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Identifying opportunities for participatory futuring

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Guiding visions of corporate smart city innovators: Identifying opportunities for participatory futuring

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ABSTRACT

Since the smart city vision increasingly shapes our urban life globally, it becomes ever more urgent to integrate participatory futuring in ongoing smart city-related technology development. This study aimed to find starting points for such integration by unraveling the 'guiding visions' of corporate technological innovators in the smart mobility and transport sector around Amsterdam. We conducted and analyzed interviews with innovators from 12 smart city start-ups and scale-ups based on three elements of guiding visions: (1) the desired future city, (2) the purposes of technologies they expect to fulfill, and (3) how technologies are thought to relate to their wider societal context. The interviewed innovators appeared to envision a clean, frictionless future city, whereby smart city technologies fulfilled four purposes: catalyzing efficiency, nudging citizens, customizing user experiences, and connecting places and people. Innovators' ambitions for societal participation were modest and mainly aimed at end-users to optimize design features. Overall, the innovators' guiding visions highlight the need for participatory futuring approaches that appeal to innovators' motivation to make a social contribution, but also help them to widen and deepen their understanding of the public values that citizens perceive to be at stake in the smart city.

1. Introduction

The smart city vision has gained significant traction over the past few decades, emerging as the prevailing vision of future urban environments. This vision revolves around harnessing the power of data and digital technologies to enhance various public values, including public safety (Moch & Wereda, 2020), sustainability (Caragliu et al., 2011; Khan et al., 2020; Sadowski & Bendor, 2019), and

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overall efficiency (Csukás & Szabó, 2021; Hollands, 2008). As such, the smart city builds on long-standing urban imaginaries such as the digital and intelligent city (Angelidou, 2015; Söderström et al., 2014), yet the 'smart' city brings these strands together in a powerful narrative that legitimizes data collection in the public space at unprecedented scale (Sadowski & Bendor, 2019). As such, the smart city raises a host of questions about e.g., privacy, security, influence of commercial interests in the public domain, and inequalities in access and benefits (e.g., Kitchin, 2016; van Zoonen, 2016). As cities continue to embrace smart city initiatives worldwide, it becomes essential to examine these questions critically to ensure a balanced approach to data-driven urban governance, now and in the future.

To ensure equitable and sustainable city futures for all, it is essential that citizens are included in deliberations about, and the design of, smart city technologies. This is also illustrated by the broad call for participatory methods from both the private and public smart city sector, and the numerous existing participatory methods and initiatives in smart city development (Cardullo & Kitchin, 2019; Engelbert et al., 2019). Despite the high expectations, however, citizen participation in the smart city often falls short in practice. Technological advancements continue unabated, while citizen concerns frequently go unaddressed (e.g., Cardullo & Kitchin, 2019; Shelton & Lodato, 2019). This disconnect between citizens and smart city developments fosters a sense of exclusion and disempowerment, undermining the intended benefits of citizen participation.

The reasons for participation efforts to fall short are much debated in academia, but one possibility is that smart city participation efforts are not sufficiently integrated in ongoing technological developments to make a significant impact. The literature on public participation in science and technology generally critiques most current participation efforts as single, ad hoc, standalone exercises that do not significantly build on ongoing technological developments (Braun & Könninger, 2018; Cohen, 2022; Stilgoe et al., 2014). In this study, therefore, we intend to make a first step towards investigating how participation efforts can be better integrated with ongoing technological developments. To this end, we build on the existing participatory futuring approach called 'vision assessment'.

Vision assessment is rooted in technology assessment and starts from the future visions of technoscientific professionals (cf. Roelofsen et al., 2008, 2010). Such visions are called 'guiding visions' because they are thought to 'guide' the thoughts, talks, and decisions of technoscientific professionals on a daily basis (Roelofsen et al., 2008, 2010). Guiding visions are considered an essential starting point for vision assessment because they are thought to both indicate as well as influence how the technologies eventually develop (Grin & Grunwald, 2000). By starting from the guiding visions of smart city innovators, citizen participation could be related to actual ongoing technological developments and directly impact the ideas that drive smart city developments.

Much has been published on the future visions of smart city actors. Yet, much of this literature is based on the communications of governmental organizations and big tech corporations (e.g., Kitchin, 2015, 2018; Sadowski & Bendor, 2019; Söderström et al., 2014). While these organizations are indeed important agents in shaping the smart city futures, these studies neglect an important smart city industry, namely that of tech start-ups. We propose that early stage enterprises play a large role in performing and shaping the smart city vision. The smart city vision of Amsterdam, for example, is partly determined by its major innovation incubator ecosystem (Angelidou, 2016). Smart city-related tech start-ups form an interesting sector of study because their visions may be similar to those of major smart city organizations, but they may also be more disruptive, idealistic, and flexible. To our knowledge, not much is known about how tech start-ups and scale-ups perceive and perform the smart city vision.

In this study, therefore, we aim to unravel the guiding visions of innovators working at tech start-ups and scale-ups in the mobility and transport sector in smart city Amsterdam. By investigating these guiding visions, we aim to learn more about the challenges and opportunities for integrating participatory smart city futuring in ongoing technological developments, on which we reflect in the discussion of this paper.

