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Changing the Rules of Play in Long Beach, California: Smart Cities, Infrastructure, and the Well-Played Game

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ABSTRACT

Drawing on insights from focus group interviews (n = 82) conducted during the development of Long Beach, California's Smart City Strategic Initiative (SCSI), we examine the extent to which the four guiding principles of the SCSI correspond to Long Beach residents' perceptions and concerns about the smart city: design for equity; earn public interest; cultivate local expertise; build civic resilience. Participants expressed widespread wariness of the fairness of smart city technologies. We find that Bernard De Koven's theory of the well-played game constitutes a promising framework for the fair deployment and maintenance of smart city technologies. Based on De Koven's work and participant insights, we provide a series of empirically-grounded and theoretically informed implications for design intended to leverage the collaborative spirit of play communities in the design of smart cities.

1. Introduction

Cities are more than mere places on a map or bundles of infrastructure in grids and wire. They are the backdrop of their residents' lives. This is where we begin: at the meeting point of technology and daily life. We present the story of a few moments in time, repeated with steady frequency, as they transpire on a particular street in Southern California.

1.1. A particular street, a changing city

Third Street is a major artery in downtown Long Beach, California. During the morning rush hour, it might as well be part of the infamously busy 710 Freeway. Cars travel bumper-to-bumper for miles. Traffic lights punctuate the flow, turn signals blink incessantly.

Third Street's wide sidewalks bustle with professionals, students and displaced homeless residents. Many on their way to the businesses, parking garages, parks, and apartment buildings lining the road. They all pass by neatly spaced street lamps, which are smart in a rudimentary sort of way.

Each street lamp is equipped with sensors cuing it to turn on and off depending on the amount of ambient light detected. The sun goes down, the lights turn on; the sun comes up, the lights turn off. Actually, however, they are easily confused. At dawn and dusk, this row of street lamps blinks in a decidedly undecided way and in tandem, like the city tapping the snooze button or fighting to stay awake; like the city between two states of being.

In the twilight, the lamps' performance demonstrates a form of techno-historical bardo: between the city and the smart city; between a known infrastructure and an emergent one. It is

within this shift – this infrastructural state change – that the present paper finds its focus. As cities morph into smart cities, the lights flicker, and residents experience that flicker. It becomes part of their daily lives. But this state change is about much more than lights. It is about the city: the heterogeneous set of infrastructures, devices, and people who live their daily lives according to its possibilities and implicit rules. It is about imagining the future mundane even while engaged in a process of building infrastructure and altering the rules of daily life.

1.2. Goals and framework

The means by which smartness is negotiated and deployed in cities, like rules in a game that is changing (De Koven, 2013), will bound the social imaginary (Taylor, 2004) of the city and therefore the daily lives of its residents. By exploring the concept of the play community and the processes by which old games are made new – processes of negotiating and renegotiating the rules of play – we leverage the theory of play put forth by De Koven (2013) in order to contextualize and understand the concerns that emerge as Long Beach city government and Long Beach residents navigate life on the precipice of smartness. In this way, we propose a playful but quite serious framework for understanding the development of smart cities as a process by which the rules of a game are renegotiated equitably amongst its players. We do so specifically in relation to theories of infrastructure, which serve as a common and problematic foundation for smart city design and deployment.

Our analysis is motivated by three research questions: **RQ1**: How might theories of play allow novel negotiation of

power among governments, technologies, and residents within the context of emerging smart cities? **R2**: Can we use the concepts of 'the play community' and 'new games' to examine and theorize a community-centered approach to smart city development? **RQ3**: How do Long Beach residents' concerns and expectations provide further nuance to the four guiding principles articulated in Long Beach's Smart City Strategic Initiative?

To answer these questions, we analyzed participant responses (n = 82) from focus group discussions meant to gauge Long Beach residents' comfort levels with and attitudes toward various technologies being deployed by the city. Through processes founded in the work of Glaser and Strauss (2017), including constant comparison (Glaser, 1965), we analyze participant responses according to a rubric that mirrors four guiding principles laid out in Long Beach's initiative: (1) design for equity; (2) earn public trust; (3) cultivate local expertise; (4) build civic resilience.

We find that participants' opinions, beliefs, and concerns about smart city technologies can be readily interpreted as issues of fairness, collaborative game play, and with the community-centered theory of play and games put forth by Bernard De Koven (2013) in his work, *The Well-Played Game*. We further posit that using such a theoretical lens constitutes a meaningful and productive mode of fostering a sense of ongoing community and resident-oriented collaborative action between smart city initiative stakeholders that eliminates the uneven power distribution implicit in the concept of infrastructure.

Through presentation and discussion of our findings, we make two main contributions. First, we contribute a sociotechnical, theoretical framework grounded in a humanistic theory of games and play that is suitable for structuring productive and community-centered perspectives on smart city design and maintenance. Second, we provide a set of implications for design grounded in the theory of play that can form a foundation for a collaborative and open process of smart city building between governance and citizenry.

2. Background & related work

On October 22, 2019, Long Beach Mayor Robert Garcia directed staff to develop a smart city strategic initiative and guiding priorities for that initiative. In his directive, the mayor noted that local government agencies already leverage technology for functions related to public safety, park and street maintenance, economic development and educational opportunities (Garcia, 2019). In order to improve efficiency and manage complex city operations, Long Beach relies on information and communication technologies (ICT) and Internet of Things (IoT) technologies. For example, Big Belly trash cans alert the Long Beach Department of Public Works when they reach capacity and should be emptied; and a network of sensors gathers data on air temperature and ozone throughout city neighborhoods.

While these types of intelligent infrastructure are increasingly common, Mayor Garcia's directive stressed the importance of developing an intentional and "coordinated" approach for deploying emerging technologies in such a way

Table 1. Description of guiding principles.

Guiding Principle	Description
Design for Equity	Reducing historic inequities and disparities by ensuring technology advancements are accessible to all and improve quality of life for communities that have been historically under represented.
Earn Public Trust	Building public confidence through excellence in data privacy, data transparency, and community engagement.
Cultivate Local Expertise	Promoting place-based growth by supporting LB entrepreneurs and businesses, improving workforce job-readiness and building partnership networks.
Build Civic Resilience	Improving capacity to respond efficiently and effectively to meet the pressing civic challenges using data-informed decision making.

that "improv[es] residents' quality of life." He also highlighted the potential to solve challenges and "meet community-sourced needs" (Garcia, 2019). Significantly, the directive depicts smart technologies in idealistic terms – touting their potential to spur economic development, to make Long Beach safer, and to develop a resilient workforce.

The SCSI guiding principles (See Table 1) are the result of a collaboration between The City of Long Beach and a global consulting firm that helps design real estate, economic development and infrastructure plans for both public and private clients. These guiding principles were informed by extensive community engagement, including focus groups (Shaffer, 2021). In order to better understand how the SCSI's four guiding principles relate to extant theories of the smart city and potentially address resident perceptions of and concerns about the process by which Long Beach is becoming 'smart,' we ground them in the overlapping literatures of smart cities, the social imaginary, infrastructure, and play. We do so to surface novel and resident-centered approaches to framing and deploying smart city technologies.

2.1. Smart cities and this smart city

Although no singular definition of a smart city exists (Albino et al., 2015; Mora et al., 2017) we identify two prominent strands of classification. The first is technical; the second holistic. From a sociotechnical perspective, this dichotomy is initially productive but ultimately problematic. It primes an adversarial relationship between the technological and the human-centered.

The most parsimonious and productive definition of which we are aware is presented by (Ramaprasad et al., 2017) and neatly accounts for both strands identified by (Mora et al., 2017):

A Smart City is a compound construct with two parts, each of which is a complex construct. It can be represented as:

$$SmartCity = f(Smart + City)$$

Ramaprasad et al. (2017) break each component of this function down into constituent parts. The smartness of cities is achieved through a combination of structure, function, focus, and semiotics – essentially a process by which meaning, up to and including the fulfilling experiences of daily life, is made through the prosthetic processing of data and the communication of results to end-users. The city, on the other hand, is broken

down into stakeholders (e.g., citizens, professionals, communities, governments, etc.) and outcomes (e.g., sustainability, quality of life, equity, etc.). These are the end-users.

