Chapter 2

Ethics and the smart city

2.1 The smart city's ethical turn

In the late 2010s the smart city's rhetorical emphasis swung from tech-centric to human-centric and from smart city to smart citizen. With this, the favored visual representations of the smart city, typically a bird's-eye view of a city graphically overlaid with connected lines and icons (Fig. 2.1), gave way to scenes of smart citizens in urban settings going about their digitally mediated lives. Visualizations released in 2022 for Saudi Arabia's smart-from-the-start city Neom that featured a 170 km long and 500 m high mirror-clad, linear city-structure, 'The Line', were also accompanied by descriptions of the project as "…a civilizational revolution that puts humans first".[a] This represented a significant shift from Neom's 2017 pitch that had hyped the project as Saudi Arabia's first fully automated, artificially intelligent-driven region, powered entirely by renewable energy sources.[b]

The Quayside smart city proposal by Google, Sidewalk Labs and planned for an industrial waterfront site in Toronto, Canada also released a series of visualizations in 2017 and 2019 that leaned heavily on the promotion of an urban lifestyle.[c] The Quayside visualizations communicated a human-scale perspective and convivial waterside leisure scenes, all without a hint of the advanced sensor-based technologies and smart systems that were also central to the project. A human-centered ethos is also evident in the Toyota Corporation's smart city project called the Toyota Woven City, unveiled in 2020. Different from the earlier mentioned examples, however, the Toyota Woven City project explicitly foregrounds high-tech mobility concepts, including autonomous vehicles and mobility as a service. The Toyota Woven City project is also openly promoted as an experimental city, and as a prototype, 'testbed' and 'living laboratory'. And while marketing copy for the Toyota Woven City is awash with references to 'well-being', 'unlocking human potential', and making life better, the project

a. https://www.neom.com/-/regions/theline?utm_source=twitter&utm_medium=social&utm_campaign=theline&utm_term=image&utm_content=en-herokv_reach_prospecting&twclid=2-2mm9804xlf067xhhjojpfaadv.
b. https://tomorrow.city/a/neom-saudi-arabia.
c. See for example: https://www.sidewalklabs.com/toronto.

Scaling the Smart City. https://doi.org/10.1016/B978-0-443-18452-9.00004-5

FIG. 2.1 A 'could-be-anywhere' smart city. *(Credit: By Author.)*

conveys a socio-technical vision that connects new mobility concepts and aims to enhance humanity and create a more engaged society.[d]

These prominent examples demonstrate how, towards the latter part of the 2010s smart city storytelling pivoted from tech-centric to human-centric. It is easy to read the smart city's humanist makeover as a corporate reputational corrective and reaction to poor publicity associated to early smart city projects and smart-from-the-start cities such as the Republic of Korea's (ROK) 'Tomorrow City', New Songdo. For example, following the completion of the first stage of New Songdo, its problematic contradictions, and by extension the smart city's shortcomings, were laid bare in numerous mainstream media articles and scholarly case studies (Carvalho, 2012; Halegoua, 2020; Halpern, Lecavalier, Calvillo, & Pietsch, 2013; Ilhan, Möhlmann, & Stock, 2015; Kim, 2014; Lee, Han, Leem, & Yigitcanlar, 2008; Mullins, 2017; Sennett, 2012; Shwayri, 2013). New Songdo was seen as an example of a smart city that in numerous ways failed to live up to its hype. For example, while it promoted itself as a 'green' eco-city, it also reclaimed land from the ocean and destroyed local ecosystems and endangered species (Shwayri, 2013; Yigitcanlar & Lee, 2014). While it attracted high-tech startups and big tech corporations such as CISCO and IBM, their competing market interests meant its 'smart' technological infrastructure initially developed in a fragmented way, resulting in rigid systems, interoperability failures and slow technological growth (Carvalho, 2012; Shwayri, 2013). Moreover, while New Songdo had been heralded as the model of a future smart city, its urban domain was inhospitable, and its high cost of living actively

d. https://www.woven-city.global.

excluded local residents (Kim, 2014). In short, New Songdo came to epitomize a smart city "…that promotes private business interests while ignoring society's needs" (Shwayri, 2013, p. 43).

Yet, efforts to humanize the smart city were not only driven by corporations. Consultants, municipalities, entrepreneurs, designers, and scholars alike have contributed to promoting the shift from a top-down to a bottom-up, human- and citizen-centered smart city vision. In a Western context, the smart city's human-turn has also mirrored larger societal and cultural shifts that took root over the course of the 2010s. This includes a prioritization of values such as collectivity, inclusion, participation, fairness, equity, and empowerment across social, political, institutional, and professional spheres and within policy frameworks. To align the smart city with these shifts, strategy documents and action plans were updated to reflect a humanist language of inclusion and participation, while smart technologies were recast as "participatory technologies" and as citizen engagement opportunities (Foth, 2018; Fredericks, Caldwell, Foth, & Tomitsch, 2019; Fredericks, Hespanhol, Parker, Zhou, & Tomitsch, 2018; Hespanhol et al., 2015; Steinberger, Foth, & Alt, 2014). With this, digital democracy tools and e-participation platforms also became a significant focus of smart city research and a new market opportunity for startups and big tech corporations.

The shift from a top-down prioritization of technology innovation and private interests to a bottom-up focus on citizens is well represented in the evolution of pioneering European smart cities such as Barcelona and Madrid (Charnock, March, & Ribera-Fumaz, 2021; Ribera-Fumaz, 2019; Smith & Martín, 2021). In the early 2010s Barcelona led the way in advancing a citizen-centered smart city through the use of digital platforms to facilitate open, transparent, and participatory decision-making. Yet, as Ramon Ribera-Fumaz (2019) reflects, even Barcelona's early citizen-centered projects were those that put citizens first on paper, yet in practice continued to treat them as users or consumers (Ribera-Fumaz, 2019, pp. 182). In other words, the citizen-centric smart city provided new opportunities for private corporations to collect even more data about citizens under the pretense of contributing to common good.

