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VALUE SENSITIVE DESIGN

AND THE CREATIVE SMART CITY

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ABSTRACT

Current smart city projects exploit Big Data analytics and IoT devices to create efficient and sustainable urban environments. However, these technologies are also powerful instruments of surveillance and control, which are deployed in accordance with existing power relations. In this context, citizens' privacy and freedom end up being threatened. An alternative kind of smart city, based on the values of privacy and creativity, is envisioned in this thesis. By having their privacy protected, citizens can limit the influence that power has on their behaviour; by developing their creativity, they might become able to conceive different forms of life than those imposed by power. Value Sensitive Design, a common method in the field of ethics of technology, is the approach chosen to realise this alternative kind of smart city. In particular, this method is here used to incorporate the values of privacy and creativity into the design of a smart bridge. The aim of this thesis is to prove the effectiveness and show the limits of Value Sensitive Design, with regard to its application to a smart infrastructure. Its incapacity to effectively deal with existing power relations proves to be one of its most important limits, while the presence of resistant, critical subjects is needed to question the power relations underlying any design work.

INTRODUCTION

As over the years several conceptions of smart city have been conceived, a number of corresponding definitions have been given to this notion. Yet, one of the main characteristics included by most definitions is the presence of ICT (Information and Communication Technologies), such as IoT (the Internet of Things) and Big Data analytics. The introduction of smart technologies in contemporary cities may serve different purposes; for instance, the collection of data about the urban environment may be useful to efficiently manage resources, create environmentally friendly infrastructures or effectively plan urban spaces.[1] However, according to an increasing number of authors, this focus on technology risks diverting attention from citizens' living experience. An excessive focus on technology as an end in itself may dehumanise cities, as "terms like smart and intelligent ignore many of the aspects that make a city a successful, liveable environment such as social connections, social capital and the ordinary messiness of daily life".[2] Furthermore, the range of sensors spread throughout smart cities and the consequent flow of data extracted from the population may become a means of surveillance and control.[3] For this reason, proponents of alternative conceptions of smart city have been focusing on a more citizen-centric system, aiming at creating environments being at the same time technologically advanced and responsive to people's rights and needs. However, one may reasonably ask, what does "citizen-centric" mean? Can we clearly identify citizens' interests as against those of governments, corporations, or technology developers? Are not citizens themselves part of these institutions making use of smart technologies? While trying to find an answer to these questions, in what follows we will present some of the ethical issues arising from the spread of smart cities. This is crucial for the development of the rest of the thesis, whose final aim is to propose the implementation of a common method in the field of ethics of technology, called Value Sensitive

[1] In order to gain an insight on the conceptions of smart city that have been conceived over the years, see for instance Irina Anastasiu, "Unpacking the Smart City Through the Lens of the Right to the City: A Taxonomy as a Way Forward in Participatory City-Making", in *The Hackable City*, ed. M. de Lange, M. de Waal (Singapore: Springer, 2019), 239-260; and Jathan Sadowski and Frank Pasquale, "The Spectrum of Control: A Social Theory of the Smart City", *University of Maryland Francis King Carey School of Law* 20, no. 7 (August 2015): 1-22.

[2] Kars Alfrink and Gerd Kortuem, "Seeing Like a Bridge. Using Cityness as a Lens to Analyse Smart City Infrastructure". Publication rights licensed to ACM. DOI: http://dx.doi.org/10.475/123_4.

[3] Sadowski and Pasquale, "Spectrum of Control", 1-22.

Design (VSD), in order to show the benefits and the limits it could provide for the creation of an "ethical" smart city.

According to Maroš Krivý, it is naive to believe that smart cities are the top-down projects of governments aiming at developing technology at the expense of citizens. By consequence, the simple inversion of this relation (that is, the bottom-up liberation of technology in the name of people) would not represent a solution to the issues arising from this context. In other words, it is the opposition between the top-down and bottom-up use of smart technology that needs to be challenged.[4] In order to question this relation, it may be useful to ask who are the proponents of the smart city discourse and whose interests smart cities are meant to serve. In short, a genealogy of the rationale underlying the idea of smart city is probably required.[5] One possible attempt has been made by Alberto Vanolo, who points out how the smart city discourse can be situated in the broader narrative of the sustainable and resilient city. According to the author, several institutions (such as corporations, governments, social movements, private individuals, local organisations) exploit the environmental discourse in order to justify their disparate activities. On the one hand the creation of a clean and intelligent city is useful to attract tourists and capital investments, on the other hand the spread of urban sensors can help institutions monitor people's lives and influence their behaviour for economic or disciplinary reasons.[6] This brief attempt of genealogy already shows how the widespread opposition between the state and citizens is too simplistic. The logic underlying the development of smart cities is much more complex and involves several social actors, who interact with each other and in so doing give rise to power relations. In order to further elaborate on the specific power dynamics lying at the basis of smart cities and thus unravel the correspondent ethical issues, we first need to look into how Michel Foucault developed the ideas of power relations and governmentality.

According to the French philosopher, in our contemporary, liberal societies the principle of representation portrayed by Hobbes has definitely failed: as power is not "something belonging to someone", it should not be regarded as a faculty possessed by a central and representative state elected by citizens.[7] On the contrary, it should be considered as

[4] Maroš Krivý, "Towards a critique of cybernetic urbanism: The smart city and the society of control", *Planning Theory* 17, no. 1 (2018): 8-30.

[5] According to the genealogical method developed by Michel Foucault, we "seek to treat the instances of discourse that articulate what we think, say, and do as so many historical events" Michel Foucault, "What is Enlightenment?", in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon Books, 1984), 32-50.

[6] Alberto Vanolo, "Smartmentality: The Smart City as Disciplinary Strategy", *Urban Studies* 51, no. 5 (April 2014): 883-898.

[7] According to Hobbes' view, the state arises when men "conferre all their power and strength upon one Man, or upon one Assembly of men, that may reduce all their Wills, by plurality of voices, unto one Will" (Thomas Hobbes, *Leviathan*, Book II, Oxford: Oxford University Press, 1996, 120).

> something which circulates, or rather as something which only functions in the form of a chain. It is never localized here or there, never in anybody's hands, never appropriated as a commodity or piece of wealth. Power is employed and exercised through a net-like organization.[8]

In other words, power is a net of relations that is spread within the social space and that at the same time articulates it. For this reason, rather than from an imaginary central point of domination and control, power spreads from a multiplicity of disseminated points, which constitute the nodes of this web of power relations. Now, the notion of governmentality refers to the way in which these decentralised powers govern individuals and the social space where they live. Each social actor involved in the system develops a set of discourses, knowledges, practices of truth that circulate among society. By affirming these discourses, institutions can create and spread articulated systems of meaning through which the social space and individuals are endlessly reshaped. In this way, individual life is continuously steered towards the predetermined behavioural paths created by power relations: the set of people's beliefs, desires and ambitions is a priori established by dominant frameworks of power. In sum, the notion of governmentality refers to the process of "the conduct of conduct" carried out by social institutions and unfolded in accordance with contingent power relations.[9] In order to figure out how the governmentality discourse can be applied to smart cities, it is important to understand how power relations take hold of physical space. Individual relationships and forms of life are not the only matter susceptible to be governed; urban space is also meant to reflect and support the power relations that dominate the social space. The territorialisation of power

> is a matter of discourse, of the immanent rules of formation – the regularities and distributions – that allow things to be said and understood about urban existence. […] Such regularities are associated with ways in which form is given to nondiscursive matter – the subjects who can speak or be spoken about; the spaces of workshops, factories, barracks, streets.[10]

The truths promoted by discourses of power materialise in the form of urban infrastructures, which cannot but reinforce the governmental power underlying their creation. For instance, ghettos can be understood as the crystallisation of a particular governmental operation,

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[8] Michel Foucault, *Power/Knowledge. Selected Interviews and Other Writings 1972-1977* (New York: Pantheon Books, 1972), 98. To further deepen the Foucauldian analysis of power, see also Michel Foucault, *The History of Sexuality* (New York: Pantheon Books, 1976).

[9] To further deepen the Foucauldian notion of governmentality, see Michel Foucault, *Security, Territory, Population. Lectures at the Collège de France, 1977-78* (New York: Palgrave Macmillan, 2007).

[10] Thomas Osborne and Nikolas Rose, "Governing cities: notes on the spatialisation of virtue", *Environment and Planning D: Society and Space* 17, no. 6 (December 1999): 738.

according to which some minorities were at the same time monitored and confined. The particular conformation of these neighbourhoods was at the same time the picture and the solidification of a living power relation.

Now, considering that the opposition citizens-state has proven to be incorrect or at least incomplete, how are power relations and governmentality supposed to affect the context of smart cities? What are the ethical issues arising from such a scenario? As already mentioned, one of the prominent characters of smart cities is the presence of ICT, such as Big Data analytics.[11] A fully-fledged smart city is covered with sensors aiming at collecting information on the ways in which people interact with the urban environment. However, the information collected does not refer to individuals as a whole, but to a number of aspects or fragments of people's behaviour that are easier to extract and analyse. In this sense Gilles Deleuze spoke of the emergence of "dividuals" in the new societies of control.[12] The individual is fragmented, atomised by digital technologies, which can for instance keep track of people's movements, read the chip of their wallets, scan their fingerprints or measure their emissions.[13] While we have seen that in Foucault's conception of society power relations were meant to shape individual identity and behaviour as a whole, the new smart technologies with which power is exercised nowadays allow to monitor specific aspects of people's lives: "In the SC [(smart city)], the subject citizen is at once an infra-individual profile of desires, attitudes and preferences and a vector within their supra-individual articulation as a 'swarm'".[14] Every single behavioural fragment becomes part of a dataset built and processed in real-time, while

> social change is construed as the accumulation of multifarious but infinitesimal behavioural adjustments [and] individual action is construed as a vector within the infinite virtuality of societal self-organisation.[15]

These capillary behavioural campaigns (for instance, built on discourses of energy efficiency, ecological resilience, quality of life, consumers' interests, urban liveability) are on the one hand enacted by means of interventions on the digital urban environment and, on the other hand, by collecting data on people's behaviour, reactions and opinions. In other words, while the digital urban environment is supposed to slightly nudge people's specific habits, the real-time analysis of people's behaviour is conversely meant to give shape to smart environments. Smart cities thus

[11] In order to gain an insight on the nature and the social phenomenon of Big Data, see for instance Ida Asadi Someh et al., "Ethical Implications of Big Data Analytics", *Research-in-Progress Papers* 24 (June 2016): 1-10.
[12] Gilles Deleuze, "Postscript on the control societies", *October* 59 (1992), 3–7.
[13] For a deeper analysis of Deleuze's dividuals as included in the context of smart cities, see Sadowski and Pasquale, "Spectrum of Control", 1-22.
[14] Krivý, "Cybernetic urbanism", 8-30.
[15] Ibid., 22.

become the ideal environment for developing and activating a number of surveillance devices, whose ultimate aim is to consolidate the existing mechanisms of governmentality. As we are going to see, the circular, governmental process mentioned above is triggered by specific socio-economic interests and supported by contingent power relations.[16] According to an increasing number of authors, Big Data analytics and urban sensing are a product of our capitalist and consumerist societies. The fragmentation of human bodies enabled by data mining allows for a better manipulation and marketisation of each component; for instance, smart applications that make use of geolocation services may keep track of people's preferred eating places and create suggestions accordingly.[17] In short, smart technologies

> present a way to not only dividualize people at minute scales, but also provide the means to intensify commodification — via strip-mining the newly available sources of data — and control — via biopolitical management — of people, all while the 'smart city' constructs a conducive platform for these activities.[18]

In conclusion, the aim of the surveillance operations mentioned above is to normalise people's existence. The spectrum of a homogenised urban environment, shaped in the name of consumerism and social control, could be regarded as the dark side of smart and sustainable cities. Even if the current development of smart cities aims at promoting ethical values such as efficiency, security, well-being and environmental sustainability, it also poses a threat to people's decision-making autonomy. As governmental relations are meant to shape individual identity and to steer their actions towards predetermined behavioural paths, people's capacity to self-determination is threatened.