This approach to smart cities is flexible enough that it can account for the majority of contemporary approaches (e.g., Fernandez-Anez et al., 2018; Ruhlandt, 2018; Townsend, 2013). It is worth noting, however, that the simplicity of the equation presented above, while productive for theorization, requires further specificity. The component, 'smart,' for example, alludes to a complex assemblage of actants. These include not only technologies – the specific devices added to a city to effect its smartness – but also those institutional actors responsible for the design, deployment, and maintenance of such technologies. These often-hidden stakeholders constitute an important component of the greater discourse of smart cities (Ramaprasad et al., 2017); however, as we will demonstrate in subsequent sections, the resident- and government-centered approach taken in Long Beach warrants an investigation that mirrors its own structure. We address the need to expand analysis to include corporate and non-governmental stakeholders in subsequent analyses in Limitations and Future Work.

The majority of HCI-oriented scholarship on smart cities focuses on their technical aspects (Bardzell et al., 2019; Papangelis et al., 2020). This technical approach generally refers to city governments that rely on technology and innovation to improve infrastructure, increase equity, and bolster quality of life (Washburn et al., 2009). According to this framework – which is both "technocratic and top-down" (Cardullo & Kitchin, 2019) – technologies link critical infrastructures and services. Officials then employ predictive and diagnostic analytics so that they may learn from data generated by these critical sectors. Ideally, this integrated approach maximizes efficiency, responsiveness and sustainability of city services (Chourabi et al., 2012; Hall et al., 2000; Harrison et al., 2010; Kanter & Litow, 2009), entrenching the concept of the smart city in the techno-solutionist tropes of convenience and efficiency (Dinh & Kim, 2016; Nolin & Olson, 2016; Sundmaeker et al., 2010). But there is much more to civic community life than the optimization of efficiency, convenience, and consumerism. These tropes form part of residents' 'quality of life,' but this quality of life is by no means fully reducible to efficiency, convenience, and heightened consumer efficacy.

Given the discursive uncertainty of 'smart cities' within the literature, as well as the complexity of the relationship between 'data' and 'city' (McMillan et al., 2016), we more narrowly frame our discussion by turning to Mayor Garcia's October 22, 2019 directive. After providing what is ultimately a resident-centered description of technology's role in Long Beach (described above), Mayor Garcia goes on to describe a conceptual frame for 'smart city:'

> As technology continues to evolve, leading cities across the country and world are developing effective strategies to adopt advancements in technology, information management, and user centered design to improve quality of life for their residents, catalyze economic development, improve public safety, and build a resilient workforce. These initiatives are commonly referred to as "smart city" programs (Garcia, 2019).

It is both notable and commendable that Mayor Garcia explicitly mentions 'improve[d] quality of life for their residents' as a feature of smart cities. Moreover, Mayor Garcia resists the tendency to over-empower technology or to frame the smartness of a city in purely technological terms. He writes:

> Through a smart city strategic initiative, Long Beach will develop a more coordinated approach to propose, design, and pilot smart city solutions that address existing City challenges. This approach will prioritize improving residents' quality of life through both technological and non-technological solutions while also protecting residents' privacy and digital rights (Garcia, 2019).

From this language, several characteristics of Long Beach's incipient smartness emerge. First, there is an expectation that smart city infrastructure will relate to and alleviate extant 'City challenges.' This is part-and-parcel with the techno-solutionism that generally characterizes the concept of the smart city. But it is far from naive: the second characteristic that emerges is an awareness that the technological and the non-technological exist side-by-side. In this way, Long Beach's SCSI implicitly acknowledges that the users of smart city technologies are not merely users. Rather, their adoption of technologies co-constitutes their status as residents and bounds their expectations of daily life. Where residents are not merely users, we identify a need to explore the relevance of humanistic theories for understanding the design and deployment of Long Beach's SCSI.

2.2. The imaginary of the smart city and its infrastructure

A city's placeness (Tuan, 1977) is comprised of the 'values and cultural and historical profiles' of the city (Allam & Newman, 2018). But placeness also emerges in the mundane: 'Smells, tastes, things, and bodies from all nooks and crannies of the world are floating by, consumed, displayed, narrated, visualized and transformed' (Swyngedouw, 2006). Technologies have unexpected impacts on placeness – from changing the nature of conversation in pubs (Su & Wang, 2015) and transforming public parks into ad hoc internet cafes (Dye et al., 2017) to the creation of 'virtual,' but no less real, spaces for play (Ringland, 2019). In this section, we consider the commonly deployed lens of infrastructure as a means of understanding how smart city technologies might impact the placeness of Long Beach and therefore residents' daily lives.

Infrastructures, up to and including information technologies (Star & Bowker, 2006) such as those comprising components of a smart city, are large-scale technological systems that form the naturalized and routinized backdrop of daily life (Edwards, 2003). While infrastructure studies traditionally fall within the purview of science and technology studies (STS), the infrastructure lens contributes much to HCI. Specifically, it offers a theoretical framework for understanding negative (Keith Edwards et al., 2010) or absurd (Seberger & Bowker, 2020) user experience or hard-to-access and underrepresented populations (Ahmadi et al., 2020; Jack et al., 2017) and the role of technological platforms in the standardization of social norms (Alaimo & Kallinikos, 2019). Infrastructure helps explain the complexities and values of end-users (Ahreum Lee et al., 2019; Zhou & DiSalvo, 2020). It has also emerged as a primary mode of understanding smart cities (Goodspeed,

2020; Sadowski & Pasquale, 2015), as well as a hopeful analytical lens within the realm of speculative design (Wong et al., 2020). But there is a limit to infrastructure's conceptual relevance to the design of smart cities, which is grounded in the temporal characteristics of infrastructure itself.

In their canonical paper, Star and Ruhleder (1996) identified eight key characteristics of infrastructures. These characteristics have received detailed attention in the realm of HCI and design (e.g., Karasti & Blomberg, 2018; Karasti & Syrjänen, 2004; Pipek & Wulf, 2009). Here we focus on two of them. First, successful infrastructures are transparent (Star & Bowker, 2006). The 'hopeful monster' (Law, 1991) of the smart city and its designers are ultimately engaged in a disappearing act: to realize the smart city as the transparent means through which actors move through daily life in the city. That which is the focus of design, development, and deployment now aspires to be the focus of nothing later: successful infrastructures, like successful technologies (Weiser, 1999), become (mostly) invisible (Seberger & Bowker, 2020).

Second, infrastructures are learned through membership (Star & Bowker, 2006; Star & Ruhleder, 1996). This speaks to the received nature of infrastructure – a temporal-grammatical facet of infrastructure that is often overlooked. Although infrastructure is often discussed as primarily relational (Wong et al., 2020) – and indeed it is (Bowker et al., 2009) – its relationality obfuscates its core temporal condition: infrastructure is received. The relationality of infrastructure emerges from its temporal condition, which constitutes a wholly separate ontology from that of the human (Bowker, 2015). While it gives rise to sets of potential relationships, those relationships are always already bounded by the state in which infrastructure realizes itself *as infrastructural*. While infrastructure is indeed relational, it is also constitutes a defined and limited set of possible relations. This emerges as a central confound to the shift toward 'infrastructuring' within infrastructure studies (Le Dantec & DiSalvo, 2013; Karasti & Blomberg, 2018; Karasti & Syrjänen, 2004). Even where the design and maintenance of infrastructure is shifted into a persistent present tense – that of the gerund – it has as its end goal an infrastructure, which carries with it the core temporality of 'always already.'

Thus, we arrive at the core problem of this paper, and the motivation for RQ1. We need an analytical framework for understanding the processes by which the smart city emerges as a potential mode of daily life, but one that does not rely on the received power relationship between governance, infrastructure, and resident nor the techno-solutionism that defines much canonical smart city research. We find such a framework in Bernard De Koven's work on play (De Koven, 2013). In the following section, we focus specifically on his understanding of what it means to negotiate the rules of a game. We contend that the playful negotiation of rules constitutes a mode of relating and collaborating that is not subject to the problematic temporality of infrastructure in which, inevitably, the assemblage of the smart city solidifies into a stable and non-negotiable power structure.

2.3. Changing the rules

In constructing the foundations for our second and third research questions, we turn to the work of Bernard De Koven. This work (De Koven, 2013) has already received attention in the HCI community (Garner & Wood, 2014; Innocent, 2016; Wood, 2014). However, prior research approaches De Koven's work from the point of view of an insider. Our goal here is to provide an introduction and thereby facilitate an understanding of the generative relationships among play communities, new games, and smart cities from the ground up.

