Ghosts in the Machine: why are citizens absent from the smart city movement?

Abstract

The smart city movement in the UK has grown considerably over the last decade. In many cases, this growth has outpaced attempts to structure or direct it, resulting in a variegated field of theory and practise. What has emerged, however, is an identifiable worldview which guides the smart city strategies of leading UK smart cities. In this paper, I draw out this worldview through analysis of city strategy documents and example projects and show that it is characterised by an implicit exclusion of city residents in favour of business interests. I then apply a systems thinking critique to the smart city movement, building on the notion of boundary critique in Ulrich (2005a), to argue that this worldview arises from a failure to properly locate the boundaries of urban problems within a normative framework that values citizen well-being in itself. After imagining possible futures of the smart city movement given the constraints of its worldview, I finally turn to a more optimistic vision of the future and, channeling Schumacher (1973), ask what could smart cities look like if they were built at a human scale.

Contents

Introduction

The notion of smart cities has been attracting attention amongst city leaders around the world for over two decades now. Whilst no precise definition exists for what constitutes a smart city, certain

traits are common: the strategic application of smart digital technology to solve urban problems; the prioritising of innovative and creative industries within city economic plans; and the transformation of cities from solid places into experiences, and of products into services.

As the idea of a smart city gains traction with city and national governments around the world, more insidious trends are emerging: the privatization of public space by monopolistic technology companies; large-scale data harvesting from citizens; an “identikit” approach to urban design that produces new cities faster than they can be inhabited (Wainright, 2019). What lies at the heart of these subversive trends is a reduction of human citizens to dematerialised data points.

City governments are naturally leading actors in the smart city movement, and in the UK city governments’ smart city designs are so far largely free from the more harmful aspects of some smart cities around the world and are guided by a will to improve quality of life for citizens. However, much evidence suggests that smart city projects are failing in this regard (see, for instance, Baeck and Saunders, 2015).

In this paper I analyse and critique the smart city movement as it manifests in the relationship of smart technology and city strategies from a systems thinking perspective to understand where the movement is in the UK today, what its issues are, and why it so often fails in its stated goal of improving citizen well-being.

Building on Ulrich’s notions of boundary critique and Critical Systems Heuristics (Ulrich, 1998; 2005a), I argue that smart city “solutions” to urban problems are at present framed by a top-down worldview in which complex urban systems of people are reduced to mechanical systems by means of externalizing the very problem that is to be solved. In such a worldview, citizens exist as ghostly inhabitants of systems rather than as actors within them. In particular, I identify within the smart city movement two fundamental presuppositions: firstly, that city problems are known and understood by city governments without need for citizen engagement; and secondly that these problems admit of technologically-focused solutions. In consequence, smart city projects often begin with goals removed from the immediate needs of citizens, such as when economic growth is posited as the sole determinant of citizen well-being.

A final section imagines a number of smart city trajectories, extrapolating the present movement over the next century based on the current trends, actors, drivers and worldview. There are of course many intersections between smart city futures and other social, economic, political and ecological trends. This section opens up many interesting avenues of questioning for future research.

The purpose of this paper is to problematize the smart city movement worldview and to seek to introduce a new worldview in which smart city technologies are seen as enablers of citizens capacity building. As such, this paper is a contribution to the ongoing conversation around smart cities from predominantly a strategy perspective, and also a contribution to systems thinking theory inasmuch as it applies to urban strategy, design and planning.

What if we could use technology not to reduce the city to a mechanical system, but instead to facilitate an understanding of and capacity to navigate a complex urban system? In this way, I make a call for smart cities to focus on livability, not efficiency.

Methodology

In this paper I have limited my focus to cities in the UK. This is to take into account the fact that city governments do not strategize in a policy vacuum and are in fact highly parameterised by central government, particularly when it comes to funding. Expanding the scope of this work to other nations would hence require a more nuanced study of the interactions between cities and central government in each nation before comparisons between cities could begin.

The cities chosen for study have all come from the report *UK Smart Cities Index 2017*, published by Huawei (Woods et al., 2017). The reason for this is that such a report provides a cross-sectional overview of the smart city movement such as it exists in the UK today and represents the aspects of smart city design and strategy considered valuable by its actors.

In order to define the smart city I have drawn principally on official city government documents and reports. Evidence to support these findings have then been drawn from available publications both in print and online from those cities chosen.

Defining the Smart City

Despite the concept of a smart city having existed for nearly three decades, no absolute definition exists. However, over the years a smart city "movement", composed of the many cities - in the UK and globally - as well as government bodies, civil society actors, think tanks, NGOs and more who operate within the nexus of urbanization and digital technology development has emerged. Each of these different actors works to their own definition of what a smart city is and some of these are presented below for comparison. Yet it is possible to identify common themes which indicate the general direction, means, aims and goals of this smart city movement.

The British Standards Institute (BSI) illustrates a trend in the smart city movement by defining not what a smart city is but rather focuses on the processual nature of smart city development, thus leaving it to individual actors within the smart city movement to define their own goals. A smart city is hereby characterised as any city that seeks an 'effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens' (BSI, 2014: 4).