In the mid-2010s, and off the back of anti-corruption, anti-privatization, and pro-transparency campaigns, new left-wing local governments were elected in both Barcelona and Madrid. Subsequently, rather than abandon the citizen-centered smart city these cities revised their underlying data governance strategies to reclaim control and management of digital platforms and data for the government and its citizens. For example, the mayor of Madrid from 2015 to 2019, Manuela Carmena, advanced an open government policy that included a new 'direct' democracy platform called "Decide Madrid" (Ruvalcaba-Gomez, Criado, & Gil-Garcia, 2023), alongside a remit to ensure that data generated from public services would also remain publicly owned (Mason, 2015).

Zooming in from the smart city to the smart citizen is a strategy that aims to promote smart technologies and systems as those that can collectively benefit governments, private corporations, *and* citizens. In this sense, the citizen- and human-centric smart city is construed here as an effort to craft an image of a more ethical smart city. Yet while smart city discourses mobilize moral values such as inclusion and participation and ethical principles such as transparency and accountability, the basic model of digital technology and urban space integration for data accumulation has remained the same. For example, social science scholars Ryan Burns and Preston Welker (Burns & Welker, 2022) discuss how moral values, sentiments, and principles are used in smart city initiatives to recruit and legitimize the digital labor that is necessary for the production and (re)production of smart cities (pp. 3–4).

A further consequence of the shift from smart city to smart citizen is that the topic of ethics has become associated with the smart city in specific ways, and predominantly through the lens of data governance and concerns about the protection of citizens' individual privacy rights. Interpreting the ethical significance of the smart city in this way and at these scales can be a powerful way to control and shape its evolution. Framing the ethical significance of the smart city in terms of how data is managed and how *individuals*' privacy rights can be safeguarded not only maintains core operations by framing ethical issues as technical problems and fixes, but it also diverts attention from other potential sites and scales of ethical inquiry and action.

2.2 Smart city ethics

Ethics is an intellectual endeavor and a scholastic activity, but it is also an applied practice. In this sense, ethics can refer to both a philosophical investigation as well as a set of principles to guide individual, social, and professional conduct. As a branch of moral philosophy ethics is concerned with how morality can be reasoned, and how norms, principles, and values come to matter. A central question in ethics is what makes values and actions right or wrong. To explore this, ethicists have devised and engaged with moral reasoning frameworks, or ethical theories, that have been formulated to systematically account for moral positions. In this sense, ethical theories do not determine what is ethically right or wrong, or good or bad; rather, they scaffold ethical debate. Ethical theories and their various concepts and thought experiments are seen as especially helpful in the context of complex and high-stakes decision-making, and particularly when faced with conflicting moral choices or ethical dilemmas. Equally, ethical thinking and perspectives can also be used in more general ways to navigate and guide the various kinds of choices that arise in work and life.

Ethical theories and frameworks have been developed in various regions of the world, with distinct approaches in both Western and Eastern traditions. In Western moral philosophy there are four main ethical theories and frameworks: deontological ethics (Kantian ethics), utilitarian ethics (consequentialism), social contract theory, and virtue ethics (Aristolian ethics). It is beyond the scope of this book to provide a detailed overview of ethical theories however, as ethical concepts are often implied in debates about the merits and limits of smart city initiatives and urban technologies a brief outline of their core differences is provided here. As deontological ethics concerns notions of dutifulness, it is also referred to as 'duty' ethics. Deontologists base moral reasoning on rules; however, they do not specify those rules, but argue that rules should be determined as a society. In deontology, the moral worth of an action is determined by examining its intent and its adherence to universal moral principles. According to German philosopher Immanuel Kant's categorical imperative, actions should align with moral principles that could be *universally* applied. Deontologists advise that when faced with an ethical choice, we should imagine whether our actions would be acceptable as a universal law of behavior. Cennydd Bowles argues that Kant's imperative is a particularly valuable ethical prompt for information technology designers as it forces them to "see ethical choices from broader social perspectives" (Bowles, 2020, p. 52).

While deontology is an ethical framework that centralizes rule-following regardless of the consequences of actions, utilitarian ethics focuses on the consequences of actions. Broadly speaking, utilitarian ethics argues that an action is morally reasonable if *on balance* it results in more benefit than harm. In utilitarian ethics, a morally right action is one that results in the greatest net happiness for all. To determine if an action results in the greatest overall benefits it must be calculated by considering an action's potentially wide-ranging impacts. This is challenging as actions can create long and difficult to trace chains of unintended consequences and externalities.[e] Given the potentially limitless implications of an action utilitarian ethics also has various sub-theories. These sub-theories go some way to delimitating the potentially infinite consequences associated with actions. However, as Bowles argues, utilitarian ethics can fundamentally "struggle to protect individuals and minorities from oppression" and risks appearing to "let dubious behavior slide" (Bowles, 2020, p. 75).

Social contract theory is premised on a core idea that individuals in a society in which they live are party to an implied social agreement wherein they agree to submit to forms of authority such as a "government and its laws in order to live in a civil society" (Herschel & Miori, 2017, p. 34). In this way, social contract theory legitimizes authority in the form of governments and institutions and locates their power in the implied consent and agreement of those governed. Social contract theory argues that individuals willingly relinquish certain freedoms in exchange for protection, security, social stability, and mutual benefit. Like utilitarianism, social contract theory strives to balance individual freedoms and collective societal well-being.

