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To cite this article: Richmond Juvenile Ehwi, Hannah Holmes, Sabina Maslova & Gemma Burgess (2023) Towards a co-creative stakeholder engagement in Smart City projects: a life-cycle approach, *Innovation: The European Journal of Social Science Research*, 36:4, 774-799, DOI: [10.1080/13511610.2023.2266579](https://doi.org/10.1080/13511610.2023.2266579)

To link to this article: <https://doi.org/10.1080/13511610.2023.2266579>



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Published online: 12 Dec 2023.



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Towards a co-creative stakeholder engagement in Smart City projects: a life-cycle approach

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(Received 5 February 2022; final version received 27 September 2023)

ABSTRACTEngaging stakeholders to co-create Smart Cities is an aspiration for many city governments. However, existing stakeholder engagement frameworks tend to be technologically deterministic from the outset, leaving no room for meaningful co-creation. This paper proposes a framework for engaging stakeholders in Smart City development without presuming an already existing technology which stakeholders must accept. The framework follows the life-cycle approach to disaggregate the Smart City development process into seven separate but interrelated stages anchored on three pillars – ‘the right to the city’, ‘the IAP2 spectrum of public participation’ and ‘technological sovereignty’ to highlight issues deemed critical for a meaningful co-creative stakeholder engagement. The study identifies funding, an understanding of the city and its challenges from multiple stakeholder perspectives, the promotion of digital rights, and meaningful stakeholder engagement as four pertinent issues that must be taken on board to move this framework from a conceptual abstraction to a practical toolkit.

KEYWORDS: Smart City; stakeholder engagement; citizen participation; co-creation; life-cycle approach

1. Introduction

As more people move into cities, pressure on existing city infrastructure and services is increasing (Angelidou 2017). City managers across the world are being called upon to address urban challenges that accompany urbanisation, including waste management, flooding, pollution, and traffic congestion (Ji et al. 2021). Smart Cities have been touted as an efficient way of addressing these and other urban issues by *doing more with less* (Bibri 2018). While the meaning of Smart Cities is still a subject of much scholarly debate (Albino, Berardi, and Dangelico 2015; Hollands 2015), there is a general consensus that Smart Cities should serve the needs of people (Ehwi et al., 2023; Cellina et al. 2020), rather than simply exhibiting technological capabilities (Angelidou 2015). To realise this needs-oriented approach to Smart City development, it has been suggested that the current debate around Smart Cities should move away from developing Smart

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Cities *for* people to developing Smart Cities *with* people to address their needs (Ji et al. 2021).

This new orientation has spurred a body of scholarship exploring how to *engage*, co-design, or co-create Smart Cities with different city stakeholders (Cellina et al. 2020). Analysts have explored wide-ranging issues regarding citizen engagement and co-creation, including open data and open government initiatives (Ma and Lam 2019), living labs (Leminen, Rajahonka, and Westerlund 2017), civic crowdfunding (Carè et al. 2018), and issue-oriented civic hackathons (Lodato and DiSalvo 2015), to name a few.

In addition, practical questions are being asked about how Smart City promoters, such as big technology corporations (like IBM and Cisco) and supranational bodies who wield financial and technology power, and city authorities who are democratically elected and mandated to provide and manage city infrastructures and services, can engage stakeholders to co-create Smart Cities and prevent tokenism (Cardullo and Kitchin 2019a). Hence, scholars have proposed some frameworks to help engage citizens and stakeholders in co-creating Smart Cities. For example, in India, Krishnan et al. (2018) developed the digital citizen engagement framework to facilitate the delivery of Ambient Assisted Living (ALL) for elderly citizens. In Finland, Leminen, Rajahonka, and Westerlund (2017) used bipolar dimensions of platforms and participatory approaches as principal axes to develop their collaborative innovation matrix framework for third-generation living labs. Balestrini et al. (2017) proposed a framework to help communities, researchers and city councils plan and run innovating sensing interventions around damp sensors in Bristol, UK. Through a synthesis of the literature, Ogie (2016) proposed the SPEC-TRUM framework, comprising socio-economic factors, privacy, effort, terms, requirements, usefulness and money to show the most appropriate ones incentivising people to participate in mobile crowdsensing.

Despite the usefulness of these frameworks, gaps remain. Particularly, most of these frameworks are developed around already existing smart technology solutions and hence the roles of citizens and city stakeholders are often reduced to users (Cowley, Joss, and Dayot 2018) who merely provide feedback to, at best, tweak or improve the functionality of these already existing solutions (Cardullo and Kitchin 2019b).

Hence, little room exists for citizens and other stakeholders to actively participate in the search for solutions to urban problems and to meaningfully engage with the wide range of activities involved in developing Smart City technology solutions. Cardullo and Kitchin (2019b) observe, for example, that citizens lack agency in the so-called citizen-led Smart City projects where ‘the focus, objectives and solutions were set *before* problems and suggestions from citizens could be taken into account’ (p.819). Thus, there is limited practical insight into how to co-create Smart City technology solutions with city stakeholders without predetermining the technology solution.

Furthermore, existing frameworks tend to be episodic rather than offering flexibility for stakeholder engagement to continue during the life course of Smart City initiatives. This article, therefore, contributes to the literature on frameworks for co-creating Smart City projects in two crucial ways. First, the framework builds on the user-centric debates on Smart City initiatives (see Garcia-Font 2021; Gomathi, Baskar, and Shakeel 2021) by assembling concepts (presented later in the paper) that illuminate the intention to engage and bring in the voices of stakeholders so as to minimise tokenistic engagements. Second, it provides a novel framework which can be useful for different Smart City initiatives irrespective of the stage at which the project has progressed to. It does so by proposing a life-cycle approach to the development of Smart City initiatives. The framework comprises seven distinct but interrelated stages, namely – problem-

framing, ideation, proof-of-concept, product/service design, testing or demonstration, deployment and operation, and decommissioning which are discussed later in the paper. This life-cycle approach is anchored on three pillars, namely, ‘the right to the city’, ‘the spectrum of public participation’, and ‘technological sovereignty’, all of which are also elaborated later in the paper. These three pillars are deemed consistent with the complex spatial arenas within which different stakeholders experience the city (see Harvey 2014) and they allow non-technical stakeholders to meaningfully follow the various iterations and processes involved in the development of Smart City technology solutions.

Using this framework, we aim to answer four key research questions: (1) what is the purpose of stakeholder engagement at each stage of the life cycle of a Smart City development?; (2) what roles do stakeholders and leaders/promoters of Smart Cities play at each stage of the life-cycle?; (3) what is the level of technicality at each stage of the development process and what role does digital technology play at each stage of the life cycle?; and (4) what are the expected outputs at each stage of the life-cycle?

