

Citizens in the Smart City: What Is Actually Happening? An In-Depth Case Study From Utrecht, the Netherlands

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ABSTRACT

While the role of citizens in smart cities is hotly debated, there is a dearth of empirical research on the subject. This in-depth study of a European city, selected for its typical smart city ambitions, explores the roles that citizens actually play in smart city projects. The study examines twelve initiatives in the City of Utrecht (NL) using a framework that differentiates between types of citizen participation. The findings show that technology-enabled citizen participation in Utrecht is highly diverse and embraces all types of participation rather than simply taking the form of either “citizen empowerment” (as the advocates argue) or “citizen subjugation” (as the critics stress). The diversity found in the study highlights the need to conceptualize the role of the smart citizen at the micro (project) level rather than at the level of the city as a whole. The study shows that citizen participation in the smart city should not be understood as a technological utopia or dystopia but as an evolving, technologically mediated practice that is shaped by a variety of factors.

KEYWORDS

Smart Citizens, Smart City Governance, Technology-Enabled Citizen Participation, Urban Development

INTRODUCTION

The core idea of smart city governance is the usage of technologies in multi-stakeholder collaboration to build sustainable cities. This inherently implies a more significant citizens’ role, as through the utilization of technology, citizens are able to actively contribute to public matters such as urban development, and the co-creation of public services (Ferro & Osella, 2017; Meijer, Gil-Garcia, & Bolívar, 2016).

Smart governance in the literature is extensively discussed and conceptualized from manifold perspectives. In this varied argumentation landscape two major views stand out: the highly optimistic views on the one hand and the critical and/or sceptic opinions on the other. The first celebrates citizen empowerment enabled by the wide availability, place- and time-boundlessness of technologies (Aladalah, Cheung, & Lee, 2017; Mukhtarov, Dieperink, & Driessen, 2018; Oliveira & Santos, 2018).

These celebrative views are countered by the chorus of critical and sceptical voices decrying the position of citizens in the smart city (Cowley, Joss, & Dayot, 2017; Datta, 2015; Willis, 2019). They warn of technological determinism and highlight the potential limitations due to the insufficient socio-

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economic or organizational capacities of the actors (Hendriks, 2014; Ogonek & Hofmann, 2018). Others foresee the subjugation of citizens in the smart city under the dictates of data, technologies and neoliberal agendas. Such an instrumental approach, these scholars argue, eliminates the core of citizenship: socio-political reflection and activism (Cardullo & Kitchin, 2018; Shelton, Zook, & Wiig, 2015; Vanolo, 2016).

The paucity of empirical work on the actually existing citizen participation in smart cities makes it difficult to draw conclusive insights (Kitchin, 2015; March & Ribera-Fumaz, 2016). The few studies available, moreover, were found to rarely investigate tangible activities in smart, technology-based projects, focussing instead mainly on narratives, discourses and imaginaries in policy- and programme documents (Cowley et al., 2017; Engelbert, van Zoonen, & Hirzalla, 2019; Fernandez-Anez, Fernández-Güell, & Giffinger, 2018; Vanolo, 2016). These studies often embody a strongly normative approach rooted in critical theory and concentrate on the stark contrast between a sloganized concept of “citizen empowerment” and the realization of “citizen subjugation.” Hence, it is problematic and too early to claim that citizens are principally passive, subjugated and marketable actors in the smart city. This is all the more doubtful when surveying the upsurge of civil grassroots initiatives across the globe (De Vries, Boon, & Peine, 2016; Seyfang & Longhurst, 2013; Tomor, 2019). It is far more likely that citizens play a variety of roles in the development of smarter cities.

It is evident that further scrutiny of urban practices is urgently required to deepen our understanding of how citizens enabled by technology contribute to public matters. The present paper therefore looks beyond the archetypal contradictions in the literature and delves into the materialization of smart governance in the city. To that end, an in-depth case study approach has been used to analyse the actual contributions of citizens in the city of Utrecht (the Netherlands) based on the question: What are the actual roles of citizens in smart city governance in the context of Utrecht? This is addressed by drawing on classifications of citizen participation to construct a model and by examining twelve technology-mediated initiatives in the Utrecht practice. The case of Utrecht is relevant because this midsize city with its smart governance ambitions resembles, and thus exemplifies, many other cities in the world.

The remainder of the article is structured as follows. In the following Section (2), a brief literature overview of extant conceptualizations of citizen participation is presented, on the basis of which an analytical model is constructed. The subsequent Section (3) describes the research methods, which is followed by the findings (4). The final Section (5) discusses the results, presents the conclusions and indicates directions for future research.

