2-2020

Subverting the logics of "smartness" in Singapore: Smart eldercare and parallel regimes of sustainability

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Citation

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ABSTRACT

This paper argues that the divergent logics of "smartness" and "sustainability" can lead to parallel regimes of sustainability. Whilst sustainability is often used to justify the need for smart cities, smart cities are often undermined by the neoliberal logics of digital governance. Moreover, because the intersection of digital technologies and society is a negotiated one, smart solutions often fail to provide adequate solutions to social problems. This is especially true when smart solutions are used to augment or replace hitherto human-centred processes, like caregiving. Parallel regimes of sustainability are an outcome of these failures. Drawing on an analysis of a trial of in-home smart eldercare technologies in Singapore, four binary pairings – public-private, individualcommunity, remote-proximate and passive-active – are used to define the parallel regimes of sustainable eldercare that emerged in response to smart technologies. To conclude, the need for urban paradigms to evolve in conversation with society is emphasised.

Keywords: Smart cities, Digital technologies, Smart eldercare, Social sustainability, Singapore

1. Introduction

Cities around the world are increasingly understood in relation to their "smartness" and their "sustainability". What exactly this means, however, is far from clear. In response, scholars from a range of social scientific and technical disciplines have started to explore the overlapping, yet often divergent, logics1 of urban smartness and sustainability (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017; Bibri & Krogstie, 2017; Lyons, 2018; Silva, Khan, & Han, 2018; Yigitcanlar et al., 2019). These explorations tend to coalesce into two distinct perspectives. On the one hand, smart cities have been understood as an 'assemblage of several pre-existing urban imaginaries' that emerged 'in the wake of the narratives of the sustainable city… and of the informational/intelligent city' (Vanolo, 2013: 887, 885). Smart cities can therefore be seen as the latest, and implicitly more efficacious, incarnation of the sustainable city. Both are believed to have the logics of sustainability at their core, with smart technologies helping to realise the vision of an 'efficient, technologically advanced, green and social inclusive city' (Vanolo, 2013: 883). In this positivist perspective, the logics of urban smartness and sustainability can be understood as overlapping. On the other hand, the defining feature of smart cities – digital technologies – has been seen to distinguish them from sustainable cities. Critical scholarship has identified how the rhetoric of sustainability has been appropriated by economically-motivated actors to 'reframe or justify' the neoliberal logics of digital governance (Vanolo, 2013: 886; see also Hollands, 2008; Angelidou, 2014; March & Ribera-Fumaz, 2014; Kitchin, 2015; Bulkeley, McGuirk, & Dowling, 2016; Cardullo & Kitchin, 2018a, 2018b; Kong & Woods, 2018a; Martin, Evans, & Karvonen, 2018). These logics reveal the homogenising tendencies of smart urbanism (Joss, Sengers, Schraven, Caprotti, & Dayot, 2019; Trencher, 2019), and the ways in which sustainability can be undermined by the term's economic underpinnings. In this critical perspective, the logics of smartness and sustainability can be understood as divergent.

This paper contributes to the critical perspective by arguing that divergence foregrounds the creation of parallel regimes of sustainability. Divergence arises when smart urbanism solutions are deployed in ways that reduces the complexity of cities – and the issues of sustainability therein – to the rationalising and homogenising tendencies of technological interventions. In such situations, smart technologies can be seen to provide ineffective solutions to the challenges of urban sustainability, causing pre-existing solutions to endure alongside (or in parallel with) their technological counterparts. This dynamic is most pronounced when issues of social sustainability are the focus of analysis. Indeed, as much as 'smart interventions aim to open up new ways of managing the city in an integrated manner' (March & Ribera-Fumaz, 2014: 817), so too are they predicated on the effective integration of hard (i.e. digital/technical) and soft (i.e. social) infrastructures. Failure to integrate foregrounds the emergence of socio-technical divisions, which, in turn, can underpin the emergence of parallel regimes of sustainability and the creation of new forms of social division and inequality. Failure can therefore undermine the realisation of what Trencher (2019) terms the "smart city 2.0", which is defined by a 'decentralised, people-centric approach where smart technologies are employed as tools to tackle social problems, address resident needs and foster collaborative participation' (Trencher, 2019: 117; see also Bouzguenda, Alalouch, & Fava, 2019; Carrasco-Sáez, Butter, & BadillaQuintana, 2017; Ibrahim, El-Zaart, & Adams, 2018; March & RiberaFumaz, 2018; McFarlane & Söderström, 2017). By contributing insights and ideas that are empirically grounded in the Singapore context, this paper highlights how the divergent logics of smartness and sustainability can limit, or even prevent, the realisation of the smart city 2.0. In this vein, divergence is acutely felt when smart technologies replace or augment human-centred processes, like caregiving.