The Department for Business, Innovation and Skills (BIS) echoes the BSI in recognizing that the concept of a smart city is not fixed (BIS, 2013a). BIS defines a smart city first through what one does: a smart city enables and encourages citizens to become active participants in their

community and city, for instance by providing feedback on local government services, the state of their built environment, and engaging in community projects (BIS, 2013a: 7). Such a processual working definition was mirrored by Manchester's CityVerve smart city project. Indeed, CityVerve talks of Manchester as a *smarter* city, not merely a smart city, in order to reflect the ongoing learning process.[1]

Contrast this to the definition used by the Huawei Smart Cities Index, an annual report highlighting leading work on smart city development in the UK. In the 2017 report (Woods et al., 2017), 20 UK cities were ranked across a range of criteria summed up in the working definition of a smart city as one that integrates technology 'into a strategic approach to sustainability, citizen well-being, and economic development'. This is mirrored by the Scottish Cities Alliance (2016: 7), for whom a smart city is defined as 'the integration of data and digital technologies into a strategic approach to sustainability, citizen well-being and economic development.'

The distinction between "integrates technology *and* strategy" (in the BSI definition) and "integrates technology *into* strategy into" (in Huawei's definition) is subtle but powerful as the latter indicates a view of technology as an enabler of strategy rather than a disruptor of existing strategy models, as implied by the BSI's definition. Indeed, this distinction can be thought of as a major theme of the smart city movement. In particular, are smart technologies a means to better city strategy, or are they, in a sense, and end in themselves, a new form of strategy altogether?

Within that first category, of cities using smart technology as an enabler of strategy, there is a risk of that strategy losing the very holism that is fundamental to the smart city movement and becoming linear, siloed strategies once more (Woods et al., 2017: 9). For instance, many smart city visions and definitions take the form of a verb model (i.e.a model of the form 'to do P by means of Q in order for R'). For instance, the view of BIS (2013a: 7) could be summarized as follows: the process of creating a smart city involves the use of digital technology, infrastructure and social capital in order to fuel economic growth and create an attractive environment for all. Or the definition used by Birmingham City Council (Cohen in BCC, 2012: 13) could be rephrased as: to be more intelligent and efficient in the use of resources by means of ICTs and data, in order to improve service delivery and quality of life.

By setting the goal of the smart city movement to be improving economic growth or service delivery, a value system is created in which smart technologies and smart city projects are judged. This in turn places a hierarchy on the stakeholders of the movement, determining whose voice is heard and whose interests pursued.

The case of smart technology as a disruptor of existing strategies leads to a second major theme worth highlighting in the smart city movement: that of leadership. In particular, who designs and leads a smart city project or agenda? Many smart city strategies make much of the idea of citizen-led design (for example Birmingham, Peterborough, London, Bristol), and yet retain a clear focus on centralized planning. For instance, Birmingham City Council (2012: 22) note that their smart city roadmap will be 'led from the top'. And both the BSI and BIS consider it fundamental to a

[1] See https://cityverve.org.uk/

smart city agenda that city authorities take responsibility for determining ‘what the future city offers its people’ (BSI, 2014; BIS, 2013a: 8).

For Birmingham City Council, a smart city is defined as a city using advanced IT technologies and data analysis to manage resources more efficiently, to improve service delivery and quality of life, and to lower the city’s environmental impact (Cohen in BCC, 2012: 13). Priorities for BCC in this regard include traffic light sequencing to improve traffic efficiency, rolling out smart meters and smart energy grids, and attracting ‘business, entrepreneurs and social enterprises’ to the city’ (ibid.: 15).

On the one hand it is natural for the smart city movement to be led by city governments, and in itself such oversight and the collective vision it affords are perfectly legitimate sources of direction. However, there is a danger that this can lead to a centralized and functional attitude to smart city development which serves only the basic statutory duties of these institutions (typically water, energy, telecoms, waste, and transport) (see, for instance, Smart Cambridge, 2017) .Whilst these are important city process that would benefit from the efficiencies granted by increased use of smart technology, there is a limit to what they can achieve for citizen well-being. After all, so long as waste is collected on time and dealt with appropriately, the vast majority of citizens will be content. It is difficult to see how improvement, however vast, in any statutory area could really improve citizens’ lived experience on a deeper level.

Top-down smart city strategies thus risk falling foul of a selective claim to knowledge of urban problems and their causes (Ulrich, 2005: 2). And whilst inefficiencies in, say, waste management may well be identified and resolved, the relationship between waste management and citizen well-being remains beyond the scope of such thinking and the question of “why are we doing this” is left unanswered.

For the purposes of this paper it will be useful to have some fixed sense of what is meant by a smart city. By drawing the widest possible circle around the various characteristics of smart cities as they currently exist in the UK we can think of a smart city as a built environment, where city government utilises technology - especially big data and internet of things (IoT) - to develop and/or execute its economic development strategy by means of improving service delivery and resource management in different urban processes such as traffic and mobility, healthcare, education, business, waste and sanitation and many others, and building connectivity across physical and virtual economic networks.

Critiquing the Smart City

The constantly evolving nature of smart cities and the smart city movement means that any critique must take aim at a moving target. However, by keeping in mind the question of who benefits from smart cities we can avoid becoming mired in any attempt at a general critique and instead develop a framework by which individual smart city agendas or projects might be assessed. In this section, therefore, I present some of the more prescient criticisms of the smart

city movement over time before synthesizing them with a systems thinking perspective on the question of smart cities.