2. Theoretical background – participatory futuring and guiding visions

Over the last decades, various futuring and foresight methods emerged for assessing and guiding technological innovations in socially robust directions (e.g., but not limited to, Boenink et al., 2010; Brey, 2012; Heidingsfelder et al., 2015; von Schomberg, 2012). Socio-technical futures, for example, *"couple techno-scientific potentials and prospects with envisioned societal change and new social arrangements"* (Konrad & Böhle, 2019, p. 101). According to Konrad and Böhle (2019), a distinction can be made between 'knowledge objects' for futuring, such as (technomoral) scenarios (Lucivero, 2016; Stemerding et al., 2018), socio-technical imaginaries (Levenda, Richter, Miller, & Fisher, 2019), roadmaps (McDowall, 2012) and narratives (Hielscher and Kivimaa, 2018), and 'practices and processes' for futuring, such as (participatory) forecasting (Heidingsfelder et al., 2015), roadmapping (Carayannis et al., 2016), and vision assessment (Roelofsen et al., 2008). These knowledge objects, practices and processes can vary in, amongst others, simplicity, embedded expertise, plausibility, short- versus long-term orientation, and the number of alternative futures (single versus plural) being incorporated (Mahmud, 2011).

For the context of this study we were looking for 'knowledge objects' that would later serve as tools or input for participatory futuring on the smart city, for example in the form of vision assessment. With participatory futuring, we refer here to research and/or practices aimed at engaging various actors, including citizens, innovators and other stakeholders, in the collaborative examining and shaping of (urban) technoscientific visions, foresights and futures (building on, for example, Guston, 2014; Heidingsfelder et al., 2015; von Schomberg, 2012). As such, we were looking for knowledge objects that would form input for the co-creative development of various alternative, rather plausible, nearby futures through and for reflection processes with innovators, citizens and other stakeholders on the potentials and prospects of smart city technologies, societal change and new social arrangements (cf. Konrad & Böhle, 2019). Taking these considerations in mind, and the above-mentioned need to relate citizen participation to actual ongoing technological developments, we arrived at 'guiding visions' as the main concept of study.

In our definition of guiding visions, we mainly rely on the work of Roelofsen et al., (2008, 2010), who conceptualized guiding

visions in the context of vision assessment. Building on the work of Grin and Grunwald (2000), Roelofsen et al. define guiding visions as "*mental images of attainable futures that are considered desirable and shared by a collection of actors*" (2008, p. 338). Guiding visions form the basis of how innovators engage in technology development; they guide interactions and shape the common language of stakeholders. In addition, Mambrey and Tepper (2000) emphasize that guiding visions – or *Leitbild* (cf. Dierkes, 1992) as they call them – shape and motivate innovators' individual actions in innovation. Or reversely, as Grin (2000) put it, guiding visions are likely to be followed by people engaged in technology development. According to Arentshorst et al. (2014), guiding visions represent a realistic view of the future, yet may contain elements of futuristic thinking or "knowledge extrapolation" (p. 261). Guiding visions furthermore contain both first and second order notions, whereby first order notions refer to how people frame problems and solutions and second order notions refer to so-called 'deeper aspects', such as underlying values and assumptions (Grin & Grunwald, 2000). Besides that, guiding visions can change over time, due to, for example, reflection processes or proceeding insights. Grin (2000) pleads that continuous reflection on visions is essential, to make sure that they are not followed too blindly.

In line with Roelofsen et al. (2008), we study guiding visions in the context of participatory smart city futuring for three reasons. First, guiding visions may have a major influence on how technologies eventually play out (Mambrey & Tepper, 2000). Guiding visions may therefore provide an up-to-date glimpse of what the future city may hold. Second, they help to identify the actors and the content to be discussed during a participatory futuring process. Thirdly, the constructing process of the visions by the professionals, for example interviews with smart city innovators, already function as a first reflection moment, which could be a supportive first step in preparing professionals for participatory futuring processes in the context of the smart city.

To identify guiding visions in this study, we follow Grin and Grunwald (2000), Roelofsen et al., (2008, 2010) and Arentshorst et al., (2014, 2017), and highlight three guiding vision elements:

- Views on what the world should be like, usually combined with a view on what is problematic about the current state of affairs,
- Views on the intended purpose of technology; what is the technology supposed to achieve?
- Views on how the technologies relate to their wider societal context: who might be affected by the technologies, in what way, and who should be involved in the technological development process.

3. Methodology

3.1. Setting of the research

This study was part of a larger project that aimed to investigate, design and facilitate participatory futuring on smart city technologies in Amsterdam, Netherlands. The city of Amsterdam was one of the first cities in the world to express its 'smart' ambitions (Dameri, 2014; Engelbert et al., 2019; Mora & Bolici, 2017) and is often considered an example for other smart cities (Capra, 2019; Engelbert et al., 2019; Fitzgerald, 2016; Manville et al., 2014; Noori et al., 2020). Amsterdam hosts an Amsterdam Smart City (ASC) network organization, which is, since its formation in 2011, a key player in shaping Amsterdam's smart city vision (Angelidou, 2017). It is sponsored by dozens of public and private organizations and hosts a community of over 700 organizations. The ASC presents mobility as one of the main development areas for smart city Amsterdam, with about 200 organizations in this sector as members of the ASC community, next to other areas like circularity and energy.

3.2. Participant selection and recruitment

To unravel the guiding visions of innovators in the Amsterdam context, we approached innovators whose companies were members of the ASC community, for which we assumed them to be 'smart city innovators'. We focused on innovators working for tech start-ups or scale-ups with products or services for the mobility and transport sector that collect citizen data such as location, personal preferences, calendars, and other profiling information. The start-ups and scale-ups either exploited the products themselves or sold their products to organizations who would target specific groups of citizens (e.g., employees, residents) to use them.