Despite the potential for socio-technical division, smart technologies have been embraced as a panacea for ensuring the sustainability of rapidly-ageing societies – and the management of pre-existing elderly populations – in cities around the world (see Schultz, Andre, & Sjovold, 2016; Skubic, Alexander, Popescu, Rantz, & Keller, 2009). In this sense, smart eldercare solutions can be understood as a neoliberal response to the management of the demographic transition towards ageing societies. The problem, however, is that the 'neoliberal bias in urban policies' often 'denies care needs' (Strauss & Xu, 2018: 1163), and can conflate otherwise divergent forms of economic and societal value. In response, alternative, often pre-existing, and implicitly more sustainable, strategies of caregiving are pursued. As a result, parallel regimes of sustainability may emerge as a direct response to the fact that 'marginal populations like the elderly have been unproblematically subsumed within the transformative benefits of smart technologies' (Kong & Woods, 2018b: 2; cf. Trencher & Karvonen, 2018). Evidence of this is reflected in the fact that the relationship between smart technologies and eldercare is often studied and understood through the normative language of "convergence" (Silva et al., 2018). By reversing this position and exploring some of the failings of smart eldercare, this paper 'foregrounds the knowledges, political priorities and needs of those either actively excluded or included in damaging ways in mainstream smart urban discourses' (McFarlane & Söderström, 2017: 312). Specifically, by focussing empirically on the resistant behaviours of elderly people trialling a series of smart eldercare technologies in Singapore, it highlights why their needs were not met by technology, and the parallel regimes of sustainability that emerged as a result.

This paper comprises three sections. The first provides a conceptual roadmap that explains how the divergent logics of smartness and sustainability can cause the intersections of smart and sustainable cities, and smart cities and society, to become problematic. The second is empirical, and provides an analysis of the trial of three smart eldercare technologies in Singapore. The third integrates the conceptual roadmap with the empirical data through a discussion of the emergence

of parallel regimes of sustainability. The paper concludes by calling for research to continue exploring the new forms of exclusion and marginalisation that can occur through practices of smart urbanism.

2. Reconciling the divergent logics of "smartness" and "sustainability"

Whilst sustainable cities are not necessarily smart cities, smart cities are often justified on the basis that they can realise the logics of sustainability. Broadly speaking, these logics refer to the efficient use and responsible management of resources. Social sustainability has a more specific meaning, and is often associated with the proactive management of differences within society, the aim being to promote social equity and to overcome situations of inequality. Often, this involves promoting social inclusivity through practices that are bottom-up, democratic and participatory in nature (see Ibrahim et al., 2018). It is about encouraging the social unification, rather than (sub)division, of the city. Care of the elderly is implicated in discourses of sustainability in both the broad and specific senses; caregiving resources need to be managed efficiently if the impact of the elderly on society is to be minimised, whilst access to, and uptake of, these resources can foreground new forms of division. The tensions embedded within these dynamics are pronounced in the context of the smart city, as smart solutions can be catalysts for efficiency, but new forms of social division and exclusion as well. Thus, whilst Martin et al. (2019): 640 highlight the emergence of "smart-sustainability" as a new "fix" for the 'economic, environmental and social challenges faced by cities', the problem is that hyphenating the two terms does not necessarily lead to the productive integration of the logics underpinning each. Rather, the rush to develop smart cities around the world has contributed to a situation in which '"smart" supersed[es] "sustainability" as a main prism through which the future of cities is viewed' (Joss et al., 2019: 3), causing the sustainable potential of smart cities to be undermined. One outcome of this primacy is that sustainability is either overlooked, or otherwise deployed as a tokenistic validation of smart initiatives.