Bernard De Koven was a primary figure in the New Games movement of the 1970s. This movement, based around the New Games collective founded by Stuart Brand, focused on two key aspects of gaming (among others): community and novelty (De Koven, 2013). In particular, De Koven's own work engaged with the meeting point of these dual concepts. In his monograph, *The Well-Played Game*, De Koven theorizes the collaborative and community-driven process by which the rules of a game can change. Where infrastructures provide the tacit rules of everyday living, we see engagement with this work as an opportunity to inform the process of transforming from city to smart city in a way that understands the smart city as an ongoing, collaborative community of heterogeneous actors.

Of the novelty of games, De Koven writes:

> The games were called 'new' not because people had never played them before but because they were kept new by the ways in which they were played. Whatever rules there were, they were only the starting point, the introduction to the game. They described not how the game had to be played, but rather how the game *could* be played. People played the games the way they wanted them to be. That was the understanding that made the games 'new.' (De Koven, 2013, p. 113)

In this sense, the smart city is a new game. City residents have always played the game of life according to the rules of the city and the imaginary it forms. They have resided through and by means of the infrastructure of the city. The impending or incipient smartness of the city, however, constitutes a change in the rules. Yet this change comes from the top-down, necessitating careful and curious engagement with a city's citizenry.

The formalist definition of smart cities (Ramaprasad et al., 2017), $f(Smart + Cities)$, provides an outline for this new game's starting point. The myriad interactions and flows between the complex components of both 'smart' and 'cities' each constitute a variation on the theme of potential daily life in a placeness that is also a smart city. In Long Beach, California, Mayor Garcia has further outlined some of the initial rules of this game. These rules manifest in the guiding principles previously described.

But because smart cities are ostensibly infrastructural, the smart city is a new game that ultimately aims to solidify as an old game. To create an infrastructure is to create a received condition of living that transcends the temporality of its building. Its newness emerges in the processes and hopefulness of designing infrastructure even while overlooking the fundamental temporality of that which is designed. Its staleness waits in the wings of the actual realization of infrastructure.

We contend that a smart city framed in terms of its potential positive outcomes is not an infrastructure at all –

not in the traditional sense. In its hopefulness, the smart city emerges as proto-infrastructure that when realized, should be a platform for variability and personalization, not a finished, received, or transparent infrastructure. It should allow its users to enhance their quality of life according to their own definition thereof; to play the game of city life according to the rules that best suit them, where the malleability of rules is fostered by the modularity of smart city components. When the 'city' component of f(smart + city) is understood foundationally as not only a community, but a play community, the apparent naivete of the proto-infrastructure recedes:

> There is a very fine balance between play and game, between control and release, lightness and heaviness, concentration and spontaneity. The function of our play community is to maintain that balance, to negotiate between the game-as-it-is-being-played and the game-as-we-intend-it-to-be. It is for that reason that we maintain the community (De Koven, 2013, p. 40).

At the core of the play community, De Koven identifies the concept of playing well. These two concepts are intertwined. The dyadic constellation of the play community and playing well is central to the proto-infrastructural smart city – a smart city that is created through the lens of infrastructure, but aims toward negotiation and flexibility rather than rule-keeping and rigidity:

> So the definition of playing well is the result of an ongoing process of negotiation and renegotiation. It changes as we do, sometimes drastically, sometimes subtly (De Koven, 2013, p. 41).

In contrast to its smart future placeness, Long Beach exists currently as the 'game-as-it-is-being-played.' As demonstrated by Mayor Garcia's deft directive, this game can be improved. The means by which such improvement – such negotiation of new rules – will be achieved, are outlined in the four guiding principles of the SCSI. New rules will emerge through the lenses of equity, trust, local expertise, and resilience. These principles are not silos and may overlap. To play the game of the smart city well is to maintain lines of negotiation and renegotiation between governance and citizenry. Playing the game well, whether the rules are well-meaning or not, requires a community of play. Collaboration is core to such a community.

Yet, with the rapid design, development, and deployment of technologies, it is easy to get caught up in negotiation and renegotiation:

> Then there is the time when we become so fascinated by our power to change the game that we tend to get carried away by it all. We become so intent on celebrating our newly regained authority that all we want to do is change rules. We never keep the same rule for longer than five minutes. We change everything: sides, scores, balls, language, clothes. You name it, we change it (De Koven, 2013, p. 45).

As the category of smart proto-infrastructural technologies expands so too does the possibility of continual top-down renegotiation. With every addition of a smart technology to the city's repertoire, the rules of the game change. To live in a time of rapid technological development is to live in a time of changing rules. Where this has been demonstrated to give rise to creepy affective experiences (Shklovski et al., 2014), absurd experiences (Seberger & Bowker, 2020), and is

contextualized by an increasing sense of digital resignation (Draper & Turow, 2019), the smart city community as game community must be founded in open and collaborative communication. It must include channels enabling residents – not only governance – to engage in the process of negotiating the rules.

But open and collaborative communication does more than foster equitable renegotiation of the rules. It also fosters and supports another aspect of the play community described by De Koven. This is the aspect of care, which De Koven describes in terms of his own games preserve:

> That's another thing I like about this place, the caring that has made it last [....] As long as it's a place that's cared for, a place where there are people who care. As long as it's built and created and changed to help us be a play community. As long as it becomes the way we want it to become (De Koven, 2013, p. 110).

The novelty and community of the smart city is already apparent in the language Mayor Garcia used to frame Long Beach's SCSI, as well as in the four principles guiding the SCSI. What remains to be seen, however, is the extent to which such language and the guiding principles are externally valid: the extent to which residents perceive them as real and meaningful as a top-down renegotiation of the rules of city living impacts their daily lives. As De Koven writes, the empowerment that resides in the ability to change the rules of any game must be distributed across the members of its community:

> By empowering each other to create new conventions, by establishing guidelines, we assure each other of a common intention and mutual respect for the willingness to play, for the need for safety and trust. We need to recognize that these guidelines are fragile and fictitious, despite all the legislation we went through to be certain they were mutually held. The only real assurance we have lies within the community of people with whom we are playing (De Koven, 2013, p. 11).

In the next section we describe the data and analytical methods that allow us to address this concern in a systematic and empirical way. Following the presentation of our findings, we return to the work of De Koven and the literature of infrastructure studies to discuss the implications of our findings. We then provide several implications for design.

3. Method

In this section, we describe the focus groups and survey data that we analyzed in order to understand how the four guiding principles of Long Beach's SCSI are reflected in residents perceptions of and concerns about their city becoming 'smart.'

3.1. Data collection and demographics

A coauthor of this study drafted the focus group prompts and co-facilitated seven focus group discussions, in which 82 people participated. Focus groups were assembled on a naturalistic basis through outreach with a range of Long Beach residents. Both authors of this paper were long-time residents of Long Beach at the time of data collection,

analysis, and writing. Given our own epistemological tendencies toward constructivism, we relied on our knowledge of the city's composition to inform our selection of focus groups. We engaged with established social groups from different strata of the Long Beach community as a means of ensuring the inclusivity of our sample (i.e. philanthropic organizations, condo-owners associations, social activists, Rotary Club, etc.).

Focus groups were conducted between November 7, 2019 and July 17, 2020:

Smart City Fest: This focus group discussion was held in-person on Nov. 7, 2019 during the Long Beach Smart City Fest. Five event attendees participated. They were recruited in person during the conference, when one of the researchers made an announcement about the discussion planned for that afternoon.

Gray Panthers: Two focus groups were held in-person on March 7, 2020 during a regular meeting of the Long Beach Gray Panthers, an alliance that provides education and advocacy on social justice and policy issues affecting older adults. Twenty-eight attendees participated. City of Long Beach staff reached out to Gray Panthers leadership, who agreed to host a focus group discussion during a regularly scheduled meeting.

Downtown Condo Residents: This focus group discussion was facilitated in-person on March 14, 2020. Eleven neighbors, all working professionals, who own units in the same downtown condominium building participated. About a month earlier, one resident had attended a community meeting where researchers disseminated a data privacy survey. This resident recruited her neighbors and suggested a date for the focus group, which took place on the building's roof deck.

Rotary Club: This focus group discussion was facilitated via Zoom on April 29, 2020 during a meeting hosted by the Long Beach chapter of Rotary International, a network that brings together business leaders for social action and community-building activities. Twenty-three members participated. City of Long Beach staff reached out to Rotary leadership, who agreed to host the discussion during a regularly scheduled meeting.

Latinx Youth Group: This focus group discussion was facilitated via Zoom on May 21, 2020. Seven young adults (between the ages of 15 and 25) who aged-out of a program for low-income kids but continue to meet weekly, along with one adult advisor, participated. A researcher reached out to the director of Downtown Associated Youth Services, a Long Beach nonprofit that works with young people. The director recruited participants.

