported case corresponded to 195 undetected cases (George et al.,

2021). Thus, lacking spatial inclusivity can create problems for pandemic management among the marginalized residents within the smart cities.

3.4. Digital inclusivity and the right to the smart city

The SCM curated steps towards digital inclusiveness among citizens, emphasizing the creation of a 'smart citizenry' requiring 'smart people' to make the SCM sustainable (MoUD, 2015). The pre-pandemic smart city initiatives encouraged smart citizen engagement through in-depth online and offline participation and e-transparency. Digital citizen participation occurred through social media through quizzes, blog posts, and logo designs, while offline activities included competitions and participation (Datta, 2018b). Execution of other digital citizen inclusion initiatives occurred through the Digital India Program (Ministry of Electronics and Information Technology [MeitY], 2019). However, half of India's population lacks internet access, while just twenty percent of Indians know how to use digital services, even though India includes the world's second-largest number of internet users (Beniwal 2022). As Selwyn (2004) suggested, physical and effective access to ICTs does not lead to meaningful use of the ICTs. The Indian population had access to the internet and could use it for basic purposes, but not for digital services. Before the pandemic, Selwyn's (2004) first stage of the digital divide, i.e., formal access to ICTs and content, was selectively available. The inaccessibility of free public Wi-Fi, smartphones, mobile up-gradation to attain 3G and 4G services, or the knowledge of Aadhaar-based linking services and to merge ID proofs (like PAN cards or voter IDs) to many citizens in smart cities highlight their lack of cultural capital (Kaur & Mehta, 2017), and poor socio-economic capital. Thus, the digital initiatives for citizen inclusion catered to a few sections of society in the pre-pandemic scenario.

In this light, it is evident that the digital divide in smart cities ranges from simplistic access divides to forms of digital inequalities augmented by effective differential engagements derived from the available ICT services. According to Asrani (2021), demographic attributes like education, household income, and age are robust classifiers of ICT adoption. He states that aspects like having secondary education, more youths in a household, or regular salaried occupational cohorts positively influence ICT adoption. In contrast, the disadvantaged social and religious cohorts within Hindus, Muslims, and other minority groups remain on the negative side of the digital divide (Asrani, 2021). Thus, digital citizen participation gets affected by the existing socio-economic inequalities. As digital citizen participation was also included in the formulation of the SC proposals, 15.2 million citizens participated at different stages, but this only considers twelve percent of the urban population of the smart cities (Bahuguna, 2016). Moreover, online platforms like MyGov.in, which endeavored to engage citizens through share and like-based responses to prioritize smart city services, had numerous unaccountable loopholes (Praharaj et al., 2017). These pre-pandemic problems within the Digital India and SCM initiatives further influenced the COVID-19 pandemic management.

At the beginning of the pandemic, Indian smart cities introduced COVID-19 IT Initiatives to handle the situation (Pradhan Mantri Awas Yojna [PMAY], 2020; National Institution for Transforming India [NITI Ayog], 2020). Indian smart cities leveraged their smart infrastructure through their Integrated Command and Control Centers (ICCCs) as COVID-19 war rooms. These war rooms monitored and oversaw the lockdowns, using GIS tracking of hotspots, predictive analysis, identification of violations, contact tracing, testing, and quarantining or providing treatment to the citizens in the cities. The war rooms also provided other citizen services like food and medicine supply, information and awareness on pandemic supervision, and a 24 × 7 city helpline through grievance redressal numbers (Sharma, 2020). Raipur, Belagavi, and Maharashtra's Pimpri-Chinchwad, among others, performed GIS mapping, lockdown Surveillance, Command Control Operations, and Public Grievance redressals for pandemic mitigation (Shukla, 2020). Bengaluru's COVID-19 War Room included a bulletin of Bruhat Bengaluru Mahanagara Palike (BBMP), which published daily real-time news and information for the citizens (World Economic Forum, 2020).

Indian smart cities also used Artificial Intelligence (AI) and drone-based lockdown surveillance, online health advisory, and provision of essential services and telemedicine provision with facilities (PMAY, 2020). COVID-positive cases were reported through applications like the Aarogya Setu (2022)[1] and its prototypes like the Gujarat COVID-19 Tracker, JSS (Jabalpur) COVID App, Safe Kashi App (Varanasi), Smart Sarathi App (Pimpri-Chinchwad), with additional safety services (Deloitte, 2020). These were mandatory for citizens in some instances of travel by road or air (The Wire, 2020). Bengaluru's COVID-19 relief application Sahaaya Sethuve app helped in COVID-relief, supported by Non-Governmental Organizations (NGOs) and other citizens (World Economic Forum, 2020). Additionally, Mehta (2020) accounted that some smart cities like Vellore and Rourkela deployed trained teams for biomedical waste disposal while some created awareness and capacity-building through campaigns such as the 'Break the Chain' initiative in Thiruvananthapuram. The Sarvam Setu app of Agra connected the citizens with the volunteers within a 300-m range through geo-tagging, providing COVID-19-related support, while other app-based services provided provisional bill payment gateways in Gujarat smart cities or free doorstep services like food and medicine to COVID-19 patients during the lockdown involving robots in Rachi (PMAY, 2020). Therefore, most smart cities in India utilized their smart technologies to manage the pandemic and support its citizens, while the citizens also participated in the state-run COVID-19 management digital initiatives. Nevertheless, these initiatives also had some drawbacks.