Before continuing to critique the smart city movement, the reference system used to do so should be made clear. The focus of this paper is citizen well-being, but given that this is also a stated goal of many smart city strategies, there is a risk of using the same term to mean two different things: well-being from the current smart city movement perspective, and well-being from my own perspective. To be clear, then, I understand citizen well-being to mean self-worth that derives from an active and competent engagement with civil society and the capacity to make choices that affect those conditions of one's life that one has reason to value.[2]

Nesta (Baeck and Saunders, 2015) have already noted the absence of meaningful citizen engagement in the smart city movement, this despite city residents often being cited as the greatest beneficiaries of smart city developments. One historic reason for this has been that the smart technology field as a whole lacks cohesion, resulting in the aims and means of the smart city movement being misaligned (ibid.: 19). However, although it was perhaps the case 10 years ago that smart city projects were either led by technology developers who had no knowledge of city planning, or city planners who had no understanding of smart technology, it seems that cities today have made efforts to remedy the situation. A holistic, "silo-busting" approach to smart city development is *de rigueur* for smart city visions today (Woods et al., 2017).

And yet, holism is no defence against an ingrained worldview, and the vision of smart cities as business-friendly first and citizen-friendly as a consequence remains dominant across today's smart city movement. Thus, although information is shared amongst government departments and collaboration encouraged, the facts that are collected and valued, that form the basis of decision-making, remain the same.

A second historic trend within the smart city movement has been for smart city projects to often start with technology and then find a problem to solve rather than the other way round (Nesta, 2015). This is particularly the case with internet of things (IoT) technologies such as sensors, which, when distributed across a city, can collect big data on air quality, footfall, traffic flows and so on. The issue being that once this data has been collected, no one quite knows what to do with it. Some cities - for instance, Future Peterborough's Hackathons - attempt to resolve this problem with "hackathons", in which IT companies are invited to access and manipulate the data to find uses for it. This risks simply reproducing the problem of accessibility however, as most citizens and businesses do not have the capacity to engage in hackathons.

Indeed, there is no shortage of evidence to suggest that the real reason for cities placing such emphasis on data collection and IoT is the potential to monetize them either directly via the "platform as a service" model, or indirectly by leveraging "smart city" as a badge of prestige to attract young professionals and outside investment (TM Forum, 2019; Hollands, 2008; BIS, 2013a).

[2] For more detail on this definition, I direct the reader to both Ulrich (1998) and Sen (2010).

Hollands (2008: 306) identifies within the smart city movement a conflation of hardware and software solutions, resulting in a failure to differentiate between infrastructural improvements and human capacity development in response to urban problems. We can understand the implications of this further by considering how BSI (2014:4) define smart city projects as occurring *within* the built environment, rather than *to* the built environment, suggesting a view of the latter as static and irrelevant to the developments of smart technology. It is certainly true that citizens of cities are increasingly living, working and playing in this digital, virtual world, and its importance should accordingly be recognized. However, such a tech-centric view can overlook the opportunities for low-tech solutions.

We have seen above how many cities are today looking for smart solutions to problems in traffic management, waste management and delivery of other statutory services (BIS, 2013a; Glasgow City Centre Strategy, 2016; Smart Cambridge, 2017). However, many of these are prime areas for citizen capacity development first, possibly facilitated by technology. For instance, Ljubljana in Slovenia has a household recycling rate of over 68% thanks to old-fashioned solutions like regular kerbside collections and investments in recycling plant technology (Dakskobler, 2019). Similarly, Swansea has cut the amount of waste going to landfill by simply banning residents from putting recyclables in their black bin bags (Swansea Council, no date).

Whilst Woods et al. (2017:15) are not wrong to suggest that the city is becoming ‘as much a virtual environment and a physical one’, it should never be forgotten that the city remains a physical space and that infrastructure and the means by which people navigate that infrastructure are just as important as any smart system. Given the centrality of infrastructural urban services to many smart city agendas within and across aspiring smart cities, this absence of any recognition of the interrelations between the physical and virtual city is striking.

This gap between working in the city and working with the city is highlighted by Bouvier (2016) who accuses the current smart city movement of creating ‘Frankenstein’s Monster cities’ - cities composed of multiple smart “parts”, just as Frankenstein’s monster is made up a parts of other humans. And just as Frankenstein overlooked the fact that a person is more than a collection of bones and organs, smart city leaders run the risk of overlooking the analogous fact about cities, known since the days of Aristotle: cities (the *polis*) are greater than the sum of their parts. To think that the integration of smart technology within the built environment will improve the lived experience of citizens is to forget that the soul of the city lies precisely in those citizens and the networks that they produce.

A Critical Systems Heuristics Perspective

So why do so many smart city projects and visions fall into the trap of excluding humans from the equation? I believe that an answer to this can be found by looking at the worldview that permeates the smart city movement.

To analyse this worldview, I draw on the work of Ulrich (1998; 2005a) and Critical Systems Heuristics (CSH). Within CSH, there is a move to consider not only systems themselves but the

context in which they are considered (Ulrich, 1998: 5). Stepping beyond the idea that any one person or even collection of people can know everything about a given system and all its stakeholders, actors, drivers and so on, CSH leaves behind linear logical analysis ("A causes B and therefore C") and instead adopts a heuristic method.

A central tool in CSH is what Ulrich (ibid.: 6) calls systemic triangulation. For any given system, its boundaries, the observable facts about that system, and the values with which we appraise that system and its functioning are all fundamentally related.