It is important to note here that there is a distinction between the Smart City as an overarching strategy, and individual projects which come under the banner of Smart City initiatives (Fernandez-Anez, Fernández-Güell, and Giffinger 2018). As this paper is centred on stakeholder engagement in the practical generation and implementation of smart initiatives, the focus here is on the latter. However, the processes by which Smart City initiatives are delivered have salience for Smart City strategies more broadly. As Fernandez-Anez, Fernández-Güell, and Giffinger (2018) suggest, stakeholder engagement is critical for effective Smart City governance, and stakeholder involvement in particular Smart initiatives could help align the development of such projects to stakeholders’ overall vision(s) for the Smart City, which they argue could be potentially important for the effective delivery of overarching Smart City strategies.

The rest of the paper is organised as follows. Section 2 reflects on the concept of the Smart City and reviews the literature on citizen engagement, highlighting critiques and calls for co-creative stakeholder engagement. The research methodology which informed the proposed framework is presented in Section 3. In Section 4, the architecture of the co-creative stakeholder engagement framework, namely the life-cycle approach, and the three pillars it relies on are elaborated. Section 5 then discusses each of the seven stages of the co-creative stakeholder engagement framework. Finally, we discuss pertinent and practical issues the framework presents and offer our conclusion in Section 6.

2. Literature review

2.1. *Smart Cities and stakeholder engagement*

The Smart City concept is not new and it follows the tradition of earlier iterations of networked cities (Graham and Marvin 2007) and intelligent cities (Kominos 2015), which all exemplify a type of techno-utopianism that is anchored ‘on the belief that deeper integration of digital technologies in urban life will spur economic, environmental and social benefits (Caprotti 2019, 2468). According to Hollands (2008), there is a ‘definitional impreciseness’ regarding what Smart Cities entail. This definitional impreciseness matters in terms of both how Smart Cities are constituted and who is engaged in the development process.

For Nam and Pardo (2011), Smart Cities comprise three factors, i.e. technology (including various digital technologies, network equipment, and service information

systems), human factors (including creativity, social learning, social inclusion and social capital), and institutions (emphasising the support of government and policy to guide the design and implementation of Smart Cities). Other scholars simply classify Smart Cities based on the domains or specific sectors in which the Smart technologies are deployed. For instance, the Future Cities Catapult (2016) classify Smart City demonstrators into six verticals: city services, smart utilities, smart health, last-mile supply chain and logistics, next-generation connectivity and data, and connected and autonomous vehicles. In short, most definitions of Smart Cities converge around the view that Smart Cities reflect an approach to solving urban problems by taking advantage of the availability of big data, ubiquitous and networked computers, machine learning and algorithmic processing of urban data to inform decision-making (see Batty 2012).

Despite the variation in definitions, there is consensus that people and their needs should be at the centre of Smart Cities (Calzada et al. 2021). Hence, the classification of Smart Cities, how they are framed and their implications for the rights of citizens and other city stakeholders have remained topical given the differential impacts of Smart City projects across cities (Willis 2019). Willis (2019) contends that Smart Cities reflect 'the aspirations and world view of a particular set of actors and subset of the population' (p.4).

Indeed, there is a view that the Smart City agenda is driven mainly by three main actors who together constitute the triple helix model: (1) city and/or national governments; (2) city universities and their affiliated technology institutes; and (3) technology companies/industry (Leydesdorff and Deakin 2010; Lombardi et al. 2012). These three actors have been found to derive mutual benefits from Smart City projects: City governments face fiscal constraints and therefore look for both funding and cost-effective solutions to city problems (Ehwi et al. 2023, 2022). In exchange, they permit city assets such as lampposts and bus lanes to be used as testbeds for Smart technologies (Future Cities Catapult 2016). Academics and data scientists in universities conduct research that generates innovative ideas that could be used to solve city problems (Ehwi et al. 2022; Kominos 2015). They, however, require funding to sustain their research and therefore often focus their attention on topics specified by, or attractive to, funding bodies (Galati 2018). Technology companies, on the other hand, do not just fund research projects, they also sometimes recruit scientists from universities to help translate research ideas into marketable and patented solutions demanded by city government (Kourtiti et al. 2014). Where decision-making in Smart City projects remains largely limited to this narrow triple helix, there is a risk that the problems addressed by such initiatives will not be those which matter most to the city's residents, nor to other stakeholders not included in this model (Ehwi et al. 2023).

It has been argued that this partnership leaves out citizens whose livelihoods and lives more broadly are impacted by Smart Cities, leading to widespread criticism (Cardullo and Kitchin 2019b). Attempts to involve citizens in the development of Smart Cities have also been questioned. These criticisms have ranged from how citizenship is framed (Shelton and Lodato 2019), through the platforms used for the engagement (Johnson, Robinson, and Philpot 2020), to what citizens can do during the engagement process (Lodato and DiSalvo 2015). For example, studies which consider how citizenship in Smart Cities in the UK is framed highlight that citizens are often reduced to users of technologies, and that little attention is given to other forms of framings that view citizens as political actors with the right to shape the urban agenda (see Joss et al. 2017; Cowley, Joss, and Dayot 2018).

Further, the intentions behind public participation in Smart City governance are of considerable importance for shaping the extent to which stakeholder engagement is

valued and makes a difference to Smart City decision-making. For instance, Muñoz and Bolívar (2019) highlight that where the use of technologies for e-participation of citizens in Smart urban governance is employed as a box-ticking exercise designed to lend legitimacy to the decision-making process, this undermines the democratic process. This is because, rather than enabling citizens to shape projects and create a Smart City using a bottom-up approach, citizen engagement can be a means of maintaining technocratic governance by quelling criticism (Goodman et al. 2020).

The context in which Smart Cities have become increasingly popular as part of urban strategies is important here. Reflecting on the neoliberal ideals underpinning citizen participation and citizenship in Smart Cities at the European level, Cardullo and Kitchin (2019b) questioned the rationale behind collecting citizen feedback in these projects. They argued that citizen feedback was taken primarily because it formed part of the project requirements, rather than to allow the feedback to shape what is eventually implemented. They further added that supra-national funding bodies also get to define priority areas, develop performance matrices and set timelines for Smart City projects, therefore making citizen engagement tokenistic (ibid). Arguably, such tokenistic engagement is intended to get stakeholders on board with the Smart initiative being planned in order to more seamlessly deliver the capital accumulation which is a key driver for many such projects, and which is often a key aim of city governments and corporations alike (Kitchin 2015).