We selected tech start-ups and scale-ups, because these companies form a major part of the smart city culture. Like many smart cities, Amsterdam, has a significant start-up ecosystem with incubators and accelerators (Angelidou, 2016). Furthermore, start-ups and scale-ups are interesting potential partners for smart city participatory futuring processes because they are typically relatively small, flexible companies, with a strong can-do mentality, looking for ways and directions that give them a license to operate. Although innovators of tech start-up and scale-up are likely to have an optimistic view of technology, their flexibility might also enable them to redirect their development trajectories and thereby take the role of change agents in an innovation system that is currently determined by large companies and governments.

After sending out emails to about 20 start-ups and scale-ups in the mobility and transport sector of the ASC community with a request for participation in this study, 60 % of the invitees responded and were willing to participate; others did not respond, or their contact information was out of date.

3.3. Data gathering

We collected data through semi-structured interviews. In accordance with ethical guidelines for interviewing (Guillemin & Gillam, 2004), we asked the innovators for informed consent after explaining the aims of the research, data collection method (audio recording), member check process, data analysis procedure, anonymization, further research steps, communication and participatory

futuring events that were planned so far.

The semi-structured interviews served to both identify guiding visions as well as to trigger reflection and prepare innovators for participation in further smart city futuring processes (cf. Roelofsen et al., 2008). The interviews were conducted with the following list of topics to address the guiding vision elements as described in our theoretical background:

- The innovators' personal drive to do the work they do, inspired by generative listening principles of Theory U (cf. Scharmer, 2009), to build rapport
- Their personal definition of the term 'smart city', to identify their views on the desired state of cities in the light of contemporary city-specific challenges
- A description of their technological transport and mobility product, to unravel the purposes that they mean their technological product to serve
- Their thoughts regarding public values put at stake by digital technologies (Kool, et al., 2017), through a card sorting exercise (see Fig. 1), to identify who might be affected by the technology, what actors and societal factors may influence the technological developments, and who should be involved in the developments.

Twelve interviews of 60–90 min each were conducted with fourteen smart city innovators from twelve different companies. Interviewees were company founders or owners (n = 7), and senior sales and/or external relations managers (n = 7). Due to the relatively small sizes of their companies, the interviewees were all actively involved in the (further) shaping of their companies' products or services. Eight interviews took place in an audio-recorded face-to-face setting; the other interviews were held and recorded through Skype. Table 1 provides an overview of the interviewees and their companies' and products' characteristics.

3.4. Data analysis

Interviews were transcribed verbatim. Transcripts were anonymized and analyzed in line with the three elements of guiding visions introduced in the theoretical background. The first author (MM) inductively identified themes within the categories and illustrative quotes for each theme; through frequent and vigorous discussions with the other authors (AF, FK and JB) about apparently dominating themes, the analysis was repeated and further elaborated.

4. Findings

Our analysis shows how innovators working at tech start-ups and scale-ups in the mobility and transport sector around Amsterdam envision (1) the desired future that their technologies are supposed to contribute to, (2) the purposes that their technologies are expected to fulfill, and (3) the relation of these technologies to their wider societal context. The wider societal context more specifically details who are imagined to benefit from, and to be challenged by, the technologies as well as who should be involved in the technology development process.

4.1. The desired future city

The innovators desired a peaceful city that strives, with the help of technology and data, for high well-being among the city's inhabitants and users. In this desired future city, products as well as private and public spaces are shared, so that there is enough space

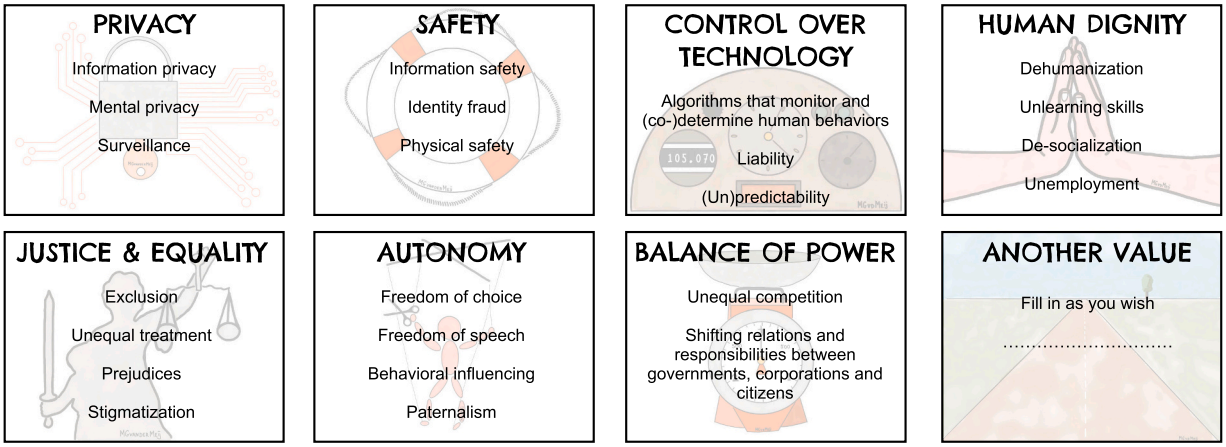

Fig. 1. Public values cards that we used during our interviews with smart city innovators to trigger conversations about who or what is affecting and who or what is affected by the smart city and / or its associated technologies: privacy, safety, control over technology, human dignity, justice, autonomy, power balance, and a 'spare' value (bottom right) (derived from Kool, et al., 2017).

Table 1
Overview of the interviewees' and smart city companies' characteristics.