YMCA Counselors: This focus group discussion was facilitated via Zoom on July 17, 2020. Seven high school students working at a YMCA summer program participated. YMCA leadership recruited participants at the request of City of Long Beach staff.

All focus group participants were asked a core set of open-ended questions intended to elicit population-specific responses and provide the impetus for more detailed conversation. (See Appendix A.) Focus groups were allowed to diverge from responses to prepared questions in order to gain a rich sense of each group's beliefs, opinions, and concerns. Participants were members of a wide variety of communities, including but not limited to older folks/seniors (e.g., Gray Panthers), Latinx youths (e.g., Latinx Youth Group), and

Table 2. Description of focus groups.

Focus Group	Description
Smart City Fest	The five event attendees who participated in this focus group discussion, held in-person on Nov. 7, 2019, had close ties to the tech industry.
Gray Panthers	Twenty-eight older adults participated in two separate focus groups held in-person on March 7, 2020.
Downtown Residents	Eleven working professionals who live in the same downtown condo building participated in this in-person focus group discussion on March 14, 2020.
Rotary Club	Twenty-three business leaders participated in this focus group discussion facilitated via Zoom on April 29, 2020.
Latinx Youth Group	Seven young people between the ages of 15 and 25, and an adult advisor, participated in this focus group discussion facilitated via Zoom on May 21, 2020.
YMCA Counselors	Seven high school students working at a summer program participated in this focus group discussion facilitated via Zoom on July 17, 2020.

high school students (e.g., YMCA Counselors). (See Table 2 for a full description of focus groups.)

Focus groups were chosen as a method of participant interaction for two reasons. First, the characteristic of focus groups allow for interactions with subsets of larger communities rather than individuals. As we theorize that the smartness of a city is first and foremost a community-derived phenomenon, this approach appeared as methodologically germane. Second, our focus on potential synergies between infrastructural theories of smart cities and De Koven's (2013) theories of play warranted the avoidance of rigidly structured interviews or surveys. Because play can be interpreted as a process of exploratory sense-making wherein rules are negotiated ad hoc (De Koven, 2013), we chose to deploy play as a performative aspect of our study design in the form of multi-party focus groups.

Findings are also based on analysis of responses to an open-ended question contained in a multi-lingual data privacy survey (Shaffer, 2021). Between November 1, 2019 and August 5, 2020, 453 people who live, work or attend school in Long Beach completed the questionnaire, which asked 16 multiple choice questions designed to gauge respondents' attitudes toward smart technologies and data sharing. Prior to the COVID-19 pandemic, Long Beach City Council members, Long Beach Technology and Innovation Department staff and members of the Long Beach Technology and Innovation Commission – a volunteer-led body that advises local officials on relevant policy issues – disseminated paper versions of the survey and promoted links to a digital version posted on the city's website. About 200 survey respondents answered the open-ended question, 'Is there anything else you would like to tell us?' About one-third of these comments were substantive enough to include in the coding for this study.

3.2. Data analysis

Qualitative research involves non-linear processes. After data is coded, it is analyzed and revisited multiple times using techniques that are cyclical, iterative and rigorous. We employed a grounded theoretical approach (Strauss &

Corbin, 1998) in which themes emerge from the text of the interviews and from responses to open-ended survey questions. We linked the interviewees' discourses regarding smart city technologies with 'guiding principles' laid out in the city of Long Beach's draft SCSI. In this form of theoretical sampling, researchers conduct interviews, analyze data to determine what to seek next in data collection, clarify theoretical concepts and refine interview protocols. We began this process in November 2019, when we facilitated our initial focus group discussion. Following this and each subsequent focus group, we coded transcripts of interviewees' responses in accordance with the 'constant comparative' method of Glaser (1965). We read each transcript multiple times to form a systematic analysis. This process relates data to ideas, then ideas to other ideas. First, we identified and coded the transcripts according to thematic relevance – in this case, concepts that align with Long Beach's Smart City draft guiding principles (earn public trust, design for equity, cultivate local expertise and build civic resilience). Then we compared these themes against the conceptual arguments supporting the study. Leveraging a blended form of inference (Tavory and Timmermans, 2014), we further analyzed the inductive results of initial analysis against theoretical constructs from the literature regarding smart cities, infrastructure, and play. (See Section 2.) We used the qualitative data analysis software Nvivo 12 to organize our data, and the nodes we created provided a streamlined structure for coding.

4. Findings

In this section, we present four main findings, each corresponding to one of the guiding principles articulated in Long Beach SCSI. We begin with findings pertaining to 'designing for equity,' and move on to 'earning public trust,' 'cultivating local expertise,' and 'building civic resilience.' These findings inform discussion about the role of smart city technology in improving quality of life for Long Beach residents and build toward an argument for the usefulness of De Koven's concepts of play communities and new games in the design and deployment of smart city technologies.

4.1. Designing for equity

Focus group participants identified the potential for smart city infrastructure to widen the digital divide in Long Beach. Importantly, they discussed the extent to which the routinization of smart technologies would further the divide according to three overlapping variables. First, a female participant at the downtown residents focus group identified a socioeconomic variable. She noted that her friend downloaded the Passport Parking app because no other alternative existed, and she identified an obvious problem:

> What if you don't have a phone? It just further divides us. (Female Participant, Downtown Residents focus group)

Second, during a focus group with the Gray Panthers, participants discussed their views on the relationship between smart city technology and older generations. They pointed out that older residents are often unable to navigate smart city technology, thereby identifying the age of city residents as a variable contributing to their concerns about widening the digital divide:

> We get older and we have to keep up with the technology – I can't keep up with passwords. Once you go on line, that's it. They hit you hard. I don't go online anymore. (Male Participant, Gray Panthers focus group)

Other Gray Panther members drew an even clearer line in the sand: 'Leave that to the young folks. We're too old for this stuff.' This statement hints at an absent desire for change. Participants' perceptions of the relationship between smart city technologies, combined with their personal realities, indicate that the mere possibility of a smart city infrastructure potentially excludes older residents.

Participants in the Grey Panthers focus group also specifically discussed the relationship between aging and disability in relation to smart city technology. These participants indicated a preexisting impression that smart city technologies are not accessible for people with disabilities:

> I'm over 80 and visually impaired, so I can't use these things. I don't think we need them. It is a burden. (Female Participant, Gray Panthers focus group)

This participant's response raises pressing questions as to the potential accessibility of smart city technologies. But, perhaps less obviously, it raises questions about the relationship between lived experience and the perception of infrastructure. We will return to a discussion of this relationship in the final section of our findings.

One response provided to Long Beach's smart city survey offers a concise summary of the issues identified by focus group participants. This respondent noted that data creates 'a false picture of the truth' when only device owners contribute information:

> We still have an access to information problem as many elderly don't have smart phones, use the internet etc. There is still a huge inequity here. If decisions are data driven, how is data collected from this segment of the population? More importantly … will it be collected? Is there sufficient outreach? How do we make these systems all-inclusive? (Anonymous Survey Respondent)

This respondent raises important philosophical questions about smart city infrastructure. When knowledge is incomplete, it obfuscates as much as enlightens. When knowledge about the city is generated in a fragmented way, how city managers use the data is also fragmented. Concerns raised by focus group participants relative to the first guiding principle of 'designing for equity' are not easily dismissed. Nor are they easily alleviated. We expand on this finding in our Implications section, when we discuss the concept of modularity.

4.2. Earning public trust

Focus group participants and survey respondents alike indicated a wide range of issues at the intersection of trust and smart city technology. However, four main points of tension emerged. First, participants provided clear evidence of uncertainty regarding the limits of smart city infrastructure. Smart cities were understood to be one element of a larger

surveillant culture that includes major technology and social media platforms, police surveillance, and vague notions of artificial intelligence. Participants were, therefore, understandably uneasy about just what it would mean to live in a smart city.

Second, participants were unable to identify all the assembled network of actors involved in smart city technology. As a result, they were largely unwilling to trust those actors. This unwillingness to trust is grounded in a fundamental lack of transparency surrounding a broader app culture that frames the social imaginary of the smart city.

Third, a general distrust in government agencies ranging from the federal to the municipal level, and including police, nearly prohibits trust in technologies that will further empower those actors. Because of an underlying adversarial relationship that emerges through the absence of trust, empowerment of those actors implicitly disempowers residents. This complex relationship between trust and potential users of smart city technology highlights core issues of privacy.