2.2. *Co-creative forms of stakeholder engagement in Smart Cities*

The above criticisms of citizen engagement in Smart Cities have led to calls for co-creative forms of stakeholder engagement that truly empower citizens. The concept of co-creation first emerged in the new public management literature (Voorberg, Bekkers, and Tummers 2015). Co-creation helps to explain the role of ‘informed, networked, empowered, and active end users in a context in which the meaning of value and the process of value creation are rapidly shifting from a product- and firm-centric view to personalised consumer experiences.’ (Prahalad and Ramaswamy 2004, 5). Attention has turned towards co-creation because of its central emphasis on end-users of public services or, in the case of this paper, Smart Cities. Indeed, the New Urban Agenda, which is an internationally agreed set of standards and principles to guide the planning, construction, development, management of urban areas – emphasises the importance of participatory and civic engagement in engendering a sense of belonging and ownership among all urban inhabitants (United Nations 2017). Specific benefits associated with co-creation include allowing citizens to directly shape public policy by advancing grassroot ideas (Grissmann and Stokburger-Sauer 2012).

In Smart City projects, benefits may include generating greater trust between citizens and municipal authorities (William et al. 2018). Also, when citizens are positioned as co-creators within Smart City projects, they are considered to spur innovative thinking and facilitate collaborative work (Voorberg, Bekkers, and Tummers 2015). Co-creative stakeholder engagement within Smart City initiatives, therefore, stands out as a means of delivering projects which takes account of a wider range of stakeholders’ views, and which involves stakeholders in a meaningful way, providing opportunities for democratic debate, and shaping projects in a way which addresses the concerns of the urban population (Balestrini et al. 2017).

Despite these benefits of co-creation, its application as a form of stakeholder engagement in Smart Cities is yet to deliver the full range of benefits, including bringing together

a diverse group of city stakeholders to discuss ideas and find solutions to city problems in a way that is bottom-up and empowering. In Tehran, Mohseni (2020) observed that although the participation of the public, NGOs and businesses was a stated goal in Smart City initiatives, participation did not result in bottom-up decision making and was largely tokenistic. Similarly, Wolff et al. (2019) stressed that although citizens were asked to propose ideas for addressing local issues in the Milton Keynes 'Our MK' project, it was the project leaders and not the citizens who ultimately chose the ideas that were implemented. Similarly, in Japanese Smart Communities, it was found that the role of citizens stated in official documents differed from what citizens were permitted to do during the co-production of public services, as they were left out of the project governance (Granier and Kudo 2016).

We therefore contend that the current approaches to stakeholder engagement in Smart Cities have not yielded truly bottom-up and citizen-led stakeholder engagement because these co-creative engagements are often organised with a predetermined technology in mind. Thus, all too often, the activities lined up, the logistics provided and the incentives given to participants in such co-creative arenas are purposefully designed to nudge them towards accepting outcomes that are predetermined (Cardullo and Kitchin 2019a). It is against this backdrop that we propose a framework to engage stakeholders co-creatively in the development of Smart Cities following the life-cycle approach.

It should be noted that this paper uses the term 'stakeholder engagement' rather than 'citizen participation' for four reasons. Firstly, stakeholders include everyone who is affected or can affect the activities of a firm or an organisation (Freeman 2010). From a city context, the term 'stakeholders' encapsulates users of urban spaces, including but not limited to residents, civil society groups, small local businesses, interest groups, visitors, minority groups, and institutions who affect and are affected by urban activities and processes in diverse ways (Kinawy, El-Diraby, and Konomi 2018). Secondly, citizenship as a concept has geographical boundedness that is often not coterminous with the remote ways in which stakeholders may influence local development (Joss et al. 2017). Thirdly, Lund (2011) explains that citizenship is a fluid concept that can be acquired and lost depending on changes in one's circumstances or actions. Finally, by grouping citizens with other city users (such as local authorities, businesses, charities, NGOs, etc.) under the umbrella of 'stakeholders', we grant each group the same level of emphasis with regards to their importance in the engagement process (Galati 2018).

3. Methodology

To formulate the proposed co-creative framework, three methodological stages were involved. In the first, the existing frameworks on co-creative stakeholder engagement in the literature (c.f. Balestrini et al. 2017; Bolz 2018; Krishnan et al. 2018) were reviewed with a view to, first, draw out their strengths and, second, identify the conceptual gaps linked to techno-determinism (Calzada 2018) and tokenistic forms of engagement (Cardullo and Kitchin 2019a; Shelton and Lodato 2019).

Then, following insights from the review, in-depth qualitative interviews were conducted with 18 different stakeholders directly associated with Smart City initiatives in UK cities. Since 2010, the UK government has promoted various initiatives aimed at leveraging the value of data – a key component of Smart Cities. For example, the Government's Data Strategy established the Public Sector Transparency Board, the Public Data Group made up of the 4-data rich organisations (Ordnance Survey, Met Office, Land Registry and Companies House) and the Open Data Institute (GOV.UK n.d.). Also, national

standards bodies such as the British Standards Institution have since 2014 published several guidelines related to Smart Cities to inform public debates and guide decision-making by key stakeholders (e.g. ‘*Making cities smarter – a guide for city leaders*’,¹ ‘*The role of standards in smart cities*’²). Furthermore, UK cities such as London, Manchester and Newcastle have been featured in both global³ and European Smart City rankings (Manville et al. 2012). For these reasons, the UK cities provide representative context to draw insights about the Smart City development to inform global debates.

The stakeholders engaged for the research comprised board members of local enterprise partnerships, officers of local authorities, managers and leaders of Smart City initiatives, technology solution providers, university academics with urban planning and computer science backgrounds, citizen engagement consultancy firms, and NGOs. They were drawn from six UK cities, comprising Bristol, Newcastle, Cambridge, Milton Keynes, Oxford, and London. Aside from willingness to participate in the study, the stakeholders were selected partly because their cities have implemented different Smart City initiatives that have gained recognition in the UK, thereby allowing us to assess both the convergence and divergence in their perspectives on stakeholder engagement even across the different Smart City initiatives their cities have implemented. For example, Bristol is recognised for its ‘Bristol Approach’ to citizen sensing and operations centre (c.f. Caprotti 2019), Newcastle for its Urban Observatory, Cambridge for its digital twin of the West Cambridge site (Lu et al. 2020). Milton Keynes for its Starship robots delivery (Murrer 2021), Oxford for its innovations in mobility technologies such as self-driving cars (Future Cities Catapult 2016), and London for its Datastore (Coleman 2013; Leeser 2019);

The interviews explored issues including why there is a need for stakeholder engagement, the forms of stakeholder engagement cities have conducted for their Smart initiatives, how the engagements were carried out, the challenges faced and lessons learned from the process. The interviews were conducted remotely over video meetings between April and June 2020, which were recorded and transcribed with interviewees’ consent.

The third stage involved a synthesis of insights from the existing co-creative engagement frameworks reviewed and those from the interviews. Here, it is worth highlighting that interviewees did not necessarily answer these questions with the life-cycle of smart cities in mind as this was a conceptual lens introduced by the researchers during the analysis. This means that the integration of empirical insights from these interviews in the reflections on the stages of the life-cycle is not evenly distributed, as many interviewees tended to be more knowledgeable around non-technical stages of the stakeholder engagement process. Hence, this paper derives from our conceptual reflections on the empirical insights gathered and the gaps identified in the existing co-creative stakeholder engagement frameworks.