The smart city movement worldview has two key parts. First, in observing the facts of urban systems, there is a belief - shared across city governments, central government, technology companies, and businesses - that cities are systems of simple systems, which is to say that any urban system (for instance, healthcare) can be abstracted from the rest of the city and studied in isolation to identify its problems and barriers (Cortright, 2017). Indicative of this is the trend, mentioned above, for smart cities to view the city as static and a place in which technology can be sited rather than a living space in which technology must be integrated. A consequence of this is that any problems identified within a system are automatically externalised and seen as barriers to the smooth flowing of the system in question, rather than being viewed as (at least potentially) inherent to that system. This is an example of what Ulrich calls boundary judgement, and it reflects a normative view that values systems themselves higher than the social context in which those systems have meaning, which, ultimately, derives from the people within them (Ulrich, 1998; 2005b).

For instance, Birmingham City Council's PULSE project aimed to use big data analytics to create a predictive healthcare system through monitoring not only individual's health risks but also wider social and environmental risk factors (Digital Birmingham, no date). The implication here is that through the reduction of a complex system (like the interaction of a human body with its environment) to a simple numerical system can quality of life be improved. This overlooking the fact that city residents have long been capable of identifying their own risk factors and taking action to mitigate against them (see for instance Harris, 2019). Such a top-down approach thus views citizens as passive customers of the service, rather than actors or knowledge-holders within a system.

The second dimension of the smart city worldview is the assumption that urban problems admit of technological solutions. This is in part a corollary of the first assumption, after all, hardware solutions are usually the solution to problems in simple or mechanical systems. However, this second dimension is unique in as much as it represents the value system underpinning the smart city movement. In particular, by valorizing technology in this way, the smart city movement prioritises those who design, produce and operate such technology - often private sector companies - above the citizens who are, ostensibly, the beneficiaries of smart city development and the capacity development of those citizens.

We see this aspect of the smart city worldview in the desire cities have to attract smart technology companies, for instance the creation of "living labs" such as Bristol is Open, in the belief that doing so will create a "honey pot" effect and thereby generating trickle-down economic benefit for the population at large (BIS, 2013a: 13).

What if we flip this smart city worldview on its head and consider city problems not as arbitrary but as emergent properties of urban systems? What if, further, we view citizen well-being not as an addendum to economic development but as a goal in and of itself? What kind of city would result from such a worldview?

Crucial in a shift towards this alternative worldview is a redefinition of urban system boundaries judgements through what Ulrich (2005a: 6) calls 'systemic triangulation'. For any given system, its boundaries, observable facts about that system, and the values with which we appraise that system and its functioning are all related.

For the current smart city movement, as we have seen, the system boundary is set by the process of "improving service delivery," the facts are inefficiencies in these services, and the values underpinning the movement are, ostensibly, citizen well-being and yet these viewed through the lens of business interests, rather than as a value in themselves.

However, if we expand the boundary of our system beyond "improving service delivery" what effect might this have on the other corners of the system triangle? We may find that previously unseen values become visible through which we can appraise the facts. Improved service delivery makes life easier, but does not in itself make life *better* in the same way as, say, engaging in civil society and feeling like a citizen whose voice matters. Better data on health risks can improve quality of life, but can't give one a reason to live in the same way as, say, being a valued member of your community. Improved traffic efficiency may get you to work quicker, but what does it matter if your work is unfulfilling? These are questions at the level of the people who inhabit urban systems, not merely at the level of those systems themselves (Cortright, 2017).

As an example, let us attempt a systemic triangulation of traffic congestion, a key issue targeted by Bristol's smart city agenda (Bristol City Council, 2017). For Bristol, smart traffic control is designed to keep traffic moving, but with this as the goal, a boundary is drawn around the traffic system and it is dealt with as a mechanical system of stocks (cars waiting at traffic lines and junctions, or stuck in congestion) and flows. Crucially, the people driving the cars are not considered within this model, and facts about who is driving, from where and to where, what is the average distance of journey, how full are individual cars, and value judgments about who needs to use the road as opposed to who uses the road for convenience, and many others are excluded.

Moreover, by limiting the boundary to the road system itself, planners prescribe the reason why they are making an intervention in the first place. For instance, if we extend the boundary of the system from the roads to, say, the entire city, we find that transport accounts for 29% of Bristol's greenhouse gas emissions (WSP, 2018:14). If we take reducing this as the "why" of improving traffic efficiency, we may find that alternative solutions present themselves. And this is indeed the case.

Instead of looking at smart solutions to traffic management, planners might be better off considering smarter road design, for instance introducing bus and bike lanes as a way of shifting people away from cars. Given that in the city of Bristol, for instance, 40% of commutes are over distances less than 2 kilometers (Travelwest, 2019: 13), enabling and incentivizing walking,

cycling and public transport would reduce traffic more than any smart solution could. Such a scheme has been successfully trialled in New York (Jaffe, 2014) and delivers not merely efficiency but greater choice for commuters and reduced emissions.

It is worth noting that smart traffic management is not even guaranteed to work. Whilst it can lower journey times, reducing lost time for drivers and cutting emissions from idling cars (Barry, 2014), doing so can be a double-edged sword. The problem of induced demand, whereby a drop in road congestion encourages more people to use the road, thus increasing congestion back to pre-intervention levels, is well attested (DfT, 2018; Schneider, 2018), thus showing that the boundary of the traffic system lies beyond the roads themselves.