Different from an emphasis on duty, rules, contracts, or calculating the consequences of actions, virtue ethics emphasizes the cultivation and expression of individual moral character. Central to virtue ethics is the idea of practical wis-

e. Bowles describes unintended consequences as those that "… affect familiar people in unknown ways, while externalities happen to people we've ignored [or overlooked] by not looking deeply enough" or looking in the wrong place (Bowles, 2020, p. 8).

dom or *phronesis* which refers to the knowledge gained through practice, and reflection on practice. Once individuals develop practical wisdom it is reasoned that they can connect general moral principles to the complexity of real-world situations and make morally sound choices that align to their virtuous character. As such, a ‘virtuous’ act requires thoughtful deliberation on the conditions of a situation and application of knowledge gained through practice and reflection. In this way, virtue ethics is argued to be similar to interpretations of design as a process of action and reflection.

The discourse on smart city ethics generally limits its engagement with ethical theories (Herschel & Miori, 2017). Consequently, much ethical thinking on the smart city presupposes the ethical or moral values at stake (Herschel & Miori, 2017; Stone, 2021). In other words, scholarly attention to the subject of smart city ethics has typically concerned the identification of ethical dimensions without explicit engagement with normative ethical theories. Herschel and Miori (2017) suggest that smart city ethics could be enhanced by engaging more deeply with ethical thinking. As, refracting the ethical dilemmas of the smart city through different ethical frameworks can lead to alternate ways of seeing and understanding them, which can in turn inspire different responses or resolutions.

Smart city ethics can be classified as an applied ethics because it is specifically concerned with the practical ethical issues that arise in the design, organization, and operation of smart cities. The ethics *of* the smart city is an emergent discourse that identifies and examines the smart city’s various ethical dimensions (Calvo, 2020; Clever, Crago, Polka, Al-Jaroodi, & Mohamed, 2018; Ehwi, Holmes, Maslova, & Burgess, 2022; Goodman, 2020; Kitchin, 2016; Kitchin, Cardullo, & Di Felicaiantonio, 2019; Ziosi, Hewitt, Juneja, Taddeo, & Floridi, 2022). Identifying the ethical concerns that arise in relation to the smart city is an important first step to creating an ethics *for* the smart city to guide and inform its ‘ethical’ operation. Writing in support of both the smart city and ethics, Rob Kitchin (2016) reasons that, rather than throwing the baby out with the bath water, injecting ethical practice into the making of smart cities can productively drive ways of improving them (p. 11).

More generally, attention to the practical relevance of ethics has grown in parallel with the rapid and pervasive adoption of digital technologies and systems across most spheres of work and life and relatedly, the exponential increase in data production since the early 2010s. In the context of technology design, the subject of ethics has moved from a more peripheral to central concern in the wake of several high profile scandals, and notably, the 2018 Facebook-Cambridge Analytica allegations of data misuse (Lewis, 2018) (Fig. 2.2). Technology ethicist Cennydd Bowles (2020) writes that the technology industry’s “…repeated missteps—racists algorithms, casual privacy abuses, blind eyes turned to harassment and hate—have eroded public faith and prompted the media to label technology a danger as often as a saviour” (p. 1). Additionally, and somewhat ironically, the unique affordances of information technology, including the Internet, the World Wide Web, and social media

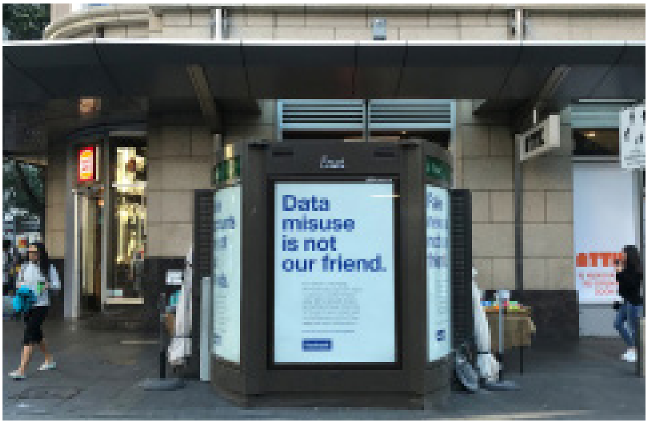

FIG. 2.2 Data misuse is not our friend advertisements in Sydney, Australia, 2018. *(Credit: By author.)*

platforms, have also made it far easier to identify and publicize the ethical missteps of governments, institutions, organizations, and individuals. Collectively, these conditions have created what Bowles refers to as "an appetite for ethical change" (Bowles, 2020, p. 1).

Ethical examinations of the smart city have been undertaken indirectly and directly, from various angles, and at various scales. At an overarching level, philosophical and ethical questions have been drawn out in social and political-economic critiques of the smart city as a new model of power, capital, and governmentality. Critics have characterized the smart city as a vehicle of neoliberalism that advances the marketization of urban governance, enables new forms of technocratic control, and reconfigures relationships between governments, markets, and citizens (Allwinkle & Cruickshank, 2011; Gabrys, 2014; Greenfield, 2013; Hollands, 2008; Iveson, 2011; Kitchin, 2014; Malek, Lim, & Yigitcanlar, 2021; Shelton & Lodato, 2019; Söderström, Paasche, & Klauser, 2014; Vanolo, 2014; Wiig, 2016). Empirical case studies have lent further weight to claims that the smart city is a model of digital capitalism that serves corporate interests over social or common good, and in so doing creates numerous kinds of exploitative, discriminatory, and unjust conditions (Curran & Smart, 2020; Datta, 2018; Datta & Odendaal, 2019; Kitchin et al., 2019; Shelton & Lodato, 2019; Shwayri, 2013; Wiig, 2016; Willis, 2019). In this way, many ethical concerns associated with the smart city also echo those associated with capitalism more generally.