Notwithstanding such problems, the fact remains that no city can ever be completely sustainable, nor can it ever be completely smart; in fact, the opposite is true. Both categories are constructs that are used to classify one city in relation to another, or in relation to a pre-defined "normative" standard. This is particularly true for smartness, which can become problematic when it is used to overlay sustainability. Indeed, what can undermine the realisation of smart and sustainable cities is the conceptualisation of "the' smart city' – one that implies homogeneity and 'off-the-shelf approaches' that 'underplays the importance of local circumstances in shaping unique smart city imaginaries and on-theground approaches' (Trencher, 2019: 142). The problematic "homogeneity" of which Trencher speaks has been recognised for some years now. For example, Caragliu, Del Bo, and Nijkamp, (2011)): 70 have argued that 'the stress on the Internet as "the" smart city identifier no longer suffices', and propose instead a more heterogeneous definition that defines smartness in relation to its specific applications. In a similar vein, McFarlane and Söderström (2017) have recently highlighted the need to 'return to the original meaning of smart and move from a technology-intensive to a knowledge-intensive' discourse that is 'grounded in places – actually existing cities – with their specific populations, resources and problems, rather than start with technology'. In recognition of these lines of argument, understanding the divergent logics of smartness and sustainability can be a first step towards reconciling them in more relational, and contextually-grounded, ways.

2.1. Problematising the intersection of smart and sustainable cities

The intersection of smart and sustainable cities is problematic because it represents the tension that exists between two distinct forms of urban imagination and praxis. A sustainable city is what has been identified as one of the "promises" of smart urbanism, as the rationalisation that comes from the deployment of digital technologies 'has the potential to make processes of economic growth and the management of public services and resources more efficient, productive and sustainable' (Kong & Woods, 2018a: 680). The problem, however, lies in the fact that such promises often remain unrealised. For example, in a recent review of the literatures pertaining to smart and sustainable cities, Yigitcanlar et al. (2019): 349 conclude that 'there is little evidence in practice that sustainability targets are achieved in cities claiming to be smart cities'. The reasons for such failings are many and nuanced, but most are underpinned by the fact that smart cities are increasingly inflected by the neoliberal impulses of the decision-makers involved in implementing smart city solutions. McFarlane and Söderström (2017) describe this as the "corporatization" of city governance, which has resulted in 'neoliberal economic interests... prevailing at the expense of environmental and social concerns' (Trencher, 2019: 117). In itself, this foregrounds Trencher, 2019 call for a more relational understanding of the role of sustainability within smart urbanism that goes beyond a singular focus on increasing efficiency and growth. More insidious, however, is the idea that sustainability is deployed in order to validate the need for smart solutions, but is not necessarily a guiding logic of them. In this view, the efficiency of smart solutions can be seen to justify their economic value, but not necessarily their efficacy as tools to achieve sustainable outcomes.

From the perspective of social sustainability, more bottom-up and entrepreneurial forms of urban governance have been shown to provide an "urban sustainability fix" (While, Jonas, & Gibbs, 2004). In particular, Walker (2015) has highlighted how such models can reconcile tensions embedded within the neoliberal economic paradigm; a paradigm that often foregrounds situations of inequality. These models do, however, contrast with the top-down impositions of smart technologies, with Lyons (2018): 8 arguing that 'technological opportunities may, at their worst, be treated as solutions looking for problems'. In seeking to explain the outcomes of such imposition, Martin et al. (2018) recently identified five "tensions" that often emerge at the intersection of smart city solutions and sustainable urban development. The first three are most relevant for the purposes of this paper; they are, the reinforcement of neoliberal economic growth, the privileging of more affluent populations, and the ongoing disempowerment and marginalisation of other (non-affluent) population cohorts.

These tensions have clear ramifications for the realisation of a more socially sustainable city through the embedding of smart technologies. Indeed, Martin et al. (2018): 271 go on to observe how, 'rather than being empowered to participate in the smart city, citizens are instrumentalised as another efficient component of the digital infrastructure'. They build on this assertion in more recent work, which identifies the fact that smart city agendas tend to be 'primarily orientated towards the business and professional classes at the expense of marginalised and precarious urban communities' (Martin et al., 2019: 642; see also Bouzguenda et al., 2019); an orientation that stands in direct contrast to the inclusive underpinnings of social sustainability. Recognising these tensions foregrounds criticisms of the positivist embrace of digital technologies without consideration of the fact that they do 'not necessarily make people themselves think or act smart' (Angelidou, 2014: S5; see also Trencher & Karvonen, 2017). Given that the alignment and integration of hard (technical) and soft (social) infrastructures is inherently problematic, there is a need to understand the outcomes that emerge at the intersection of smart cities and society.