There is a parallel here between the application of smart technology and Shumacher's (1973) notion of 'appropriate technology.' Although Schumacher's analysis was largely limited to improving the quality of labour, whilst we are here concerned with quality of life, we can nonetheless appreciate the similar contradictions of (per Schumacher) applying large-scale industrial technology to achieve rapid economic development at the expense of gainfully employing the majority of people, and (in the smart city movement) applying smart technology to remove problems from the consideration of citizens such that the majority of citizens are rendered as passive "ghosts" within their own city.

Smart City Trajectories

What does the future look like for the smart city movement? Within the above analysis, I have identified the following stakeholders: city governments, smart technology companies, the wider business sector, and citizens. Using Ulrich's (1993) terminology, we can say that the first three of these are involved in the current smart city worldview whilst the latter - citizens - are merely affected. Also, we have various drivers, including city governments' desire to cut costs and improve efficiency of service delivery, the latent value of the smart technology sector, estimated to be £400bn by 2020 (BIS, 2013b), and consumer desire for technology.

In this section, I extrapolate the present smart city movement from the perspectives of these stakeholders acting under the prevalent smart city worldview, and for each imagine a different trajectory, which, whilst relatively simple, can serve as guides to help us identify the problems inherent in the movement today and prevent them from spreading.

There are a number of wider political, economic and social trends that will impact smart city futures. The first of these is the increasing stress on the global supply of minerals like gold and tantalum from which the technological components themselves are built, a particular issue in the EU which has few natural deposits (Goodenough and Shaw, 2011). Secondly, climate change will disrupt city strategies by demanding adaptation faster than many cities around the world are capable of. Thirdly, the widespread introduction of Artificial Intelligence (AI) into industrial sectors, will cause mass displacement of the labour force which, without adequate mitigation in the form of reskilling and retraining to adapt the workforce to this AI environment, will result in mass unemployment and associated social tension.

These trends are omitted from explicit consideration here as they are beyond the scope of this paper. However, full stress-testing of the smart city movement would provide a valuable contribution to the smart city discussion and a welcome subject of future research.

Trajectory 1: Statutory Service Delivery

Under this trajectory, the smart city movement continues much as it has this past decade with technology being applied principally within the boundary of statutory service delivery on the part of city governments. However, through the actions of the technology sector, and those cities' desire to cut service costs and balance their budgets within a tight fiscal environment, these services become increasingly privatized with the effect that much smart technology development is controlled by private utility companies.

The success of smart city projects in these conditions will likely depend largely on the political environment and support for new technology investments, and on regulations. For instance, the electricity market regulator Ofgem has made room for experimentation and innovation in energy provision in areas such as local peer-to-peer trading (BEIS, 2019: 21).

The underlying smart city worldview as analysed above is clearly present here. Within this there is another, often overlooked, barrier to the take-up of smart technology in service delivery: the IT literacy of the end users i.e. citizens. This was demonstrated by the recent digitalisation of the benefits system in the UK, which served to exclude those without internet access or computer skills - which group has a strong overlap with those needing benefits - from accessing the support they need (Gentlemen, 2013). This absenting of people's real needs from the benefits system only serves to reduce efficiency and increase implementation costs, thus generating a feedback loop in which more digitalisation creates the presumed need for more digitalisation.

Over time, one major weaknesses of this trajectory is that it siloes smart technology development into particular areas of life. As the fourth industrial revolution progresses and technology enters more and more realms of life, city governments may find themselves lagging behind the curve.

Possible benefits to citizens include lower service costs due to efficiency savings. Environmental benefits follow as, for instance, recycling becomes much more widespread and effective, water systems become more efficient and less prone to wastage, and smart energy grids balance supply and demand in real time to reduce the burden on generation (National Grid, 2019).

Trajectory 2: Digital Playground

In a bid to access the increasingly large smart city investment potential, cities compete to attract technology companies and start-ups. Prime models of this include the “living lab” such as those being trialled in Amsterdam and Helsinki (Smart City Embassy, no date; Smart City, 2019), and the “city-as-a-service” model (Eggers and Skowron, 2018; Grech, 2015).

The ostensible purpose of these models is to decentralize control and ownership over smart city projects, enabling government, private sector, and citizens to come together, share ideas, and co-create new technological applications. However, the profit motive is more prevalent than ever in this environment, driven as it is by the private sector (see, for instance, Flynn and Skowron, 2018).

Whilst such a focus may well lead to greater interest and investment of time and money, resulting in invest in faster development of technologies like autonomous vehicles, VR cinema, digital, allowing them to become mainstream faster than they otherwise would. However, the prime actors and beneficiaries of this model are the technology companies themselves who can make large profits from the comfortable economic provisions made for them. Hence, we find within the living lab the exact same worldview as analysed above, along with all the same drawbacks. For instance, Smart Kalasatama[3] promises to improve quality of life by reducing time spent in traffic (cf. the example given in the previous section).

Private sector actors need to protect investments in necessary infrastructure and secure against risk (Flynn and Skowron, 2018). For this, smart technology companies are increasingly seeking the privatisation of the public realm, as has been the case with Google’s smart city project in Toronto, Sidewalk Labs. There arise from this significant questions around privacy and data usage and ownership (Bliss, 2018).