CITIZENS’ ROLES IN THE SMART CITY

This sections first briefly discusses how citizen engagement in smart, technology-facilitated urban development is conceptualized in the literature. Based on these insights, an analytical framework is presented to study the roles citizens actually play in smart city development in Utrecht.

Citizen Participation

Although citizens’ roles in the smart city have only recently captured scholars’ attention, the use of ICT in the public sector for citizen participation has been extensively studied in other domains such as urban planning and e-participation (Ertiö, 2015; Wilson, Tewdwr-Jones, & Comber, 2017). These studies devised a wide range of conceptualizations and classifications of citizen participation in collective issues (Haklay, 2013; IAP2, 2007; Krabina, 2016; Macintosh, 2004; OECD, 2001; Tambouris, Liotas, & Tarabanis, 2007).

These classifications have all tended to build on Arnstein’s (1969) well-known participation ladder, which, throughout the decades, has sustained its heuristic utility to understand citizen involvement and power relations in decision-making. Its eight steps represent different gradations

of citizen involvement, from non-participation to citizen power: by going up the ladder, citizens are given more power and are thus more able to alter socio-political goals according to their aspirations.

Citizens in the Smart City

Some of the studies on citizen engagement in the smart city make use of Arnstein’s participation ladder or of its revised versions (Cardullo & Kitchin, 2018; Granier & Kudo, 2016; Willems, Bergh, & Viaene, 2017). Other studies conceptualize citizen participation by drawing on urban citizenship, subalternity and urban utopias / dystopias (Datta, 2015; Grossi & Pianezzi, 2017; Vanolo, 2016), techno-social assemblages and the notion of publicness (Cowley et al., 2017; Kitchin, 2014). Others again combine democratic models with issues of policy-making and service implementation (Berntzen & Johannessen, 2016; Simonofski, Asensio, De Smedt, & Snoeck, 2017). A dichotomous view - either gloomy or cheerful - of the role of the citizen in smart cities emerges from these studies. Table 1 (a and b) summarizes the viewpoints on citizens’ roles in smart governance in the current studies. Arnstein’s participation ladder is taken as the reference to visualize participation levels across the studies. Table 1 (a) presents the more pessimistic studies, in which the roles of citizens are clustered in the lower half: non-participation and tokenism, with in between emergent consumption-based citizenship. These studies expose the gap between the citizen-centric rhetoric and reality: citizens participate barely or not at all and function as manipulated subjects, customers and data sensors (Fernandez-Anez et al., 2018; Grossi & Pianezzi, 2017; Willis, 2019). By contrast, Table 1 (b) presents the more optimistic studies on the roles of citizens, positioning these at the highest level, namely citizen power. These active citizens engender socio-technical systems to solve urban problems (Capdevila & Zarlenga, 2015; Townsend, 2015; Trencher, 2019).

Table 1. (a) Citizen roles in the smart city: Gloomy views

Arnstein 1969	Berntzen & Johannessen 2016 (Norway)	Vanolo 2016 (UK)	Kudo & Granier 2016 (Japan)	Simonofski et al. 2017 (Namur, Belgium)	Cowley et al. 2017 (6 Cities, UK)	Grossi & Pianezzi 2017 (Genova, Italy)	Willems et al. 2017 (UK, London)	Cardullo & Kitchin 2017 (Ireland, Dublin)	Anez et al. 2018 (Vienna, Austria)	Willis 2018 (Chennai, India)
Citizen power								Very few: within a neoliberal frame		
Tokenism	<ul style="list-style-type: none"> • One-way information • Consultation 						<ul style="list-style-type: none"> • Informing • Consultation 	To contribute to initiatives already largely predetermined		
Emerging role: consumption		Future citizens	Restrained co-implementation		<ul style="list-style-type: none"> • Entrepreneurial publicness (economic use; co-creating services) 	<ul style="list-style-type: none"> • Consumers • voluntarily and unconsciously involved in the ideation of new services • Defining services already settled 		Consumerism		
Non-participation	<ul style="list-style-type: none"> • Invisible citizens • Subjugated citizens • Citizens as sensors 	<ul style="list-style-type: none"> • No direct citizen involvement & inputs expected • Citizens required to consent to be steered 	<ul style="list-style-type: none"> • Citizens not included 	Service user	<ul style="list-style-type: none"> • Citizens only share individual preferences & utility • Data providers; sensors 	<ul style="list-style-type: none"> • Therapy • Manipulation 	<ul style="list-style-type: none"> • Steered, controlled, and nudged to act in certain ways • Sources of data (to turn into products) 	Civil society is not involved	Reinforcing and reproducing spatial and economic exclusion of marginalized citizens	