2.2. Problematising the intersection of smart cities and society

Whilst technology is the enabler that underpins smart cities, its efficacy can be relativised by the ways in which society in general (and different social groups in particular) engage with it. When social and technical infrastructures are aligned, a city can be defined as "smart". Non-engagement foregrounds the misalignment of socio-technical infrastructures, and can undermine the potential value of technical solutions. In light of this, Carrasco-Sáez et al. (2017): 2) recently developed a "pyramid of needs", the aim being to mitigate against the problem of misalignment and to realise 'a more human vision of the smart city'. Misalignment can cause the smart city to become an abstraction that operates in isolation from – and sometimes in tension with – pre-existing socio-cultural norms. Given the 'tendency to believe that innovative technological instrumentation automatically transforms a city into a 'smart' one, and a biased use of the buzzword 'smart' in fragmented or superficial ways', situations of socio-technical misalignment can serve to 'hinder the clarification of the subject even further' (Angelidou, 2014: S3). Indeed, society is often expected to adapt to the logics and demands of the smart city, as smart solutions are typically 'designed based on the assumption that structural problems can be resolved through changes in the behaviour of individual citizens' (Martin et al., 2018: 274). This assumption underpins the emergence of parallel regimes of sustainability, which are explored in detail below.

Recognition of the problematic alignment of socio-technical infrastructures informs recent calls to reimagine smart cities in ways that are more "citizen-focussed" and thus 'rooted in the right to the city, entitlements, community, participation, commons, and ideals beyond the market' (Cardullo & Kitchin, 2018a: 1). The broader point here is that in order to realise this more "citizen-focussed" vision of the smart city, 'citizens from all walks of life need to be socialised – both ideologically and technically – into new ways of being governed' (Kong & Woods, 2018a: 686) if the promises of a smart city are to be realised. In other words, as much as smart city solutions must be aligned with citizens' needs, so too do citizens need to be willing to adapt to technologicallyoriented forms of governance if the problem of socio-technical misalignment is to be overcome. As Vanolo (2013): 894 puts it, 'smartness is becoming a field of social control that makes intrusion in a person's private life quite natural'. For the purposes of this paper, what this means is that the rhetoric of the smart city runs the 'danger of being used as a means to discipline cities and their populations, reducing sustainability and the urban question to a technical discourse' (Gibbs, Krueger, & MacLeod, 2013: 2156; see also March & Ribera-Fumaz, 2014). The shortcomings of such a technically-oriented discourse are most pronounced with regard to social sustainability, wherein the complexity of society is limited by the parameters of the algorithms that respond to social problems. For example, observing how smart electricity company, Ausgrid, refers to Newcastle, Australia, as "Anywhereville", Bulkeley et al. (2016): 1721Bulkeley et al., 2016Bulkeley et al. (2016): 1721 argue that 'the material politics of the urban are not reducible to an abstract grid logic'; instead, their materialisation foregrounds various processes of negotiation, compromise and adaptation. The fact that such abstractions deny the realities of 'messy, complex and human issues' (Trencher, 2019: 119; see also Ibrahim et al., 2018) and social needs can undermine the value of smart technologies.

This denial is acutely observed when technology is used to replace hitherto human-centred processes, such as caregiving. As much as smart technologies help overcome the limitations of space and time in a costeffective way, the experience of care is a highly localised phenomenon. Whilst smart caregiving solutions clearly align with the neoliberal underpinnings of smart cities, they are less likely to align with the needs of care recipients. This tension can cause the logics of "smartness" to be subverted; a tendency that is now considered in relation to the Singapore case.