Finally, participants identified a fundamental need to design, deploy and use smart city technologies responsibly. While the nature and interpretation of responsibility differs from person to person, this finding highlights the need to incorporate ethical calculus in smart city calculus. It further argues for the design of smart city infrastructure through the lens of the play community. Below, we present these findings in more detail.

Focus group participants demonstrated future-oriented concern over how smart city infrastructure would be used by governments and agencies. An agreement allowing the Long Beach Police Department to request Ring camera data from residents supports these concerns. A female participant in the Rotary Club focus group discussion endorsed the idea of residents sharing camera footage in order to help solve crimes. But she also wondered whether police can hack into residents' Ring cameras:

> Law enforcement now knows everyone who has a Ring camera, and do they have back doors into that technology? I feel like we are not responsible enough for everyone in society to have access to that data. (Female Participant, Rotary Club focus group)

Worries associated with who will have future access to data collected by smart technologies permeated reservations about their use. A further lack of clarity around the meaning of 'smart' in 'smart city' confounded this concern. As evidenced in the following quote from a male participant in the Downtown Residents focus group, people are generally unaware of what exactly 'smart city' means and how to interpret that term. As a result, they draw on perceptions of novel technology in general to formulate opinions about smart cities:

> I'd be skeptical because the whole point of artificial intelligence is to collect more data. Like one of those movies where the police say, 'You're under arrest because you plan to commit a murder tomorrow.' (Male Participant, Downtown Residents focus group)

Participants were clearly concerned about the role of smart city infrastructure in the further normalization of surveillance culture. They saw 'smart cities' as a vague extension of their experience with major tech platforms. At the same time, participants acknowledged an optimism that underlies the social imaginary of the smart city. This is an optimism, however, that appears in the greater context of pessimism. A female participant in the Smart City Fest focus group commented:

> I think that is very hopeful. But the people on the other side have a different agenda than your interests. And so they are going to do some really serious things with our data, especially our biometrics when our bodies become digital. They can do harmful insurance manipulation, accessibility for program manipulation, toward you directly so I think it is very serious. Therefore, I don't do social media. I don't do things like this [use smart city technologies], really. (Female Participant, Smart City Fest focus group)

For focus group participants in general, the hopefulness of the smart city always emerges in relation to an overwhelming sense of resignation. There is a sense that the technological colonization of every facet of daily life is inevitable, so participants tended to look for silver linings.

To put a finer point on the uncertainty surrounding the concept of the 'smart city,' and therefore contributing to a sense of wariness among our participants, we draw on survey responses. One respondent provides a community-centered take on smart city infrastructure building, indicating that technological capabilities should not define a successful smart city. Rather, commitment to civic engagement and democratic principles are paramount:

> Technology such as shown here has the potential of doing what it says and much more. Yet 'smart' comes at the cost of privacy and more importantly, one must ask, -smart for whom? With a government such as we have in Washington, DC and in the city of Long Beach, I'd be pretty scared about this. Particularly now that facial recognition software is so prevalent — at least in areas of high security such as airports — I worry that under the right (or wrong) government, we can end up like in China. We have one of the most secretive police departments in California, which is already very secretive within the U.S. The LBPD ranks near the bottom of the largest police departments in California and has a long history of abuse of power, lack of accountability and transparency. This technology is far too Orwellian in the hands of a government like ours. Thank you, but let's fix the government so that it's of the people, by the people and for the people first. The rest will fall into place. (Anonymous Survey respondent)

As previously noted, participants demonstrated a widespread inability to identify smart city technology stakeholders. We found that this contributed to an inability to trust in the concept of the smart city or City Hall. Yet sacrificing privacy and security are fundamental, even infrastructural, aspects of contemporary digital culture. Comments made by a woman during the Smart City Fest focus group highlight this:

> There has to be a cost involved when you are getting something. I am a believer that you have to give something too. We all know that as we search on Google and use our Gmail, they extract data from us. It is a trade-off we have to make. It is a voluntary decision we make to sign up for a Google account, knowing these things are gonna happen to us. I'm okay with that. As long as it is not a total privacy invasion. I don't see it that way, to that level, so I'm okay with it. (Female Participant, Smart City Fest focus group)

Given the assumption that data is extracted from users' actions and leveraged to perform other tasks, the city's long-term plan to implement smart city technologies suggests an unhealthy and passive precedent:

> I want to know my data is not accessible any more than it already is by an outside company like Google. If it stays in the city, then

the city can be held accountable. There is that sense of control. (Female Participant, Downtown Residents focus group)

The key, then, is personal responsibility, according to focus group participants like this downtown resident:

> We produce this tech. If we don't learn to use it responsibly and trust the community, it will get out of hand. We need to hold people accountable and encourage responsible sharing policies. It's not going away. (Male Participant, Downtown Residents focus group)

In the implications section of this paper, we approach this concept of responsibility through the lens of clear and forthright communication.

4.3. Cultivating local expertise

During all seven focus group discussions, participants expressed major concern about how smart technologies might impact municipal employees: 'Are they laying off city workers because of this?' asked a male Gray Panthers focus group participant. Moreover, participants demonstrated a strong belief that technology leads to the elimination of jobs. One survey response succinctly summarizes this widely held view: 'Smart cities eliminate good paying benefited jobs' (Anonymous Survey Respondent).

Focus group participants were not only concerned about an immediate or near-future loss of jobs, but also about the extent to which the City of Long Beach will train residents for technology-oriented careers. As a female downtown resident observed during a conversation about the Passport Parking app during the Downtown Residents focus group:

> Now the city doesn't have to employ meter maids. So there's a whole other concern about people being out of jobs. But by moving to a technological society where you can monitor everything and you don't need humans to do that, there's a financial trade off. They can justify it by not spending money elsewhere. Will the city train people for high tech jobs? (Female Participant, Downtown Residents focus group)

In a slightly different – but clearly related – dimension of the employment issue, some participants expressed that money invested in developing smart city infrastructure would be better spent on job creation. Again, we see prior assumptions about technology infiltrating concerns about smart cities. This indicates that city officials must clearly communicate their plans for smart city infrastructure to stakeholders and residents. One survey respondent stated they would prefer to live in a city with a high employment rate, as opposed to a city where 'smart' technology displaces workers:

> [However, if] any of the 'smart' tech changes are actually being planned, I hope they are done slowly and in neighborhoods that most need them first. So many tech innovations claim to work much better than they actually do, plus there is always the need to maintain and upgrade them. Spend the money on employing people. (Anonymous Survey Respondent)

In terms of 'cultivating local expertise,' we find that participants are deeply conflicted as to the benefits of smart city technologies relative to the job market.

4.4. Building civic resilience

Participants indicated that smart city infrastructure has the potential to improve communication between the city and its residents. Anecdotes about electrical outages and natural disasters were common. A participant in the Latinx Youth Group focus group discussion recalled a massive explosion – caused by an underground electrical fire – that left 30,000 homes and businesses without power in 2015:

> It would have been nice if there had been a rapid explanation of what had just transpired so we wouldn't have to guess. This happened during the summer and we had hundreds of children in our program. We didn't know if a bomb had just been dropped in the neighborhood or what happened. It was frightening. If there had been a text message or some alert, it would have helped our wider community in knowing what was going on. (Female participant, Latinx Youth Group focus group)

Similar modes of better communication between city and resident emerged in relation to Long Beach's propensity to issue parking citations. Like many coastal communities throughout California, the Long Beach Department of Public Works sweeps city streets weekly. Vehicles parked in designated zones end up with a $70 ticket on their windshield. These citations are a major source of consternation among residents. Several focus group participants, like this male Rotary Club member, suggested that smart technology could help residents avoid parking citations:

> If you ever use Post Mates or Grub Hub, it shows Google maps and shows a car coming with your pizza. My idea is to have the same technology for the street sweeper. So you can open up a city app that shows you where the street sweeper is relative to your house and make sure you have enough time to move your car. (Male Participant, Rotary Club focus group)

In general, participants demonstrated a desire to leverage smart city technologies to improve communication between various municipal sectors and residents. Despite the concerns and wariness evidenced in previous findings, participants were able to envision ways that smart city infrastructure might lead to better communication with local government. This indicates that the SCSI is not fundamentally flawed. Rather, opportunities exist to improve quality of life in Long Beach and the development of smart city infrastructure can contribute if implemented in a sensitive, transparent, ethical, and community-based way.