The mechanisms of surveillance and control described above are already determining the aspect of the smart cities that are growing in our societies. Moreover, these practices are already shaping the world of Big Data analytics and ICT, where people's privacy is continuously threatened

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[16] Not only is this circular relationship fed by the data provided by citizens, but it also informs their tastes, desires and needs, which in turn are collected in the form of data and used to shape smart cities accordingly. It is not therefore surprising that smart city discourse is increasingly dominated by the idea of civic participation. However, merely asking citizens about the city they want does not emancipate them from power relations; on the contrary, in this way the governmental circle ends up being strengthened. Indeed, "by making civic systems more user-friendly, they ultimately make users friendlier to civic systems" (Eric Gordon and Stephen Walter, "Meaningful inefficiencies: Resisting the logic of technological efficiency in the design of civic systems", in *The Playful Citizen. Civic Engagement in a Mediatized Culture*, ed. René Glas et al., Amsterdam: Amsterdam University Press, 2019, 320). For this reason, when it comes to realising an alternative vision of smart city, we will not appeal to methods directly inspired by the idea of participatory design.

[17] The vicious circle described before is here again reproduced: since people's preferred eating places are likely to be the most visible in the food market, when smart services suggest them, they are actually reinforcing existing power dynamics; conversely, the dominant sources of power are interested in accessing smart services in order to further affirm their position.

[18] Sadowski and Pasquale, "Spectrum of Control", 1-22.

by a variety of institutions to collect precious information about their lives. When the flow of data includes personal information concerning particular individuals, the control they can exercise on this sensitive data is gradually lost; in this way, their privacy is violated.[19] For instance, large internet companies are monitoring people's online searches or social network activities in order to profile individuals and provide them with personalised advertisements accordingly.[20] By means of Big Data analytics, internet companies are able to meticulously watch over people's online lives and extract economic values by influencing their behaviour. Furthermore, before the birth of smart cities, people's conduct was already monitored by governments for reasons of order and security. Big Data analytics is often used to predict where criminal activities are likely to occur: in order to better identify and catch criminals, the police make use of algorithms to create profiles of people who are suspected of developing criminal behaviour.[21]

Now, as this technology is also being moved to the context of smart cities, the practices described above are going to become even more widespread. By means of a more pervasive internet that also embraces things, smart cities are becoming platforms even more conducive for activities of surveillance and control. For example, as reported by Rob Kitchin, in London a private company installed sensors and screen on two hundred bins.[22] These sensors could connect to people's phone identifiers as they passed by the bins and access some of the information stored in their system. The aim of the project was to sell the data collected to other companies, which in this way could create personalised advertisements and show them on the bins' screen to the passer-by. In this way, every time someone had passed by one of these bins, some targeted ads based on individual phone activity would have appeared on the screen and captured their attention. The company also declared that by combining all the detections made by the bins, they would be able to keep track of individuals' movements or activities, such as the stored visited and the time spent there. Even if the project was probably not completely realised, the possibility to have smart nudging bins spread all over the city of London was concrete.

Is there a way out of this creepy scenario? Can we conceive the idea of a smart city that does not end up surveilling and steering people's lives? One of the aims of this thesis is to show that an alternative version of smart city is imaginable and maybe even realisable. First of all, in this

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[19] To further deepen the way in which individual privacy is threatened by Big Data and smart cities, see Someh et al., "Ethical Implications of Big Data Analytics", 1-10; and Rob Kitchin, "The ethics of smart cities and urban science", *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 374, no. 2083 (2016): 1-15.

[20] See Shoshana Zuboff, "Big other: surveillance capitalism and the prospects of an information civilization", *Journal of Information Technology* 30, no. 1 (2015): 75–89.

[21] See Sarah Brayne, "Big Data Surveillance: The Case of Policing", *American Sociological Review* 82, no. 5 (2017): 977-1008.

[22] See Kitchin, "The ethics of smart cities", 1-15; and James Vincent, "(Updated) London's Bins are Tracking your Smartphone", *Indipendent*, 9 August 2013, https://www.independent.co.uk/life-style/gadgets-and-tech/news/updated-londons-bins-are-tracking-your-smartphone-8754924.html.

different kind of smart city individual privacy must be protected. If people do not have control over their personal data, the mechanisms of surveillance and control depicted above become effective. Second of all, the information collected needs to be freed from the rigid constraints created by the constituted power. If it were released, if the knowledge resulting from data analytics started serving interests and purposes others than the governmental ones, new horizons for interpretation and unprecedented forms of life could be disclosed. But in order to realise this perspective, people need to start living cities and using technology in a different way: citizens need to become aware of the power relations moulding smart cities and creatively reshape it. In this way, the technology embedded in smart environment will become a means with which the subject exercises their freedom.

More concretely, let us reconsider the case of the smart bins mentioned above. What if, instead of showing targeted ads, they provided people with suggestions on alternative or creative ways of living their city? Instead of tracking people's phone identifier in order to obtain information on their internet activity, they could limit themselves to detecting the presence of a passer-by and trying to communicate with them. For example, each screen could indicate hidden spaces to people, suggest unusual activities or perspectives from which to approach the city, or facilitate the creation of meeting places.[23] In this way, smart, interactive technology would encourage citizens to look at their city with a different eye; by distracting them from their usual routine or from the main touristic attractions, this kind of smart system could allow people to give new meaning to their ordinary life. By experimenting creative ways of living their (smart) cities, by realising that a multitude of unexpected possibilities can be realised, people might expand their horizons and see the limits shaped by existing power relations. One of the aims of this thesis is to examine whether this creative and resistant attitude can be encouraged by means of smart technology. If this is the case, a smart city different from that of surveillance and control could be realisable.

This thesis develops on three main levels: a methodological level, in which VSD is technically applied to a smart infrastructure; an ethical level, where the values needed to design an alternative kind of smart city are presented and analysed; and a philosophical level, in which any design principles end up being questioned by critical subjects. Rather than being assigned a specific chapter or section in the thesis, these three dimensions will overlap and alternate with each other.

Specifically, the first chapter will deal with a different way of conceiving life in (smart) cities: by drawing once again on Foucault's work, we will analyse the concept of resistance, which turns

[23] There are a few smartphone applications that were created for similar purposes: they suggest detours, perspectives that could be adopted or interactions with other user. See for instance "Serendipitor", Civic Tripod, accessed May 24, 2019, http://civictripod.com/civictripod.com/games/serendipitor/index.html; or "Situationist", Civic Tripod, accessed May 24, 2019, http://civictripod.com/civictripod.com/games/situationist/index.html.

out to be the attitude necessary to question existing power relations and autonomously conceive different forms of social life. Then, with the help of the situationist idea of *détournement*, we will present alternative ways of interacting with the urban environment and technology. With Saskia Sassen's work on cityness and Richard Sennet's notion of open city, we will subsequently shift the focus from the concept of resistance to that of creativity. Not only will the distinction between these two notions assist the introduction of VSD, but it will also be crucial to ascertain the latter's limits: as we will see, since the attempt to develop resistance by design would be undesirable and contradictory, the implementation of VSD will only concern creativity and privacy protection.[24]

The method of VSD, which is needed to concretely give birth to the desired project, will be presented in the second chapter. VSD is "a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process".[25] As we will see afterwards, this approach presents several strengths but also some theoretical and methodological weaknesses.

In order to evaluate its efficacy in this scenario, in the third chapter we will apply VSD to a smart sensing infrastructure, named MX3D bridge, which will be imagined as surrounded by a fully-fledged smart city. The smart bridge in question, which will incorporate the values of privacy and creativity, will represent an alternative kind of smart city in miniature, in which the threats of surveillance and control have vanished. As we will see, VSD will prove to be effective with regard to the implementation of the value chosen. However, it will present limitations with regard to the complexity of a smart city system, the distinction between design and use and the possibility to question power relations.

[24] While the notion of privacy has been given a number of specific definitions, the concept of creativity is probably harder to grasp in a single formulation. Instead of providing a single definition of creativity, we will see how this notion will gradually take shape along the course of the thesis. However, as VSD methodology requires a working definition of the values considered, we will eventually draw on a few design studies in order to come up with a working definition of creativity.

[25] Batya Friedman, Peter H. Kahn jr. and Alan Borning., "Value Sensitive Design and Information Systems", in *The Handbook of Information and Computer Ethics*, ed. Kenneth Einar Himma and Herman T. Tavani (Hoboken: John Wiley & Sons, 2008), 70.

CHAPTER I

THE CREATIVE CITY

1. The subject of resistance

In this chapter I will further develop the idea of an alternative smart city lived by resistant and creative subjects. While in the introduction the concept of resistance and creativity were briefly presented as merged together, I will show that this indistinction can be misleading. In the first two paragraphs I will illustrate the idea of resistance as conceived by Foucault and show how the idea of creativity can arise as a result; in the last two paragraphs I will reverse these two notions in order to determine whether creativity can be followed by resistance. As we will see, the asymmetry in their relation will result in the exclusion of resistance from the possible lists of values to be implemented in VSD.

As briefly mentioned in the introduction, the precarious equilibrium upon which rests society is composed by a complex whole of power relations. As pointed out by Foucault in *The History of Sexuality*, "power is everywhere"[26]; that is, there do not exist spaces or situations untied from power relations. Every individual action in any possible situations is happening within systems of meaning whose boundaries have been traced by a whole of power dynamics. Individual identity (who people are) and behaviour (what people do) always take place within the rationale of particular discourses of power or "games of truth".[27] Now, at first sight a context of this kind seems to leave little or no room for resistance and freedom. However, in the framework conceived by Foucault power and freedom do not exclude each other; on the contrary, "where there is power, there is resistance, and yet, or rather consequently, this resistance is never in a position of exteriority in relation to power".[28] In short, power can only try to take hold of something that cannot but behave

[26] Foucault, *History of Sexuality*, 93.

[27] "In this sense, individuals under a regime of governance are rendered subject to their own identities and, as such, act out of a tendency to conform to the regulations and ongoing practices of the various social agencies that define and shape these identities" (Kevin Thompson, "Forms of resistance: Foucault on tactical reversal and self-formation", *Continental Philosophy Review* 36, no. 2 (2003): 130.

[28] Ibid., 95. A few lines below, the text continues: the existence of power relations "depends on a multiplicity of points of resistance: these play the role of adversary, target, support, or handle in power relations. These points of resistance are present everywhere in the power network. Hence there is no single locus of great Refusal, no soul of revolt, source of all rebellions, or pure law of the revolutionary. Instead there is a plurality of resistances, each of them a special case: resistances that are possible, necessary, improbable; others that are spontaneous, savage, solitary, concerted, rampant, or violent; still others that are quick to compromise, interested, or sacrificial; by definition, they can only exist in the strategic field of power relations".

like an object of opposition, of constitutive reluctance to be dominated. Namely, the precise point where power asserts itself is also the point where some kind of resistance takes place. Instead of considering freedom as an intrinsic (read: metaphysical) capability of an individual capable of exercising it regardless the power relations by which he or she is surrounded, Foucault places freedom at the same point of resistance where power tries to take hold. By consequence, the freedom of a resistant subject is not to be realised by breaking free from the (power) relations that shape him or her existence, in order to give birth to a decontextualised reality where the individual is finally capable of self-determination. On the contrary, the space for a possible exercise of freedom is immanent in the net of power relations itself, which needs to be challenged by the critical subject that aims at giving their life a new shape. With the words of Foucault:

> This philosophical ethos may be characterized as a limit-attitude. We are not talking about a gesture of rejection. We have to move beyond the outside-inside alternative; we have to be at the frontiers. Criticism indeed consists of analyzing and reflecting upon limits.[29]

In short, the resistant subject needs to unmask the mechanisms underlying the surrounding whole of power relations; in this way, he or she can recognise the contingency of the discourses of power that are supposed to organise his or her life. As a consequence, the individual may finally become able to question and challenge the forms of life instilled by power. However, given that a position outside power relations is not conceded and that resistance itself occurs as a limit-attitude, how is resistance supposed to manifest itself? The questioning subject engages in an act of reinterpretation of the truths told by power, but reinterpretation is only possible through a recombination of other immanent truths. The resistant subject challenges and alters power dynamics by means of the truths, concepts and practices determined by other power dynamics. In short, the new interpretations accessible to a resistant subject are the result of a critical but also creative intervention on reality. Therefore, resistance manifests itself as a form of creativity.