Participating company #	(Anonymized) company description	Number of interviewees	Job description of interviewee (s)	Brief product description	Interview setting
P1	Parking service	1	Owner	Offers parking facilities and gives municipalities input for e.g. parking policy, through collecting and displaying data about parking lots and parking behaviors	Online
P2	Parking service	1	Sales & external relations	Offers city visitors a (5-star) parking experience through analysis of driver behaviors and traffic data, and unlocking unused parking spaces	Face-to-face
P3	Parking service	1	External relations	Unlock empty spaces and private areas for parking (by means of door systems, gates, an app and monitoring), convert these places into mobility hubs (with lockers, shared bicycles, etc.) through data collection and display about these areas or hubs, and about drivers looking for a parking spot	Face-to-face
P4	Car sharing support service	2	Sales & external relations	A platform with data-based matching services for existing car-sharing companies and companies that want to have their own car-sharing platform, to deploy their fleet efficiently for multiple users	Face-to-face
P5	Taxi sharing	1	Investor / owner	Taxi sharing platform, through data gathering about people looking for taxis and taxi platforms or taxi users driving around with available spaces	Online
P6	Scooter sharing	1	Owner	Electric scooter sharing platform through data matching and monitoring of people looking for a short ride and scooters of the company available in public space	Online
P7*	Cargo bike delivery	1	Owner	A flexible and integrated delivery service with cargo bikes, connecting package ordering data with behaviors of courier, addressee, and city city traffic	Face-to-face
P8*	Cargo transport company	2	External relations	Food & retail transport with a focus on small truck sizes in old city areas, connecting ordering data to driver, addressee, and city traffic data	Face-to-face
P9	Journey monitoring	1	Owner	Encourages sustainable day-to-day traveling of employees through analyzing and rewarding travel behaviors	Face-to-face
P10	Agenda-based travel planning	1	Founder / owner	Advices for best travel option by coupling transport availability to employees' agenda data, with a reward system for sustainable choices	Face-to-face
P11	Autonomous public transport systems	1	Sales & external relations	Public transport solution with autonomously driving vehicles, gathering data about the street, traffic, and (intended) vehicle users	Online
P12	Cycling promotion platform	1	Owner	Platform and app for stimulating and rewarding of cycling behavior or employees, through gathering and monitoring of cycling travel data	Face-to-face

* Interviewees P7 and P8 were interviewed together, since they had a meeting with each other on the day of the interview; responses of P7 and P8 were analyzed separately.

for living and traveling for everyone despite the increasing number of residents and visitors. The city is governed through strong collaborations between companies and the municipality as well as through fast, databased cycles of policy or decision-making, learning, and innovation. The city is physically very accessible through a fine meshed network, and the air and streets are clean. These ideas imply a focus on making everything 'better', smoother, or creating frictionless and effortless cities; it seems like the innovators are looking for ways to enable people to be and live as close to each other as possible without bothering each other. For some innovators this desired future was already within reach, whereas others described it as a distant future.

Interestingly, the interviewees motivated their vision of the desired future city by highlighting problems that could be solved with smart city technologies. Interviewees, for example, often mentioned the pressure on space and resources caused by the continuously increasing number of residents and traffic in urban areas. One interviewee of a cargo company for example said:

> *"I think it [a smart city] is more with groups, trains, buses; just that it runs constantly and not at specific times. That it all runs smoother [.]. The whole logistics sector is designed for 'one single person' now. It is everything for yourself, like 'when will* ***I*** *get there?' and 'how do* ***I*** *get there?'; it is not bundled at all, or something collaborative." (P8)*

In this quote, the innovator frames today's problems as something that smart city technologies can solve, namely that public transport does not run smoothly, and is not sufficiently 'bundled'.

In general, interviewees also put high emphasis on technology, as can be read in the extract of an interviewee that worked on a personalized routing product:

> *"We are, I certainly am, really 'highly technological' and really enjoy playing with technology. And I also strongly believe that 'the solution is in technology'." (P10)*

This innovator, and many others, seemed to develop their product partly because they had a, sometimes unarticulated, idea that change in current cities is needed for better well-being and sustainability, but also because technology and data are available to experiment with inciting such change. This will be further illustrated in the following sub-section.

4.2. The purposes of smart city technologies

How the innovators envisioned the purposes that their technologies were expected to fulfill, further explains how they envisioned the relationship between smart city technologies and their desired future city. In total, we identified four purposes.

4.2.1. Catalyzing efficiency

Many of the interviewed innovators said that their product was meant to increase efficiency in terms of time, resources like fuel, and/or physical space. Most interviewees linked this efficiency gain to a 'higher goal' such as healthier people in general, healthier employees of their clients' companies, or more sustainable cities. The purpose of catalyzing efficiency becomes apparent, for example, in the way the following interviewee described their company's shared electric scooter service:

> *"We offer shared electric scooter rides for 30 cents per minute [.] we think it is a very nice supplement to public transport and a fantastic alternative in comparison to using cars in the city, because we are faster and cheaper than a car." (P6)*

When asked about the bigger issue to which this promised efficiency would contribute, the interviewee said:

> *"We are contributing to air quality improvement and reducing pressure on public spaces in the city. Because we are able to move more people around with fewer vehicles. We contribute to safety with our electric scooters – we have made the safest scooters possible, think of maximum speed, winter tires, and a humble cyclists' warning horn. And we contribute to the transport flows in the city by offering an additional 'last-mile-solution'." (P6)*

This faster-cheaper-cleaner-safer rhetoric appeared in many interviewees' product descriptions. All the other interviewees comparably linked a possible efficiency gain to the tackling of 'major city issues' or 'bigger aims' by e.g., reducing the pressure on urban space by maximizing the number of parking lots, or supporting sustainable innovation by reducing fuel use or wastage in general.