3. Subverting the logics of "smartness" in Singapore

Singapore is an island city-state with a rapidly ageing population and a government that has embraced the potential of smart city solutions through its "Smart Nation" initiative. In the first instance, Singapore's total fertility rate has dropped from 4.66 in 1965 to 1.17 in 2017, whilst life expectancy has increased from 64.5 years to 83.1 years over the same period (2018b, SingStat, 2018c). Compounding the problem of rapid ageing is the corresponding decline in the number of working-age persons to support the elderly – from 16.9 in 1965, to 4.8 in 2018 (SingStat, 2018b). These trends reveal a situation whereby caring for the elderly is – and will continue to become – one of the key sustainability challenges facing Singapore, and is an issue at the forefront of the political agenda. Accordingly, and in the second instance, the Singapore government launched a "Smart Nation" initiative in 2014, the aim being to 'promote more efficient, digitally-enabled means of addressing some of the critical challenges facing Singapore' (Woods & Kong, 2018: 10). The initiative can be seen as an attempt to seek new strategies of social, economic and political resilience, sustainability and growth through the widespread deployment of smart technologies. These technologies align with the "economic logics" that have long underpinned public policy in Singapore, and can therefore be seen to reflect the neoliberal logics of smart city governance outlined above (Woods & Kong, 2017). At the intersection of these two characteristics is the development of smart eldercare solutions, which are designed to enable elderly people to live autonomously in their homes. Whilst the economic value of such solutions is self-evident, their ability to relieve the social problems associated with caregiving is less evident.

Between late-2014 and 2018, the School of Information Systems at Singapore Management University, in partnership with Tata Consultancy Services, developed and trialled three smart eldercare technologies. Two smart technologies are the focus of this paper: inhome sensors that detect motion and/or periods of irregular (in)activity, and a panic button that, when pressed, will alert caregivers to distress. These technologies can be considered "smart" insofar as they both activate digital feedback mechanisms to alert caregivers to distress; the first does so automatically, the second manually. The trial was conducted amongst approximately 50 low-income elderly living alone in a public housing estate in Singapore. All triallists were over 60, yet the vast majority were in their 70 s and 80 s. Whilst all were ablebodied, they typically did not have family members to provide roundthe-clock support, and their financial statuses often precluded them from being technological literate, as most could not afford personal technologies (such as computers; even those that had smart phones used them for the purposes of making phone calls and sending text messages only), and therefore had limited exposure to them2 . The empirical data that this paper draws on were part of a secondary, qualitative study conducted by the School of Social Sciences, and involved 26 in-depth interviews with elderly triallists (22 interviews) and their caregivers (4) in mid-2017.

Organised as binary pairings – private versus public, individual versus community, passive versus active, and remote versus proximate – the subsections that follow reveal how the divergent logics of smartness and sustainability are reproduced through the trial of smart eldercare technologies. These pairings were derived from an analysis of interview data, and underpin the parallel regimes of sustainability that arise in response to smart eldercare in Singapore.

3.1. Private versus public

A defining feature of the smart technologies was that they were located within the home. The motion sensors were designed to monitor activity inside the home, and the panic button would always

be kept within the home as well (often in a fixed, or more often hidden, location). Accordingly, the smart technologies being trialled were designed to monitor the home, and to alert a caregiver of irregular activity. Irregular activity (which could, for example, signify a fall) would be detected by sensors, which would automatically send an alert to caregivers to check-in with the care recipient, either by calling or visiting them. The home, then, is treated as a clearly bounded space; a private space that is mutually distinct from the public spaces surrounding it; technologies reproduce these boundaries by privatising both the supply of, and demand for, care. Public housing in Singapore does not, however, accord with such distinctions. The flats that the triallists occupied were arranged along an outward-facing, shared corridor; each flat is equipped with a solid front door and porous metal grille, and windows (also covered with a porous metal grille) that look out onto the corridor. Doors and windows are typically left open, but the grilles closed. This causes the boundary between the private space of the home and the public space of the corridor to become porous. A female triallist in her mid-80 s explained this situation, observing how "some people are very busybody… they will just walk around and peek inside my house, because I usually sit here [in the living room] watching TV, I can see them", whilst another female in her mid-60 s reiterated this idea of porosity, explaining how "daytime I am always alone, but, for me, I open my doors so people can see [in]". If help is needed, a shout can alert neighbours, or anyone walking along the corridor. The care practices of the elderly are therefore predicated on an expanded understanding of the homespace; one which sees the private merging with the public, and the public intruding into the private if needed.