Ultimately, what this “digital playground” creates is a widening gulf between those who are computer literate (in the widest sense, not simply of being able to use a computer, but of actively engaging with technology, and especially apps, and digital services as a part of daily life) and those who aren’t, which translates into a question of who has the power to use, shape and transform the public realm. Without substantial investment in computer education, or a rehaul of the underlying worldview so that people come first (see the example of Knowle West Media Centre below), it is difficult to imagine how open such a city could ever really be.

Trajectory 3: Fortress City

The smart city worldview, as we have seen, consists of a belief that technology by itself is the answer to life’s problems. In an increasingly fearful and insecure world, what happens when technology is used as a defense mechanism? The answer is that we start to see

[3] See https://fiksukalasatama.fi/en/

technology, and today increasingly smart technology, used to build walls - physical and virtual - between segments of society.

In an urban context, this can manifest as a smart city that becomes a tool for surveillance, whether that is government-led as in the case of China's 'Big Brother smart cities' (Yang, 2018), or private sector-led as is the case with Google's Sidewalk Labs (Canon, 2018). In light of this, the recent cooperation of the British and Chinese Governments to develop coordinated smart city agendas (BEIS, 2019) should perhaps be cause for concern.

In more physical manifestations, smart technology can be used to protect gated communities such as those common in cities like Sao Paulo and Bangalore, and already smart systems are being used to facilitate this (Mari, 2017). The promulgation of gated communities in England (Blandy and Lister, 2005) prompts reflection on the possibility of this future for England and the UK.

At the apex of this trend sites Forest City, an entirely new city is being built outside Singapore.[4] With property far beyond the price range of most people in Malaysia, situated on an artificial island separated from the mainland by a causeway and encircled by a '"virtual electric fence"' (Wainright, 2019), Forest City is a chilling vision of a smart city future in which a minority can escape from the world and sequester themselves in private luxury. Moreover, with its plastic plants and fake animals (Kobie, 2016), Forest City is the ultimate example of the disjuncture between subjective experience and physical reality than can result when profit and technology are pursued in abstraction from real human need.

In the absence of capacity building and digital literacy on a society-wide scale, the digitisation of the basic functions of everyday life (work, leisure, health, transport, food etc.) and the governance structures that facilitate and administer them becomes an opaque barrier between the two, thus making the notion of a modern civil society increasingly hard to realise.

As a final smart city future trajectory, let us imagine a smart city built with an alternative worldview, one in which people matter and in which smart technology is a source of cohesion.

Trajectory 4: People-scale Smart Cities

A smart city built on an alternative worldview could of course take many forms. However, having already encountered the tension between strategizing in the city and strategizing with the city as it exists within the smart city movement, let us imagine the smart city that moves past this debate and explore the idea of situating strategy within the networks of people whom it is designed to benefit, and who have the knowledge necessary to design

[4] See http://forestcityjohor.com/.

and then implement it. Ulrich (1998) notes the importance of considering systems in their social context, the next step is to consider strategy in its social context.

As a case study in strategizing in the community, let us consider Bristol's Knowle West Media Centre (KWMC) and "The Bristol Approach," a method of creating and implementing smart city projects that benefit people at a level that people can understand and engage with. The aim of The Bristol Approach is to act within and develop the urban commons, the resources, including knowledge and human capacity, that we share by virtue of living together (KWMC, 2016).

The Bristol Approach is an iterative method for developing smart city projects and has 6 steps: identification, framing, design, deployment, orchestration, and outcome. This closely resembles Ulrich's systemic triangulation (1998), where the identification of facts about an issue is done in unison with framing that issue and locating points at which intervention can be made.

Where The Bristol Approach Draws its strength from is the value it places in engaging people, and hearing multiple voices; stakeholders, actors and drivers are never static but always under renewal (KWMC, 2016). In particular, when framing an issue and the intervention that could be made, we are encouraged to ask: 'can sensor technology and open data help to tackle the issue?" Moreover, once an intervention is identified and technological solutions designed, citizens are still engaged in the process to ensure that any technology is fully accessible to all, regardless of ability or computer literacy.

Though this iterative, inclusive and self-critical process, The Bristol Approach operates in a worldview entirely opposite to that which is driving much of the smart city movement today. Here, citizens are intrinsically involved in the design of projects, thus giving them control and recognising their expertise within the context of their own lives (Ulrich, 1993). Following Schumacher (1973), we might call this "smart cities as if people mattered." As such, it offers an indispensable guide to how the movement might in the future work to build more cohesive and resilient communities, and cities at a human scale.

A citizen-led approach is itself not without weaknesses, however. Small-scale projects can be difficult to scale or translate, even in cases where different communities could clearly benefit from the same idea. Moreover, as has been seen with small start-up companies for decades now, they are at risk of being bought by larger companies who fear competition.

Finally, community smart city projects can have the adverse effect of creating exactly the "honey pot" conditions that attract other technology companies to the area and the associated processes of gentrification which can accompany that.