In sum this questioning, critical attitude aims at engaging the subject in an endless reinterpretation of themselves (hence the expression *Hermeneutics of the Subject*)[30] and of the political space he or she is living within. An authentic margin for freedom resides in the critical attitude by means of which a subject distances themselves from the practices of truths established by power

[29] Foucault, "What is Enlightenment?", 42.

[30] The care of the self that the critical Greek subject used to exercise in order to become able to exercise their freedom is the topic of the late lectures given by the French philosopher at the Collège de France. By challenging the practices of truth that aimed at determining the way in which the subject had to conduct their existence, he or she could become able to affirm unprecedented truths and forms of life. See Michel Foucault, *The Hermeneutics of the Subject: Lectures at the College de France 1981-82* (London: Palgrave Macmillan, 2005); and Michel Foucault, *The Courage of Truth: The Government of Self and Others II; Lectures at the Collège de France, 1983-1984* (London: Palgrave Macmillan, 2011).

relations. By renegotiating the frontiers of meaning and bending the well-established rules the subject can creatively give birth to unprecedented forms of life.

> The process of self-constitution itself can begin to take hold of us and enable us to cultivate new forms of being and doing, new kinds of value and obligation, ones that stand in accordance with the process of constitution itself. This is what Foucault is referring to when he speaks of an 'aesthetics of existence' and, like every craft, this art has its own inherent rule: self-governance.[31]

In other words, the process of self-reinterpretation passes through the re-definition of one's relation with established powers; by working on this relationship, by reshaping the limits of the horizons of meaning within which one's everyday practices take place, the free subject can become able to live an original and authentic existence at once. The subject who engages in an "aesthetics of existence" creatively conceives truths and forms of life others than those prescribed by power.

However, it is important to point out that resistance should not be regarded as an activity prescribed by morality. When Foucault speaks about power relations, he never regards them as morally bad or undesirable. Even if their capacity to confine practices within codified meanings may represent a constraint for individuals, it also allows these practices to assume a specific shape. In other words, the limits created by power relations both constrain forms of life and allow them to agglomerate. The free subject is not an individual who has broken free from the hold of power, but someone who is able to critically question its manifestations and dynamise its contingent limits. Moreover, since the surveillance technologies deployed by smart cities are nothing but the means through which power seeks to assert itself, they should not be regarded as evil in themselves either. As we have seen, the issue of these technologies of power consists in the threat they pose to people's freedom and capacity to question power relations. For these reasons, the alternative smart city we are going to suggest does not reject power relations; rather, it seeks to emphasise their contingent and dynamic character, which can be exploited by the free subject that aims at developing alternative forms of life.[32]

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[31] Thompson, "Forms of resistance", 123. To further deepen the Foucauldian conception of aesthetics of existence, see also Marli Huijer, "The aesthetics of existence in the work of Michel Foucault", *Philosophy Social Criticism* 25, no. 2 (1999): 61-85.

[32] It is also important to point out that this thesis does not aim at objecting to the principles promoted by current smart city projects, such as security, efficiency, well-being or environmental sustainability. The point is not the desirability or the immorality of some specific principles proclaimed by power, but their contingent and always questionable character. In short, we do not want to replace some ethical principles with better ones, but to show how a critical subject can exercise their freedom by challenging the power discourses on which the establishment of any ethical principles rests. To be coherent with the discourse about resistance and power relations, we should not consider this alternative kind of smart city to be absolutely "better" than the existing one, because even this statement would inevitably make sense within the horizons of meaning established by some contingent discourses of power. As we will see at the end of the thesis, the critical, philosophical subject needs to question all the shapes and configurations that reality assumes, even those that replace surveillance and control with privacy and creativity.

Now, how can we integrate the resistant subject into the context of smart cities? How is the free subject supposed to interact with the environment he or she lives in? In what follows, I will show that working creatively on oneself and giving new shape to one's own surroundings are two potentially intertwined activities. When the subject questions the (power) relations that give shape to their life, he or she inevitably changes the approach to their reality. In other words, the resistant individual becomes able to shed light on their surroundings in different, unprecedented ways. Not only is this process supposed to affect the subject's living relationships (which are meant to change in accordance with the interpretation he or she gives to them), but it can also involve the physical space he or she is surrounded with. As we have seen, the urban space is steeped in power relations that shape individual and infrastructures conjointly. Even though predominant discourses of truth can easily crystallise in the physical environment, their contingent character makes them possible to be overturned and even eradicated from the urban landscape. When local pockets of resistance agglomerate and jointly challenge the established power, the social order and the infrastructures that are meant to support it are put into question. In sum, since the subject that is working on themselves cannot but address the whole of (power) relations that are meant to give shape to their identity, the social and urban cradle of these power dynamics cannot but be affected by the resistant subject. The following paragraph will examine the way in which resistant individuals can exercise freedom by recreating the urban environment.

2. Reinterpreting urban space

While a lot of work has been done to cover the issue of surveillance in urban space and smart cities, the topic of resistance in these contexts has received little attention. In this paragraph I will draw inspiration from the Debordian conception of *détournement*, in order to develop the topic of urban resistance.[33] Guy Debord and the situationists provide a brilliant example of how a critical and resistant subject can subvert the authoritarian powers spread over the urban environment. The Situationist International was an organisation made up of intellectuals and artists born with the aim to fight against the lifestyle and the social order imposed by capitalism. Their members used to give rise to alternative "situations", often placed in urban or public spaces, in order to liberate their everyday lives from the constraints of the established power.[34]

[33] Beverly Geesin, *Resistance to Surveillance in Everyday Life*, Phd diss., University of York, 2012.
[34] To further deepen the situationist ideas and activities, see Kristin Ross and Henri Lefebvre, "Lefebvre on the Situationists: An Interview", *Guy Debord and the Internationale Situationniste* 79 (Winter 1997): 69-83.

With specific regard to the city, Guy Debord and other situationists conceived the idea of "unitary urbanism", which was defined as "the theory of the combined use of art and technology leading to the integrated construction of an environment dynamically linked to behavioural experiments".[35] The kind of urbanity envisioned here aims at promoting original, experimental ways of living the city: through an original use of urban space and the creation of unprecedented forms of life, Debord imagined that the individual could escape the spectacular and consumerist logic that was meant to shape society. In this sense, the notion of *détournement*, which was defined as "the reuse of preexisting artistic elements in a new ensemble",[36] was central in the situationist project. If applied to the urban context, this idea encouraged a subversive and original reappropriation of spaces and artefacts. By using the urban space in different ways from those encouraged by the established power, the latter's original purposes were likely to be unmasked. In other words, by changing the context of use within which artefacts were conceived and developed, the resistant individual could reveal all those practices of meaning that usually went unnoticed. Unitary urbanism was meant to "include both the creation of new forms and the détournement of previous forms of architecture, urbanism, poetry and cinema".[37] The reappropriation of these forms simultaneously implied an act of reinterpretation, of re-definition of the meaning and the purpose of artefacts. By questioning the discourses of truth underlying the development of the urban space, the resistant citizen had the opportunity to creatively exercise their freedom. With the words of Henry Lefebvre, whose work was largely inspired by Debord's ideas,

> an existing space may outlive its original purpose and the raison d'etre which determines its forms, functions, and structures; it may thus in a sense become vacant, and susceptible of being diverted, reappropriated and put to a use quite different from its initial one.[38]

Drawing from the analysis of Foucault's work conducted in the previous paragraph, we can state that the reorganisation of physical space goes together with the questioning of the power relations that underlie its creation.[39] Similarly to how the Foucauldian notion of resistance develops, an authentic space of freedom cannot be found in a place other than that shaped by power; on the contrary, the resistant citizen needs to unravel the ubiquitous practices of truth and subsequently

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[35] "Definitions. Internationale Situationniste #1 (June 1958)", Situationist International Online, accessed May 5, 2019, https://www.cddc.vt.edu/sionline/si/definitions.html.
[36] "Détournement as Negation and Prelude. Internationale Situationniste #3 (December 1959)", accessed May 5, 2019, https://www.cddc.vt.edu/sionline/si/detournement.html.
[37] Guy Debord, "Report on the Construction of Situations and on the International Situationist Tendency's Conditions of Organization and Action. June 1957", accessed May 5, 2019, https://www.cddc.vt.edu/sionline/si/report.html.
[38] Henry Lefebvre, *The Production of Space* (Hoboken: Wiley-Blackwell, 1974).
[39] Again, the idea of the reappropriation of the urban space suggested by Debord does not refer to the restitution of the city to citizens, as opposed to a despotic central government; regardless the social position of each citizen and the power relation by which he or she is surrounded, the resistant subject can challenge them and thus reappropriate the urban space by reshaping it in an authentic, personal way.

recombine them in unprecedented ways. By infringing the limits within which things are what they are, by creating new combinations of objects and practices already existing, the free citizen becomes able to give birth to new forms of life.

So far, I have presented the Debordian conception on how urban spaces can be taken away from its well-established context of meaning and therefore be reinterpreted. Now, I will show how the notion of *détournement* is also susceptible to be applied to an urban social environment surrounded by smart surveillance technology. Cities have always been surrounded by technological artefacts: not unlike contemporary surveillance devices, buildings, streets, means of transport, pavements are technological products that affect citizens' conduct of everyday life. If the ordinary urban landscape, as we have seen, can be diverted and thus reappropriated, advanced modern technology should not represent an exception. Indeed, any form of technology can be experimented in order to explore its potential regardless its prescribed use; for the subject of *détournement* technological devices does not represent a restriction for individual creativity, but an opportunity for creating a different everyday life.[40] By approaching surveillance technologies from a different viewpoint than that instilled by their promoters, the resistant citizen challenges the meaning according to which they were deployed.

> The uses of surveillance technologies are not necessarily proscribed in their design and […] there are alternative uses for the technologies which may be taken advantage of to liberate individuals from the gaze rather than to subject them to it.[41]

Even though the design of an artefact is meant to encourage a certain kind of utilisation, people can always use it differently. For instance, even if the main purpose of a book is that of being read, people can use it in a number of different ways: books can become decorative objects or supports for desks, they can be used as paperweights or maybe represent a memory of a missing person. As we will see in the next chapters, the difference between design and use will represent a significant issue for the development of VSD. For the moment, let us stick to the analysis of the conduct of a resistance subject immersed in a technological urban landscape. As the design of an artefact reflects the power relations that the artefact itself is meant to reiterate, its different use for different purposes can lead to the reshaping of the balances of power and to the reinterpretation of the social environment. The truths that discourses of power materialise in the form of a correct or suggested use of a particular device can be challenged by the subject who reinterprets its meaning. The hybridisation of forms and the integration of "inappropriate" practices have the

[40] See also Henry Lefebvre, *Critique of Everyday Life: Volume 2* (London: Verso, 2002).
[41] Geesin, *Resistance to Surveillance*, 82.

potential to open a breach in the constrained whole of practices allowed and give birth to unprecedented combinations of meaning.