4.2.2. Nudging citizens

Several interviewees developed smart city technologies with the purpose of nudging citizens' behavior towards more efficiency, well-being, and/or sustainability. An interviewee related to a company with a travel-monitoring system illustrated such nudging as follows:

> *"We are very busy with CO2 emissions; the building and construction sector is a good example here; in the tendering process they are enormously pushed to have as little CO2 emissions as possible, throughout the entire chain. Which of course they are part of themselves, because they often have transport vehicles driving around. That is why they [construction companies] try to influence this [CO2 reduction]* via *their own employees. And you can do that in two ways, either top down and just shout 'YOU CANNOT USE THAT MUCH FUEL ANYMORE' or bottom up, in which we believe a bit more; focus on the employee and just give a positive incentive when he shows good behavior." (P9)*

The product of this innovator rewards employees with (discount) coupons in line with the (higher) goals of employers, who are the clients that actually purchase the product. The interviewee highlighted that these goals vary from a client's HR department (e.g., healthy employees) to Corporate Social Responsibility departments (e.g., reduction of CO2 emissions) or finance (e.g., reduction of travel expenses).

Although this particular smart city technology achieved nudging through monetary rewards, interviewees usually considered non-monetary rewards to be more effective. They mentioned, for example, that monetary rewards only had temporary effects and that non-monetary rewards could be more closely linked to the personal ambitions of their clients and users (e.g., social events with colleagues for better social cohesion).

4.2.3. Super-customizing user experiences

Several interviewees developed smart city technologies with the purpose of offering highly customized experiences and services. At first glance, such customized service mainly served to improve user friendliness. One interviewee, for example, said that their customized car parking services meant to offer a "*five-star parking experience*" (P2). Other interviewees did not express the same ambition for decadency, but they did show tendencies in that direction. For example, in describing a service that offers routing advice precisely tailored to an employee's agenda, one interviewee highlighted that they wanted to 'unburden' their users:

> *"At a certain point we build-in a calendar functionality that looks 60 days into the future [.] so we know for 60 days in the future at what time people are leaving and what their journeys look like. [.] And then we offer them smart alternatives; so, for example, bicycle-train-bicycle [routing] [.]. You have to unburden people a bit. In the end, our ultimate goal [.] is something, you know, like the Netflix of mobility." (P10)*

Upon second glance, however, these customized services also served another purpose, namely, to offer data and insights about primary users to other clients. A parking location service, for example, not only offered a customized parking experience to motorists,

but also offered insights about those motorists to the municipality:

> *"Yes, so we develop a lot of technology, in different areas, with the aim of being able to combine that immediately into one large solution. And what we then do, because we have that data, which helps motorists to find a parking space quickly, we can also make that data available to the municipality so that they gain insight into the traffic pressure in the city. We have a solution for that too, which is a dashboard, where the municipalities can see the search traffic and parking pressure on a map of the city in real life." (P1)*

All smart city technologies that were meant to customize user experiences shared this additional goal of creating data and insights for other parties. In that sense, these technologies transcend the level of customized services, and may be considered 'super-customizing technologies', because they offer accessible and adjustable services to multiple parties at once.

4.2.4. Connecting people and places

A final selection of interviewees developed smart city technologies with the purpose of shaping and strengthening the connections between 'people and places' or between 'people and people'. For example, a company's parking service was described as a connector of people and places:

> *"We unlock scarce urban spaces, especially private parking areas, and we transform them into mobility hubs [.]. We have developed the technology to unlock the doors using an App. [.] Many new garages are being built right now, but that is not necessary at all, because they are already there; you just have to unlock them [.] so that people are easily guided there." (P3)*

This parking service is described as a connector that 'unlocks' the connection between people and parking spots. Other interviewees frequently used 'unlocking' and similar words as well, such as 'linking' or 'creating networks'.

Other technologies were meant to connect people with people. Interviewee P12, for example, considered technology as a means to improve connections among neighborhood communities; their platform stimulates users to choose cycling over fueled transport by offering a monetary reward to local neighborhood initiatives in their users' name. In this way, users can stimulate initiatives in their own neighborhood by taking the bicycle rather than the car. The interviewee described how the platform created connections beyond the actual product, evoking a collective 'green and healthy' movement in a particular neighborhood. A few other interviewees also described similar collective movements, but those movements occurred among employees within their company rather than among citizens within their neighborhood.

4.3. Relation of smart city technologies to their wider societal context

In this section, we will describe the professionals' views on who might be affected by the technologies, either positively or negatively, and who should be involved in its developments. While discussing whom the smart city innovators envision as beneficiaries and challenged groups, we also indicate through which public values (see Fig. 1) these beneficiaries and challenged groups are thought to be affected.

4.3.1. Beneficiaries

In line with the above-described technology purposes, the most important beneficiaries of smart city technologies were considered to be the primary users of the smart city technologies, i.e., individual citizens and employees of organizations who would use and/or purchase their products or services. In addition to the four intended purposes of smart city technologies mentioned above, the primary users were thought to benefit from smart city technologies by getting insights into publicly gathered data and/or their own data, and, in some instances, by saving money or gaining rewards. These benefits were usually not articulated at a public value level, but when asked, primary users were thought to experience increased autonomy, for example by being able to choose the best travel options, or increased safety, for example by being able to select a harmless taxi co-rider.