Summary

In this paper I have presented an overview of the smart city movement over the last decade, covering various definitions of the concept, real world examples, and pressing criticisms. My purpose for asking “where are citizens” has been twofold. Firstly, to attempt to provide a degree of uniformity to the conversation so that, going forwards, a more meaningful debate on the benefits, drawbacks and direction of the smart city movement is possible. Secondly, to seek to apply pressure to that conversation so as to alter the direction of the smart city movement, which, I believe, has become too enamoured with the economic case at the expense of its potential to substantially improve quality of life for citizens.

Simultaneously, by drawing on systems thinking methods, in particular CSH, I have sought to provide the building blocks for a new worldview that might be applied to smart city strategies so as to ensure meaningful citizen participation and engagement. It is my hope that this model is taken up by those acting within the smart city movement, whether that be city leaders, planners, technology companies and businesses, or citizens.

The two key takeaways are, firstly, to recognize that the city is a complex system of complex systems and cannot be reduced to simple systems without losing that which makes urban life so enigmatic. When considering urban problems, apply heuristic methods, not linear or logical deductive ones (Ulrich, 2005a). Be sure to extend the boundary of the system to include the problem itself and therefore the context in which that system has meaning, which often means reconsidering the stakeholders and actors we have identified within the system. Otherwise we risk attempting to fix a system when it is the values we hold about that system or facts we have observed which are at fault.

Secondly, with a problem identified, ask: does this *need* a technological solution, or would a human capacity solution be better? With the latter possibly facilitated by technology, but not dependent on it. Or, to put it another way, use smart technology not to prescribe a certain way of life but rather to supplement capacity building for citizens and their ability to navigate the city.

Why are citizens absent from the smart city movement? Because that movement is dominated by a worldview in which citizens are not perceived as actors but rather as passive, ghost-like entities. Until this worldview is changed, and citizens placed at the heart of the movement, smart cities will remain soulless automata.

The smart city does not yet exist; it is the city of tomorrow. Let us be sure that it is built at a human scale.

Bibliography

Baeck, P. and Saunders, T. (2015) *Rethinking Smart Cities*, London: Nesta.

Barry, K. (2014) *The Traffic Lights of Tomorrow Will Actively Manage Congestion* [online] [accessed 31 May 2019] available at https://www.citylab.com/transportation/2014/09/the-traffic-lights-of-tomorrow-will-actively-manage-congestion/379950/.

Birmingham City Council (2012) *Birmingham Smart City Commission Vision: Establishing a Roadmap to a Future City*.

Blandy, S. & Lister, D. (2005) Gated Communities: (Ne)Gating Community Development?, *Housing Studies*, 20:2, pp. 287-301.

Bliss, L. (2018) 'How Smart Should a City Be? Toronto Is Finding Out' [online] [accessed 24/0719] available at https://www.citylab.com/design/2018/09/how-smart-should-a-city-be-toronto-is-finding-out/569116/.

Bouvier, P. (2016) *How to Model Our Future Cities?* [online] [accessed 31 May 2019] available at https://knowledge.insead.edu/blog/insead-blog/how-to-model-our-future-cities-5113.

Bristol City Council (2017) *State of the Art Operations Centre Opens in Bristol* [online] [accessed 24 June 2019] available at https://news.bristol.gov.uk/news/state-of-the-art-operations-centre-opens-in-bristol-2.

British Standards Institute (2014) *Smart City Framework - Guide to Establishing Strategies for Smart Cities and Communities*, PAS181:2014.

Canon, G. (2018) *'City of surveillance': privacy expert quits Toronto's smart-city project*, The Guardian, available at https://www.theguardian.com/world/2018/oct/23/toronto-smart-city-surveillance-ann-cavoukian-resigns-privacy [accessed 28/06/19].

Citron, R., Chow, T., Labastida, R. R., Leuschner, P., Woods, E. (2017) *UK Smart Cities Index, 2017* Boulder, CO: Navigant.

Cortright, J. (2017) *What does it mean to be a "Smart City?'* [online] [accessed 20 June 19] available at http://cityobservatory.org/smart_city_definition/.

Dakskobler, L. (2019) *From no recycling to zero waste: how Ljubljana rethought its rubbish* [online] [accessed 13 June 2019] available at https://www.theguardian.com/cities/2019/may/23/zero-recycling-to-zero-waste-how-ljubljana-rethought-its-rubbish.

Department for Business, Innovation and Skills (2013a) *Smart Cities: Background Paper* [online] [accessed 31 May 2019] available at www.gov.uk/government/publications/smart-city-background-paper.

Department for Business, Innovation and Skills (2013b) *The Smart City Market: Opportunities for the UK*, BIS Research Paper No. 136, London: Business of Innovation and Skills.

Department for Business, Energy and Industrial Strategy (2019) *Regulation for the Fourth Industrial Revolution*, HM Government White Paper.

Department for Transport (2018) *Latest Evidence on Induced Travel Demand: An Evidence Review*, London: Department for Transport.

Digital Birmingham (no date) *H2020: PULSE (Participatory Urban Living for Sustainable Environments)* [online] [accessed 28 May 2019] available at http://digitalbirmingham.co.uk/project/h2020-pulse-participatory-urban-living-for-sustainable-environments/.

Eggers, W. D., and Skowron, J. (2018) *Forces of change: Smart cities* [online] [accessed 26/07/19] available at https://www2.deloitte.com/insights/us/en/focus/smart-city/overview.html.

Flynn, M. and Skowron, J. (2018) *The Challenge of Paying for Smart City Projects*, Deloitte.