3.2. Individual versus community

The distinction between the private space of the home and the public space of the corridor reveals the assumption that care is an individualised practice; that is, individuals are both the providers and recipients of care. Smart technologies enable individualised practices of caregiving, as they help to connect people in non-proximate ways by alerting caregivers to the needs of care recipients. Thus, the sustainability enabled by smart technologies is defined by non-proximate connections between individuals; they tend to treat the individual as distinct from the community. In reality, however, the porous boundary between the private space of the home and the public space of the corridor situates the individual within a community of neighbours and passers-by, providing a communitarian counterpoint to the neoliberal underpinnings of smart eldercare technologies. For example, a female triallist in her early-80 s explained that "there is always help around", whilst another female in her mid-80 s commented more specifically that "I don't close my door when I am at home; if people see me lying at home, they will wonder 'oh, what happened'?". Whilst these examples reveal a passive form of community caregiving, other triallists were more active in calling for help. For example, a male in his early-70 s explained how "my friend will come to my help once I scream". In this sense, then, the immediate community can be activated in times of need, and can provide an immediate and familiar form of assistance to elderly residents. Another male in his early-70 s recalled a time when:

> I fell down here, and that thing [the panic button] is hanging there, and my phone is here. Then I didn't dare stand up, so I called 'Rashid! Rashid!'… I called to that Malay neighbour.

Here we can see that the panic button was not only ineffective (as it was hanging on the wall), but also less immediate than calling for neighbours to help. Moreover, the individualised forms of caregiving provided by the activation of the panic button take longer to effect (as caregivers would be non-proximate), and caused some concerns amongst the triallists that it may be provided by strangers. Accordingly, elderly residents often relied on community-style forms of caregiving. As much as this reflects the divergent logics of smart and non-smart eldercare solutions, so too does it suggest a way to reconcile them. It highlights the need to develop smart solutions wherein 'civic responsibility takes on a meaning that expands beyond an individual's family, home or environment' (Kong & Woods,

2018a: 698), and that enable individuals to become more interconnected with their friends, family members, neighbours, and environments more generally. Embracing interconnectivity would help to further embed the individual within the community, and would thus augment and strengthen pre-existing social practices.

3.3. Remote versus proximate

The value proposition of in-home smart eldercare technologies is that they enable the elderly to be cared for remotely. Caregivers do not have to be physically present (or even proximate) to be alerted to the caregiving needs of the elderly. In turn, this means that one caregiver can theoretically look after more people, as the practice of caregiving becomes decoupled from the specificities of space and time. Decoupling enables the elderly to be cared for – or, more critically, to be governed – from a distance. This does, however, increase the responsibility of the caregiver; one care worker explained that receiving notifications on her phone created "unseen stress" and caused her to monitor her phone even during her time off. Conversely, elderly people tend to operate in terms of the micro-localities of their bodies, their homes, their neighbours and their housing estate. Smart eldercare technologies reverse this dynamic; they use specific datapoints (derived from the micro-localities of the elderly), but analyse and respond to them in a much more general way. For example, in-home sensors can notify a caregiver of irregular activity, but they cannot tell them whether such irregularity is serious or not, intentional or not, actionable or not, and so on. As a result, caregivers were often frustrated by false alerts, or by being alerted for minor things.

Moreover, because of such remoteness, completing the feedback loop between the demand for care and the provision of care takes time, especially in light of the more proximate, community-based caregiving practices the elderly have come to expect. One care worker explained how "they don't really understand how it [the panic button] works and the limitations… they perceived that by pressing it, the staff will appear and the ambulance will appear", causing triallists to be frustrated by time needed to complete the feedback loop. For example, a male in his early-70 s shared how he tried to use the panic button when he fell down in the middle of the night, but because "no-one call me, I think they are sleeping, no-one called me" he instead called an ambulance himself. This experience foregrounded a refusal to use the panic button again, as "this panic button is for show only… I have no confidence [in it]". Altogether, these scalar tensions can undermine the efficacy of smart solutions (March & Ribera-Fumaz, 2014). They enable the elderly to be continually monitored from afar, creating a remote sense of caregiving that is detached from the recipient in space and time. The fact that such a sense was often an insufficient substitute for more proximate forms of caregiving highlights the inadequacies of remoteness, and consolidates the parallelism of caregiving practices.