Table 1. (b) Citizen roles in the smart city: Optimistic views

	Arnstein 1969	Aylett 2013 (Portland, USA)	Baccarne et al. 2014 (Ghent, Belgium)	Townsend 2015 (Nairobi/Kenya, NYC/USA, Amsterdam, the Netherlands)	Oliveira et al. 2015 (27 European cities)	Candésola & Zúñiga 2015; March & Fomaz 2018 (Barcelona, Spain)	Goodspeed 2015 ("Code For All" Global Movement)	Goodspeed 2015 (Chennai, India) Mefarlane & Silderström 2017 (Cape Town, SA)	Crowley Et. Al. 2016 (US cities)	Jiang Et. Al. 2016; Nikderer & Priester 2016 (Amsterdam)	Trencher 2019 (Aizuwakamatsu, Japan)
Citizen Power	Communities design and implement green-tech sustainability transformations	Bottom-up socio-technical innovations with/by/ for citizens	Citizen science by community-led data-gathering to influence policy-making	Citizens empowered: main drivers of change to co-create solutions	<ul style="list-style-type: none"> • Civil initiatives, creation, innovation • Top-down citizen empowerment by peer-to-peer relations • Social & political citizenship; grassroots movements, social innovation 	<ul style="list-style-type: none"> • Tech-supported civil participation in decision- & city-making 	Data collection by the poor to shape policies and budget allocations	Citizens as innovation partner of government	<ul style="list-style-type: none"> • Citizen science by collecting & acting upon data • Bottom-up neighbourhood movements • Rising public interest 	<ul style="list-style-type: none"> • People-centric use of smart technologies to address residents' needs • Citizens co-create in problem-solving 	
Tokenism											
Non-participation											

Whether these participation patterns can also be traced in smart governance practices in Utrecht is the focus of this study. In the next section, a classification framework is proposed, designed to obtain empirical evidence about the roles of citizens emerging in the Utrecht context.

Analytical Framework

An analytical framework for these insights into citizen participation is provided in Table 2. While this framework may apparently draw on Arnstein's original ladder of participation and the numerous

Table 2. The analytical framework

Participation Form	Citizens' Roles
Citizen power	<ul style="list-style-type: none"> • Active and influential actors: negotiators; co-creators; co-deciders; bottom-up initiatives
Consultation	<ul style="list-style-type: none"> • Feedback and suggestions
Consumerism	<ul style="list-style-type: none"> • Purchasing and (co)creating smart products and services • Data product
Passive participation	<ul style="list-style-type: none"> • Invisible, silent political subjects • Information recipient (e.g. to consent, change behaviour) • Service user: (un)conscious data-collector • Subjugated actors

adaptations of this concept, it deviates in certain aspects. It is a condensed model, distinguishing only four stages of participation, enriched by insights from recent smart city studies. Two of the stages have been renamed and reorganized (i.e. passive participation; consultation) and a new gradation has been introduced (i.e. consumerism). This condensed model is expected to provide a more straightforward manifestation and understanding of the various forms of participation. This is particularly valuable since previous models often entailed complicated or overlapping structures (Cardullo & Kitchin, 2018; Krabina, 2016; Molinari & Ferro, 2009). A further difference in this readapted framework is that it does not exclusively refer to citizens' roles in relation to powerholders' allocation of authority. This is because smart urban initiatives are increasingly being launched by non-state stakeholders such as citizens, communities, universities or businesses (Breuer, Walravens, & Ballon, 2014; Niederer & Priester, 2016; Reinsberger & Posch, 2014). Hence any form and level of citizen participation can derive from either top-down or bottom-up initiators and is thus not merely reliant on governments.

Passive Participation

In the literature, there is a school of thought that presents citizens as invisible and silent political subjects for whom policymakers create smart cities and smart lifestyles (Fernandez-Anez et al., 2018; Yigitcanlar & Lee, 2014). According to these studies, this leaves little space for citizens' voices and grassroots actions "because planners and technological gurus seem to know exactly what citizens desire" (Vanolo, 2016, p. 34).

Others present citizens as one-way conduits of information about development plans, through which citizens can be educated and steered, to obtain their consent (e.g. to policy proposals) and adjust their behaviour (Cardullo & Kitchin, 2018; Cowley et al., 2017; March & Ribera-Fumaz, 2016).