2.3 Smart city harms

A core issue in smart city ethics concerns how digital methods of data collection, processing, and use can extend opportunities for surveillance, also described as dataveillance, and potentially compromise human liberties. Numerous high-profile smart cities such as Rio de Janeiro (Townsend, 2014), San Diego (Figueroa, 2020), and Hong Kong (Fussell, 2019) have attracted attention for deploying smart technologies that collect various kinds of data related to citizens in urban public spaces. Principally these concerns relate to claims that smart technologies were deployed without full disclosure about how collected data would be used. The ethical principle in question is that of transparency. For example, data collected to purportedly aid disaster management in Rio de Janeiro, and to save energy and costs in San Diego, were later used for additional and non-disclosed purposes such as surveillance and law-enforcement. In 2020, City IQ smart streetlights in San Diego were deactivated by order of the Mayor of San Diego, City Council, Kevin Faulconer, in response to protests from elected officials as well as community and social activist groups that camera data was being accessed and used by local police (Figueroa, 2020). In 2019, concerns about smart streetlight surveillance saw protesters in Hong Kong use electric saws to cut down lampposts equipped with sensors, cameras, and facial-recognition capabilities (Fussell, 2019).

The Stratumseind Living Lab project launched in 2013 in the Dutch city of Eindhoven is another example where the deployment of smart technologies in urban public spaces attracted critical media attention. A collaboration between the municipality of Eindhoven in the Netherlands, the Eindhoven University of Technology (TU/e) and the technology company Philips, the Stratumseind Living Lab transformed Eindhoven's popular nightlife street into a "smart street". Equipped with sensor-based technologies, the Stratumseind Living Lab set out to evaluate crowd control and safety strategies in a real-world setting.[f] It used 22 smart street poles with sensor-based technologies including sound meters, cameras, weather sensors, and WIFI-trackers as a method to detect and deter aggression and crime. The smart street poles also featured adjustable LED lighting to test whether lighting hues and luminance could influence human behavior. The lighting test proved inconclusive and these experiments were discontinued (Figueiredo & Agyin, 2019).

The Stratumseind Living Lab project ignited questions about the ethics of urban living labs more generally. Urban living labs or urban labs and similar iterations[g] refer to experimental, situated, and immersive approaches to test digital technology integration in small-scale, real-world contexts. Living labs are characteristically interdisciplinary and collaborative; they aim to progress innovation through modes of intervention in real-world sites that can be mea-

f. https://www.tue.nl/en/research/research-institutes/top-research-groups/intelligent-lighting-institute/infrastructure/stratumseind/ Last accessed 27 October 2022.

g. Several authors conflate urban labs with living labs and refer to Urban Living Labs (ULL) (Della Valle et al., 2021; Schliwa & Mccormick, 2016). Scholl and Kemp (2016) distinguish the notion of a "city lab" from an urban lab as they argue they are projects with less emphasis on technology and are created and led by city administrations to explore and generate ideas to innovate planning processes (pp. 89–90).

sured. The European Network of Living Labs (ENoLL) defines living labs as "… real-life test and experimentation environments that foster co-creation and open innovation among the main actors of the Quadruple Helix Model, namely: citizens, government, industry, and academia."[h] However, the concept is also used by the commercial sector to describe situated testing and experimentation of smart products, typically with the view to exporting and upscaling them to other contexts (Silver & Marvin, 2016). For this reason, scholars are also critical of living labs, arguing that they can also be non-transparent mechanisms to cultivate citizen acceptance of smart technology solutions rather than being genuine processes of experimentation and collaboration (Della Valle, Gantioler, & Tomasi, 2021, p. 2).

A key benefit but also ethical conundrum of living labs is that they provide a real, local context to test and evaluate human–technology behaviors (Karvonen, 2018; Karvonen & Van Heur, 2014; Silver & Marvin, 2016). In the case of the Stratumseind Living Lab, critics raised concerns about the ethics of experimenting on unwitting citizens, and the legality of collecting data about them without their informed and explicit consent. The project was criticized by legal experts for failing to notify visitors of its living laboratory status (Naafs, 2018). Citing data protection law in the Netherlands, legal scholar Maša Galic argued that the public must be notified about the deployment of smart technologies, particularly where they are used to profile, nudge or actively target people (Naafs, 2018). Responding to these criticisms, Stratumseind Living Lab stakeholders reasoned that notification and informed consent for data collection were not necessary as the collected data pertained to *crowd* behavior and not individuals. It was further reasoned that using smart technologies to collect data about individual citizens in public spaces without their explicit consent was ethically acceptable because the project's objective was to make all citizens safer (Naafs, 2018). This approach to ethical reasoning reflects tenets of both utilitarian ethics and social contract theory. The argument that on balance the outcomes of public data collection are ethical as they can make more people safer reflects a utilitarian perspective. The implied assumption that citizens should accept certain kinds of surveillance conditions imposed by a ruling authority, in return for their wider societal benefits, further reflects tenets of social contract theory.

These examples demonstrate how data collection and use are central concerns of smart city ethics. The ethical values at stake include a citizen's right to fair and humane treatment, and to privacy. The ethical principle these examples point to is that smart systems should be designed to be transparent. A normative expectation that the principle of transparency suggests is that citizens should understand what smart systems are designed to do, how they do it, and, moreover, why. Yet, data collection in and about cities and people is not a new undertaking. Similarly, ethical concerns about surveillance and control in urban settings also pre-date the smart city (Ziosi et al., 2022). Still, smart city systems

h. https://enoll.org/about-us/.

that combine sensor-based technologies and computational methods enable an unprecedented scale of data collection and analytic capabilities that can amplify existing problems as well as create new ones. Notably, this includes intangible harms that are often not immediately obvious but are nonetheless detrimental, such as "…information privacy impact and data discrimination", otherwise known as data harms (Metcalf & Crawford, 2016, p. 2).