5. Discussion

Our findings highlight several concerns that generally emerged from focus group participants and survey respondents. Participants demonstrated problems differentiating smart city technologies from a slew of emerging and recent technologies, including social media platforms, big tech platforms, and artificial intelligence. While the nebulous understanding of smart cities is, in and of itself, an interesting finding that necessitates certain actions, concern generally framed this understanding. Despite or perhaps because of the opacity of the smart city concept, participants demonstrated wariness of smart city technologies and viewed them as extensions of other dubiously empowering technologies.

Among participant conceptualizations of smart cities, we found a tendency to focus on the negative or potentially negative future impacts of smart city infrastructure. Although some participants identified a sense of hopefulness within the concept of the smart city, such hopefulness was ultimately overshadowed by fears of surveillance and disempowerment. Disempowerment emerged in the form of anxiety or subtle frustration at the prospect of having to adapt the practices of daily living to new technologies. It also stemmed from a concern about who would access data collected through smart technologies.

Participants' levels of trust in governmental agencies, up to and including local police, mitigated perceived general benefit or detriment of smart cities. If a primary guiding principle of Long Beach's SCSI is to foster trust, then the City must take steps to do so. In the absence of transparency, residents are expected to simply believe, or place faith, in the process. Given the citizen-government relationship described by participants, it is unreasonable to ask faith and belief of citizens. Therefore, we contend that Long Beach and other cities currently developing or planning to develop smart city infrastructure must communicate transparently and clearly. We cover this recommendation in greater detail in the Implications section.

Participants were unconvinced that smart city technologies can adapt to suit the needs of often-overlooked members of the community, including those who are socioeconomically disadvantaged, elderly, and/or disabled. Rather, participants imply that smart city infrastructure will exacerbate and widen the digital divide. Where each or any of these concerns is understood, explicitly or implicitly, to contribute to a set of problems solved by smart city infrastructure, these concerns are reified and infrastructuralized. Where infrastructure necessarily refers to a state of transparent functionality, infrastructure bounds the experiential possibilities of daily life. Where those possibilities of daily life are bounded by an infrastructure designed in recognition of problems and concerns that it does not solve, but rather builds upon, foundational problems are solidified.

5.1. The problem of infrastructure in smart cities

The nebulousness of smart cities raises fundamental questions about the value of approaching the smart city as a process of deploying infrastructure. Earlier in this paper, we pointed out that infrastructure is always already received: it preexists and subtends daily experience of the place that it co-constructs with that place's inhabitants. We argued, then, that to design a smart city infrastructure is to design an experiential future comprised of daily life, aspects of which are both prescribed and proscribed by smart city technologies. Where successful infrastructures are transparent and infrastructures are also learned through membership (Star & Bowker, 2006; Star & Ruhleder, 1996), using the concept of 'infrastructure' to define the process of smart city building is problematic. Its use frames the development of smart cities in a top-down way, implying that residents must bend and shape their daily lives according to the whims of those responsible for developing infrastructure. While we do not contend that this is actually or entirely the case, our data suggests this perception is real. The

top-down implications of infrastructure axiomatically complicate the realization of a smart city infrastructure that improves end-users' quality of life.

Long Beach's smartness is emergent. The planning of infrastructure and the building of infrastructure are not the same as infrastructure itself. This is fundamentally a question of the temporality of infrastructure and the extent to which such a thing as 'infrastructuring' can exist (Bowker, 2015; Le Dantec & DiSalvo, 2013; Karasti & Syrjänen, 2004).

Temporality is always a difficult issue when infrastructure is considered: 'Infrastructures, for their part, do not have plotlines or heroic figures, the kinds of temporality that we associate with much historical storytelling' (Bowker, 2015). By this, Bowker means that it is historiographically invalid to describe or narrate infrastructure through the same ontology with which we describe and narrate human life. Yet the complex temporalities of infrastructure are filtered through the temporalities of direct human (and institutional) experience when infrastructures are built. Like asking, 'When is a pile of sand?' the process of building infrastructure involves increments of time and human action that are alien to the temporality of infrastructure itself. Where Bowker claims that 'infrastructures do not inhabit human lifetimes,' we augment this claim and posit that infrastructures are, rather, that which human lifetimes inhabit. We build them through the temporality of a lifetime; yet once built, they envelop us in a social imaginary that bounds possible actions. The social imaginary of the smart city – a mode of making sense of daily life in the futures of the smart city – paradoxically emerges through multiple overlapping temporalities (Bowker, 2015) of infrastructure and experience, none of which are particularly accessible to the other.

Ultimately, we contend that this is the case even where infrastructure is described through the temporally and ontologically problematic lens of 'infrastructuring.' Infrastructuring has been used as a term to describe the process of designing and building infrastructures. It has been variously defined as: (1) 'the integration of new tools and technologies with existing people, materials and tools' (Karasti & Syrjänen, 2004); and (2) 'the ongoing and continual processes of creating and enacting information infrastructures' (Karasti & Blomberg, 2018). Given the onto-temporal problematics – problems emerging from the 'what is' and 'when is' of infrastructure – described by Bowker (2015), we see infrastructuring as an act that temporarily passes infrastructure through the needle's eye of human experience.

As a concept, infrastructuring appears to gracefully side-step the top-down, received qualities of infrastructure. By relocating infrastructure in the perpetual present tense of the gerund, it highlights the possibility of constant careful maintenance and renegotiation of infrastructural rules. We, however, find this approach to be only rhetorically effective where the ultimate outcome of infrastructuring is still, after all, infrastructure. Where the infrastructural lens generally fosters a view of the human end-user through the lens of infrastructure (i.e., an objectified and reductionist view [Seberger & Bowker, 2020]), the conceptualization of the smart city as infrastructure also does so. When the rubber meets the road, or the chicken crosses it (Seberger & Bowker, 2020), infrastructure *qua* infrastructure is of limited use for

understanding the role that smart-ifying of cities will have on the daily experience of their inhabitants, or 'users.' It creates a view of the user through the lens of infrastructure, but not of infrastructure through the lens of the user. But the extent to which we filter the temporality – indeed, the ontology – of infrastructure through the eyes, hands, and pens or keyboards of its builders offers much insight into the way we envision our futures.

5.2. Not infrastructures, but play communities

Think back to the street lamps described at the beginning of this paper. They represent a city in transition – a transition that is punctuated and represented by the way its technologies function and are perceived. It goes without saying that the mesmerizing limbo of a vast grid's indecision – on or off, night or day? – is an unexpected functionality of that particular infrastructural assemblage. And yet for those residents who have seen it, it is undeniable. Unplanned, but undeniable.

Just behind the benignly absurd hyper-functionality of those street lamps (Seberger & Bowker, 2020), we identify the received power structure of infrastructures. This power structure implies a need to reconsider the use of 'infrastructure' as a concept for framing the design, development, and deployment of smart city technologies.

Infrastructural components function in this way or that and residents abide through and by means of those functionalities. Where users abide in the received condition of infrastructures that constitute the stage on which their daily lives are played – intentionally or unintentionally, explicitly or implicitly – they exist in relation to infrastructure. Where the scale of infrastructure is greater than the scale of the individual and the temporality of infrastructure enfolds and envelops that of human experience, the distribution of power is clear. City residents live in the context of their city's infrastructure. Their daily lives are bounded by it.

Given the characteristics of infrastructure described by Star and Ruhleder (1996) and Star and Bowker (2006), when we think of novel city-wide implementations of technology, we are primed to think of them as ultimately *received*. They form the preconditions for daily experience in the city based on the set of rules they represent – the forms of interaction between 'city' and 'smart' described by Ramaprasad et al. (2017) and the hopeful logics of Mayor Garcia's directive (Garcia, 2019). Although we may design and deploy them now, once deployed, infrastructures demonstrate emergent properties. Artifacts have politics (Winner, 1980), and designs demonstrate wicked problems once released into the wild (Buchanan, 1992). The street lamps flicker and residents witness.

The passivity of the witness sums up the weary passivity of our participants: will smart city technologies be fair? Will they put people out of jobs? Will they be accessible? Will they be used in honest and ethical ways or as means of surveillance? In the face of such questions and the implicit top-down power structure implied by the term 'infrastructure,' we contend that 'infrastructure' (or its problematic cousin 'infrastructuring') are not concepts well-suited to developing a smart city strategic initiative that empowers city residents. While the issue of power in the discourse of smart-city-as-infrastructure is

subtle, it is foundational. If there is a better foundation available, we are obligated to consider it.