Another research stream characterizes citizens as service users of utilities such as transport, water, and electricity. Users catered to by smart technologies (e.g. apps and sensors) (in)voluntarily collect and provide data (Berntzen & Johannessen, 2016; Cowley et al., 2017). Examples are software-mediated traffic flow regulation, citizen-sensing for environmental monitoring and passengers' travelcard-based data provision (Wehn, Rusca, Evers, & Lanfranchi, 2015). This is viewed by Vanolo (2016) as citizenship symbolized by the smartphone, while Gabrys (2014) calls it "computational responsiveness" (p. 38); as such, it is more instrumental than empowering as citizens have limited access to and cannot act upon these data.

Finally, the literature offers dystopian imaginaries of smart urbanism, in which citizens are considered subjugated actors who can be monitored, controlled, predictively policed and even "cleansed" from the public space by using intelligent cameras, big data analytics, and algorithms (Datta, 2015; Engelbert et al., 2019; Vanolo, 2016).

Consumerism

An increasing number of scholars argue that the smart city discourse appeals to citizens as consumers (Cardullo & Kitchin, 2018; Grossi & Pianezzi, 2017; Taylor Buck & While, 2017). These scholars point to the neoliberal underpinning of smart city strategies, which promotes business interests. This is supported, Vanolo (2016, p. 34) argues, by framing techno-solutions within an *ambiguous politics of time: past citizens* are guilty and irresponsible, creating an environmental catastrophe for *future citizens*, requiring *present citizens* to purchase eco-friendly technologies. Citizens, therefore, choose "smart" services from the marketplace, something reserved for a select population group capable of buying smart products (e.g. buildings, meters, electric cars) or of living in a smart district. Furthermore, citizens can co-create services that produce economic value (Cosgrave, Tryfonas, & Crick, 2014; De Jong, Von Hippel, Gault, Kuusisto, & Raasch, 2015). Cowley et al. (2016) call this the "entrepreneurial sense of the public" (p. 64), which is conjured up in commercially incentivised activities. Here, citizens can become part of service ideation by sharing their preferences and opinions about the utility. According to these researchers, such citizen roles do not boost deliberative processes but should be seen as restricted forms of co-implementation (Granier & Kudo, 2016).

Finally, there are also studies (Kitchin & Lauriault, 2018; Rabari & Storper, 2015; van Zoonen, 2016) that highlight the fact that citizens function as data products by unconsciously creating marketable data through their smart appliances.

Consultation

In the literature, the various types of participation at this stage and onward are shown to have both democratic and utilitarian value (Berntzen & Johannessen, 2016; Michels, 2017). The latter refers to citizens' resources that support better plan-forming and urban solutions. Consequently, in consultation processes citizens are invited to share their opinions and suggestions for proposed courses of action and for specific city challenges. Although consultation permits citizens to potentially reshape plans and activities, their input is not binding to decide or redirect the process (Rogers & Cook, 2016; Wiig, 2016).

Citizen Power

Arnstein saw citizen power as the apex for city-making, reflecting the aspirations of its inhabitants. In her view, citizen power was about a more political discourse of rights, citizenship and urban commons. Citizen power in this framework indicates all participatory forms in which citizens meaningfully influence and (co-)decide about developmental plans (Goodspeed, 2015; Opromolla et al., 2017; Wimmer & Scherer, 2018). It therefore also comprises bottom-up initiatives in which citizens seize technological opportunities for (re)making their city (Aylett, 2013; Breuer et al., 2014; De Vries et al., 2016; Niederer & Priester, 2016).

This analytical framework positions the two main streams in the literature on citizen roles—the gloomy and the optimistic—in the smart city. The pessimistic studies are clustered in the three lower sections of the model under passive participation, consumerism and consultation. Although the latter enables citizens to express their ideas, critics consider consultation to be a predetermined process: “citizens are enabled to partially re-arrange the deckchairs on a ship’s deck, but not to determine how the ship is run or its general course” (Cardullo and Kitchin 2018, p.14).

This analytical framework is used in the present study to assess where the actual roles of citizens in the city of Utrecht are positioned.

RESEARCH METHODS

This study aimed to discover whether the pessimistic versus optimistic images of citizen roles in the smart city also apply to the city of Utrecht. To that end, an in-depth case study of twelve initiatives in that city was completed.

The Utrecht Context

The fourth largest city of the Netherlands, Utrecht is a wealthy, business-oriented community with knowledge-intensive sectors and a highly educated workforce. Like many other fast-growing midsize cities in the world, Utrecht today is facing the challenge of accommodating urban growth in a sustainable way. The city is therefore an advocate of a smart governance model in which all urban actors and technologies are aligned, enabling urban solutions to be developed (Maltha, Driessse, & de Boer, 2018; van Buren, 2016). These ambitions are comparable to those of many other cities around the globe, making Utrecht a suitable case to examine how smart governance, and especially citizen participation, fares on the ground.