3.1. *The building blocks of the co-creative stakeholder engagement framework*

We determined that moving beyond techno-determinism in Smart City stakeholder engagement requires an approach that allows stakeholders to appreciate how the development of smart city technologies unfolds, and to do this, we drew on the life-cycle approach. This is an approach to interpreting and analysing a phenomenon characterised by processes of change (Guidice, La Rosa, and Risitano 2006). Guidice et al. (2006) note that two main characteristics underly the life-cycle approach. The first is that the change process tends to be linear and irreversible (See also van de Ven and Poole 1995), meaning there is a single sequence where every immediate phase becomes a necessary precursor of a subsequent phase, making the process of value addition cumulative. Secondly, there are

exogenous forces within any environment where the phenomenon is conceived and developed. These forces can include societal values, market mechanisms, and institutional and governance logics. For Guidice et al. (2006), 'in principle, [the life-cycle approach] can be applied to any system that undergoes a series of changes over the course of its existence' (p.38).

The usefulness of the life-cycle approach to the development of a Smart City lies in the fact that technologies and other smart devices deployed in Smart Cities do not emerge from a vacuum, nor are they independent of the proclivities of the computer scientists, software engineers, programmers and coders who make them (Marcus and Davis 2019). Their development is also underpinned by assumptions and ontologies of so many things, including but not limited to how cities should be designed, built and governed, what should count as a city problem, how it should be solved and with what tools. These proclivities and biases are often buried within different stages of the smart technology development process and thus require disaggregation of the entire process to uncover and deal with the same. Thus, we disaggregate the process of Smart City development into seven separate but inter-related stages in the framework, namely: problem-framing, ideation, proof of concept, product or service design, testing or demonstration, deployment, and post-deployment or decommissioning, which in our view will require different rationales and logistics for engagement and expected outcomes. These stages are elaborated more fully in the next section.

Whilst the life-cycle approach allows the trajectory of Smart City development to be followed, in itself, it is not enough to ensure that different stakeholders can assert their rights and meaningfully engage with the different development stages. Thus, we draw on other concepts that allow room for stakeholders to pursue co-creative forms of engagement. Although a long list of relevant concepts could be compiled, we settled on three, namely, the right to the city, the spectrum of public participation and the concept of technological sovereignty. The reason for the selection of these concepts is elaborated on below.

The first of these concepts is the right to the city. Following Lefebvre, Harvey (2012, p. x) indicates that 'the right to the city' can be viewed as both 'a cry and a demand'. As a cry, it responds to the powerlessness that people experience in everyday city life; as a demand, it is a charge to boldly advance an alternative urban future modelled after one's experience of the city. This right is not just an individual right, but also belongs to the collective (Harvey 2008). Mitchell (2003) adds that the right to the city is also a right to public spaces in cities where different urban actors, including activists, may occupy sensitive urban spaces to press their claims or demand attention for local or international issues. More recently, the concept has been extended to Smart Cities and digital transformation under the aegis of 'the right to the digital city' (Foth, Brynskov, and Ojala 2015). Like the mother concept, it calls into question issues regarding the democratisation of digital transformation, and the neutrality and objectivity ascribed to machine learning algorithms in social media platforms and Smart Cities. Thus, by considering the right to the (digital) city as an underlying concept in the proposed co-creative form of engagement, we can advance the inclusivity of stakeholders and their meaningful participation in Smart City projects that take place in or affect public spaces.

Second, according to the International Association of Public Participation (IAP2), public participation is a spectrum that ranges from merely informing people about proposed interventions without them having any agency to influence decision outcomes, to empowering them by placing final decision-making powers in their hands. The level of commitment expected from the public and the capability required to transition from

being mere information recipients to implementers of decisions requires empowerment. As Balestrini et al. (2017) have observed in the context of citizen sensing, the public ‘often lack the skills required to operate sensing technologies and struggle to make sense of collected data’ (p.2283). Hence, embedding the IAP spectrum of participation (*sic* inform, consult, involve, collaborate and empower) allows for an assessment of the support needed to empower the public to meaningfully engage with different stages of the Smart City development process, assess how collective decisions are incorporated in technology solutions and provide a basis for demanding accountability at each stage.

Third, the concept of technological sovereignty (Galdon 2017, April 25; Lynch 2020) is also drawn upon because it calls into question ‘techno-capitalism’ (Lynch 2020), purposeful or inadvertent trust in market deregulation, technological solutionism and the view that more data is synonymous with better decisions. Rather, it supports the design approaches, governance frameworks and technology solutions that do not abuse citizens’ data but enable citizens to be informed about the use of their data at any given point in time. According to Calzada (2018), technological sovereignty under the experimental cities umbrella allows for the following transitions around Smart Cities to happen: citizens moving from data users/providers to decision-makers, the city from a market to a platform, data ownership from being owned by firms to being publicly scrutinised, stakeholders from triple or quadruple helix to a Penta helix, and in terms of scalability and replicability, from urban solutionism to unpacking urban problems. In short, technological sovereignty seeks to break down the dependence on proprietary software programmes while encouraging responsible public leadership and data sovereignty (Galdon 2017, April 25).

While these three base concepts complement the life-cycle approach and strengthen our case for a co-creative stakeholder engagement framework, we recognise that they are by no means exhaustive but represent an attempt to demonstrate varied perspectives integral for inclusivity, accountability and access for stakeholders. The next section of the paper presents the seven stages of the life-cycle based framework to developing stakeholder engagement in Smart Cities and addresses the four research questions posed earlier.

4. The co-creative stakeholder engagement framework elaborated.

First, it is important to emphasise that the framework poses a challenge to tendencies towards tokenistic forms of stakeholder engagement in smart city governance. It is targeted towards the engagement of stakeholders, including citizens and local interest groups (e.g. businesses, churches, schools, charities etc) who are typically those least empowered to engage meaningfully as involvement in Smart City development progresses to the more technical stages of the process (Shelton and Lodato 2019). Additionally, from a broad urban governance perspective, the framework is targeted at city leaders and their project partners who make critical decisions and lead the implementation of city development strategies.

4.1. The problem framing stage.

At this initial stage, decisions must first be made around whether there is a problem which needs to be addressed, and subsequently, whether or not Smart initiatives could be part of the solution. As such, at this stage, particular areas and issues to be addressed are identified, and a decision is made regarding whether a Smart City project is needed at all, or whether a non-technological solution would be preferable. One interview participant affirmed this when he observed that ‘every Tuesday morning, city leaders, business

leaders from across the city, community leaders, and environmental groups would meet in City Hall and thrash out what we believe were the problems the city was facing ... we didn't start with some big fancy vision, we started with people who lived and worked in the city' (Interview participant, Bristol). Another interview participant from Newcastle also added that 'during our consultation, we didn't start by asking people what a smart city means to them or what exciting digital technologies they were using today, but rather, what Newcastle meant to them, what they did not like about the city and what challenges they wanted addressed'.