Data harms are not ethically unique to the smart city and are problems common to all data-based software systems. Data harms can be created in various ways, including in the processes of data collection, processing, sharing, and use. The topic of data harms is widely discussed in applied ethics fields and under headings such as technology ethics, data ethics, and most recently, artificial intelligence (AI) ethics. Of significance to this discussion is that the focus on data harms represents a shift in the level or scale at which ethical inquiry into the smart city is concentrated. For example, philosophers Luciano Floridi and Mariarosaria Taddeo (2016) see data ethics as an evolution of computer and information ethics that "… changes the level of abstraction (LoA) of ethical enquiries from an information-centric (LoA_I) to data-centric one (LoA_D)" (p. 2). They note that ethical inquiry has narrowed its focus from an investigation into the ethical significance of content in information systems to the harms that arise in relation to techniques of data aggregation and processing, and in turn, how data analysis insights are applied.

Necessarily, a data-centric ethics also extends to how algorithms interact with data and shape analysis and outputs. Algorithms are mathematical constructs and processes used in programs, software, and information systems. An algorithm is a finite sequence of instructions that is created to accomplish a task or solve a problem. In the smart city, algorithms are critical to the analysis of large datasets and to teach machines and systems to 'learn' and perform tasks in autonomous ways. Various ethical concerns arise in relation to the use of data and algorithms to create autonomous systems. Autonomous systems can make decisions to meet goals and/or perform specific tasks without explicit human control or interaction. The ethical significance of autonomous systems has been discussed most often in the context of specific applications such as autonomous weapons systems and autonomous vehicles or self-driving cars, and where autonomous systems are proposed for use in high-stakes and life-and-death decision-making.

In the case of autonomous weapons systems, many reason that they are fundamentally unethical and that it is "morally wrong to let a machine be in control of the life and death of a human being" (Santoni De Sio & Van Den Hoven, 2018, p. 2). However, while autonomous weapons systems are explicitly designed to cause harm, many other kinds of autonomous systems such as self-driving cars are designed to benefit humans. Because human error is a leading cause of most traffic accidents, self-driving cars offer potentially significant, life-saving benefits. As professor of artificial intelligence Toby Walsh (2022) argues, "[w]hen we eliminate human drivers from the equation, cars will be much safer. [because] Computers aren't going to drive tired, or drunk. They won't text while driving, or make any of the other mistakes humans make" (p. 63). Consequently, a goal of ethical deliberation in the case of *well-intentioned* autonomous systems is to anticipate unintended consequences such that they can be pre-emptively designed out.

The testing of self-driving cars in real-world contexts however has already resulted in several accidents, and significantly, the loss of human life. For *Wired* journalist Lauren Smiley (2023), the 2018 self-driving Uber car accident in Tempe, Arizona, that claimed the life of a pedestrian "… instantly turned what had been a philosophical conundrum into a glaringly real, legal one". In July 2023, five years after the accident, the human sitting behind the wheel of the car was—in a *legal* sense—attributed with some responsibility and liability for the accident (Smiley, 2023). Legal responsibility, however, differs from ethical responsibility, which concerns a deeper commitment to making 'good' choices and behaving in ways that align with shared societal values.

The self-driving car has brought sharp focus to autonomous systems and how the pervasive integration of digital technologies across many spheres of life, more generally, troubles long standing ways of thinking and reasoning in ethics, particularly in relation to concepts such as responsibility and agency. As digital technologies mediate human decision-making in innumerable ways, questions arise about who or what can be understood to be 'in control' and the methods required to understand and explain this. What does the addition of autonomous systems in life mean for notions of human agency, and, *how* can responsibility for technological action be attributed?

Numerous scholars reason that it is fundamentally illogical to ascribe responsibility or blame to autonomous systems and machines (Coeckelbergh, 2020; Walsh, 2022). Philosopher Mark Coeckelbergh writes that "[m]achines can be agents but not *moral* agents since they lack consciousness, free will, emotions, the capability to form intentions, and the like" (p. 111, original emphasis). Yet, as Coeckelbergh (2020) reflects, a further complicating factor is that autonomous systems and machines are complex systems, which means that there are "many hands" directly and indirectly involved in any given technological action.

Autonomous systems and machines—from self-driving cars to robot vacuum cleaners—are cyber-physical systems that interconnect hard and soft technologies, potentially multiple algorithms, and can involve forms ofreal-time data feedback. They are systems that can also require design input from multiple human actors. If a system or machine itself should not be held responsible, a question that follows is who and how many can be held accountable? Many argue that the root of ethical accountabilities associated with autonomous systems resides in computer or information systems engineering design. Notably, the ethical dilemma associated with how self-driving cars make decisions in the face of complex life and death scenarios is discussed in both mainstream media and scholarly research as an algorithmic or programming issue. As a result, the self-driving car decision-making dilemma has been approached as a challenge of *translating* both legal and human moral reasoning into algorithmic schemas, or programming in moral values (Awad et al., 2018; Geisslinger, Poszler, & Lienkamp, 2023). However, as Walsh (2022) reflects, ensuring autonomous systems behave in ethical ways is fundamentally complicated by a central question in ethics: whose moral values?

Ethical concerns about self-driving cars have centered on the question of how autonomous systems make choices. In one sense, this debate serves an important educative function. The publicity around self-driving car accidents has (unfortunately) fostered a wider understanding that autonomous systems and algorithms are not neutral technologies; rather, they are inexorably value laden. Human value-judgments are baked into an algorithm's operational parameters, weightings, or thresholds in both explicit (known) and implicit (unknown) ways. Algorithms, however, also rarely work alone. They interact with other algorithms and are typically embedded within larger software systems and machines (Boyd & Crawford, 2012; Mittelstadt, Allo, Taddeo, Wachter, & Floridi, 2016; Tanweer, 2022; Zwitter, 2014). As technology ethicists observe, "it makes little sense to consider the ethics of algorithms independent of how they are implemented and executed in computer programs, software, and information systems" (Mittelstadt et al., 2016, p. 2).