Case Selection

Initiatives were identified based on three criteria: 1) collaboration including the participation of citizens; 2) the use of technologies; 3) the aim to upgrade the urban environment. Municipality

officers, citizens and intermediary professionals were consulted, and desk research was carried out. This resulted in a final selection of twelve projects, which, contrary to what is usual in most studies, were not all necessarily labelled as smart city projects. Importantly, each of these initiatives fit the smart governance definition used in this paper in that they employ technologies for cooperation to achieve urban improvements. This broader definition can capture a more comprehensive image of the activities undertaken by citizens in smart city building.

Data Collection

Data collection took place in a number of steps, the first of which consisted of detailed desk research covering policy and project documents, articles, websites and social media related to the projects selected. Next, where possible, an in-depth interview was conducted with the city official responsible for the project. In some cases, interviews were also held with other actors (e.g. citizens, external professionals, businesses). Finally, field observations were made of several projects and events such as gatherings, conferences, “city talks”, and workshops were attended the data collection is visualized in Table 3.

Table 3. Data collection

Project Name and Activity	Documents	Interviews (Total)	Municipality Officers	Citizens	Other Actors	Websites, Social Media	Events	Field Observations
Ringpark Spatial development: creating a green park zone	2	3:	1	1		3		2
Smart Solar Charging Community-based sustainable energy and mobility scheme	10	16:	4	3	9	4	7	2
Utrecht Alert Neighbourhood safety and crime prevention	1	1:		1		7		
Johan Wagenaarkade Spatial restructuring	6	1:	1			2		1
Environmental and Planning Vision Vleuten Policy development for long-term area development	9	2:	2			2		
Amsterdamse-Straatweg Spatial restructuring	7	2:	2			4		1
Revising Traffic Lights Optimizing road infrastructure and traffic	3	1:	1			2		
Argu.nl Online discussion platform on city matters		1		1		2		
Public Health Monitor Health status of the population	2	4	4			1	1	
Merwede Kanaalzone Smart city area transformation	8	3		2	1	4	5	2
IRIS Kanaleneiland-Zuid Urban transformation: a near-zero energy district	1	2	2			4		
Wijkconnect Online neighbourhood platform		1		1		3		
Total citations in the text	49 D1-D49	36	17 R1-R17	9 R18-R26	10 R27-R36	37 W1-38	13 E1-E13	8 F1-F8

Subsequently, a factsheet was compiled, which detailed the findings on the main characteristics of the projects: their objectives, the initiators, citizens' roles, the role of government, the types and aims of the technologies used, collaboration features and contextual factors. This factsheet enabled the different types of citizen participation to be better understood within their contexts, which helped in moving towards an answer to the research question.

Coding Scheme

The projects examined were organized into the different categories of citizen participation in the analytical framework in Table 2. For this purpose, a coding scheme was devised, which allowed the verbal expressions in the off- and online documentations and the essence and nature of participants' actions to be analysed. The following guidelines were applied to categorize the expressions and actions in the initiatives:

- **Passive participation:** Formulations such as “informing”, “updating”, “describing”; where no feedback or one-sided data provision is requested from citizens; encouraging consent and behaviour change;
- **Consumerism:** Consuming and purchasing goods and services and the stimulation of behaviour change in this respect;
- **Consultation:** Requesting citizen feedback for predefined plans or urban issues in collective discussions, whereby the project owner promises to consider and react to input from citizens; enthusing citizens to participate;
- **Citizen empowerment:** Citizens' co-creation and co-design of plans and activities; bottom-up activities launched by citizens.

FINDINGS

This section presents the findings that are summarized in Table 4. It shows each project together with the corresponding features: the initiator, the type(s) of citizen participation and the technologies used, including the purposes these serve. These findings are discussed per type of citizen participation.

Passive Participation

The website of the municipality-run Public Health Monitor offers information about health issues to citizens to “enhance their own insights and make well-considered choices” (W25). It aims, according to respondents from the municipality, to inspire citizens to aim for a healthy lifestyle and to learn about the underlying public values (R28-30). Another example is the 3D screen on which the future “Merwede Kanaalzone” – as it will look after its smart city transformation – is displayed (W29; E9). While ostensibly employed as a face-to-face consultation tool, citizens merely function as spectators of these images and plans (E10;E11;E13;). Given the purpose of this tool, this passive role is hardly surprising: after all, the aim is “pure information and hard data transmission to seduce residents” (E9), allowing the municipality to achieve its main goal, which is “not about participation itself but to funnel the processes towards realization” (E9).