3.4. Passive versus active

Finally, as the preceding three subsections have highlighted, the triallists were prone to rely on their own, more proximate, and more community-oriented strategies of eldercare. They were, in other, words, active in developing care strategies that suited their lives and environments. In many respects, these strategies undermine the value of smart eldercare technologies, especially the motion sensors, which are based on the passive monitoring of behaviours and alerting caregivers to irregularities. Ironically then, the "smart" aspect of smart eldercare technologies – that is, the ability to respond to changes in the environment through reflexive, algorithmically-determined, feedback loops – is neutered by elderly people's active engagement with their own caregiving needs (Brenner, 2007). This insight reveals how the elderly often engage with smart eldercare technologies in ways that range from being agentic (i.e. by misusing them – activating the panic button when they felt lonely, for example) to apathetic (i.e. by not using them), both of which can be seen as a subversive

response to the technocratic logics that often underpin the implementation of smart eldercare technologies (Kong & Woods, 2018b). In this sense, agency and apathy reflect the refusal to comply with the new modalities of caregiving associated with such technologies.

For example, a male triallist in his early-70 s revealed his apathy towards the panic button when he stated that it is "better if I dial 999 [for an ambulance], faster". Both agentic and apathetic forms of engagement serve to negate the value of smart technologies. Another male triallist in his early-70 s explained how the technologies had no meaning for him, as, "they put [i.e. install them] okay, don't put also okay. Don't put, if we fall down, we got neighbours, [I will shout] 'Help! Help! Ambulance! Ambulance!'". In many respects, the envisioning of the smart city 2.0 is a conceptual response to such expressions of apathy towards technology. It is rooted in the 'vastly more important task of determining what citizens needs actually are and then selecting the technologies required to address these' (Trencher, 2019: 117), with the aim being to 'see technology from the priorities and hopes of residents themselves' (McFarlane & Söderström, 2017: 319). Whilst these determinations and perspective cannot be faulted, it remains to be seen if they can effectively – and at scale – overcome the pervasive sense of apathy that the parallelism of the smart city 1.0 may have already caused to become entrenched.

4. Parallel regimes of sustainability

As the data presented above show, there was a high degree of resistance to the smart eldercare technologies being trialled. Most triallists resorted to pre-established techniques of requesting and receiving care from those that happened to be around them when they needed it; techniques that were believed to be more reliable and effective on a day-to-day basis. These techniques provide critical insight into the fact that many implementers of smart solutions have a 'tendency to view citizens without agency, assigning them only passive roles as smart technology consumers or data generators' (Trencher, 2019: 119; see also Bouzguenda et al., 2019). Accordingly, the implementation of technologically-defined eldercare solutions in a top-down manner is misaligned with the bottom-up responses from those they are meant to benefit, which, as demonstrated above, focus on solving immediate problems through community-based solutions. Parallel regimes of sustainability emerge when 'two competing narratives, tensions or activities… co-exist in the same milieu' (Trencher, 2019: 118); they highlight the problem of divergence – and the challenge of integration – that underpins the logics of smartness and sustainability.

Parallel regimes of sustainability are therefore an outcome of the misalignment of technology and society. Smart technologies enable the rational and efficient management of (human) resources; they are sustainable in the sense that, technically speaking, fewer caregivers can look after more elderly that are dispersed around a larger area. Conversely, the lifestyles of vulnerable elderly populations involve relying on informal, proximate and community-based forms of support; they are sustainable in the sense that they have arisen organically, and in response to the lack of resources – monetary, family, and others – to fulfil their needs. Accordingly, parallel regimes of sustainability are not reproduced uniformly throughout society. Rather, they reflect the variable ways in which different social groups respond to smart city interventions, and bring to light the idea that 'people have to be willing to adapt to, and to live in, smart cities' (Vanolo, 2013: 893, emphasis added). For the elderly, non-participation in smart solutions foregrounds the problems of social parallelism and exclusion that can undermine the sustainability of smart cities (Cardullo & Kitchin, 2018a, 2018b). Taken to the extreme, smart solutions can run the risk of reproducing old, and creating new, forms of socio-technical division and exclusion.