Next to primary users, interviewees expected other actors to benefit from their smart city technologies as well, namely the employers of these primary users, their municipalities, local initiatives, and big corporations; these actors were thought to benefit by gaining access to data that is gathered about primary users, sometimes combined with publicly gathered data, and indirectly also by saving costs or increasing revenue. Especially the benefit to big corporations was associated with public values like 'shifts in the balance of power' and 'control over technology', but in a potentially dangerous way. For example, as one interviewee issued:

> *"Big companies such as Google and Microsoft, with whom we also cooperate, simply offer ready-made solutions that create profiles [of users], so we don't have much work on that ourselves. And when you talk about control over technology, at a certain point, we cannot know exactly why the technology decides that someone is placed in a particular box." (P9)*

This innovator described that they frequently do 'empirical checks' to keep certain control over the technology used in their product as well:

> *"You can run tests with that, see what comes out of that, and decide 'yes this is the right thing'. Then you grow a kind of faith in the technology that is being offered […] I do find it really scary though [.] that in 20 years, we may not really understand what a machine is doing anymore." (P9)*

These extracts show how tech innovators can struggle with the control and power gain of big corporations if they embed features of these corporations in their product: such features generate control and power shifts with great benefits to the big corporations but downsides for all other actors, including the interviewees' own companies.

4.3.2. Challenged groups

Although targeted as the main beneficiary, the primary users of the innovators' companies were often also considered to be the main challenged group, especially when it came to privacy, security, and autonomy. Many interviewees referred to autonomy loss of their primary users in various ways. Interviewees who worked on vehicle sharing thought that their product could result in less freedom on the *"color of the vehicle that users can choose"* (P4). One of the interviewees foresaw that the company's autonomous public transport solution could eventually result in cities where "*parking in front of your own door is forbidden"* (P11). However, several other interviewees who worked on routing or travel advice products highlighted more profound impacts on autonomy: giving users the best travel options requires lots of data-gathering, involving untransparent, potentially biased, algorithms to personalize it, which may result in behavioral influencing (or even manipulation) that considerably decreases a users' freedom to choose for themselves.

The interviewees mentioned several strategies in which they tried to mitigate any adverse effects for challenged groups. For privacy protection, for example, all interviewees reported on numerous actions they had taken to comply with the General Data Protection Regulation (GDPR), albeit often with a sigh. Most interviewees referred to active user agreement for sharing specific data after it is collected (e.g., with employers), anonymization, encryption, options to remove data on request once people desire to stop using a product, and even the founding of a separate foundation for data storage to prevent anonymized data from being unprotected if the company were to go bankrupt. For the security of such data, several interviewees mentioned that their product embedded rigorous identification checking to prevent fraud and professional protection systems to protect against hacking. However, one interviewee issued:

> *"I don't really believe that you can make the data we collect anonymous forever, because if I know where someone comes from and where someone is going, I can see patterns, and then I know where someone lives, and then I can also figure out who it is. [.] I find it hard to make GPS data anonymous. [.]". (P9)*

While another interviewee expressed a counter opinion:

> *"In the beginning of the Internet [.] I was not eager to share my data. Nowadays I have become easier at this. So, it's also a matter of accepting the change and having faith in the protections that are out there." (P4)*

Whereas the faith of the latter interviewee resulted in appeasing a (potential) clients' privacy and security concerns, the impossibility of GPS data anonymization refrained the former interviewee from participating in governmental tenders, in which open data is often a requirement. These concerns resulted in a full shift in the company's acquisition strategy to corporate clients.

Next to mitigating potential loss of privacy and security breaches, various interviewees mentioned that they (were planning to) implement 'sharing and caring' principles to compensate for any power imbalances that their products had created. An interviewee from a parking service company for example mentioned:

> *"It could happen that 10 new residents move into the building, who'd like a parking lot. And then these lots are already given to us. [.] We therefore return our parking lots to residents in the evening, without making money because we are guests in the buildings [.]; we want to make sure there is something in it for them too. So, other shared vehicles that they can use, a separate cheaper parking zone for their visitors, or EV chargers, and so on. Or we encourage parking space owners to share the money they earn with the residents." (P3)*

Another interviewee also gave an example of such a sharing and caring strategy, in this case to (silently) 'fight' against the big revenue models of many big companies:

> *"I am much more in favor of sharing. I'd rather give you 50 cents and keep 50 cents to myself than keep the whole euro myself. [.] When I apply for public tenders, I always give a proportionate part [of the revenue] back to local initiatives. And other parties mostly do just 5%." (P12)*

4.3.3. Ideas for dialogue with society

Innovators reported, when asked for their ideas on dialogue with societal actors, several interests. Although three innovators showed light hesitance to spend time on interactions with societal actors that have no clear immediate value, most of them also foresaw fruitful outcomes. Intuitively most interviewees started daydreaming about networking with other companies or governments on where to create linkages between each other's collected data, and collaboration for market expansion, or co-transition of the mobility and transport system of Amsterdam or beyond. When prompted for ideas on interactions with the city's citizens instead of the innovator-networking that they initially thought of, they foresaw citizen-inclusive events to showcase their company or smart technology, but also collaborative needs analysis regarding mobility and transport in the city – in some cases with vulnerable groups since they were 'harder to reach for them' – or product co-design sessions. One interviewee mentioned an interest to engage in multi-actor dialogue about the use of particular values to shape the company's data utilization process:

> *"I am quite a fan of the multiple-eye principle, because the things I see are completely different from you due to your background, your wishes, and in that way, everybody has a completely different reality. And then it is nice to see what a set of data can do in one's own environment. I would really like that; to engage in dialogue. But preferably always deriving from the positive, health, air quality, biodiversity, and freedom of choice. Those values should be clear continuously." (P12)*

In this way, this interviewee displays enthusiasm to engage with diverse citizens, but it also shows a certain desire to remain in control of the topic of the conversation.