Firstly, the IT initiatives for pandemic management were neither universally functional across all smart cities nor socially and digitally inclusive towards all sections of the citizens in the smart cities. For example, only forty-five smart cities converted the ICCCs to COVID-19 War rooms (Datta, 2020), risking the management mechanisms. For instance, Datta (2020) highlighted how the second-tier smart cities like Jalandhar lacked ICCCs or adequate hospital and ICU facilities while Shimla suffered from poor health infrastructure. Compared to those mentioned above, the stark difference in services and technological infrastructure within and between smart cities reflects the inequality they face in their capacity to tackle the pandemic crisis. Even in the case of digital connectivity, which became essential to ensure the citizens' well-being within smart cities (Gulati, 2020), most IT initiatives ignored the digital divide. The inherent inclination of the smart city ICCCs toward big data corporatization and privatization dominated the local authorities and the citizens' needs and services (Praharaj, 2020). Consequently, a few examples of smart infrastructure facilitated effective citizen engagement, as in Agra, Pune, Raipur, and Bhopal (Babar, 2021; Bagchi, 2020; Gera, 2020; Srivastava, 2022; The Statesman, 2020). Therefore, unequal smart infrastructure, lacking ICT access, and effective citizen engagement make the examined IT services debatable for all citizens.

Secondly, app-based services deepened the digital divide in the pandemic context. For example, the Arogya Setu app was appropriated by only 21.54 crore Indians (Aarogya Setu, 2022) out of 140 crores as of March 22, 2022 (Worldometer, 2022). Such applications filtered out the digitally-excluded population comprising the subaltern, informal and migrant categories, many of whom lacked Aadhar ID cards or authentic sources of information to obtain welfare benefits (Datta, 2020). For instance, the 'denotified' Adivasi marginalized communities like the

[1] Aarogya Setu is an Indian COVID-19 contact tracing, self-assessment, and COVID-19 case syndromic mapping mobile application that also devolves healthcare service, developed by the National Informatics Centre under the Ministry of Electronics and Information Technology (MeitY) (Aarogya Setu, 2022).

Gonds, Pardhis, Kanjars, Saperas, and Dafales in Bhopal slums suffered from inaccessible and unavailable digital healthcare services (Sethi & Oza, 2021). Further, the subaltern and informal migrant workers comprised eighty-one percent of the Indian workforce as of 2018 (Punia, 2020). Excluding this considerable section led to their exodus from the cities on foot just before the lockdown, as most were unaware of effectively using technologies to register for Shramik trains or booking railway tickets to travel back to their villages, as also witnessed in smart cities like NDMC, Delhi region, Pune, Indore, and Bengaluru, to name a few (Biswas, 2020; Lama, 2020; Nanda & Ghosh, 2021).

Thirdly, aspects of citizens' digital and informational rights during the pandemic were disputable. IT initiatives in smart cities revolve around problematic outcomes or consequences in the short, medium, or long term (Selwyn, 2004). For instance, the Aarogya Setu application was considered a risk to an individual's digital privacy (Söderström, 2021). Its state-level prototypes also faced doubts regarding data privacy security due to their non-open-source nature, which questioned the information's reliability (Clarance, 2020). Moreover, they were subjective to the citizen's discretion and truthful declaration of their health status, liable to alleged falsifications and breaches. In addition, Kitchin (2020) also brings forth the question of surveillance-oriented pandemic management and apprehensions regarding the exploitation of such surveillance-based citizen-tracking and privacy intrusions post the pandemic, resulting in long-term consequences regarding citizen privacy. Thus, the lack of reliability in such digital services, alongside poor digital participation, hindered the pandemic management. The expanding digital divide exacerbated this situation within cities in India and its smart cities.