Future Peterborough (no date) *Instant Atlas* [online] [accessed 28 May 2019] available at http://www.futurepeterborough.com/project/instant-atlas/.

Gentlemen, A. (2013) *Charities say millions without internet access will face benefits struggle*, The Guardian, available at https://www.theguardian.com/society/2013/feb/21/universal-credit-online-benefit-claimants [accessed 28/06/19].

Glasgow City Centre Strategy (no date) *What Are Smart Cities* [online] [accessed 04 June 2019] available at https://www.glasgowcitycentrestrategy.com/what-are-smart-cities.htm.

Grech, G. (2015) *Cities as Platforms*[online] [accessed 26/07/19] available at https://techcrunch.com/2015/08/07/cities-as-platforms/.

Harris, J. (2019) *How to Take Over Town: the inside story of a local revolution* [online] [accessed 12 June 2019] available at https://www.theguardian.com/society/2019/jun/12/how-to-take-over-your-town-the-inside-story-of-a-local-revolution.

Hollands, R. (2008) 'Will the Real Smart City Please Stand Up?', *City*, 12:3, pp. 303-320.

Knowle West Media Centre (KWMC) (2016) *The Bristol Approach In Action: working together to create tech for the common good* [online] [accessed 30/05/19] available at http://www.bristolapproach.org/bristol-approach/.

Kobie, N. (2016) *Malaysia's city of the future is an uncanny valley* [online] [accessed 26/07/19] available at https://www.wired.co.uk/article/forest-city-malaysia-report.

Jaffe, E. (2014) *When Adding Bike Lanes Actually Reduces Traffic Delays* [online] [accessed 31 May 2019] available at https://www.citylab.com/solutions/2014/09/when-adding-bike-lanes-actually-reduces-traffic-delays/379623/.

Mari, A. (2017) *São Paulo Mayor outlines smart city plan*, ZDNet, available at https://www.zdnet.com/article/sao-paulo-mayor-outlines-smart-city-plan/ [accessed 28/06/19].

National Grid (2019) Future Energy Scenarios.

Report of the Deputy Chief Executive [online] [accessed 31 May 2019] available at https://democracy.leeds.gov.uk/documents/s124710/Smart%20Cities%20Report%20Appendix%20041214.pdf.

Roberts, D. (2014) *Smart Cities: Delivering a sustainable City in the Digital Age.*

Schneider, B. (2018) *CityLab University: Induced Demand* [online] [accessed 31 May 2019] available at https://www.citylab.com/transportation/2018/09/citylab-university-induced-demand/569455/.

Schumacher, E. F. (1973) *Small is Beautiful* London: Blond Briggs.

Scottish Cities Alliance (2016) *Smart Cities Scotland Blueprint*.

Sen, A. (2010) *The Idea of Justice*, London: Penguin.

Smart Cambridge (2017) Smart Cambridge Brochure 2017-2018 [online] [accessed 04 June 2019] available at https://www.connectingcambridgeshire.co.uk/smart-places/smart-cambridge/.

Smart City (2019) *Living Labs: Co-creating Possibilities In The Smart Cities* [online] [accessed 25/07/19] available at https://www.smartcity.press/living-lab-in-smart-cities/.

Smart City Embassy (no date) *IoT Living Lab* [online] [accessed 25/07/19] available at http://smartcityembassy.nl/initiative/iot-living-lab/.

SmartUse (no date) *The Circular Economy* [online] [accessed 04 July 2019] available at https://smartuse.global/main/circular-economy/.

Swansea Council (no date) *Keep it out - it's time for everyone to recycle* [online] [accessed 13/06/19] available at https://www.swansea.gov.uk/keepitout.

TM Forum (2019) *Three Approaches to Monetizing IoT* [online] [accessed 30 May 2019] available at https://inform.tmforum.org/insights/2019/05/three-approaches-monetizing-iot/.

TravelWest (2019) *Draft Joint Local Transport Plan 4, 2019-2035* Bristol@ TravelWest.

Ulrich (1993) 'Some Difficulties of Ecolgical thinking, Considered from a Critical Systems Perspective: A Plan for Critical Holism', *Systems Practice*, 6:6, pp. 583-611.

Ulrich, W. (1998) *Systems Thinking as if People Mattered: Critical Systems Thinking for Citizens and Managers*, Working Paper No. 23, Lincoln, UK: University of Lincoln.

Ulrich, W. (2005a) *A Brief Introduction to Critical Systems Heuristics* [online] paccessed 27 June 2019] available at http://projects.kmi.open.ac.uk/ecosensus/publications/ulrich_csh_intro.pdf.

Ulrich, W. (2005b) *A Mini Primer of Boundary Critique* [online] [accessed 27/06/19] available at http://wulrich.com/boundary_critique.html, first published 17 October 2005.

Wainright, O. (2019) *'The next era of human progress': what lies behind the global new cities epidemic?* [online] [accessed 26/07/19] available at https://www.theguardian.com/cities/2019/jul/08/the-next-era-of-human-progress-what-lies-behind-the-global-new-cities-epidemic.

WSP (2018) *Strategic Environmental Assessment: Joint Local Transport Plan IV*.

Yan, F. (2019) *China's Big Brother smart cities*, Policy Forum, available at https://www.policyforum.net/chinas-big-brother-smart-cities/ [accessed 28/0/6/19].