Other prominent examples where the use of autonomous systems has sparked concerns include judicial sentencing decisions, financial lending decisions, and the screening of job applications. These examples have drawn focus to role that data quality plays in the performance and fairness of autonomous system outputs. Poor quality and insufficient data for training algorithms, for example, can contribute to adverse autonomous decision-making outcomes such as bias and discrimination (D'ignazio, 2020). In smart city systems, 'patchy' urban data can significantly undermine demographic, geographic, and socio-spatial representativeness (Eubanks, 2018; Graham & Dittus, 2021). Poor quality and/or patchy urban data can place real limits on the reliability of autonomous systems to, for example, instruct the equitable distribution of urban services such as maintenance, direct policing initiatives, or instruct emergency services routing.

Nonetheless, extreme examples of autonomous system failure, such as self-driving car accidents, tend to dominate headlines and debate. While autonomous mobility is a significant consideration for future (smart) cities and valuable ethical insights can be gleaned from debates about self-driving cars, ethical inquiry should not be limited to extreme dilemmas. In other words, self-driving car ethics or smart city ethics should not only consider situations related to physical harm and the loss of human and nonhuman life. Smart city ethics must also extend to thinking through what kind of life can be lived with technologies in situated contexts. A more comprehensive ethical inquiry that frames autonomous mobility as a sociotechnical system can account for the wider implications of autonomous mobility. For example, how might forms of autonomous mobility reshape how citizens move within, make use of, experience, and value public spaces within cities?

Data ethics is an approach that many see as the correct focus to address "ethical problems such as privacy, anonymity, transparency, trust and responsibility" (Floridi & Taddeo, 2016, p. 3). Floridi and Taddeo (2016) argue that this is because it is not the hardware, machines, or robots "… that causes ethical problems, it is what the hardware does with the software and the data that represents the source of our new difficulties" (Floridi & Taddeo, 2016, p. 3). This perspective locates significant agency with software and data (and those who program and are responsible for using data processes), which can in turn diminish attention to the situatedness of autonomous systems in real contexts. For professor of engineering and manufacturing history David Mindell (2015) the idea of *fully* autonomous systems, and the notion that autonomous systems are the pinnacle of technological progress are problematic myths that fuel expectations that the negative consequences associated with autonomous systems can be designed out at the scale of data and algorithms. Consequently, Mindell advocates for a more nuanced understanding of "situated autonomy".

Drawing on examples of autonomous system failures such as the Air France 447 disaster, Mindell reasons that "autonomy works best when it is [conceived of as] deeply situated within human systems", and is understood as "…connected, relational and situated" (Mindell, 2019). By understanding that autonomous systems also form part of specific contexts and interact with other technological, social and environmental systems, designers can identify potential issues as well as opportunities for human oversight that might otherwise be overlooked. In short, while algorithmic design and the quality and utility of datasets can and do influence negative outcomes, attention should also be directed to how autonomous systems are situated within and operate in relation to wider social, organizational, and spatial contexts.

2.4 Ethics by design

Kitchin (2016) summarizes the smart city's main ethical issues as concerning "… privacy, datafication, dataveillance and geosurveillance, and data uses such as social sorting and anticipatory governance" (p. 5).[i] To address these ethical concerns he offers three core recommendations. These include a call to reject problematic assumptions about urban science and big data, such as the myth that, "… large data sets offer a higher form of intelligence and knowledge that can generate insights that were previously impossible, with the aura of truth, objectivity, and accuracy" (Boyd & Crawford, 2012, p. 663). Kitchin further reasons that data-driven decision-making should not replace human decision-making. Read as ethical principles for smart cities, Kitchin's (2016) advice can also be summarized as: (1) smart city systems should not be conceived as fully autonomous systems and should always maintain humans-in-the-loop (2) smart

i. In a 2019 publication Kitchin et al., reproduce this list but also add the concept of "nudging" (p. 8).

city systems should be transparent and explainable, and (3) smart city systems should maintain an individual's right to privacy.

Devising ethical principles to guide the design of smart technologies and autonomous systems is a useful and necessary approach. In a technology industry context, Anissa Tanweer describes existing ethical tools as ranging from "… templates for documenting decisions and transformations made during research or design … frameworks for conducting algorithm audits … activities for prompting critical reflection, and checklists for ensuring due diligence" (Tanweer, 2022, p. 2). Growing attention to AI technologies has accelerated the creation of ethics-oriented resources for technology design, yet those in industry continue to report that ethical principles, guidelines, and frameworks are too broad, too elastic, and too prescriptive to genuinely shape ethical outcomes (Morley et al., 2021; Morley, Floridi, Kinsey, & Elhalal, 2020).

Ethics has long suffered from a yawning gap between overarching principles and messy, real-world complexities. The application of ethical principles may appear straight-forward in theory, but when mapped to real-world situations, ethical principles come up against nuance, uncertainty, and conflicting interests and values. Ethical principles are necessarily abstract, and they cannot account for all permutations and variations of real-world ethical concerns. Yet, as Morley et al. point out, "… ethical principles should be seen as providing the foundation and not the details of ethical practices …" (Morley et al., 2021, pp. 4–5). This means that additional mechanisms are required to "… bring ethical guidance down to the Design level" (Morley et al., 2021, pp. 4–5).