Now I will illustrate a few examples of *détournement* involving surveillance technology. There are many different ways in which these technologies of control can be creatively reappropriated. Indeed,

> through artistic engagement, the flaws and true function of these technologies can be exposed. Individuals adopt GPS for purposes of evasion, groups perform in front of CCTV cameras transforming them into a form of theatrical expression, RFID tags are employed for pervasive games and then there are countless everyday practices of self-surveillance in which surveillance technologies which generally function to separate out individuals are deployed to develop social ties and interactions.[42]

While these activities of resistance are usually performed by common citizens, a number of artistic creations were conceived to challenge the power of urban surveillance technologies. For instance, the work of Michelle Teran, called "Life: A User's Manual", aims at unravelling the surveillance activity conducted by means CCTV in public spaces.[43] The artist's performance consists in dressing up as a homeless and wandering around different cities, while showing the pictures on a television she carries in a shopping cart. The artist is able to hack the CCTV and show their footage to the people on her television. In this way, the surveillance activity performed by security systems is unmasked and put before the eyes of citizens: the invisible power of surveillance, which is ensured by the unawareness of the people that do not know they are being spied on, is in this way exposed and openly denounced. By dressing up as a homeless, Teran can embody the border-line subject who lives at the margins of society. The homeless may indeed represent the free subject who looks at the established power from outside and thus becomes able to question it. As we have seen with Foucault, the unmasking of existing power relations represents the preliminary activity that allows the resistant individual to challenge them. Once their limits (not only their flaws, but especially the horizon of meaning within which they occur) have been shown, they can finally be challenged and opened up to new possibilities of creation. Another work born with the aim of unravelling hidden mechanisms of surveillance is "Tracking Transience", by Hasan Elahi.

In 2002, the artist was mistakenly suspected of being engaged in terrorist activities and eventually arrested by the FBI. Even if the accusations turned out to be unjustified, once he was released the FBI encouraged him to notify them about all his journeys. Instead of just providing the FBI with essential information, Elahi started tracking every move and activity occurring in his

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[42] Ibid., 80.

[43] See Michelle Teran, "Life: A User's Manual", accessed May 6, 2019, http://www.ubermatic.org/life/.

everyday life. By means of a mobile phone equipped with a camera and GPS, he has been uploading thousands of pictures representing the meals consumed, the places visited and even his debit card transaction receipts on a real-time updated website.[44] Instead of overtly offering resistance to the power of monitoring and disciplining people's behaviour, Elahi's work aims at exposing it by means of an ironic and destabilising counteraction. Where the purpose of the FBI was to keep monitoring this person with the aim of getting hold of any compromising information, the artist's reaction was to make public every insignificant detail of his life. By subverting the rules arranged by monitoring powers, the artist chooses not to play the game of surveillance; in this way, the rules are exposed and the game loses part of its meaning. In short, when there is nothing to hide, there is also nothing to discover. That is why

> processes which seek to manage, control and predict behaviour are useless if individuals resist through behaving in ways other than expected. […] While not dismantling these systems, these practices question their purpose and functionality. Importantly, they provide methods for living a bit more freely within the surveillance society as a component of a critique of everyday life.[45]

Works like the ones just presented represent an important instrument of freedom because by unmasking the invisible games of power occurring in society, they give people the opportunity to become aware of them and thus to adopt a self-governing position. Most importantly, the idea is not to authoritatively instil in people's mind a viewpoint different from that of established powers. An approach like this would only impose another unconscious truth, though being alternative to the one put into question. Instead, by pointing at the games of power underlying our everyday practices, the artistic and free subject can stimulate other people to critically reflect themselves in order to creatively reshape their existence.

3. Cityness and the open city

In the previous two paragraphs I have shown how this critical, resistant attitude manifests itself in the creation of alternative practices of meaning; in the following ones I will instead start from the notion of creativity and demonstrate how resistance does not necessarily follow. Again,

[44] Hasan Elahi, "Tracking Transience", accessed May 6, 2019, http://elahi.umd.edu/track/. Even if the artist developed this idea before the rise of smart cities and social networks, his work is of even greater importance nowadays, when everyone is eager to share personal information and smart cities are intensifying the flow of data. Urban sensing devices, coupled with people's eagerness to share information, have finally the potential of "tracking transience". For this reason, Elahi attempt to expose surveillance mechanisms can represent a relevant tool to develop a critical and resistant attitude to the spread of surveillance technologies in smart cities.
[45] Geesin, *Resistance to Surveillance*, 337-338.

the context of this theoretical reflections will be that of the urban environment: starting from the notions of cityness and the open city, I will show how the dynamic nature of cities can stimulate citizens' creativity. Once this faculty is enhanced, people may or may not develop authentic forms of freedom and resistance.

In the previous paragraphs, we have seen how power is keen to spread throughout the urban space in order to effectively mould it according to its interests. This intervention aims at ensuring better control over space and social relations, which in this way end up being channelled towards predetermined paths. ICT, which are deployed with the purpose of reinforcing these dynamics, are likely to lead to

> the over-determination both of the city's visual forms and its social functions. The technologies which make possible experiment have been subordinated to a regime of power which wants order and control.[46]

By over-determining cities' social functions, powers give birth to systems of meaning that are not meant to be negotiable or interpretable; on the contrary, citizens are constrained to endlessly reproduce them in the same way. According to Saskia Sassen, the rigidity of these discursive practices poses a threat to the spontaneous renewal of cities, which are able to thrive as long as they remain involved in a dynamic exchange of ideas and social practices. The building of smart cities for reasons of profit, together with the use of closed intelligent systems to control buildings, threatens to deurbanise the urban environment.[47] However, in Sassen's opinion cities are not doomed, as the multiplicity of interactions they accommodate still makes them dynamic spaces:

> In cities we can see the making of new subjects and identities that would not be possible in, for example, rural areas or a country at large. There is a kind of public-making work that can disrupt established narratives and thereby make legible the local and the silenced even in visual orders that seek to cleanse urban space.[48]

Despite the increasing attempts to impose well-defined forms of life by means of surveillance technology, cities are still environments where a large number of disparate forces, cultures and social situations intersect with each other. As a result of the combination between different instances, the social space is still enriched with new shapes and realities. The dynamic

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[46] Richard Sennett, "The open city", *Urban Age* (November 2006). http://downloads.lsecities.net/0_downloads/Berlin_Richard_Sennett_2006-The_Open_City.pdf.
[47] See Saskia Sassen, "Does the City Have Speech?", *Public Culture* 25, no. 2 (2013): 209-221.
[48] Ibid., 214.

nature of cities makes them possible to thrive on the superabundance of possibilities and combinations, which instead is often lacking in rural areas. For this reason

> the city, and especially the street, is a space where the powerless can make history, in ways they cannot in rural areas. […] Becoming present, visible, to each other can alter the character of powerlessness.[49]

In short, thanks to the conformation of cities, the powerless can always make creative use of the social space that is mainly given shaped by the mighty; they have the opportunity to escape from the coercive power relations trying to harness their lives and even to subvert these dynamics. Moreover, since in a dynamic context such as the urban one any unusual act is easily visible by other citizens, it is easier for subversive activities to circulate among citizens. These ideas, which stress the role of creative subjects, the productive intersection of differences and the endless flow of meaningful practices involving people and space are encompassed in Sassen's notion of "cityness".[50] In order to provide a concrete example of cityness, the author portrays a particular situation occurring in mid-town Manhattan, where lots of immigrant vendors fill the streets with the aim of selling grilled meat. Here, the high-tech finance world inhabited by business men is not separated from the one just mentioned, as lots of professionals often take the opportunity to have a quick lunch in these places. In this scenario tourists, residents, immigrants gather together and share a common living situation; worlds that are normally supposed to be distant from each other intersect and give birth to unprecedented combinations. Still, it is important to point out that even if the multiplicity of interactions may lead to the creation of new forms of life, the situation as it is described can hardly be regarded as an example of emancipation; in fact, it is hard to believe that these interactions are not part of a well codified set of power relations.

Even when their lives are determined by powers, citizens interact with the urban space in innumerable ways. Conversely, the urban space does not remain inert; instead, the city "talks back".[51] That is to say, the practices of meaning that occur in the urban life are not solely performed by people. On the other hand, they are not driven by the simple conformation of the urban environment either. It is the combination of these two elements, that occur one in response to the other and nevertheless simultaneously, which gives birth to the practices of meaning. In other words, the interaction between citizens and their city constitutes what Sassen calls "the speech" of the city. The speech of the city is the ever-changing whole of practices, meanings, shared codes of

[49] Ibid., 213.
[50] See Saskia Sassen, "Cityness in the Urban Age", *Urban Age Bulletin* 2 (Autumn 2005): 1-3.
[51] See Saskia Sassen, "The Future of Smart Cities", Lift Conference (July 7, 2011), http://opentranscripts.org/transcript/future-of-smart-cities/.

conduct and even atmospheres that constitute the urban environment. Sassen herself declares to be

> interested in recovering the possibility that the interactive deployment of people, firms, infrastructures, buildings, projects, imaginaries, and more, over a confined terrain, produces something akin to speech: resistances, enhanced potentials, in short, that the city talks back.[52]

In Sassen's opinion, this interaction between people and the urban space they inhabit must remain dynamic and prolific, or the whole amount of social relations risks withering together with the urban landscape. The renewed opportunity to give birth to unprecedented encounters, combinations and interactions is crucial for the speech of the city to keep flowing. Without a steady process of hybridisation of truths and forms of life, the speech of the city, which is made of all the meaningful interactions between citizens and their living space, ceases to renew and thus to thrive. Now the meaning of "cityness", which earlier was referred to as a notion emphasising the creative role of resistant subjects and the productive intersection of differences, should be more clear. When we speak of cityness, we refer to the endless speech of the city, to the swarm of meanings created by citizens in a responsive urban environment. In sum, we refer to the capacity of the city to creatively reinterpret, reinvent itself in order to give birth to new practices and forms of life. The remainder of this paragraph will draw on Richard Sennett's work in order to show how the design of an "open city", similarly to Sassen's notion of cityness, can give rise to creative environments.

The principles that lie at the basis of the design of open cities are similar to those encompassed by the concept of cityness. The possibility to create interactions, the encounters between different forms of life and the creation of new meaningful practices represent the openness of the city envisioned by Sennett. In contrast, the closed city (which according to the author is gradually taking hold in our contemporary societies) is made of closed systems that are not susceptible of interacting with each other. Such settings, which are always built by means of cutting-edge technology, facilitate an efficient model of organisation and control. According to the conception of the open city,

> places should become both dense and diverse, either in the form of dense streets or packed squares; such physical conditions can prompt the unexpected encounter, the chance discovery, the innovation which is the genius loci of cities. Healthy, clean, and safe: you

[52] Sassen, "Does the City Have Speech?", 211.

> can experience these environmental virtues in a suburb, if you are rich enough, but only a certain kind of place, an open city, will stimulate you.[53]

In short, the principles of cityness can be embedded into the conformation of the city, whose physical characteristics may be suitable for promoting interactions or unexpected encounters. Sennet identifies the features of an open city in these three main aspects: the presence of ambiguous edges, the development of incomplete forms and the planning of unresolved narratives. All of these characteristics need to be incorporated into the design of an open city. First, with regards to the feature of ambiguous edges, Sennett starts by making a distinction between boundaries and borders: while the boundary marks the end of something, the border represents an edge through which distinct entities can interact with each other. In other words, while boundaries are insurmountable walls that are meant to exacerbate differences, borders are permeable membranes that encourage prolific exchanges of ideas and information. As an example of a border, Sennett mentions the shoreline that connects the land with the sea, whose unique hybrid conditions have the potential to give birth to new species. The same framework can be applied to the urban environment:

> These natural differences between boundary/wall and border/membrane clarify closed and open built form. The boundary/wall dominates the modern city. The urban habitat is cut up into segregated parts by streams of traffic, by functional isolation between zones for work, commerce, family, and the public realm. The most popular form of new residential development internationally, the gated community, takes to an extreme the idea of the boundary wall. The result is that exchange between different racial, ethnic, or class communities diminishes.[54]

Modern cities tend to avoid situations such as the one described above, where immigrant vendors, tourists and professionals were interacting together in Manhattan. A rigid separation of spaces facilitates the development of efficient, goal-oriented environments. However, this way of designing cities inevitably jeopardises the rise of possible interactions between different forms of life.