Indeed, problem identification and framing constitutes the most critical stage because if city problems are not well-articulated from a wide stakeholder perspective at this point, the ideas that will be subsequently proposed as solutions could end up either benefitting only a segment of the city (Shelton, Zook, and Wiig 2015) or not delivering solutions to problems at all (Yigitcanlar and Kamruzzaman 2018). An important question worth answering at this stage is who is a stakeholder in a city, how do they interact with the city and how are they identified to participate in the problem identification. A question that should guide project commissioners to avoid excluding vulnerable and minority groups is 'who are we missing and who are we likely to miss at this stage'. Therefore, at this stage, it is crucial for Smart City promoters and municipal governments to recognise the varied ways in which communities, people, businesses, institutions and groups experience the city, and to pay attention to the many scenarios in which different stakeholder groups may envisage improvements in the city (c.f Balestrini et al. 2017). Hence, drawing from both 'the right to the city' and the IAP2 spectrum of public participation, stakeholders should be allowed to contribute towards the (political) process of problem-framing (Dillon 1982) or future imaginaries (Dixon and Tewdwr-Jones 2021).

This is the stage at which many urban planning proposals fail to engage stakeholders since typically stakeholders (especially the general public) are reached out to only *after* it has been decided that the project will be going ahead and in what form (see Cardullo and Kitchin 2019b). The proposed framework, therefore, depends upon stakeholder engagement which actively invites discussion, disagreement and enables stakeholders to freely express their views.

However, this does not suggest that it is necessary to gather the inputs of every person, group and business within a city before identifying and deciding the most pressing city problems to resolve, although participants must represent the diversity in cities. Rather, it is about detecting the relevant aspects of problems, allocating resources, and ensuring the stakeholder engagement process accommodates a variety of competing interests for stakeholder groups within cities. This process, however, needs to be carefully balanced against several considerations including, among others, the spatial scale of the project, the sources of project funding, the project timeline and its beneficiaries and risk-bearers. One interview participant for example observed that, 'once we decided that it was going to be a plan of the people, we accepted that our timeline was going to be a stretch, and that was fine' [Interview participant, Bristol]. Also, at this stage, the aim should not be to arrive at a single city problem prioritised by all, as this could be unachievable due to differences in views and experiences among the stakeholders. Rather, efforts should be directed towards soliciting different and potentially conflicting framings of problems to enhance understanding.

Additionally, given the non-technical nature of activities at this stage, care should be taken to avoid discussions being dominated by technical language and jargon, as this can potentially exclude stakeholders who may not feel confident engaging in such technical conversations. As Balestrini et al. (2017) point out in citizen science that many people

may struggle to make sense of very technical language, and data collected. Instead, the activities are to be aligned with democratic principles of inclusion, mutual respect and tolerance of dissenting views. Also, at this stage, the recognition by Smart City promoters and municipal governments of uneven economic, political and social powers among stakeholders is essential. They should aim to empower, encourage and incentivise under-represented and minority groups to articulate their views. Multiple modes of stakeholder engagement orientated towards informing, involving, consulting, collaborating and empowering stakeholders must be pursued to achieve these goals (see [Table 1](#)).

4.2. *The ideation stage.*

At the ideation stage, the ideas gathered from the problem-framing stage are organised and turned into project ideas that are feasible for carrying forward within the given context. This stage is crucial because although every city problem articulated by stakeholders is important, not all can be taken forward at the same time. Therefore, Smart City convenors should ensure that non-verbal cues, posture and language used in rationalising this are not dismissive of certain problems while seeming to privilege others (Rominięcka 2008). The role of convenors of stakeholder engagements at this stage is to guide and support stakeholders to formulate the criteria to prioritise the problems to be addressed, taking account of the urgency of the problem, logistics, funding and required time.

One interview participant who had led a co-creative workshop aimed at project ideation shared some practical insights which illustrate how stakeholder engagement at this stage of project development can be delivered: They indicated that they used a series of prompts highlighting the city's 'wicked problems' and 'all the great points about the city', and asked participants to choose one positive and one negative prompt to depict a plausible city circumstance. They then asked participants to imagine themselves as city leaders, and to work through the issues raised by these prompts to develop ideas, and consider whether their ideas would be workable.

Here, it is worth mentioning that different approaches to ideation exist and each comes with a different level of technicality, as stakeholders are now encouraged to move beyond problem identification to thinking about and analysing issues in a structured and logical way. However, it is important to note that at no stage in the framework are technical skills a requisite for participation. Indeed, stakeholders should be incentivised and empowered to elaborate on the ideas which, in their view, would address the shortlisted problems. This is in line with the participatory design approach based on participants' tacit knowledge and embodied experience (Whitman, Lafayette, and Roark 2018). By adopting this approach, paternalistic and stewardship characteristics of stakeholders as mere problem-finders and not solution-providers can be curtailed (Cardullo and Kitchin 2019a). Solutions will largely depend on the chosen forms of engagement and the available boundary artefacts such as logistics and event setting (Chow and Leiringer 2019), which should be sensitive to the diverse needs of different stakeholders. Where ideas are many and cannot be implemented altogether in their entirety, stakeholders should again be encouraged, supported and empowered to revisit the ideas, prioritise and select those which are viable for taking forward.

4.3. *The proof-of-concept stage.*

Having settled on the urban problems and ideas to proceed with, the proof-of-concept stage entails identifying the resources required for implementation and mapping the

Table 1. A matrix showing relevant stakeholder considerations and features under each stage of the life-cycle of a Smart City (SC) project.

	Problem-framing	Ideation	Proof-of-concept	Product/service development	Test or demonstration	Deployment and operation	Decommissioning
<i>Purpose of stakeholder engagement</i>	To understand the nature, scale, and history of city problems	To organise and prioritise city problems and translate them into feasible ideas solutions	To explore workability of proposed idea solutions under different scenarios and resources required	To develop the technology or technology-supported proven concept	To explore functionality of the technologies at a small scale and over limited time period	To facilitate discussions with stakeholders about the installation the Smart City technologies at scale	To facilitate discussions with stakeholders about the termination of the project
<i>Role of Smart Cities promoters</i>	To organise, facilitate and empower stakeholders to articulate city problems	To support, empower and facilitate stakeholder to organise, prioritise and shortlist city problems	To empower and guide stakeholders through the scenario development process	To train stakeholders to develop technology or Empower stakeholder to demand explanation of the logics and algorithms underpinning the technology developed	To oversee the trials or demonstration exercise and ensure that stakeholders are informed about initial insights and outputs	To provide stakeholders with relevant information regarding how the deployment will be done, for how long, by who and how data will be owned and accessed.	To ensure that there is evidence of how city problems have been addressed by the Smart City project and to inform stakeholders about Smart City data ownership and how the data stored will be used, including derivative uses.