5. Discussion

Our study yields in-depth insights into the guiding visions of smart city innovators working at tech start-ups and scale-ups in the mobility and transport sector of Amsterdam. The findings show that to these innovators, the smart city is a clean, frictionless place where citizens can live together in high density with a high quality of life with little resources. In this city, data technology is envisioned to play a major role by catalyzing efficiency, nudging people towards sustainable behaviors, providing super-customized services, and connecting people and places. Most innovators expect smart city technologies to positively affect various actors, including users, citizens, municipalities and corporations, in terms of their autonomy, justice and equality. However, a few innovators also saw – and occasionally struggled with – the idea that their technologies could negatively affect actors, particularly their users, primarily in terms of their autonomy, privacy and security. In the remainder of this discussion, we will use these findings to identify the challenges and opportunities for integrating smart city participatory futuring in ongoing technological developments before discussing the limitations of this study.

5.1. Challenges for smart city participatory futuring

Our findings indicate that there are various challenges for participatory futuring in ongoing technological developments. Participatory futuring is about opening up the technology development ecosystem to alternative visions of the future (cf. Konrad & Böhle, 2019). In this study, we found that smart city innovators paint a fairly uniform picture of the desired city: most interviewees agreed that it is clean, safe and efficient. In this way, our findings are in line with the findings of, for example, Sadowski and Bendor (2019) who found that the smart city puts ideas about the future city in a single, well-selling narrative. Even though the vision itself may raise little objection at first (who would not want to live in a city that is clean, safe and efficient?), the homogeneity of this vision is problematic for participatory futuring, because it foregoes the idea that other people might prefer other futures. People might prefer, for example, the chance to get to know each other through 'inefficient' processes that involve friction, spontaneity, and face-to-face contact. Also, citizens may highly value a clean and safe city, but with less extensive or no use of (data) technologies than the innovators envision. Therefore, one of the challenges of integrating participatory futuring methods with ongoing smart city technology developments is reconciling the ideal of opening up city futures with the reality of the single, uniform future driving the smart city.

In addition, our study suggests that a participatory futuring process on the smart city should broaden and deepen the conversation about the public values at stake in the smart city (for an overview of possible public values at stake, see Fig. 1, but also Kool, et al., 2017). Our findings indicate that the smart city innovators were aware that their technologies impacted public values, in particular autonomy, privacy, and security. This is hopeful to some extent, because it means that technology development trajectories, at least in companies of our interviewees, consciously consider these public values in some way. We also noticed, however, that the interviewed innovators focused on this small set of public values, while other values were considered less often. Furthermore, public values were sometimes fairly narrowly defined. Moreover, smart city innovators sometimes expressed boredom or frustration when talking about public values, especially about privacy and safety; for them, considering these values had become an ever-returning checklist. Smart city futuring processes should, therefore, help to embed public values in smart city developments in a way that is alluring to smart city innovators, but also does justice to the ambiguity, complexity, and depth of these public values.

Third, our study suggests that any participatory futuring processes on the smart city should particularly safeguard several conditions to establish meaningful interactions between innovators and laypeople. The technology purposes that we identified in this study – catalyzing efficiency, nudging citizens, customizing user experiences, and connecting places and people – imply that smart city innovators know and try to do what is best for citizens or society in general. Although well-intentioned, this - in its most extreme form - also narrowly construes the citizen as 'an empty signifier' (Kitchin, 2018, p. 120) who needs to be told what to do. When professionals employ – as Kitchin calls it – such 'civic paternalism' (2018), we foresee that this inevitably results in hierarchical differences in conversations with people that are not part of the smart city professionals' community. Participatory futuring processes that involve both societal actors and smart city innovators, therefore, need to mediate any hierarchical differences that may arise to guarantee inclusivity and perceived fairness in participation.

5.2. Opportunities for participatory futuring on the smart city

Our findings also indicate several opportunities for integrating participatory futuring on the smart city in ongoing technological developments. First, even though smart city innovators envisioned the societal role of smart city technologies in a homogeneous, instrumental way, they did at least envision a clear societal contribution. The innovators interviewed in this study coupled smart city technologies to major societal issues, like urban growth and climate change. This is in line with the Dutch innovation culture, which is fairly supportive of socially responsible innovation because it partially sees innovation as a way to create societal value (Wittrock et al., 2021). This suggests that the innovators are motivated to develop innovations that are socially relevant and desirable, which could be a strong motivation to engage with societal actors in participatory futuring.

Second, we argue that innovators working at tech start-ups and scale-ups could be particularly relevant conversation partners, if not 'battle comrades', for larger processes of multi-actor smart city futuring that tap into national or international ongoing smart technology developments. Most literature on smart cities focuses on the role of large corporations (e.g., Sadowski & Bendor, 2019; Wiig, 2015). Our study indicates that tech start-ups and scale-ups offer a similar but also a notably complementary perspective: the innovators included in this study often criticized strategies of big tech companies and reported to consciously battle them. They, for example, contradicted common big tech statements (such as "*we put your privacy first*") or adopted locally and socially driven business

models, such as giving revenues or connecting to local entrepreneurs or community initiatives. Despite their optimistic view of technology, therefore, the start-up or scale-up innovators already tried to redirect their development trajectories. Tech start-ups and scale-ups may be supported to disruptively expand their socially driven pathways in several ways. Incubators, accelerators, and innovation coaches, for example, can stimulate smart city innovators' dialogue skills and teach them to acknowledge the expertize of societal actors. Intermediaries (cf. Schuijer et al., 2022) or arts-based public engagement (see for an overview, Fraaije et al., 2022), as well as self-help tools for responsible innovation (e.g., Long et al., 2020) can further stimulate the ethical and social reflection within start-ups and scale-ups.