The second feature that open cities need to incorporate is the presence of incomplete forms. If the forms of the city are open and incomplete, if they can suggest a number of possible functions without constraining to a specific and predetermined behaviour, the subject becomes able to engage in creative interactions with the urban space. The flexibility of forms is crucial to

[53] Sennett, "The open city", 7.
[54] Ibid., 9.

maintain borders open for prolific exchanges, whereas their over-determination leads to their tightening and withering.

> If, like a Georgian row house, the form is simple -- in this case, basically a building in the form of a shoe-box -- then it can become flexible. But most modern buildings, especially tall ones, have complex infrastructures for lighting, heating plumbing, and electricity. It's hard to make this infrastructure adapt to new purposes; for instance, recent efforts to convert office towers on Wall Street into apartment buildings have proved costly and unsatisfying. Incomplete form challenges the design ideal of a physical object as fit for purpose. Instead, the challenge of incomplete form is how to use new technologies to make building both simpler and more flexible in operation. Once we break the strangle-hold of function on form, once buildings are less tightly fit-for-purpose, they can become living, evolving structures.[55]

The simpler the form of an artefact, the easier it is for people to use it in diverse ways. Conversely, the more complex the mechanisms underlying the functioning of a system, the more specific its functions and purposes will be. By consequence, any deviation from the prescribed use is likely to result in the failure of the system. Furthermore, if closed-ended systems encourage a well specific use, it also means that they can easily result in the production of prefabricated behaviours. Now, since smart technologies are becoming increasingly complex and closed-ended at the same time, the challenge is to open a space of creativity within them.

The third feature of open cities is the development of unresolved narratives. The idea is similar to the previous one, which is here translated into a less tangible level. Sennett's idea of narrative might be compared to the speech of the city mentioned by Sassen, as it refers to the development of the interactions between citizens and the urban space. Again, while a closed-ended narrative entails that every discursive practice is predicted and preset from the beginning, an unresolved narrative implies that the unfolding of living meanings is left open. The idea here is that the multitude of directions that a narrative can take, which cannot be envisioned in advance, represents as many possibilities for the creative subject, whose freedom might be valorised as a result.[56] In the next paragraph I will show that the features reported by Sassen and Sennet are

[55] Ibid., 11.

[56] Hence the idea of "the city without qualities", which represents the common thread of a collection of papers largely inspired by Robert Musil's work, entitled "The man without Qualities". The idea is that of a city without a dominant o predetermined narrative, whose infinite potential can unfold in a multitude of possibilities or "qualities". See Hannah Hopewell and Andrew Douglas, "Introduction: The city without qualities", *Interstices* 16, (2018); and "Interstices 16", Interstices. Journal of Architecture and Related Arts, accessed May 8, 2019, https://interstices.ac.nz/index.php/Interstices/issue/view/32.

potentially realisable by digital technology. However, even if they were fully deployed, they would not necessarily promote the development of resistance.

4. Creativity in the age of digital reproduction

As we have said, the introduction of smart technologies in modern cities risks creating closed-ended systems, whose shape and purposes are predetermined in advance. The fragmentation of individuals enabled by data analytics leads to the creation of the Deleuzian "dividuals", whose atomistic and shattered nature makes them easy to monitor and influence. Since the elementary nature of each behavioural fragment makes them easier to grasp and direct, a social environment shaped by means of Big Data is likely to pave the way for mechanisms of surveillance and control.

However, the opportunity to reverse the situation lies precisely in the process of fragmentation made possible by digital technologies. In other words, digital technologies may also become a means for escaping the closed narratives provided by surveillance mechanisms and therefore an opportunity to develop creativity. In order to prove this idea, I will start from Walter Benjamin's work called *The Work of Art in the Age of Mechanical Reproduction*. According to the author, in the first half of the last century, the new means of reproduction and communication allowed people to take hold of reality and release it from the burden of tradition. By means of cameras, whose peculiarity is that they can reproduce objects as they already are, reality became approachable as it had never been before. Once portions of reality could be extracted from the context and endlessly reproduced, things and situations started losing the aura that tradition had so far condensed in them. Like a surgeon, the cameraman could tear apart reality and recombine it at will:

> The painter maintains in his work a natural distance from reality, the cameraman penetrates deeply into its web. There is a tremendous difference between the pictures they obtain. That of the painter is a total one, that of the cameraman consists of multiple fragments which are assembled under a new law.[57]

Once the fragments are collected, they can be decontextualised and reconnected to other fragments in order to create unprecedented forms. It is important to notice that it is the fragmented nature of these pieces itself that makes them combinable and thus open to the creation of new meanings. Once reality is broken apart, it loses its entirety and returns to a state of incompleteness, which in turns opens up to new possibilities. In short, even though fragments are easy to collect and organise, they also have the potential to be endlessly rearranged so as to free people's creativity.

[57] Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction", in *Illuminations*, ed. Hannah Arendt (New York: Schocken Books, 1969), 14.

This is even more true for digital technologies, which allow for even greater possibilities of manipulation. Pixels' atomistic nature makes the power of reproduction and recombination potentially unlimited. One of the features of digital reproduction is

> the capacity of the user, or viewer, to manipulate the work of art and thus *control the context of viewing*. Software allows user to adjust the image seize and the resolution, to focus in on minute details, to extract portions of an image, to combine one image with another, and to surround the image with a new textual or visual context.[58]

Given their analytical power, the capacity of digital technologies to chop reality, reproduce and reconfigure it is even greater than that provided by the mechanical tools described by Benjamin. The same logic can be applied to the world of Big Data, ICT and IoT: instead of images and pixels alone, in this context a broader variety of digital information is available. In this case, we can imagine that the flow of data may be endlessly recombined in order to give rise to new knowledge, which in turns is meant to serve a number of different purposes.

> The categories that result from such meticulous disaggregation of reality are recaptured in software code and reassembled to wholes or unities […]. At this juncture, computation moves away from culturally and perceptually recognized units of the reality.[59]

In an analogous way, IoT devices might engage subjects in the creation of infinite scenarios of augmented reality and give birth to unprecedented interactions or practices. In sum, while the potential for creation and creativity is immense, the challenge remains its exploitation in smart cities. The aim is therefore to design a smart environment that opens up to different utilisations by citizens, an urban space filled with devices whose rationale is not established by their promoters once and for all. The same wish was expressed by Saskia Sassen in a conference on the topic of smart cities:

> Now, I am not at all against using all kinds of technologies. […] So, the image that I have again is this notion of urbanizing technology, open source urbanism, the city as hacker, and

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[58] Bertram C. Bruce, "The Work of Art in the Age of Digital Reproduction", *Journal of Adolescent & Adult Literacy* 44, no. 1 (2000): 68. To further deepen how the death of the aura has given rise to both opportunities for emancipation and mechanisms of subjugation, see Marcello Gurisatti, *Scacco alla realtà. Estetica e dialettica della derealizzazione mediatica (Reality in Check. Aesthetics and Dialectics of Mediatic Derealisation)* (Macerata: Quodlibet, 2012).

[59] Jannis Kallinikos, "On the Computational Rendition of Reality: Artefacts and Human Agency", *Organization* 16, no. 2 (2009): 190. While our main intention is to show how digital technologies may encourage the development of creative perspectives on reality, Douglass H. Thomson highlighted its emancipatory potential: "Now instead of cultic devotion to the singular text, we have multiple texts; now, instead of copy-texts, we have decentered texts; now, instead of the canonical text, residing unapproachably in its authority, we have versions of texts (nodes) that situate themselves in a myriad of relations to other texts, to the reading publics of their historical conditions, and to ours; now, instead of the completed text, we have the open-ended one, encouraging interaction as part of its own continuing structure (Douglass H. Thomson, "The Work of Art in the Age of Electronic (Re)Production", *Romanticism on the Net* 10, no. 1 (1998): 575).

> sort of the foundational core image for *any* interactive technology, incompleteness. Because the logic of the users does not 100% correspond with the logic of the engineer.[60]

As we have said, in order for smart urban technology to be used in a creative, unconventional way, it must be designed in such a way to be open, incomplete and interactive. If its purpose is not predetermined in advance, people have the opportunity to combine the available elements at will. This idea of "design for creativity" seems, at least on paper, realistic and concretely realisable. However, Sassen also seems to suggest that the unique interactions realised by citizens-hackers would emancipate them from the established power. However, is this idea of "openness by design" sufficient to give rise to authentic forms of resistance? Can the sole combinability and interactivity of elements stimulate the development of a conscious and critical attitude towards the constituted power? On the one hand, it is true that the opportunity to create new combinations and to experiment different realities may make the individual aware of the limits imposed by established power dynamics. Once people have been faced with new possibilities and have had the opportunity to broaden their horizons, they might develop the need to break free from the constrains of a reality they start perceiving as restrictive. In this case, they might become able to consciously reshape reality in order to give rise to creative acts of resistance. On the other hand, creativity may simply manifest itself in ludic acts performed by an unconscious subject, who simply enjoys themselves playing with the elements at their disposal. In short, the combinability and openness of artefacts do not necessarily lead to the development of a critical and free attitude. As we had anticipated at the beginning of the chapter, while authentic acts of resistance necessarily manifest themselves as creative recodifications of practices of life, creativity is not always followed by the emergence of resistance.

Ultimately, the design features described so far are meant to promote the development of creativity, but not necessarily to directly encourage resistance. Still, would it be desirable to engage in a project of "resistance by design"? Would it make sense to forcefully instil resistance in people's mind? I claim that if resistance were forcibly introduced in people's lives by means of artefacts properly designed, the nature of resistance itself would be irremediably corrupted. Indeed, resistance consists of a free and critical attitude that aims at questioning the way in which life is "designed". Therefore, if it came itself from an act of design, it would not consist of that free and critical attitude anymore. Rather, the subject would be steered by its unquestioned power. For these reasons, I will not attempt to use VSD to design resistant smart cities. Only the value of creativity (and privacy, as we are going to see), which is represented by the technical features mentioned

[60] Sassen, "The Future of Smart Cities".

above, will be embedded in the design of the smart bridge. In the next chapter I will present VSD and show its theoretical and methodological limits.

CHAPTER II

VALUE SENSITIVE DESIGN: POTENTIAL AND LIMITS

1. An overview on Values Sensitive Design

The idea of designing artefacts in such a way as to make them sensitive to a set of values lies on a well specific conception of technology. VSD proponents believe that technology is not value-neutral; on the contrary, it stems from specific moral and political choices, which in turn end up being reaffirmed once the artefact is built and spread over society.[61] In order to illustrate this idea, this compelling example is commonly provided by scholars: in the thirties the architect Robert Moses was asked to design the overpasses for the only highway connecting Long Island to New York. Interestingly, the bridges were designed very low, in such a way as to only allow cars to pass. Busses, which were the only means of transport accessible to racial minorities and the worse-off in general, were too high to fit under the overpasses. According to some, the bridges were intentionally designed with this purpose, while others just point out how the way in which they were conceived ended up leading to discriminatory situations.[62] In sum, we must acknowledge how technology, artefacts and even urban infrastructures incorporate the moral and political ideas that manage to prevail in society; as I have shown earlier in this chapter, power relations get embedded into the social urban environment.

Considering this, VSD was proposed as a method to design technology in such a way that ethical considerations could become integrated into artefacts. Specifically, this approach focuses on ethical values, which need to give shape to the design of an object and eventually emerge from its utilisation. VSD is "a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process",[63] where values are regarded as "what is important to people in their lives, with a focus on ethics and

[61] See Noëmi Manders-Huits, "What Values in Design? The Challenge of Incorporating Moral Values into Design", *Science and Engineering Ethics* 17, no. 2 (2010): 271-287.