Under the large umbrella of responsible innovation, numerous models propose ways to operationalize ethical principles in and through design practice. This includes value-sensitive design (VSD) (Friedman & Hendry, 2019), design for values (DfV) (Vermaas, Hekkert, Manders-Huits, & Tromp, 2015), pro-ethical design (Floridi, 2016), and from the perspective of artificial intelligence (AI), ethics as a service (Morley et al., 2021). VSD is a popular approach in the technology industry and in the fields of computer science, information technology, human-computer interaction (HCI), and computer ethics. Pioneered by professor of computer science Batya Friedman in the late 1990s, VSD advances the idea that moral values can be identified and embedded in technology design. VSD is a tripartite framework that aims to surface, analyse, and operationalize values in the design process, using a wide range of methods including interviews, focus groups, user profiles, and scenarios.

VSD explicitly aims to identify, embed, and articulate values in and for design. It also aims to surface how values might be compromised through design and use. In so doing, VSD is reasoned as an approach that can help designers configure more responsible technical systems that mitigate negative consequences. However, VSD is criticized for advancing an overly paternalistic approach to ethical design and one that implies designers can control the outcomes of projects. Aiming to systematically eliminate all conceivable threats to moral values reflects a risk-averse perspective that can also constrain design opportunities and innovation potential (Morley et al., 2020). From an industry perspective, Bowles (2020) reflects that VSD is "… rather too theoretical for technology teams to follow step-by-step" (p. 125).

Technology ethicist Taylor Stone (2021) further observes, that the discourse on value-sensitive design tends to avoid "… questions about the metaphysical foundations of moral value (and practically, which values matter in which circumstances and why)" (p. 367). Identifying moral values deemed relevant to a project at the outset of a design process and using these to shape design can imply a static or rigid reading of morality, and a view of values as discoverable, pre-existing, and stable. In this way, overly prescriptive or systematic approaches to fostering ethical design appear to leave little room for ethical deliberation, and critically, for challenging normative assumptions and values. This matters not only because history demonstrates that morality is mutable, but also because morality and value creation are dynamic processes that unfold and are shaped in and through material, lived realities. In this sense, while identified values can drive the design process, designed artefacts and spaces are never morally complete; new and unexpected values, as well as unintended consequences and externalities, can also emerge through use and interaction.

The broader DfV perspective highlights that methods for identifying and designing for values "… are already available in design methodology [and] include methods for design for user and social values" (Vermaas et al., 2015). While not explicitly marketed as ethical design tools, a variety of empathy-oriented methods are regularly used across the design field to draw out and explore stakeholder requirements and values. This includes design methods such as cultural and urban probes, user journey maps, user profiles, card-sorting, futuring and design fiction (Bleecker, Foster, Girardin, & Nova, 2022; Tomitsch, 2018). Similarly, Professor of Architecture Lara Schrijver argues that human value systems have always been a central concern for the spatial design disciplines such architecture where "value-sensitive design has been incorporated from its very beginnings" (2015, p. 590). What has changed however is an increased public awareness and demand for values to be explicitly communicated, for design logic to be more transparent, and for designers to evidence systematic and evidence-based approaches to responsible innovation.

To overcome some of the perceived shortcomings of value-led design approaches, Stone (2021) and others draw on situated, relational, and interactional concepts. Relational and interactional concepts are discussed across a range of scholarly traditions. For example, pragmatist philosophy (Hickman, Neubert, & Reich, 2009), feminist new materialism (Barad, 2003; Bennett, 2010; Haraway, 2016), and feminist care ethics (Tronto, 1998) draw focus to materializing processes—and to human action in the world—to understand experience and nature, to reveal power relationships, and to question normative ethical priorities. Relational, process-based, and interactional perspectives are further significant to rethinking ethical concepts such as human agency. Philosophy of pragmatism advances the idea that humans are part of the world, not separate from or above it. Professor of Feminist Studies Karen Barad uses the concept of *intra*-action to argue that agency does not pre-exist relations between humans and the world but rather emerges within them. And philosophy of technology postphenomenologists combine perspectives to reason that human-world relations are almost always human-technology-world relations. As such, a postphenomenologists construe technologies as mediators that co-shape human and non-human (animals, plants, or ecosystems) capacities, relations, and experiences with and in the world (Ihde, 1990, 2009).

Postphenomenology combines phenomenological and pragmatist traditions and frames "… actual technologies and technological developments as a starting point for philosophical analysis" (Rosenberger & Verbeek, 2015, pp. 9–10). To investigate the significance of human-technology-world relations, philosophy of technology professor Don Ihde (1990, 2009) formulated a mediation theory that includes the four core analytic categories of embodiment relations, hermeneutic relations, alterity relations, and background relations. Embodiment relations refer to technologies that directly transform how humans perceive and relate to the world (such as contact lenses and eyeglasses that mediate vision). Hermeneutic relations refer to technologies that sense, measure, and represent real-world conditions (such as wrist watches that convey time and thermometers that convey temperature). Alterity relations refer to technologies that reflect a proxy humanness enabled by interactional capacities (such as robots, ATMs, GPS devices, and digital assistants). Lastly, background relations refer to ambient technologies (such as digital displays in the public realm). To account for developments in technology since the 1990s, scholars have added new categories including cyborg relations (where technologies merge with the body, such as brain implants), immersive relations (where cyber-physical or smart systems give feedback in the built environment), and augmented relations (the use of Microsoft Hololens mixed reality headset, the failed Google Glass and Apple's Vision Pro) (Rosenberger & Verbeek, 2015).