The concepts of the play community and the novelty of games offer an alternative to the conceptual convolution of infrastructuring. Where infrastructuring wrangles the future perfect tense of infrastructure into a perpetual present tense in which design methods might be leveraged to obtain feedback from stakeholders, it fails to explicitly achieve its own end goal: an infrastructure that is characterized by Star & Ruhleder's eight central characteristics (Star & Ruhleder, 1996). If, on the other hand, infrastructuring acknowledges its perpetual present tense, its relevance to the concept of infrastructure becomes moot. Infrastructures represent the way it is; infrastructuring represents the way we (or they) want it to be. But the implementation gap is wide.

We contend that the hopeful, values-sensitive, and ultimately humanistic theoretical lens of infrastructuring is better realized by divorcing its function from the concept of infrastructure. To do so, we posit the play community as a suitable replacement. De Koven characterizes play communities in terms of community-member collaboration, care, and negotiation. Power is evenly distributed through each member of the community: the power to play, to negotiate the rules of play, and to be represented.

Each of these characteristics emerges naturally within human temporality. Therefore, play communities meaningfully sidestep the temporal problems of designing infrastructure – ultimately an end goal – in the present tense, thereby blinding its designers to the enveloping and transparent future perfect tense in which infrastructure functions. If seen through the lens of the play community, the smart city becomes a site of constant maintenance and negotiation. It becomes a social imaginary of hopeful possibilities rather than proscriptions and digital division, surveillance and intrusion. In the next section, we examine the implications of approaching Long Beach's SCSI through the lens of play rather than infrastructure in the following section.

6. Implications for design

In this section, we offer implications for designing the conditions of a play community relative to Long Beach's SCSI. As we show, these implications are not only of practical relevance but theoretical relevance, too. We provide these implications with a caveat. Drawing on work by Dourish (2006), we contend that the primary implications of work in HCI need not be design-specific. Indeed, such designerly and instrumentalist focus potentially obscures the potential value found in exploratory theoretical orientations. The development of such orientations constitutes fundamentally exploratory work; the reduction of such orientations to immediately actionable implications for design risks prematurity. As such, in what follows we provide speculative implications for design, highlighting points of potential synergy between De Koven's (2013) theory of play and smart city development.

6.1. Building civic resilience and designing for equity

De Koven's theorization of the well-played game offers several strategies that may be employed to build civic resilience.

Notably, however, the process of building civic resilience must focus on resilience relative to the newness of Long Beach's impending 'smartness' before such smartness can be implemented effectively and sensitively to address known civic concerns.

Each of the strategies described by De Koven (2013) touches upon methods for earning public trust, cultivating local expertise, and designing for equity. To be resilient in a civic way that is contextualized by the burgeoning smartness of a city is to adapt to the emerging sociotechnical rules of daily life that flow from 'smartness.' But the maintenance of fairness relative to adaptation necessitates collaborative negotiation of the rules. Put differently, the possibility of civic resilience is predicated on not only the clear communication of rules – i.e., the ways in which a smart city collects and uses data – but also the extent to which the rules of data collection and use are perceived of as 'fair' (De Koven, 2013).

De Koven presents several strategies for the achievement and maintenance of fairness in the well-played game. The concept of hinting, however, appears most germane to the smart city. Hints are bridges between the ostensibly competitive roles of players which are constructed for the sake of the game itself; hints ensure the continuation of a game when the demands of the game exceed the capabilities of its players (De Koven, 2013). The provision of hints constitutes a lifeline to the game itself: one that ensures it is (and can be) played well.

But a hint in a smart city is distinct from a hint in a game. Rather, the process of hinting in a smart city implies the construction of a lengthy and multi-perspective players' manual of sorts. Such a manual – possibly a publicly accessible corpus of videos – should provide residents with tools for addressing any concerns they have about smart city technologies and their use in Long Beach. For example, different citizens will possess different facilities with digital technologies. Similarly, different citizen groups will face different challenges in using smart city devices or being governed through digital means. In the case of privacy, for example, hints should provide residents with: (1) accurate and clear descriptions of what the City does with resident data after it has been collected; (2) the boundaries of data collection, such that the distinction between the smart city and a resident's home is clear – much like the provision of 'safe spaces' or 'home bases' in games (De Koven, 2013); and (3) an entry point to a community of equally concerned residents, such that the community may engage in processes of renegotiation. Foremost, however, is the idea that hints about living in a smart city must address the intersectionality of the city's populations: hints must be accessible from and relevant to multiple perspectives.

We recommend that hints be constructed in the form of community outreach programs and a dedicated human infrastructure (Charlotte P Lee et al., 2006) for smart city training and education. We see libraries and public education systems as ideal public-facing homes for outreach programs. Such outreach programs may form the core of the resilience that Long Beach's SCSI seeks to instantiate.

Such hints should be developed by what de Koven (2013) refers to as a 'fair witness.' An example of a fair witness in a game is an umpire in baseball. An example of a fair witness in a smart city could be an oversight committee comprised of diverse stakeholders, including community leaders within different resident demographics, local business leaders, civil servants, and utilities representatives. If the city possesses or is affiliated with a university, we would recommend the inclusion of domain experts from legal and privacy studies, sociology, and HCI, as well.

If comprised of diverse stakeholders, such an oversight committee could be responsible for ensuring that: (1) the expected functionality of smart city systems is fair to both government and citizen, including underrepresented and at-risk citizens; (2) the use of data generated and collected by smart city systems is equitable and communicated transparently; and (3) that sufficient opportunities for renegotiation of the smart city systems and their implementation exist. The creation of a civilian oversight committee would contribute not only to civic resilience, but to equity.

In service to civic resilience, we also recommend that smart city initiatives roll out smart city technologies incrementally. Roll outs should be complemented with periods of sustained community engagement – times for renegotiation of tentative rules, such that all stakeholders are maximally served. We further recommend that smart city deployments be customizable. Customizability can be ensured through the implementation of a default opt-in structure which seeks resident approval prior to enrolling them in smart city services. As mentioned above, civic resilience cannot refer specifically to problems that smartness seeks to address. Rather, it must account for resilience to smartness itself.

For our participants, it was not only the implicit nebulousness of smart cities that was problematic. Participants' concerns over fairness and the digital divide further motivates wariness of smart city technologies. Such concern is only flamed when the concept of the smart city is implicitly understood as a 'one-size-fits-all' infrastructure: something that is to be implemented and lived with rather than actively negotiated and opted into. The fluid assemblage (Redsröm & Wiltse, 2015; Redström & Wiltse, 2018) of technologies that will make Long Beach 'smart' – like the placeness of the city itself – is not necessarily a one-size-fits all entity. We therefore suggest that when developing and imagining smart cities, those in the position of power should implement modularity.

By modularity, we mean a flexible and customizable set of smart city technologies: a suite of features from which residents can choose, rather than all-or-nothing package. While this initially seems to complicate the process of deploying smart city technologies, upon closer inspection, it provides a level of scientific control. The modularity of technologies implicated in Long Beach's SCSI would allow the City to roll out features one by one and to measure their impact and their alignment with social norms and residents' desired outcomes.

This recommendation is not only derived from analysis of our participant responses, but also from the theory of play put forth in *The Well-Played Game* (De Koven, 2013). When discussing the process for changing the rules of a game, De Koven recommends that players systematically vary the rules one at a time. In doing so, players obtain some control – both the scientific and ethical kinds – over the shape that new rules will give the game. Given that participants in our focus groups

and respondents to our survey repeatedly stressed the importance of community in relation to the smart city, we suggest that this play-community-oriented approach to planning and developing smart city infrastructure will benefit both government and citizenry.

The smart city is imagined largely from the top-down, but it is lived primarily from the bottom-up. While local governance engages closely with the smartness of the city through processes of management, the majority of players are residents. Therefore, it is critical to maintain channels of communication that encourage residents to provide feedback about their experiences playing a smart city game. We contend that cities would do well to bolster preexisting means of communication (e.g., forums, community meetings) with time allocated for discussion and negotiation of smart city features.

6.2. Earning public trust and cultivating local expertise

Relative to earning public trust, smart city initiatives must be flexible and responsive. That is, the mere provision of hints in the form of outreach programs and fairness in the form of oversight committees means little if these provisions support only one way communication. Yet, communication from government to citizen is the necessary starting point. Such communication should be founded on open and honest public relations, as well as the clarity of the smart city concept.