Consumerism

The summary in Table 4 shows that consumerism is indeed an emergent type of citizen role. It appears in two projects that promote the need for a society-wide sustainability shift, for which “smart” solutions are offered such as energy grids, solar panels, smart meters, and electric vehicles (W4;W6;W30;F3). These solutions stimulate citizens, in their role as consumers, to improve society. For instance, in the case of the citizen-launched Smart Solar Charging initiative, residents are informed about environmental issues and the lifestyle changes needed to tackle these (E1-4). For this to succeed,

Table 4. Citizen roles in the smart city: The Utrecht realities

Project Name and Objectives	Initiator	Citizen Roles and Corresponding Technologies
Ringpark Dichterswijk Spatial development: creating a green park zone	A few (professional) residents	Citizen power - Project website and social media (Facebook): requesting and using residents' ideas, as well as mobilizing residents to realize and maintain the green city belt
Smart Solar Charging Community-based sustainable energy and mobility scheme	Local citizen-entrepreneur	Consumerism - Solar charging station and smart grid: sustainable local energy network by prosuming residents - Smart phone app: electric car sharing - Social media (Twitter, Facebook) & project website: information provision on the project and services, marketing, requesting users' feedback Citizen power - A bottom-up establishment of an energy and mobility system
Utrecht Alert Neighbourhood safety and crime prevention	A resident	Citizen power - WhatsApp via smart phones: the platform and operational fundament (group formation, linking neighbourhoods, real-time communication and coordination) - Project website: information about the aims and activities
Johan Wagenaarkade Spatial restructuring	Municipality of Utrecht	Consultation - Municipality website: information on the plans and consultation sessions - iViewer, a digital geo-screen: offline discussion with and among citizens on the plans; gathering citizens' views and suggestions; process recording
Environmental & Planning Vision Vleuten Participatory policy development for long-term area development	Municipality of Utrecht	Consultation - Municipality website: information provision on the ambitions, the process and outcomes; residents can define topics for the policy agenda; online survey - Social media/Facebook: municipality campaign to encourage inhabitants to fill in the survey - E-mail: municipality responds to citizens' ideas - Online, real-time discussion platform: district talks about the plans
Amsterdamsstraatweg Spatial restructuring	Municipality of Utrecht	Consultation - Municipality website: information provision on plans and decisions; digital, non-interactive idea map for citizens' suggestions and ideas; - E-mail and Social media (Facebook, Twitter): responding to citizens - An external online discussion platform: citizens share their experiences and ideas supported by argumentation and voting
Revising Traffic Lights Optimizing road infrastructure and traffic	Municipality of Utrecht	Consultation - Municipality website: a digital non-interactive idea map for citizens' suggestions and for the municipality's reactions to citizen input;
Argu.Nl Online discussion platform on city matters	A local start-up enterprise	Consultation - Online agora for residents, users, companies, and city governments - To launch ideas and calls concerning urban issues - Argumentation and voting
Public Health Monitor Information on the population's health status	Municipality of Utrecht	Passive participation - Municipality website: asking data from citizens concerning their health conditions; information provision on events and issues; encouraging citizens to live a healthier life
Merwede Kanaalzone Smart City area transformation	Municipality of Utrecht	Consultation - Municipality website and digital newsletter (via e-mail): information provision and update on project course and consultation sessions Passive participation - 3D digital virtual reality showing the future scenario: to "seduce" residents to accord the plans and to accelerate realization
Iris Smart Cities Kanaleneiland Zuid Urban transformation into a near-zero energy district	Municipality of Utrecht	Consumerism - a living lab: smart energy, lighting and mobility solutions are integrated based on information services from the open ICT urban data platform; apps to: - make citizens enablers of the energy transition, who understand, trust and use the integrated energy and mobility solutions in their homes and district. - to motivate and train the tenants for energy-saving behaviour and to use solar-powered mobility services instead of their own conventional vehicles
Wijkconnect Online platform by & for the neighbourhood	Citizens	Citizen power - an online civil platform to contribute to the neighbourhood by: - linking demand, supply and organizations, and creating initiatives, activities, participation, chances for local economy, community feeling

the role of citizens is vital in purchasing and producing the renewably-based services developed by a market-oriented alliance (D3-12; R19-21; W4-7). A further role of the community members participating in the initiative is that they share their experiences and put forward ideas to refine the new scheme. Such user feedback is provided via the project website and social media (Facebook, Twitter). Members operate the system through a smartphone app that serves as a reservation tool and as the key to the shared electric cars (R27-29; R31;D6-8;E1-3).