Philosopher of technology Peter-Paul Verbeek argues that while Ihde's mediation theory provides a framework to examine a spectrum of life-technology-environment relations, it can also reveal the moral dimensions of technology design. More specifically, Verbeek's (Verbeek, 2008, 2011) discussion of ultrasound technology as a hermeneutic relation convincingly demonstrates how life-technology relations have moral significance. Verbeek refers to ultrasound technology as "… not simply a functional means to make visible an unborn child in the womb", but a mediation that "… actively helps to shape the way the unborn child is given in human experience, and in doing so … informs the choices his or her expecting parents make" (Verbeek, 2008, p. 14). This further demonstrates how, while the analytic foci of postphenomenological analysis are directed in the first instance at human- or life-technology relations, such sites can also expose larger moral issues (Ritter, 2021). Verbeek's ultrasound example is also relevant to understanding how the sensor-based technologies that are central to smart city systems also mediate the perceptions, actions, and decision-making of urban authorities and citizens. Smart sensor-based technologies and computational systems are further significant, as they create ways of measuring, analyzing, and representing real-world conditions that cannot be perceived and understood by human senses alone. Given this, as Verbeek (2008) reasons, this "… makes the design of technologies a highly responsible activity" (p. 30).

Designers shape technologies and technological systems, and in turn, technologies and technological systems mediate actions and choices in the world. For this reason, Verbeek characterizes the activity of design as morally significant and as a "material form of doing ethics", and a method to "materialize morality" (Verbeek, 2011, p. 91). Rather than only seeing design as a practice that is shaped by given values, this equally understands design practice as a context *for* moral deliberation (Loo, 2012). In this sense designers and the activity of design can also be construed as agents of moral influence. Professor of architecture Thomas Fisher (2019) similarly argues that the activities of architecture and urban design provide a "… way of manifesting, in physical form, people's ideas of what constitutes a good life. Every design communicates those values and every design decision has ethical implications as a result" (p. xxii). Fisher adds that "… questioning, challenging, and exploring alternatives to [extant ideas about a good life] represents one of the key roles that architects play" (Fisher, 2019). Bowles and others describe design activity as a necessary means to exercise moral imagination, explained as "… the ability to dream up and morally assess a range of future scenarios" (p. 18). With its origins in political philosophy, the practice of moral imagination calls for moral deliberation to extend beyond formal, abstract logic and principles, and to be grounded in understandings of real, situated, lived, and collective experience (Burke & Mitchell, 2009).

In the context of design practice, drawing on postphenomenological mediation theory can provide a mechanism to shift the focus of ethical inquiry in relation to the smart city to human- or life-technology-environment relations, and in short, to the interplay between the urban *and* the technological. This affords a way to bridge the gap between the micro ethical focus on data and algorithms and the macro level critique of the smart city paradigm. In so doing, it also suggests the possibility of broadening the scope of smart city ethics such that it can account for the contextual and material specificities of local contexts within which smart technologies are embedded. Moreover, exploring alternate configurations of digital technology and urban space and their potential moral significance through design practice provides a way to ask significant questions about the "quality of life that is lived with technology" (Verbeek, 2011, p. 156).

Professor of Information Science Daniel Susser (2022) reasons that there is an urgent need to explore alternate sociotechnical design visions for the smart city because smart city advocates and citizens have too quickly accepted the technology industry's standard narratives about what makes technology 'good'. Susser argues that alternate visions can help "to contest the tech industry's vision of the technological future" and to challenge the technological fixes that claim to address ethical concerns such as privacy, profiling, bias, and unjust decision-making, yet that maintain "technology work as intended" (Susser, 2022, p. 298). Afterall, the practice of ethics is not simply about helping "… realize the goals of technology creators—minus *some* of the harms" (Susser, 2022, my emphasis).

2.5 Conclusion

Examining who (and what) stands to gain and lose in the smart city, and what kind of urban life smart city initiatives create, are questions of a philosophical and ethical import. Scholars and journalists have critiqued the smart city paradigm and examined its various projects and experimental initiatives to reveal its numerous ethical dimensions. Design practice can also provide a productive context for ethical inquiry as well as intervention. Moreover, designing the smart city from a spatial design perspective that attends to the local or urban precinct scale and pays close attention to the quality of life-technology relations can draw out a potentially different set of ethical concerns, namely, questions about the kinds of life that could also be lived with technology.

The following Chapter 3 explains the pedagogic logic of an undergraduate design course that rethinks the smart city at the scale of urban technology. It reasons that cultivating ethically attuned urban technology designers necessitates approaches in design education that can scaffold moral imagination alongside the integration of spatial design and digital and computational literacy skills. Accordingly, Chapter 3 sets out a cross-scale design framework that is grounded in sociotechnical systems thinking and adopts an integrated approach that combines spatial design and physical computing principles. It construes speculative urban technology design projects as situated and material thought experiments that can re-orient thinking on the ethical significance of the smart city and bridge the gap between its micro-ethical focus on data and macro-level socio-political critique.

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Non-Print Items

Abstract:
Examining who (and what) stands to gain and lose in the smart city, and what kind of urban life smart cities create, are questions of a philosophical and ethical import. Since the early 2010s scholars and journalists have critiqued the smart city paradigm and examined its various projects and experimental initiatives to surface its ethical dimensions and significance. The smart city's rhetorical swing from tech-centric to human-centric and from smart city to smart citizen is construed here as a further effort to create the image of a more ethical smart city. Consequently, the topic of ethics has also intersected with the smart city in particular ways, predominantly through the lens of data governance and the protection of privacy rights. This chapter argues for an expanded approach to smart city ethics. It proposes a focus on urban technology design to bridge the gap between a micro-ethical focus on data ethics and macro-level political-ethical critique. Bringing philosophical thinking on technology together with a design-led approach to urban technology is argued to provide a further way to draw out a potentially different set of ethical concerns and to explore how urban life can be lived with technology.

Keywords: Design; Design process; Ethics; Ethics by design; Material ethics; Philosophy of technology; Postphenomenology; Practical ethics; Smart city; Urban technology; Value-sensitive design