Based on our findings, we contend that open and honest public relations materials would bolster the perceived usefulness of smart city technologies. Communications should present a clear and precise plan, including which systems within the city will be made smart and how smartness benefits both the City and residents. Further, such communications should present good faith and easily readable summaries of how data collected by smart city technologies will be used, stored and shared with third parties.

While it is likely that such transparency will complicate the transformation from city to smart city, we see this as the only ethical course of action. In the long run, this course will not only foster trust between residents and governance, but foster a more equal distribution of power between residents and governance such that the rules of daily life might be collectively negotiated as in a play community.

Communications should also be ongoing. We posit that cities engaged in implementing smart city technologies should produce annual, bi-annual or quarterly reports to clearly and concisely present any outcomes derived from prior implementation of smart city technologies. We recommend that such reports be overseen by the 'fair witness' (De Koven, 2013) committee described above to ensure clear communication and communal relevance. They should also present and justify any changes to the smart city plan, as well as provide a list of the technologies included in these changes. Such regular communications entail one form of hinting discussed above (De Koven, 2013).

By opening a dialog through the presentation of honest and transparent updates, as well as by soliciting direct feedback, cities will actively involve residents who doubt the benefits of smart city technology. Cities could also develop an understanding of how to phase in infrastructures in ways that do not impose unreasonable or unwanted lifestyle changes on residents. In this way, consistent messaging and reporting would constitute a building block in the foundation of a play community: a community that is collaborative and mindful of its constituents' needs.

The term 'smart city' is possibly detrimental to the goals of the smart city as represented by Long Beach SCSI's four guiding principles. Focus group participants routinely demonstrated confusion regarding what constitutes smart city technologies, often conflating it with broader categories of technology such as artificial intelligence. The so-called 'smartness' of a smart city appears as a floating signifier. In the absence of a concrete yet flexible definition of smartness, it constitutes a black-blox. As with other recent work in HCI (Seberger et al., 2021), we contend that this black-box potentially constitutes the kernal of power imbalances between developers, governments, and residents. Such imbalances, roughly aligning with the concept of 'conditional empowerment' (Seberger et al., 2021), have real-world implications for residents. For example, participants saw a relationship between smart city technologies and surveillance, primed as they are by LBPD's access to Ring camera footage. In short, 'smart city' represents different things to different people, not all of them positive or beneficial.

Where, on the one hand, the ambiguity of the term 'smart city' can be harnessed to foster a sense of hopeful progress – as in the mild techno-solutionism of Mayor Garcia's directive (Garcia, 2019) – it is also detrimental. Where 'smartness' is not clearly and specifically defined, it emerges as a source of potential intrusiveness, exploitation, and exposure. Any attempt at deploying smart city technologies for the benefit of city residents as well as city governance should do so through clear and binding description.

We contend that Long Beach must concisely and transparently define the form and reach of the 'smartness' they aim to deploy. This definition should include all internet-connected services, the extent to which existing technologies (e.g., smart home devices) might be incorporated into the 'smart city' vision, and a comprehensive list of third-party affiliates. Further, we see the relationship between city governments and smart city service providers as relevant to righting power imbalances that relate to the black-box of 'smartness.' Governments are, after all, consumers in this relationship. This constitutes a meaningful opportunity to exercise consumer power by boycotting smart city packages that do not align with human- and community-centered concepts of infrastructure, or indeed the ongoing process of negotiation we have described as central to the infrastructuring of smart cities.

We understand that municipal officials might feel overwhelmed by this transparent approach to building infrastructure. Third parties often explicitly obfuscate the ways in which they, themselves, share data (Draper & Turow, 2019) making transparent communication all the more difficult. However, given that improving quality of life is one of the end goals of transitioning to a smart city (Garcia, 2019), we see this is an essential step toward the production and maintenance of a city community that has equal say in negotiating the rules of their daily life – a play community (De Koven, 2013). We further see the development of such a play community – one

founded in collaboration, communication, and care – as essential to the healthy development of the smart city.

We recommend that cities engaged in the process of implementing potentially invasive technologies should conceptualize and present their plan systematically, perhaps in the form of a visual hierarchy of functionality. Where smart city technologies are not well understood as a category, one can hardly expect city residents to form meaningful opinions about their suitability. As an example, the base level of a smart city technological hierarchy would include technologies that impact the majority or all city residents. In the case of Long Beach, these would include technologies such as smart water meters. A second level might include such technologies as smart parking meters, which are implemented by the City, but do not necessarily impact all residents. The next level might include modular and customizable components of the smart city. For example, officials can feasibly enfold Ring doorbells and similar devices into the city's smartness, but doing so is not essential. Through such communication, residents can develop a shared understanding of the overall game plan.

7. Limitations & future work

The research presented in this paper is subject to the limitations of qualitative and exploratory-pragmatic work. Although we contend that the theoretical contributions of this work will prove generalizable across time, generalizability was not our specific goal. We therefore chose to engage in inductive, qualitative work such that future work might have grist for the mill of quantitative validation.

Because of the way in which Long Beach framed its SCSI in public-facing communications, we specifically avoided analysis of the role that third parties (i.e., smart city service providers) play in the development and deployment of smart city technologies. Third parties clearly play an important part in the development of smart cities, but to engage in exploratory analysis from the top-down, focusing on those actants who possess the most power (e.g., smart city service providers, consultants, etc.) would be to undercut our human- and community-centered focus of our work. Notably, the consulting firm involved in the production of the SCSI guiding principles was not engaged in the sale of smart city technologies, but was responsible for analysis of data derived from community engagement. In the current work, we are first and foremost concerned with the city as a site of daily lived experience. We are therefore primarily concerned with the view from the street: perceptions of the smart city that come from those who live in that city. Future work would do well to engage with the role of third parties in smart city development, but we contend that such future work would be best facilitated by solid human- and resident-centered foundations such as those identified in this paper.

8. Conclusion

We found that Long Beach residents who participated in focus groups and responded to surveys hold a generally wary view of smart cities. They identified several issues with transforming

Long Beach into a smart city, each of which fits comfortably within the four guiding principles of Long Beach's SCSI. We did not, however, see evidence to support the idea that the four guiding principles of the SCSI are realistically realizable in the absence of several recommendations, which we presented and discussed in the Discussion and Implications sections of this paper. These recommendations are founded on the community-centered collaborative spirit of communities of play and the negotiated novelty of games (De Koven, 2013).

We also presented an argument for a move away from infrastructure as a lens through which to view the design and deployment of smart city technologies. We contend that Bernard De Koven's work on communities of play and new games, particularly the process by which the rules of existing games might be communally and collaboratively changed, presents as a suitable alternative lens to the infrastructural. By approaching the development and deployment of smart city technologies according to the guiding principles of De Koven's work, it is possible to create a truly community-centered and collaborative process of smart city development wherein all stakeholders have a voice in the renegotiation of the implicit rules that guide the practices of daily life in a city on the verge of smartness.

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Appendix A. Protocol

A.1. Focus Group Discussion Prompts

(1) What does the phrase "smart cities" mean to you?

(2) You may have noticed that parking meters at the city's beach lots now accept payment through a super-convenient mobile app called Passport Parking. The Parking Passport app sends alerts before your meter expires, plus you can add time without having to walk back to your car. But when you install Parking Passport on your phone, the app asks for some pretty invasive permissions. For instance, it requires permission to access photos and other media stored on your phone, and it tracks your location. There's also a good chance the app developer sells that personal information to third party advertisers and data brokers. How do you feel about the trade-off … more convenient parking at the beach, in exchange for your personal data being collected and sold?

(3) You've probably noticed Ring doorbells in your neighborhood, or even have one yourself. If not, Ring is a home surveillance company owned by Amazon. And in August, the Long Beach Police Department began partnering with Ring. Police can use Ring's app, called Neighbors, to request videos from residents. If police request home surveillance footage from a specific resident, the decision whether to share it is entirely voluntary. Still, some people worry this partnership could turn residents into informants. It could also subject innocent people to greater surveillance and potential risk. How do you feel about local police easily accessing footage from residential security cameras? In particular, does the arrangement raise privacy concerns for you?

(4) Homes and businesses throughout Long Beach now have smart water meters that transmit data over the internet. This technology has multiple advantages. For instance, technicians no longer have to physically read meters, and this means a reduction in greenhouse gas emissions from driving. Smart water meters can also detect leaks. But how do you feel about the Long Beach Water Department using data from smart water meters to send you text messages, suggesting that you water your lawn less frequently or shorten your showers?

(5) Do you have any suggestions for tools or features that can help make Long Beach a "smarter" city?