In the government-university IRIS project, the Kanaleneiland Zuid district functions as a smart living lab which is undergoing the transformation into a fossil fuel-free area (W30-31; R16). To that end, an array of smart energy, lighting and mobility technologies, open data platforms and apps have been developed by knowledge and societal institutes, companies, specialists and planners. This technological intervention can only work, said the respondents in the present study, if citizens become enablers of this transition (R5; R17; D49). This requires the acceptance and uptake of the (market) solutions offered, for which “co-creation sessions with neighbourhood residents, schools and pupils” (W30) are organized aimed at changing people’s daily electricity use and behaviour. Co-creative activities are also included, although the exact role of citizens and the opportunities for participation have remained unspecified (W30-33; R16).

Consultation

Citizens have been invited to comment on and make suggestions about specific urban issues, such as the spatial restructuring of the Amsterdamsestraatweg and the Johan Wagenaarkade, the optimization of traffic flows by switching off redundant traffic lights, or developing a long-term environmental vision for the Vleuten district (W 15-21). According to the government officials interviewed, the municipality in turn then undertakes to take the views and ideas put forward by citizens into consideration during the process of decision-making and to provide citizens with feedback and arguments on the choices taken (R6; R7; R9;R11; D14;D20; D38).

The technologies employed include (project) websites, social media, and a 3D tool, allowing citizen input to be given in various ways. Examples of where websites were used are online surveys (Vleuten case), “idea maps” (traffic lights) and urban restructuring (Amsterdamsestraatweg) (W16; D23-25; R9-11). In the latter case, the municipality switched to e-mail, as it lacked the capacity to handle the massive volume of incoming ideas (R9). Another instance of website-enabled consultation is that of the virtual agora, Argu.nl (W 23-24). It was established by young professionals to improve argument-based deliberation by citizens and other stakeholders in collective matters such as co-designing the sustainability policy of a housing cooperation, participatory budgeting, measuring support for a new hotel in a residential district or repurposing abandoned sites and buildings (R23; W23-24). Although this platform facilitates citizen-government dialogue, city officials refrain from participating in the discussion, as to “remain neutral and not to influence ongoing debates” (R23).

The use of social media is exemplified by the Vleuten project, in which the municipality used Facebook to mobilize all inhabitants of the district, asking them to define the main themes to be addressed by filling out an online survey (R7; D22-26). Similarly, in the case of the Amsterdamsestraatweg, the municipality used Facebook and Twitter to react to citizen input (R9-10). A 3D iViewer in the form of an interactive geo-map was used in the “Johan Wagenaarkade” urban regeneration project. This large screen supported face-to-face exchanges between the municipality and citizens by visualizing the actual and future situation and catalysing in-depth discussions (R6;D16-17).

Citizen Power

Citizen power was found not to derive from the Utrecht municipality, but from citizens who empower themselves to address urban challenges by technological means. For instance, smart phones form the operational base of Utrecht Alert, a neighbourhood watch app that was initiated by a resident to counter rising criminality in his district (R22; W8-W11). Neighbourhood residents have created WhatsApp communities to warn each other of suspicious activity and incidents. These have since

gained widespread popularity and spread to communities throughout the country, with even the police joining, as well (D13;W13-14).

Smart technologies were developed in the bottom-up Smart Solar Charging initiative, a community-based sustainable energy and mobility system. Its initiator, a citizen-entrepreneur, partnered with (global) corporations such as GE or Renault to technologically advance this new scheme. Its societal diffusion challenges the monopoly of mainstream energy providers (R19-20;D9-12;W5-7).

In the civil initiative Ringpark Dichterswijk, the use of social media (Facebook) has proven vital to stimulate joint actions to reach specific goals. Via Facebook, fellow residents are mobilized to take part in collective decision-making processes aimed at conceptualizing and constructing the 3km-long green zone (R1;R18;F1;D1;W1).

Wijkconnect is another bottom-up initiative arising from the need felt by citizens to make a tangible contribution to the neighbourhood: “I worked, had my friends, and did the shopping outside my neighbourhood. So I added nothing to the place where I lived and the place added nothing to me. This is crazy. What can I do?” (R 26). The solution was to create an online community platform through which citizens, companies and non-profit organizations in the neighbourhood can connect and engage with one another. The roles of the citizens are varied and crucial to keeping the momentum going: they can both start and find events and organizations and they can both ask for and offer social support. Furthermore, the strategies used in Wijkconnect, co-designed by a group of community members, have matured into a social enterprise that is expanding in Dutch cities. Funding derives from a membership fee charged to businesses joining the initiative (W34; W35).