[62] It is important to mention that the credibility of this story has repeatedly questioned by a number of scholars, according to whom the presence of several flaws in its historical reconstruction would make it nothing more than a legend. Nevertheless, its plausibility still makes this story an effective demonstration of how power relations are supposed to mould physical reality and social spaces. See for instance Bernward Joerges, "Do Politics Have Artefacts?", *Social Studies of Science* 29, no. 3 (1999): 411-431.

[63] Friedman, Kahn and Borning., "Value Sensitive Design", 70.

morality".[64] If we imagine to apply VSD to the case of the overpasses described above so as to avoid those discriminatory situations, values such as equality, justice or freedom from bias could have been embedded into their shape.

VSD originally arose from the human-computer interaction studies conducted during the nineties; for this reason, so far it has mainly been applied to projects involving ICT. As the design of this kind of technology usually focuses on principles such as usability, efficiency, affordability and reliability, scholars felt the need to start considering ethical values that were not merely concerned with the idea of functionality. For example, VSD was used to incorporate the values of privacy, autonomy and trust into the design of web pages, with regard to a management of cookies based on informed consent.[65] Even if VSD has already been proposed for the construction of IoT device, smart infrastructures or whole smart cities, it has not probably been applied to any of these technologies yet. However, the flexible nature of this method makes it applicable to the most disparate fields, from the design of robots to that of institutions.[66] My intention is to use of VSD in order to design a smart infrastructure (specifically, a smart bridge) in order to avoid the threat of surveillance and control depicted in the introduction. As we have seen, the design of artefacts is never independent from power relations; for this reason, I do not claim that this specific implementation of VSD would be free from power dynamics. Neither do I aspire to design smart cities in such a way as to make citizens develop deliberate acts of resistance against these powers, as I stated at the end of the previous chapter. Rather, the aim here is to design a smart infrastructure capable of promoting the values of privacy and creativity, in order for citizens to be protected against the "nudging" smart city and to allow them creatively reshaping it by means of smart technologies. While the implementation of privacy is quite a traditional praxis for the VSD scholars and practitioners dealing with ICT, the incorporation of an atypical value such as creativity has so far been rather infrequent.[67] Before applying VSD to the smart bridge, we will have an overview on its methodology and identify the issues that are likely to emerge.

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[64] Batya Friedman, David G. Hendry and Alan Borning, "A Survey of Value Sensitive Design Methods", *Human-Computer Interaction* 11, no. 2 (2017): 68.

[65] Friedman, Kahn and Borning., "Value Sensitive Design", 69-101.

[66] As stated by their creators, "Value Sensitive Design enlarges the arena in which values arise to include not only the workplace […], but also education, the home, commerce, online communities, and public life" (Friedman, Kahn and Borning., "Value Sensitive Design", 85).

[67] For instance, creativity was one of the values taken into account in the design of plasma displays that were meant to be introduced in offices in order to provide real-time images from the outside. The project aimed at realising artificial windows capable of increasing employees' well-being, health and creativity. However, as we will see, the notion of creativity considered in that occasion was substantially different from the one we have dealt with so far. To gain an overview on the project, see Friedman, Kahn and Borning., "Value Sensitive Design", 69-101.

2. VSD methodology

VSD methodology is composed of three integrated parts: conceptual investigations, empirical investigations and technical investigations.[68] It is important to point out how these three steps should not be regarded as sharply distinct; on the contrary, they are often supposed to inform each other, overlap and sometimes occur in different orders.

Conceptual investigations mainly consist of two activities: identifying the stakeholders affected by the technology in question and identifying relevant values. Concerning the first, the designer needs to make a distinction between direct and indirect stakeholders. The former are those who will directly make use of the technology under study, the latter are the people that are not meant to actively deal with the artefact, but whose lives will nonetheless be affected by direct stakeholders' use of the system. For instance, if we wanted to design a self-driving car, direct stakeholders would be represented by drivers and passengers, indirect stakeholders would be all the passer-by needing for protection. With regard to the second activity, relevant values need to be identified and subsequently provided with a definition; in this way, they can eventually be incorporated into the technology under study. For instance, autonomy, safety, efficiency, affordability and sustainability might be plausible values in the design of a self-driving car.

Empirical investigations concern all those activities meant to involve stakeholders, who may be needed to find out relevant values, identify benefits and harms, help balance potential value conflicts or assess the effectiveness of the value incorporation into the technology in question. A variety of methods, such as interviews, questionnaires, surveys or practical experiments can be employed to collect information about stakeholders' opinions and experiences. In the example of the self-driving car, stakeholders' contribution may be required in order to identify significant values or to subsequently verify whether they manifest during use.

Technical investigations focus on the specific features of a technology. In this phase, the designer needs to conceive the specifics of the artefact in such a way that it can effectively express the values found in the conceptual and empirical investigations. This particular phase of VSD can also be applied in reverse: starting from an existing technology, its features can be analysed in order to find out whether they support or hinder specific values in a given context of use. When it comes to assessing how a particular physical feature deals with some prescribed values, it is important not to make confusion between empirical and technical investigation: while the former is meant to

[68] For the presentation of the three investigations, I will mainly refer to Janet Davis and Lisa P. Nathan, "Value Sensitive Design: Applications, Adaptations, and Critiques", in *Handbook of Ethics, Values, and Technological Design*, ed. J. van den Hoven et al. (Dordrecht: Springer, 2015), 11-40.

evaluate how the user interact with the artefact in relation to the prescribed values, the latter only focuses on its technical specifics.

In conclusion, it is important to recall that these three development phases, depending on the project in question, are supposed to overlap and intertwine with each other. As reported by Davis and Nathan, even researchers and designers in this field do not always clarify how the three investigations alternate within a project. Still, in the following paragraph I will try to show how they may emerge along the course of a typical VSD implementation.

3. VSD implementation procedure

In this paragraph I will briefly conjugate the three investigations presented above in a typical implementation procedure. Similarly to what happens with the investigations, the steps I am going to illustrate may also vary according to the project in question. Some of them may overlap, occur in different orders or even be left out in particular cases.[69] As we are going to see, even if the three investigations are spread all over the process, the first phases tend to be mostly conceptual, where the last ones move towards technical properties.

3.1 The meaning of the project

The first two steps are purely conceptual. In order to properly lay the foundations for the project, the designer needs to clarify their intentions: what is at stake? Why VSD is needed in this case? The designer can start either from a bunch of values, maybe coupled with a specific situation, or from a particular technology. For instance, we may want the everyday life of some vulnerable social groups to embed the values of equality, well-being and freedom; alternatively, we may need to start from a specific technological device in order to make it sensitive to a bunch of values that are going to be discovered afterwards. As imaginable, this first choice will influence the course of the whole process.

3.2 The clarification of the designer stance

In order for the project to be carried out in a rigorous, impartial way, it is important to make explicit any possible biases embedded in the designer's mind. If their personal preferences, beliefs and tastes become visible, the operations prescribed by ethical theories or stakeholders' needs will be better conducted. The designer needs to engage in these reflections on reflexivity and transparency because even though in this context "technology is considered value-laden, the neutrality of those

[69] For the presentation of the implementation procedure, I will mainly refer to Friedman, Hendry and Borning, "Value Sensitive Design Methods", 63-125.

involved in carrying out VSD seems to be taken for granted in the methodology".[70] As the designer is supposed to lead the project and to significantly influence its development, it is important to verify on which assumptions their powerful position lies.

3.3 The identification of stakeholders

This phase should first be conducted on a conceptual level, as the designer needs to envision who is going to be affected by the technology under study; second, an empirical investigation is needed to confirm or revise the initial results. As pointed out by Davis and Nathan, when we think of potential stakeholders, we have to refer to roles and not to specific individuals: indeed, depending on the situation, the same individual may both assume the role of direct and indirect stakeholder.[71] For instance, at different moments the same person may either drive a self-driving car or be affected by its presence on the road. In order not to leave anyone out, it is important to create as many groups of stakeholders as possible and then prioritise those which are more affected. As pointed out by Manders-Huits, even if this part of the methodology may seem quite unproblematic, when it comes to evaluating complex technologies this task risks becoming tricky. For example, we will see how in the design of a smart cities can potentially affect the whole population. The issue is further complicated by the fact that stakeholders are called to participate in the design process, as they are the target of empirical investigations. If the stakeholders' groups are too many or too large, it becomes hard to obtain a substantial contribution from them.[72]

3.4 The identification of benefits and harms for stakeholders

This phase should also be conducted both on a conceptual and empirical level. First, the designer needs to make assumptions as to how each stakeholder group is likely to be affected by the technology or the situation under study; subsequently, the results must be confirmed or revised by means of empirical studies. For instance, stakeholders can be interviewed in order to find out whether they feel threatened by something that could not be envisioned during the conceptual investigation. A common problem with the empirical investigation to be carried out in this phase is that people are not always fully informed about the potential benefits and harms that may occur in a given situation; and even when they are, they might not have the competencies required to provide a significant judgement.[73]

3.5 The identification of potential values

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[70] Job Timmermans and Brent Mittelstadt, "Reflexivity and Value-Sensitive Design" Conference Paper (January 2014), 4, https://www.researchgate.net/publication/275891887_Reflexivity_and_Value-Sensitive_Design.
[71] Davis and Nathan, "Value Sensitive Design", 11-40.
[72] Manders-Huits, "What Values in Design?", 271-287.
[73] Ibid.

There are multiple ways to identify relevant values in a given context: conceptual investigations, empirical investigation or a combination of both. In some cases, you may need to start from a well-defined ethical theory and subsequently implement the values discovered; in other cases, the situation may require a bottom-up inquiry on the values that people deem important. Empirical investigations may also be useful to adjust the set of values provided by ethical theory. Oftentimes, values are directly drawn by the analysis of benefits and harms conducted before; for instance, if a harm that is characterised as invasion of privacy translates into the value of privacy. This phase is probably one of the most controversial also from a metaethical point of view, from which any methodological consideration should probably follow. For instance, what do we know about values? Are they relative or absolute? Do they merely consist of with what people deem important, or do they need to be drawn from some strong ethical principles? In order to answer these questions, appealing to the specific situation or to the choices of the designer is presumably not sufficient.[74] Furthermore and on an empirical level, values are sometimes hard to identify as stakeholders do not always mean the same thing when they deal with abstract ideas. For this reason, creating a coherent set of values on the basis of stakeholders' statements might be challenging.[75]

3.6 The working definition of the key values

The focus of this step is not the detection of a mere theoretical formulation of a value, but of its working definition. In order for values to be effectively embedded into technology, they need to be defined in such a way to be identifiable for some specific characteristics that can eventually be translated into technical features. As we see, we are gradually moving towards the most technical phases of VSD. Also in this case, the specifics of values can either be drawn from ethical theories, or from empirical investigations involving stakeholders.

3.7 The identification of potential value tensions

Once values are chosen and defined, they need to be balanced against each other, both on a conceptual and technical level. Similarly to the social space, values are interconnected with each other; if one is somewhat affected, the whole equilibrium is likely to change. Indeed, they may also come into conflict: if we turn to the example of the self-driving car, whenever the driver wanted to take over and exceed the speed limit, we can see that the value of autonomy comes into conflict with that of security. Just as for the identification of potential values, the detection and the solution of value conflicts can be either conducted through conceptual or empirical investigations: while in some cases an ethical theory may prescribe a well-defined priority in balancing values, in other

[74] Ibid.
[75] Ibid.

situations stakeholders might be given the final say. Again, metaethical considerations as to how these decisions should be taken are likely to arise from this phase.