In many respects, then, the reproduction of parallel regimes of sustainability can be interpreted as a theoretical response to Broto, Trencher, Iwaszuk, and Westman, (2019)): 449; see also Granier & Kudo, 2016; Joss et al., 2019; Martin et al., 2018; Yigitcanlar & Kamruzzaman, 2018) assertion that there is 'thin evidence of transformative capacity' when it comes to urban sustainability initiatives. In particular, they highlight the growing disjuncture between the "normalisation" of sustainability and the lack of empirical evidence to support such transformations; a disjuncture that is reproduced through the parallel regimes of sustainability that smart technologies can give rise to. Rather than sustainability being an "initiative" they instead propose that it is 'about fostering a cultural transformation, an ongoing process of social learning through which sustainability objectives are seen as a 'moving target' and never truly accomplished' (Broto et al., 2019: 450). To the extent that 'smart city projects are big and expensive investments that are supposed to drive societal and environmental transformations' (Yigitcanlar & Kamruzzaman, 2018: 50), the difficulty of realising such "transformations" underpins the need for smaller-scale projects that are developed from the perspective of the social groups they are meant to serve. Doing so would foster inclusion from the outset, and would result in the dismantling of technocracy through the development of solutions that do little things that help to augment, and incrementally improve, pre-existing patterns, processes and paradigms of caring for the elderly.

5. Conclusions

This paper has highlighted the divergent logics that problematise the intersection of smart and sustainable cities, and of smart cities and society. Divergence foregrounds the emergence of parallel regimes of (social) sustainability, which reflect the disjuncture between solutionoriented smart eldercare technologies, and problem-oriented societal interventions. Reconciliation is needed to overcome divergence, and to integrate smart and social infrastructures in ways that consolidate and strengthen the realisation of more sustainable cities. Divergences lead to divisions, which can further undermine the effective and efficient governance of urban environments. As reflected in recent articulations of the smart city 2.0, there is a need to overcome the socio-technical divisions that can underpin the parallelism of smart urbanism solutions (Hollands, 2008; Vanolo, 2013). The case of smart eldercare in Singapore highlights a situation in which 'technology does not replace human interaction, but can enable it' (Woods & Kong, 2018: 17). However, in order for technology to enable and empower citizens it must be shaped around their context-specific needs. Whilst there is evidence to suggest that effective solutions are being developed and implemented (Trencher & Karvonen, 2018), the fact remains that any smart solution must be "owned" by its beneficiaries (de Lange & de Waal, 2013) if it is to serve, and, more importantly, to realise, the purpose of sustainability.

There is, then, a need to reimagine what "smartness" and "sustainability" mean in different contexts around the world, and how the integration of terms can unlock more emancipatory models of urban development. Martin et al. (2018): 276 echo this sentiment, asserting that 'an imaginative leap on the part of digital technologists, urban developers, municipalities and citizens is needed to envision and develop these alternative forms of smart city that engage with a broader notion of sustainability'. The need for breadth is reflected in the empirical data presented above, which highlight how triallists were able to participate in smart eldercare, but often did not want to. The value of smart eldercare was unrealised, as it did not provide a compelling alternative to pre-existing practices. Non-participation can therefore be reinterpreted as intentional – even desired – exclusion from the notion of smart citizenship. This reveals a bigger problem that undermines the assumptions of beneficence and inclusion that underpin the sustainability rhetoric of smart city initiatives. In view of the findings presented here, it may be worth developing smart solutions that are designed to augment pre-existing social practices in ways that enhance their efficiency. Doing so would help to overcome the current

division between what is smart and what is sustainable, whilst opening the discourse up to less prescriptive, and more organic, understandings of what a city that incorporates elements of smartness and sustainability into its everyday fabric can become.

Whilst there have been calls to further interrogate and develop emergent urban paradigms like the "post-anthropocentric city" or the "more-than-human city" (Yigitcanlar et al., 2019), there is need for caution. People are the city, and cities have no meaning or purpose without the people that occupy them. Recognising this will help to reconcile the disjunctures between people and planning, or between the planning and praxis of policy, that have come to undermine the realisation of smart cities around the world (Broto et al., 2019; Trencher & Karvonen, 2017; Vanolo, 2013; Woods & Kong, 2017). To this end, more research is needed to explore what exactly it means to be a "smart citizen at the margins", and to therefore explicate how 'persistent sociotechnical bifurcation' can fuel the (re)production of marginality, resulting in a 'more complex shift in discourse regime' (Joss et al., 2019: 23). Being old and/or technologically illiterate does not preclude people from being a "smart citizen", but it does mean that certain accommodations need to be made if the category is to serve their needs as well as others. Doing so will enable the realisation of what Kitchin (2019) refers to as a "genuinely humanizing" smart urbanism; one that starts from the premise of fairness, equity, ethics and democracy, and builds outwards from there.