CONCLUSION

This study set out to answer the question: What are the actual roles of citizens in smart city governance in the context of Utrecht? In addition to investigating the contradicting perspectives on the role of citizens in smart cities, the aim was to contribute to the very sparse empirical literature addressing the subject. While techno-optimists celebrate citizen empowerment in public matters, studies conducted by gloom-and-doom pessimists refer to subjugated citizens who are steered by data, technologies and neoliberal agendas. To learn whether these patterns also characterized the situation in Utrecht, twelve technology-facilitated initiatives were examined based on a framework with classifications of citizen participation.

The overall finding of this study is that citizens in Utrecht take part in smart governance in very diverse ways and encompassing all participation forms. The reality of citizen participation in the smart city can therefore not be captured in paternalistic or market-driven framings, nor is it merely about citizens’ having complete control of the city. This study nuances the debate revolving around the stark contrast between “citizen empowerment” and “citizen subjugation” by exposing the spectrum of diversity between these extremes. This contributes to understand citizens’ varying roles in the smart city, resulting not in a technological utopia or dystopia, but which rather should be seen as an evolving practice of technologically mediated citizen participation. These insights also show the difficulty of portraying citizen engagement in smart governance at the city level. Understanding the richness of the roles played by citizens requires a micro-level conceptualization, although different types of participation can co-occur, even within projects.

The findings reveal that “citizen power”, the highest participation rung, does not stem from government but from citizens themselves. Citizens launch their own initiatives in which the collective use of technologies to address common problems in the city are experimented with. This demonstrates that citizens do not wait for the allocation of power by others to become involved in collective issues, as suggested in classical participation models. On the contrary, citizens create their own powerful position to shape their environment and these civil efforts are supported by new technological opportunities.

The findings also show that a consumerism type of citizenship is indeed manifest in Utrecht, very much like in other cities investigated in previous studies. However, this should not necessarily

be strictly understood as a neoliberal, supply-driven and top-down arrangement. This is visible in the bottom-up Smart Solar Charging initiative that gained support from community members concerned about the harm being done to the environment. This community-based energy scheme challenges the monopoly of unsustainable infrastructural provisions, although it cannot survive on charity basis. The quest for a viable business model –as in the other bottom-up initiative, Wijkconnect - represents a creative tactic rather than neoliberal calculations.

It is also evident that the citizens' roles identified in the present study are not rooted in social and political citizenship, as envisaged by a number of scholars (Arnstein, 1969; Cardullo & Kitchin, 2018; Cowley et al., 2017; Vanolo, 2016). The roles described here have a pragmatic character, in that they serve real-world issues: suggestions for a development plan, using a new app or energy system, or making the neighbourhood more liveable. They do not question or resist political choices and the status quo. This also applies to citizen-initiated projects that fit local governmental strategies and therefore receive support. These outcomes may be partly ascribed to the limitation of this study, namely the optional selection of initiatives. Firstly, since several of the cases relate to spatial development, the roles of specific actors are more or less given in the Dutch setting. Here, the local state is the primary task-owner, responsible for multiple interests and legal regulations, with citizens being only one of the many stakeholders. Secondly, the case selection did not use a purposeful lens to filter socio-political struggles, as the study aimed to open-mindedly explore the actual situation in Utrecht.

This paper recognizes the value and need of critical studies illuminating the tensions and societal drawbacks of smart city development. However, the approach used in this study had the advantage of enabling a more comprehensive and a more accurate image of the actual roles played by citizens to be attained. This advantage lies in the combination of the broader definition of smart governance projects, the scrutiny of tangible activities rather than document and narrative analysis alone, and not taking normative perspectives as the single point of departure.

Future work should continue the empirical work started in this study by investigating many more cases of citizen participation in smart, technology-enabled initiatives. Especially studies comparing different cities are needed, which also scrutinize the influence of specific urban and national contexts on citizen engagement. This can help to arrive at an up-to-date and contextualized conceptualization of citizen participation in the smart city. A further interesting avenue would be to zoom in on citizens' off- and online inputs in collaborative smart governance practices: what is the content of these inputs and what happens to them? Do they support local governments and communities in urban development? This knowledge could better highlight the extent to which people actually influence policies and decisions on the course of action to be taken and whether the use of technologies stimulates or hinders these processes.

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