(Continued)

Table 1. Continued.

	Problem-framing	Ideation	Proof-of-concept	Product/service development	Test or demonstration	Deployment and operation	Decommissioning
<i>Role of stakeholders</i>	To provide context and insight into problem city problems	To decide matrices for organising, prioritising city problems and engaging in dialogues on prioritisation of city problems	To draw on their knowledge and guidance from SC promoters to explore different feasibility scenarios	To understand issues about proprietary algorithms, artificial intelligence, proprietary software etc	To use the technologies developed and to provide feedback on issues previously unknown or not considered	To use the technologies developed and provide feedback on emerging issues	To ensure that SC promoters provide evidence of how Smart City project has addressed city problems
<i>Role of technology</i>	Does not feature at this stage	Does not feature at this stage	Can be considered as ONE of the resources that will be required to 'help' solve a problem	Feature prominently if proven solution is largely technology-oriented	Feature prominently throughout this process	Feature prominently throughout this process	Does not feature although it is centre of attention
<i>Extent of participation</i>	Full participation throughout the process	Full participation throughout the process	Full participation throughout the process	Maximum participation if stakeholders receive training and empowerment	Maximum participation in terms of using the technology and providing feedback	Maximum participation in terms of providing feedback on emerging issues	Full participation throughout the process
<i>Technical expertise required of stakeholders</i>	None and no training required	None but some support may be required to help stakeholders develop matrices for prioritisation	None but support may be needed to help stakeholders develop scenarios and resources needed	None if algorithms and artificial intelligence codes will be explained in simple plan language	None required if SC promoters can provide relevant information of how the technology works	None required if SC promoters can provide relevant information of how the technology works	None required

<i>Some key considerations by SC promoters</i>	Bringing stakeholders together, ensuring diversity in stakeholder composition	Availability of relevant boundary artefacts to facilitate organisation, prioritisation and dialoguing	Technology does not become the only solution to solving city problems.	Technology developers provide explanation of algorithms and coding in simple and plain language. SC promoters show how stakeholders' feedbacks are fed into the technology development	SC promoters include stakeholders' feedbacks in improving the technology	SC promoters document stakeholder experience of the technology provided.	SC promoters provide evidence of how projects have solved city problem, and at what cost.
<i>Main output at the end of this stage</i>	List of city problems from different stakeholder perspectives	Financially and logistically realistic, time-sensitive list of city problems	Technology and/or idea solution supported by technology	Document and audio visuals that provide easy to read and understand logic behind algorithms and codes embedded in technologies	Improved technology that incorporates stakeholder initial feedbacks	Stakeholder experiences of how technology has addressed problems for which technologies were developed.	An evidential material of the nature and scale of city problem targeted, and the improvement made following by the Smart City project.
<i>Examples of engagement approaches with stakeholders</i>	(Online) workshops, (online) consultations, charrettes	(Online) workshops, (online) consultations charrettes	Living Labs, (online) workshops, (online) consultation, charrettes	Debriefing, website portals, newspaper adverts and social media posts and flyers with URLs to documents and audio-visuals	Interim reports, debriefings, website portals, newspaper adverts, social media posts, and flyers with URLs to audio-visuals of how to use the technology	Debriefing, website portals, newspaper adverts, social media posts, and flyers, with URLs to audio-visuals of how to use the technology	Final reports, full video documentary and short videos.

different scenarios of how ideas would work at both theoretical and practical levels. Here, depending on the problems prioritised, the proof-of-concept stage can be either very technical (reflected in terms of the level of conceptual thinking required, and the language and tools being used), or less technical. Whatever form the prioritised problem assumes, Smart City promoters should refrain from considering the availability of technology as the main or sole resource to (dis)prove the idea when discussing resources for the project, as this may result in solutions that do not require smart technologies being overlooked (Concilio et al. 2013; Hollands 2008).

That said, as the framework is informed by a life-cycle approach to the development of Smart Cities specifically, it is expected that the engagement will be orientated towards a technology-enabled solution (especially because funding for smart initiatives likely requires the use of some kind of technology). Hence, at this stage, it is reasonable to expect some attrition in the number of stakeholders as the language and tools used become somewhat technical and the engagement subsequently becomes narrower and more specific. This notwithstanding, Smart City promoters still must strive to sustain stakeholders' interest and, whenever possible, provide relevant tools or training to help all stakeholders meaningfully participate. In line with this, Wolff, Kortuem, and Cavero (2015; 2019; 2020), have extensively studied how citizens can be engaged on technical aspects, including teaching digital skills to school children to enable them to ideate Smart City solutions and engage in co-creative design templates in the MK:Smart initiative in Milton Keynes. Against this backdrop, the stakeholder engagement pursued and the activities proposed at this stage should primarily aim to empower stakeholders to meaningfully participate in activities like scenario analysis in the proofing of ideas.

4.4. *The product/service development stage.*

This is the stage at which either pre-existing or bespoke technologies are selected for the development of a proven concept. Owing to the specialised skills required at this stage, there is a risk that the product or service being developed becomes the preserve of a select group of technocrats, i.e. programmers, software and hardware engineers, and data scientists. This group is often viewed as value-neutral and ethically compliant (Tsamados et al. 2019). However, it is essential at this stage to scrutinise several issues including but not limited to assumptions and ontological biases inherent in specific devices being deployed in the product development. This is significant considering the ethical biases found in decision-making algorithms in several domains, as one interview participant conceded that 'the modern AI techniques like deep learning tend to be very opaque ... you just crunch big data and identify patterns which can be biased because the dataset itself is biased' [manager of smart city initiative]. Indeed, examples of such biases have been reported in the criminal justice system where the likelihood of a person of colour reoffending was predicted by an algorithm based on the criminal histories of their friends (Richardson, Schultz, and Crawford 2019; Tsamados et al. 2019).

Such ethical issues can be deliberately or inadvertently carried over into the development of Smart City technologies, especially those procured from third parties (Richardson, Schultz, and Crawford 2019). Thus, drawing on the concept of technological sovereignty (Lynch 2020), the neutrality of the tools and existing technologies assembled and the 'objectivity' of multinational corporations who build the supporting infrastructure are challenged in our co-creative framework. Thus, although few stakeholders will be equipped with the technical skills needed to contribute to the practical development of proven Smart City ideas and concepts, Smart City promoters should encourage and

empower more stakeholders to still engage with this stage of the development process by encouraging them to question the logic behind depoliticised and normalised activities in product or service development in Smart City discourse (Vanolo 2014), and asserting their 'right to an explanation' regarding algorithmic processing of Smart City data and automated decision-making (Edwards and Veale 2018).