3.8 The realisation of the technology

At this point, the technological device can be realised. The designer needs to conceive the technical specifics in such a way that they express the prescribed values when the technology is used by stakeholders. Technical investigations here need to be conducted together with empirical investigations: experiments or interviews should be carried out in order to verify whether the use of the technology effectively express the values in question. If that is not the case, the designer can modify the specifics of the artefact. Technical and empirical investigations are supposed to be intertwined also for technically finding a balance in possible value conflicts. The designer needs to find practical solutions in order for these balances to become "physical" part of the device, while data from stakeholders are useful to show whether this equilibrium is effectively realised.

4. The limits of VSD arising from the smart bridge project

In the next chapter I will follow the implementation procedure described above in order to design a smart bridge. Even if the theoretical analysis conducted so far has focused on the issues and opportunities arising from whole smart cities, as we are going to see the application of VSD to such a complex system would be a challenge too great for this thesis. However, the infrastructure under study will be considered as part of a hypothetical entire smart city. In this way, all the ethical concerns and occasions previously depicted will be able to effectively arise in the simulated smart environment. As I have already stated, two crucial motivations will direct the design of the smart bridge: the need to defend citizens against the threat of surveillance and control and the promotion of users' creativity. By consequence, VSD will be implemented with the aim of realising these two purposes. In this paragraph, I will show how the implementation of VSD is going to present some limits specifically related to each of these purposes.

First of all, VSD will prove to be limited with regard to the defence against surveillance and control. Even if the technological artefact that we are going to deal with is not substantially different from other ICT treated with VSD, the complex of interconnected devices, urban structures and social institutions that surround the infrastructure under analysis is huge and intricate. Indeed,

> the network of connected intelligent, adaptive, and self-learning devices and services in a smart city can be considered as a complex system […]. This implies that due to the interactions of the individual parts new phenomena emerge, which may hinder human

> values. […] To avoid such undesired effects, the interaction between different parts of the system needs to be coordinated, for instance, by designing communication protocols, standards, rules and policies.[76]

As the behaviour of every single smart device is largely influenced by the presence of other elements of various nature, every single element is considered to be part of a complex system. Therefore, in order for each part to effectively implement the values prescribed by VSD, it necessarily needs to be considered together with the others. In our case, in order to have citizens' privacy effectively safeguarded, VSD should be applied to the whole smart city and not only to a single infrastructure. Not only are privacy issues likely to differ in relation to each smart device, but they also change depending on the institutions involved and the existing legislation. Whereas this task is beyond the aims and the possibilities of this thesis, a real project would have to deal with the whole complex of interconnections. In our case, the implementation of VSD does not aim to deal with privacy issues in a fully-fledged smart city, but to demonstrate that any smart infrastructure can be designed in such a way to safeguard individual privacy.

The second limit of VSD mainly concerns its implementation with regard to the promotion of creativity. The issue here arises from the distinction between design and use: even if an artefact can be designed in such a way to promote a certain utilisation, people can always use it differently.[77] This implies that even if a device is meant to convey certain values, whenever people use it for different purposes than those envisioned by the designer, the promotion of these values risks being undermined. For instance,

> a screwdriver is not only for tightening screws; when camping a screwdriver can be used as a peg for the tent and even to hammer down other pegs (or screwdrivers!); when at great risk a screwdriver can serve as a potentially dangerous weapon; modernist artists have used screwdrivers to scratch their paintings thus creating a particular surface. The purpose of these examples is to emphasize that technological artifacts can enter into many very different human–technology relations and that a technology is defined by its particular relational context.[78]

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[76] Maaike Harbers, Peter van Waart and Eva Visser, "Value Sensitive Design of Smart Cities", Conference Paper (August 2015), 1, https://pdfs.semanticscholar.org/fbea/23ba91734be1fcc4719e8b71469aebc6eee0.pdf.

[77] Of course, this issue concerns all the design features that are supposed to inform an object; here I direct the attention to creativity because this value is meant to be proactively supported by design, while privacy is only "negatively" safeguarded. It is therefore interesting to notice that even though a specific use is overtly encouraged, different interactions may occur. On the other hand, the simple prevention of a particular use can only be circumvented by directly hacking the design of the object.

[78] Anders Albrechtslund, "Ethics and technology design", *Ethics and Information Technology* 9, no. 1 (2007): 68.

The artefact should never be considered as an isolated object equipped with a set of fixed properties; on the contrary, objects are meant to change depending on the particular relationship occurring each time. Designers can intervene on the design of an artefact but not on its relationship with the user; in other words, while the shape of an object can be designed, the relationship between design and use cannot in turn be designed. In our case, even if the bridge is designed in such a way to convey the value of creativity, that does not mean that this value will be expressed every time someone makes use of it. For instance, even though the set of available options is meant to be easily combinable by a curious subject or to valorise proactive interactions, some users might use the system in quite a monotonous or conventional way. Alternatively, people might hack the whole system and use it in unpredictable manners and for a variety of different purposes.

The third and final issue arises from the context of power relations that are supposed to surround the smart bridge. This limit of VSD is likely to affect both the design for privacy protection and that for creativity. With regards to the first, the problem is how such an unconventional system can be introduced in a context dominated by well-defined power relations. This is not only a practical issue (who is going to concretely develop the system, for whose interests the infrastructure will be deployed), but also a matter of compatibility with other similar devices. We have repeatedly illustrated how power relations act like streams that endlessly give shape to society. Now, if all the infrastructures were built with the aim of surveilling and controlling people, would a single bridge be able to serve different purposes (while still being part of a giant interconnection of devices and while contributing to its data flow)? Would it be able to protect individual privacy, whereas all the other smart technologies were deployed with the aim to violate it? Instead of promoting an alternative vision of smart city, the development of this infrastructure might end up being absorbed by the constituted power and reinforcing the existing power relations.

There is a second concern involving privacy and power relations. Even if privacy can reasonably be regarded as an effective defence instrument against the power of surveillance and control, this does not mean that privacy is not affected itself by power relations: as we have said, power is everywhere. Indeed, the logics that underlie the discourse on privacy are to some extent similar to those underlying the collection of data. We have seen that data are mined by corporations to make a profit from people's personal information; in this regard, we have said that the existence of Big Data analytics and smart cities can be justified on the basis of economic reasons. Now, if personal data are worth a certain amount of money, not only their sale but also their protection will inevitably have a price. Whereas privacy used to be an individual right aiming at safeguarding our freedom, now it has become a commodity that we are often willing to exchange for other goods or

services.[79] But if we are willing to give away our privacy together with our personal data, this means that the idea of privacy has been shaped by the same economic discourse that affects dataveillance. By consequence, even if a smart city based on respect for privacy will protect people against surveillance and control, it will not emancipate people from power relations. On the contrary, the capitalist power of commodification that already underlies the practice of dataveillance might emerge strengthened. In addition, even if privacy protections are supposed to safeguard the possibility for people to exercise their freedom without being nudged, subjects might paradoxically have their critical attitude weakened: indeed, they might think that once their privacy has been reinforced, they will have nothing to fear from the dynamics of power that shape society. But as we have seen, power is meant to affect any design practice, whether it involves technologies, institutions or even people's behaviour. In order to be able to question the power relations that shape our (smart) cities, whether they are built to support privacy or surveillance practices, people need to actively develop a critical attitude towards the whole of practices that are "designing" their lives. As any form of design is inevitably shaped by power relation, the only authentic possibility of emancipation for a free subject relies on their philosophical, resistant ability to question any given discourse of power.

With regard to the relationship between power and creativity, the problem is that the latter can only be developed from some given design elements. Now, as these elements are supposed to lay the foundations for creative interactions, they cannot also be part of the creative process itself. In other words, people cannot recombine them in order to *create* new realities, as they are precisely what *allows for* creativity in the first place. These given features, which are inevitably determined by power relations, are in principle inaccessible; the interests and purposes that determined their existence are not negotiable by creative subjects. These unquestionable elements look like the insurmountable borders surrounding a sand box, in which children are left to play with a bunch of toys. The children can use the toys as they please, they are even encouraged to use their imagination in order to create all the possible worlds they can envision. However, they are allowed to develop their creativity as long as they do not exceed the boundaries of the sand box. The world outside the sand box is inaccessible, all they can manipulate, combine and interact with is determined by someone else. In this way, their creativity is inexorably limited.

[79] In the space of a single generation, "privacy has been effectively reconceptualized in the popular imagination as a commodity of ever declining value, which serves the interests of the capitalist enterprise" (John Edward Campbell and Matt Carlson, "Panopticon.com: Online Surveillance and the Commodification of Privacy", *Journal of Broadcasting & Electronic Media* 46, no. 4 (2002): 592. In the narration of a dystopian but plausible future scenario, Linnet Taylor et al. imagine that the data market will be followed by the rise of a fully-fledged market for privacy, where the possibility to make personal data anonymous is sold at a high price. See Linnet Taylor et al., "Customers, users or citizens? Inclusion, spatial data and governance in the smart city", Maps4Society Final Project Report (2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2792565.

In sum, power relations represent the final frontier for design and creativity. For this reason, now the concept of resistance turns out to be helpful again. As we have seen, resistance consists of a critical attitude that allows the subject to *insist* on the limits established by power. The resistant subject is aware of the horizons of meaning within which their everyday practices take place; thanks to their questioning attitude, this subject is motivated to look beyond these limits in order to reshape their life in a more personal and authentic way. This is what the "aesthetics of existence" conceived by Foucault consists of: by reinterpreting and recombining the truths established by power, the resistant subject becomes able of self-governance. This immanent and creative form of freedom also represents the most authentic form of self-care.

As we have said, designing for resistance would be a contradiction. Since every work of design, even the most open ones, inevitably needs to start from some substantial shapes or ideas, it cannot but lay some unquestioned foundations. In other words, as design aims at realising some forms and goals, it cannot at the same time design for their questioning. In fact, this critical act is up to resistant individuals: thanks to their living subjectivity, they can question the meaning of given, *objective*, design elements. While the borders of the sand box depicted before constitute an insurmountable limit for the playful but unaware subject, they precisely represent the target of the resistant subject, whose aim is to keep insisting on their meaning and occurrence. Because of their need for freedom, critical individuals will always try to live beyond the horizons determined by the contingent sand boxes built by power, even in the event that they were shaped to encourage creativity or privacy. The resistant subject will constantly need to question the way in which and the reasons why reality is every time designed. For instance, if we were not aware of the power relations underlying the smart cities currently under development, we would not feel the need to give rise to a different kind of smart city based on privacy and creativity. In order to creatively envision scenarios that are radically alternative to the existing ones, the foundations on which the latter are based need to be revealed and challenged. In this sense, the work represented by this thesis itself could be regarded as an act of resistance.

In conclusion, if we use VSD to develop creativity, the power relations that determine the presence and the features of the smart infrastructure might remain unquestioned. Power can provide people with a playful environment and in the meantime keep affirming its interests. Because as already mentioned, even if the development of creativity may result in an expansion of the subject's horizons, there is no guarantee that individuals will mature an authentic need for freedom. Anyway, even if we have seen that VSD is not infallible and presents some constitutive limitations, it still gives us the opportunity to incorporate two crucial values such as privacy and creativity into the design of a technology. The reasons why privacy protections may be desirable in

smart cities were illustrated in the introduction, while the idea of creativity was presented and separated by that of resistance in the first chapter. With this in mind, we can now turn to its concrete application to the smart bridge.