During the pandemic, the digital divide impacted the economic and education sector, affecting Indian smart cities and regular cities alike. As social distancing and lockdowns curbed movement, jobs and education shifted to online modes, further expanding the digital inequality. However, only a section of the community could afford internet services, as around 23.8% of Indian households and 12.5% of Indian households with students have internet and smartphone access (PTI, 2020b). Quacquarelli Symonds (2020) reported poor connectivity issues, cable cuts, and signal problems that handicapped e-education and the economic sectors, which were less digitally equipped (India Today, 2020). This situation stirred a thirty percent rise in urban unemployment (Vyas, 2020), with the digitally excluded losing jobs, while lack of access to e-education increased school dropout rates (Mishra, 2020). Certain smart cities like Gandhinagar took steps to enhance digital access by installing multifunction smart poles, yet this further served the formal or theoretical access of ICTs rather than the effective usage. As a result, those lacking internet access "struggled to access government services, locate public amenities, telework, or turn in their homework" (Samms, 2020, para. 4). Hence, without digital access and effective usage, the physical availability of ICTs only benefitted the digitally included while excluding the rest from the ICT-oriented pandemic services.

4. Smart cities and their beneficiaries – a way forward

Smart cities had a relative advantage in managing the crisis during the pandemic. This research explored how the pandemic IT initiatives in India mitigated and shaped citizen responses to the pandemic. The paper used the theoretical perspectives of the digital divide and the right to the smart city in conjugation, which researchers have not used so far as a lens to understand smart cities in the Indian context, which adds to the existing perspectives on smart cities.

The research revealed the factors that led to the digital exclusion of the marginalized peripheral residents and informal migrant communities before the pandemic. Lack of consultative and spatial inclusivity, absence of sufficient access, and effective engagement with ICTs minimized their chances of inclusion during the pandemic management in the smart cities. This finding depicts the first two stages of Selwyn's digital divide, i.e., the formal digital access and the lingering form of effective access to ICTs, which largely hindered citizen participation in the selected Indian smart cities. Thus, pandemic IT initiatives within the smart cities catered to the selective few, i.e., the digitally included active, upwardly mobile citizens with available and accessible economic, social, cultural, and technological capital. This selective catering of smart city IT initiatives advances the knowledge of the interaction between the smart cities and their citizens, emphasizing the social sustainability of the smart cities as other scholars have also emphasized (see Nam & Pardo, 2011; Praharaj et al., 2017; Praharaj et al., 2018; Ahad et al., 2020; Han & Kim, 2021; Moreno et al., 2021; Okafor et al., 2022; Nagarale & Telang, 2022), but contextualizing it within the pandemic.

Through its analysis of smart cities, this paper finds that Datta's (2018a) discursive '*chatur* citizenry' became operational during the pandemic management in a few of the Indian smart cities. These citizens and communities acted as "breaches" (p. 409) between the state and the citizens, being politically engaged and capable of using circumstances to their advantage with street-smart tactics to support the marginalized sections (Datta, 2018a). This category emphasizes the need to identify such communities within the smart cities that can dismantle the banal effects of socio-economic and digital divides through their bottom-up resourcefulness. Through these examples, the paper provides concrete cases of '*chatur* citizenry' as Datta (2018a) theoretically conceived. Such examples can help future researchers and policymakers identify similar communities that can help dismantle the digital divide in other developing countries, creating a socially sustainable city.

The findings of the study suggest that the marginalized and the digitally excluded have little right to the smart city, be it their spatial, participatory, or digital inclusion, supporting the earlier studies in the area (Andrade, 2019; Basu, 2019; Kitchin et al., 2019; Praharaj & Han, 2019). The techno-driven COVID-19 pandemic management furthered the digital divides that existed in the pre-pandemic times, mainly ignoring the marginalized and the digitally excluded citizens. However, the study also found that including citizens in pandemic management is essential for successfully mitigating the crisis. The study thus recognizes the need to focus on citizen inclusivity from both the rights and digital inclusion perspectives, essentially for the marginalized and the digitally excluded, to better control citizen-centric crises like the COVID-19.

The study proposes suggestions that could moderate the exclusionary influence caused by the lack of rights of the marginalized and the digitally-excluded sections within the smart city in light of the pandemic. First, it suggests the necessity of expanding local decentralization to effectively manage citizen-centric crises, as this seemed capable of flattening the curve in some smart cities. In addition, the study emphasizes the need to curate a mediating agency to surpass the digital divide at different levels of the society, moving beyond simple sporadic participation by NGOs and volunteer groups as witnessed during the pandemic. Further, including '*chatur* citizens' within the mediating bodies by the smart cities might enable them to breach the digital divide to a more significant extent. Hence, the study suggests that framing policies and initiatives that could train citizens to become potential '*chatur* citizens' has a probability of converting the marginalized citizen's simple access to ICTs into effective engagement with the ICTs. Future studies could reflect on the factors that can lead to the growth of '*chatur* citizens' and other categories that could help bridge the digital divide, bringing in inclusivity and effective management of the pandemic within smart cities of India or other developing countries.

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Maitrayee Mullick: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft, preparation. **Archana Patnaik:**

Supervision, Visualization.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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