One of the ways such structural biases can be challenged, as Tsamados et al. (2019) suggest, is for 'the model developed for the technology, the datasets, and metadata used in developing the algorithms to be published for external scrutiny' (p.12). This call should not be made only after technology solutions and products are fully developed but at every critical juncture within the technology development process. As a precedent for this, a recent study examining engagement strategies in three Canadian communities under the Smart City Challenge demonstrated how a community invited a software developer to explain the logic behind the software for a Smart City Challenge they entered (Goodman et al. 2020).

4.5. *The testing or demonstration stage.*

At the testing stage, the development of the Smart City technology or application is complete and ready for testing or demonstration. Having subjected the technology development process to stakeholder scrutiny, stakeholder engagement that aspires towards greater stakeholder involvement and control over decision-making will at this stage entail encouraging stakeholders to use the Smart City technology or applications co-developed with them and to give their feedback to make improvements. Alluding to this, one interview participant observed that 'local people are very entrepreneurial in the sense that they are more than happy to be guinea pigs in trials of new systems and technology'. There is growing evidence that engaging stakeholders at the testing stage and gathering their feedback can substantially improve Smart City solutions (see Wilson, Tewdwr-Jones, and Comber 2019 for how citizens used smartwatches to report urban planning problems in Newcastle, UK). Also, as the engagement process becomes heavily technical and technology-led, citizens are often kept in the dark regarding crucial issues such as who will own the data to be generated during the trial phase of the Smart City technology solution. Thus, at this stage, engagement should be orientated towards empowering stakeholders to obtain information about the performance of the Smart City technology solution during the trial phase, about how their feedback will be used to improve the smart technology, and about the use and storage of the collected preliminary data.

4.6. *The deployment and operation stage.*

The deployment and operation stage is where the results from the trial phase of the co-created technology solution – including how the technology functions in real-life scenarios, its user-friendliness, design challenges and feedback from stakeholders – have been considered and used to improve the final Smart City technology solution. Smart City promoters must provide stakeholders with evidence of how their feedback has informed the development of the final Smart initiative to be deployed. Ahead of the deployment, it is expected that Smart City promoters will inform stakeholders regarding where the technology is going to be deployed, when and how. Stakeholders would also need to know how any deployed technological device can be identified. This will require consistent labelling and relevant contact details which stakeholders can easily access to report issues.

Also, stakeholders should be informed about what data the Smart City technology will collect, who will own the Application Programming Interface (API) and where it will be based, what rights third parties will have over the data collected and what possible derivative uses of the data are intended. In some cases, stakeholders must be informed about the frequency of the data collection, the deployment period, the expected life span of the Smart technology, and its maintenance cycles. For example, for Smart City projects such as digital twins which rely on different sensors for data collection, visualisation and decision-making (Lu et al. 2020), stakeholders would need to know the relationship between data collection, back-stage processing and automated or actioned decision-making. After the deployment, Smart City promoters should inform stakeholders that the deployment stage is complete and operations have begun. This will raise public awareness of the project and potentially arouse stakeholder interest in tracking the delivery of co-created Smart technology.

4.7. Decommissioning stage

Smart City projects often begin as experiments or demonstrator projects that last for a specific period and are tied to finite funding pots (such as Milton Keynes' *MK:Smart* or Manchester's *Cityverve* and *Triangulum*) (c.f. Future Cities Catapult 2016). They could also become embedded and wrapped around the delivery of city services by local authorities and other institutions such as the police service, fire service, the NHS and departments of transport (e.g. Smart Cambridge's open data portal, *Cambridgeshire Insight*, and Bristol's *Operation Centre*). The consideration of trial and demonstrator projects that do not continue into perpetuity (which rarely happens in practice) allows for reflection on stakeholder engagement during the decommissioning stage.

At the decommissioning stage of the Smart City life-cycle, there is a need to provide stakeholders with detailed information as to how the project will be decommissioned, when, and by whom. If the project was delivered through a partnership involving city authorities and private-sector companies, stakeholders must be provided with information related to the ownership of legacy assets. This is also the stage where Smart City promoters extensively document their experiences, lessons learned and best practices. Indeed, following 'the right to the city' (Harvey 2003), Smart City promoters must explore different mediums through which such evaluation can be communicated and accessed. This will involve using different forms of media (traditional print media and social media) and information packaging (textual, graphical, audio-visual etc). Here, concise communication of project learning in a non-technical language is key to reaching out to a wide audience.

Also, even if projects were funded externally, efforts should be made by Smart City promoters to enable transparency about how much money was spent on the entire project, especially expenditure related to stakeholder engagements, and what commitments came from local authorities. This information holds the potential to improve public confidence in the extent of stakeholder engagement activities undertaken throughout the project. Also, project outcomes such as promising business cases, new collaborations and partnerships and the next steps for the project should be reported in the evaluation (Balestrini et al. 2017). Finally, Smart City promoters must gather stakeholder feedback on the efficiency of the Smart City technology solution in tackling the city problems for which it was co-created. All information about the project should be archived both electronically (e.g. on a dedicated website or portal) and in print (e.g. in a public library) for reference by the public.

In some cases, legacy assets from trial or demonstrator projects, including investments in hard and soft infrastructure such as electric vehicle charging points or collaborations, can become resources for new Smart City initiatives. In such circumstances, Smart City promoters need to inform stakeholders about the transition, changes in governance arrangements and operational models as part of decommissioning engagements.

Table 1 summarises the key stakeholder engagement issues and features at each stage of the proposed Smart City life-cycle framework.

5. Discussion and conclusion

Given that the proposed framework challenges several established ideas around stakeholder engagement in Smart City initiatives, there are pertinent issues that need highlighting to facilitate the implementation and inform practical application of the framework. In this section, we discuss four of these issues.

5.1. Funding

Under the current systems of funding, meaningful co-creative engagement is difficult to achieve. Indeed, regardless of whether they have a democratic mandate, funders of Smart initiatives influence decisions around who is engaged, how they are engaged, and the objectives and timescale for engagement (Cardullo and Kitchin 2019b). Funding can be difficult to acquire, and often requires intensive efforts which demand extensive time and resources, meaning that most funding applications come from organisations that make up the triple helix model, namely, universities, technology companies, and local government (ibid.). Developing such applications is already expensive and involves time-consuming collaboration between expert actors – adding stakeholder engagement with non-experts to the mix could complicate the process further, making it more expensive, and is therefore often avoided until after the technology solution has been developed. At this stage, funding will already have been earmarked for a specific type of project with defined goals, and any stakeholder engagement which subsequently occurs will not give stakeholders the freedom to identify the concerns they wish to address in a meaningful way (Cardullo and Kitchin 2019b).