Third, we see fruitful possibilities for integrating participatory futuring in ongoing technological developments, through the alignment between urban planning and smart city technology subsidizing or purchasing and implementation processes in the municipality. In the Amsterdam context we noted that the implementation of smart technologies often happens beyond urban planning participation mechanisms of the municipality. The participatory urban planning efforts focus merely on the co-design of the public space, like the green facilities, pavements, routing, or food production (see also, for example, Anguelovski, 2013; Checker, 2011; Curran & Hamilton, 2012; Goossens et al., 2020). Citizen inclusive decision making on the technology that is being purchased and implemented in that space, hardly seems to take place. When we spoke with urban planners in Amsterdam, shortly after this study, it appeared that other departments than urban planning, namely, for example the department of data and information, put out tenders and subsidiaries for smart technologies. This divide is a lost opportunity, considering the long tradition of research into and practices of participation in urban planning; a widespread set of methods and processes have been developed over the past 50 years (e.g., Arnstein, 1969; Raposo, Eloy, & Sales Dias, 2022; Sanoff, 2000; Seydel & Huning, 2022; Williams, 1976). We propose that participatory smart city futuring thus should be embedded in early stages of smart technology tender processes, involving municipality urban planners' citizen and stakeholder participation skills and experiences, to ensure that the subsidizing, purchasing and implementation of smart technologies stimulate streamlining within the municipality and alignment with public values thought to be at stake.

5.3. Study limitations

Several limitations of this study should be considered as well. First, it should be noted that we employed an exploratory study with a relatively small number of smart city innovators within one domain, namely that of mobility and transport, and in one city, namely Amsterdam. To what extent are the results translatable to other domains and other cities? A shared characteristic of the smart mobility and transport technologies investigated in this study (see also Table 1), was the discrepancy between who buys the product, who uses the product, and whose data is being processed through such use. Such discrepancy raises questions about who is watching who in the public space, an issue sometimes described as 'dataveillance' (Kitchin, 2016). The findings of this study may therefore be particularly applicable to smart city domains in which dataveillance is also a significant issue, such as the energy, and safety and security domain.

With regard to this study's location: Amsterdam is often considered an example smart city for other cities (Capra, 2019; Engelbert et al., 2019; Fitzgerald, 2016; Manville et al., 2014; Noori et al., 2020) and a pioneer with regard to societal participation in the smart city (Capra, 2019; Noori et al., 2020). Amsterdam thereby functions as a paradigmatic case (cf. Flyvbjerg, 2006) for studying smart city futuring, meaning that the guiding visions of smart city innovators based in Amsterdam may exemplify those of tech start-up or scale-up innovators working in other smart cities as well. Alternatively, Amsterdam has a relatively extensive start-up and scale-up culture, with a strong focus on sustainability and improving urban services, and its citizens are characterized by their high level of education and high accessibility to ICTs (Caragliu et al., 2011). Although more and more cities host an incubator ecosystem, the focus on sustainability and continuous improvement of urban services gets relatively much attention in Northern Western cities (Tang et al., 2019), for which our findings may apply most to other major, well-connected, and high-income cities in Northern Europe.

It should be noted that our interview technique might have driven interviewees to less deeply and broadly address their moral struggles than with more critical interview techniques. Our interview technique was inspired by generative listening of Scharmer's Theory U (2009). This technique builds on the assumption that everybody has the intention to positively contribute to change, and that one needs to listen with an open mind and open heart to let fruitful pathways to transformative change emerge (Scharmer, 2009). Due to its future orientation, we considered the technique as an interesting direction to be integrated in studying guiding visions, but we also saw that it made our interviewees feel very comfortable. Therefore, our findings do not mean that the innovators are *incapable* of deep reflection on, for example, the public values cards that we discussed with them (see Fig. 1). The applied interview technique merely tells us what visions the innovators rely on by default when they are relaxed.

5.4. Conclusion

Our interview study on the guiding visions of smart city innovators showed that there are opportunities and reasons for engaging citizens in smart city developments. Futuring processes should in particular open up issue framings and future visions, widen the depth and scope of public values discussed and support innovators to make room for citizens in their development processes. In line with the idea that studying guiding visions can have reflective value (Roelofsen et al., 2008), the fact that our interview study made smart city innovators reflect, especially on public values, suggests that multi-actor conversations about the societal aspects of smart city technology can indeed be a first step towards participatory futuring. To incite further steps, follow up action research is needed into the design and application of methods and tools for smart city participatory futuring. Rather than stand-alone exercises that are imposed on smart city innovators, such participatory futuring should be embedded in the innovation process, and if possible, the municipal purchasing and implementation process, and meaningfully address (at least) citizens and the smart city innovators involved. Based on this study, we started doing this by creating various arts-based futuring tools meant to critically examine data gathering in public

space, such as video installations[3] and theatrical debates, leading to a longer-term futuring process with citizen and stakeholder participation in the development, purchasing and implementation processes of one specific smart technology, in a specific area of the city of Amsterdam (Fraaije et al., 2023; Fraaije, 2023).

Declaration of Competing Interest

None.

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[3] See, for example: https://vimeo.com/755500965

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