Thus, the co-creative form of stakeholder engagement will require funders to rethink stakeholder engagement not as a superficial exercise but as the keystone in any proposed strategy to solve city problems. We contend that people can meaningfully engage with every aspect of the Smart City development process when they are empowered to do so (Goodman et al. 2020). This should therefore translate into setting up funding specifically devoted to co-creative stakeholder engagement and ensuring that all key stakeholders have been engaged and that outputs reflect local knowledge, experiences and priorities (Whitman, Lafayette, and Roark 2018). This could be done in a variety of ways. For example, interviews with Smart City experts indicate that allocating initial funding for stakeholder engagement during the development of proposals themselves is integral to allow for stakeholder engagement during the problem-framing stage. Alternatively, making meaningful stakeholder engagement with non-experts a requisite of funding applications within mainstream funding options could be a step in the right direction.

As we have shown, funding is closely linked with power and agenda setting (Cardullo and Kitchin 2018) and sometimes it is not clear who is setting the agenda at the grassroots level. Hence, another option that steers away from the current mainstream funding channels would involve leveraging alternative funding options, such as crowdfunding to

support grassroots organisations of non-expert stakeholders to bring forward and implement solutions to the urban issues which matter most to them (Carè et al. 2018).

5.2. *Understanding the city and its challenges from multiple stakeholder perspectives*

Challenges facing cities are neither static nor equally shared by all. Also, identifying the city problems and those most affected cannot be determined solely by city leaders. Thus, it is important to consider that elected city leaders may struggle to understand and represent the evolving interests of their constituents and businesses and interest groups in their local areas. Hence, collaborative planning (Healey 2003) and participatory governance (Levenda et al. 2020) become beneficial and ensure that democratic decision-making is followed. This also underscores why it is necessary to extend the problem-framing to wide-ranging city actors, especially those not included in the triple helix model to avoid homogenising city problems. In seeking to empower stakeholders, it is important to create room for stakeholders to consider and discuss who owns the city (Sassen 2015), who has rights to do what (Harvey 2008), in what places (Mitchelle 2003), and how the decisions taken over Smart City initiatives might shape these considerations going forward.

5.3. *Promotion of digital rights.*

Balestrini et al. (2017) suggest that there is a view that Smart Cities are technical concepts and people experience difficulties in understanding technical concepts. Hence, to better enable city stakeholders to demand an explanation of the ontologies underpinning digital technologies or proprietary algorithms used in their data collection and processing (Edwards and Veale 2018), the ‘digital rights’ of people, including the right to be forgotten on the internet, the right to be unplugged, the right to protect one’s integrity from technology, and the right to transparent and responsible usage of algorithms need to be widely communicated (Calzada et al. 2021). This might require oversight by legislators and regulatory officials given that ‘the city is increasingly reproduced through digital information’, by powerful actors (typically large technology companies) who influence how digital information is collected, shared, and used, and also have considerable influence over the reproduction of the city itself (Shaw and Graham 2017, 908). Thus, improving opportunities for stakeholders to engage co-creatively at the technical stages might come in the form of enacting and widely disseminating legislation and regulatory standards that first empower stakeholders to assert this right while simultaneously holding technology companies to a higher standard of ethical scrutiny in terms of how data is obtained, processed, analysed and supports decision-making (Kitchin 2016).

This poses challenges, especially where legislators may not fully understand how algorithms work, as recent enquiries by lawmakers in the US and UK following the Facebook papers show (Maruf 2023). Nonetheless, progress has been made in this area, as exemplified by the guidelines designed by national and international organisations such as the European Group on Ethics in Science and New Technologies, the UK’s House of Lords Artificial Intelligence Committee, and the OECD principles on AI (Tsamados et al. 2019).

5.4. *Making stakeholder engagement meaningful*

As previously highlighted, stakeholder engagement has all too often been used as a tick-box exercise to legitimise the decisions which have been taken, while stifling the

democratic process (Levenda et al. 2020). This should however not be the case as the New Urban Agenda has underscored the importance of engaging different urban stakeholders in new urban visions to promote a sense of belonging and achieving prosperity for all (see United Nations 2017). Questions remain over whether the proposed framework may be used similarly by project leaders going through the motions of stakeholder engagement without any real commitment to co-creation. Importantly, the proposed framework for stakeholder engagement is not in itself a blueprint for democratic engagement. However, the framework emphasises the need to ensure that stakeholders' voices are heard at each stage of the project life cycle and therefore can contribute to the process of shaping the city through the Smart City project. The framework will only work if there is space at every stage of the process for disagreement and debate, and if efforts are made to broaden the scope for non-triple helix model actors to take an active role in decision-making. This will require an acceptance of the fact that agenda may differ and power unequally distributed among stakeholders. Hence, negotiating reasonable compromises remain essential to implementing each of the seven stages. This is likely to present challenges to the different stakeholders, but this should not lead to discontinuing the engagement process. Indeed, various actors are typically involved in delivering smart city projects, including local authorities, tech companies, and civil society, and each will have their own agendas for smart projects, and how these multiple concurrent agendas are managed and negotiated in practice will require careful consideration.

As such, in setting out a framework for how stakeholder engagement can be understood and implemented throughout the life-cycle of a Smart City project, this paper builds upon and fills a key gap in the existing literature. This framework for stakeholder engagement holds possibilities for improving engagement and debate throughout the life-cycle of Smart City projects, thereby enhancing opportunities for such projects to meet the needs and expectations of a diverse stakeholder base. Translating this framework into practical application would require project commissioners having responsibility for city governance to oversee its application whilst avoiding dependency on a singular stakeholder like a large (technology) corporation the pursuit of whose interest may result in lock-in and exclusionary effects. Accordingly, we invite practical applications of the proposed framework to further improve the framework.

Notes

1. This report can be accessed via this URL: <https://www.bsigroup.com/globalassets/localfiles/en-gb/smart-cities/resources/bsi-making-cities-smarter-guide-for-city-leaders-summary-of-pd-8100-uk-en.pdf>
2. This report can be accessed via this URL: <https://www.bsigroup.com/globalassets/localfiles/nl-nl/smart-cities/resources/bsi-smart-cities-report-the-role-of-standards-in-smart-cities-uk-en.pdf>
3. Different global rankings of smart city exists and each uses different metrics for the index and apply different weights to specific smart city verticals. Examples of such index includes IMD's Smart City Index 2020.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The author(s) disclose receipt of the following financial support for the research, authorship, and/or publication of this article: This research forms part of the Centre for Digital Built Britain's (CDBB) work at the University of Cambridge within the Construction Innovation Hub, which brings together world-class expertise from the Manufacturing Technology Centre (MTC), BRE and CDBB to transform the United Kingdom construction sector. The Construction Innovation Hub is funded by UK Research and Innovation through the Industrial Strategy Fund under Grant Number RG96631.

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