CHAPTER III

THE IMPLEMENTATION OF VALUE SENSITIVE DESIGN

1. The MX3D bridge

The MX3D bridge is a 12 meters long pedestrian bridge that will be placed on one of the most famous canals in the red-light district of Amsterdam.[80] This bridge is the first one to be entirely printed in 3D by welding robots, which also made possible the realisation of its unusual shape. Since that this construction technique is still in its experimental phase, the bridge is filled with sensors in order to make sure that the whole structure does not collapse. The presence of these sensors makes this bridge an IoT-enabled infrastructure and a potential element of a smart city. The data collected by these sensors will feed a real-time software-based replica of the bridge, which is meant to digitally simulate the physical environment. The bridge is filled with more than sixty sensors, which are placed all over the structure and designed to allow different measurements: there are load, strain, inclination, acceleration and temperature sensors. At present (May 2019), the sensors are being placed on the bridge and trained to recognise and interpret a large variety of possible inputs by means of machine learning techniques. Eventually, they will be able to recognise a variety of activities occurring on the top, such as people walking, running, jumping or simply standing on the bridge surface.[81] However, the quality of the information provided by this network of sensors may pave the way for further, different uses. For instance, the real-time data concerning the flow of people that are crossing the bridge could be integrated in a larger system and be used to gather information about Amsterdam's traffic situation. Possible traffic jams could in this way be better managed, maybe by creating new infrastructures or by pushing people to take different routes.

Alternative ways to exploit this smart infrastructure and its sensors are also under way. For instance, the BRIDE (BRIdging Data in the built Environment) project gets inspiration from Sassen's notion of cityness in order to find original ways of involving citizens in the utilization of the smart bridge. Specifically, by

[80] For general information about the project, see the official site of the MX3D bridge, available at: https://mx3d.com/.
[81] The functioning of this smart technology was presented in a workshop organised last year. See Anita Star, "MX3D Bridge Update October", published on October 19, 2018, video, 1:00, https://www.youtube.com/watch?v=1r_Azsa4nqU.

> building on the concept of cityness, the BRIDE project will provide insight in how designers, technologists, and citizens can utilize rapid urban manufacturing and IoT technologies for designing urban space that expresses its intelligence from the intersection of people, places, activities, and technology, not merely from the presence of cutting-edge technology.[82]

By investigating Sassen's notion of cityness in the context of smart cities, the BRIDE project's proponents aim to move beyond the technocratic discourse on smartness and allow citizens to reappropriate the urban space. In their vision, citizen participation is a crucial element for realising Sassen's ideas of incompleteness, complexity and the possibility of making.[83] At present, the BRIDE project is collecting ideas on how to let citizens use the bridge's sensors (or even other possible IoT devices installed afterwards) for purposes that differ from those of the original MX3D project. Now, even if this thesis is largely inspired by the BRIDE project (to which I have collaborated myself), it differs for two fundamental reasons: the fact that power relations have been taken into account (which in turn, as we have seen, end up mitigating the expectation with regard to citizen participation), and the implementation of VSD. Thus, on the basis of the argumentations advanced so far, instead of designing for cityness we will use VSD to design for the values of privacy and creativity.

In the following paragraph I will start applying VSD to the MX3D bridge. In order to make this project fit in the theoretical framework presented in the previous chapters, I will imagine the MX3D bridge as part of a fully-fledged smart city, where all infrastructures are connected to each other and to a common shared dataset. In this way, we will have the possibility to deal both with real threats to privacy and tangible opportunities to develop creativity. Therefore, VSD will not be applied to the smart bridge as it stands today. For instance, we can imagine that the idea of using its sensors to collect data about traffic is actually carried out. In this way, the smart bridge would track people's movements, presumably in collaboration with other smart infrastructures. Now, can we prevent this system from monitoring people's movements? How can we protect their privacy? Besides defending individual privacy, VSD is also needed to promote creativity. While the BRIDE project eventually aims at installing IoT devices in order to let citizens interact with each other, here we can imagine that people could have access to the dataset comprising all the information collected by the smart network. By means of a screen mounted on the bridge, they could have the opportunity to creatively use data for developing alternative knowledges or even unconventional

[82] "BRIdging Data in the built Environment (BRIDE)", NOW, accessed May 31, 2019, https://www.nwo.nl/en/research-and-results/research-projects/i/68/30568.html.
[83] To further deepen the relationship between the BRIDE project and the concept of cityness, see Alfrink and Kortuem, "Seeing Like a Bridge".

practices. For example, if the screen were able to show the position of anonymous groups of people in the city, users could combine this information with other available options (such as entertainment, green areas or illumination) and decide what to do. In the course of the implementation of VSD, we will concrete find out how privacy and creativity could be promoted.

In order to properly apply VSD to the smart bridge, I am going to follow the methodological procedure indicated in the previous chapter. As we will see, this particular project requires a consistent conceptual investigation and lighter empirical and technical investigations. For this reason, I will mainly consider all the seven steps previously indicated from a conceptual viewpoint, while the empirical and technical parts will be discussed separately.

2. Conceptual investigation

The context in which VSD is developed cannot but have an impact on the specific way in which the process is carried out. In this case, all the argumentations advanced before provide a theoretical framework that needs to be taken into account. For this reason, it can be said that many parts of the following conceptual investigation directly take root root in the previous chapters.

2.1 The meaning of the project

In this initial phase, we need to make it clear why VSD is needed and what we want to achieve with it. In doing so, we will be able to pick a technology or a few values as a starting point. In order to clarify that, a brief summary is here required. Our initial investigations have revealed that the way in which smart cities are currently being developed makes them powerful devices of surveillance and control. However, starting from Sassen and Sennet's works, we have conceived a different kind of smart city, based on the values of privacy and creativity. Hence, for practical reasons we choose a particular technology – the MX3D smart bridge – as a starting point. In short, we first started from a particular technology (the smart city) in order to show what possible harms were likely to emerge; but we actually started from a specific value (creativity) when it came to envisioning the possible benefits deriving from an alternative vision of smart city. In sum, we adopted a mixed approach, focused first on a given technology and then on a specific value.

2.2 The clarification of the designer stance

Since the indications as to how the smart infrastructure needs to be designed come from the theoretical background, the designer's (or the researcher's, in this case) stance is in line with it. This does not mean that the stance in question is impartial: as we have seen with Foucault, every opinion, motivation or practice is inevitably determined by power relations. For this reason, we must be

aware that even the intention of designing alternative smart cities takes root in questionable power dynamics.

2.3 The identification of stakeholders

As we are assuming that the bridge is part of a whole smart city, the list of stakeholders inevitably becomes quite large. With respect to direct stakeholders, here we can envision two possible roles: the passer-by who cross the bridge and whose movements are tracked by sensors and those who actively make use of the system conceived to promote creativity. With regard to indirect stakeholders, the situation is more complicated: first, as the screen is meant to show information about all the citizens tracked by the smart city, these people should be regarded as indirect stakeholders. However, this is not enough: as shown by many authors, privacy issues do not only concern the people who are directly surveilled, but also those who are not monitored but nonetheless share some characteristics with them.[84] For instance, if the data collected from some individuals are used to draw information on the neighbourhood in which they live, the impact that future decisions will have on that neighbourhood will also affect the people who had not been tracked in the first place. Potentially, the second group of indirect stakeholders can be therefore identified with the overall smart city, if not even with society as a whole. In addition, it is worth recalling that the same individual can be part of different groups. Empirical investigations may be helpful in order to better diversify each group of stakeholders, especially the indirect ones.

3.4 The identification of benefits and harms for stakeholders

Since the purposes of this project are limited to the realisation of the values of privacy and creativity, we do not aim at finding all the benefits and harms arising from a smart infrastructure. Such a project would be way too broad, as it would entail taking into account the whole smart city complex and the Big Data world.[85] If we considered all the possible benefits and harms, we would also need to translate them into a corresponding number of values to be embedded into the bridge. In this way, the whole theoretical framework developed above would lose part of its meaning. With regard to the possible benefits, we can thus refer to the conception of smart city presented above and affirm that people could enjoy the opportunity to develop their creativity. In particular, this benefit concerns only the individuals who make active use of the screen installed on the bridge, that is the first group of direct stakeholders. The possible harms can be drawn from the introductory

[84] See for instance Carter Jernigan and Behram F.T. Mistree, "Gaydar: Facebook friendships expose sexual orientation", *First Monday* 14, no. 10 (2009); or Nadezhda Purtova, "Do Property Rights in Personal Data Make Sense after the Big Data Turn? Individual Control and Transparency", *Journal of Law and Economic Regulation* 10, no. 2 (2017): 64-78.

[85] To gain an insight on the possible harms and benefits arising from smart cities, see for instance Kitchin, "The ethics of smart cities", 1-15; to get an idea of the benefits and harms coming from Big Data analytics, see for example Someh et al., "Ethical Implications of Big Data Analytics", 1-10.

description of the smart cities currently under development. They consist in the threat of surveillance and control that affects their inhabitants. When we consider the sole smart infrastructure, this harm concerns the people crossing the bridge, whose movements are tracked by its sensors, and both groups of indirect stakeholders. As already mentioned, privacy issues arise not only for the people who are directly monitored, but also for the overall population. Since in this case the classification of benefits and harms is given by the theoretical framework, empirical investigations are not needed here.

3.5 The identification of potential values

This step is quite straightforward, as relevant values are not to be derived from empirical investigations; indeed, they have already been mentioned multiple times. The first value can be drawn from the harms of surveillance and control mentioned above: as these threats arise from a lack of privacy (see the introduction), privacy is the value that needs to be implemented. The second one comes from the main characteristic of the alternative kind of smart city described in the first chapter. The second value is thus creativity.

3.6 The working definition of the key values

At this stage, the values mentioned above need to be given a working definition. Namely, we need to reduce them to a few specific features that can become part of the design of the bridge. These characteristics will be eventually translated into technical specifics during technical investigations. In this case, the working definitions of privacy and creativity will be provided by means of conceptual investigations. No empirical investigations are needed here.

With regard to privacy, lots of definitions have been given. For instance, privacy has been defined as "the claim of individuals, groups, or institutions to determine for themselves when, how, and to what extent information about them is communicated to others".[86] In short, privacy can be regarded as the possibility for people to have control over their personal information, where personal data "means any information relating to an identified or identifiable natural person ('data subject')".[87] However, this definition is still too broad for being translated into technical specifics; in fact, we need it to embody some specific features. For this reason, we will split the idea of "control over personal information" into four fundamental parameters, which are meant to provide the building blocks for our working definition of privacy. In this sense, privacy can be regarded as "the manner and extent to which persons can control how information about them is: (1) collected;

[86] Alan. F. Westin, in *Privacy and Freedom*, ed. Daniel J. Solove (New York: Athenaeum, 1967), 7.
[87] *GDPR* (2018), art. 4, https://gdpr-info.eu/art-4-gdpr/.

(2) retained and/or maintained; (3) used; and (4) communicated, disclosed or shared".[88] During technical investigations we will therefore find practical ways to allow people managing their privacy in relation to these four parameters.

With regard to creativity, we need to start from Sassen and Sennet's works and identify some key features that can be developed by design. To sum up, we could condense Sassen's ideas into the notions of interaction and incompleteness; while Sennet's three points consisted of: open borders, incomplete forms and open narratives. However, these features were only generically described as part of a creative city, whereas we need some specific, working characteristics that can be appealed by the designer. In order to find them, we will explore how the concept of creativity has previously been framed by designers.

The current type of smart city tends to develop closed-ended forms in order to serve predetermined interests. For this reason, they need to straightforwardly convey the amount of data collected towards specific directions or purposes. In order to develop creativity, we first need to let the data flow break its levees; we have to prevent it from supporting some interests established once and for all. According to Gordon and Walter, games have the power of violating the strict constraints imposed by efficiency:

> Games are built to be inefficient as the player seeks to overcome unnecessary obstacles to reach the goal and to engage in the process of play for itself […]. Civic tech, on the other hand, is steeped in the discourse of efficiency, with a laser focus on the instrumentality of activity.[89]

As playful activities are not meant to efficiently serve a purpose outside to the activity itself, they can be regarded as an end in itself. In other words, the meaning of the game precisely consists in all the inefficient goals and rules on which the game builds itself. The repetitive but open nature of games makes them endlessly reinterpretable: even if players are playing the same game, they can make use of their imagination to give birth to different meanings. In order to understand how to design these "meaningful inefficiencies", we will explore the world of game and toy design.

The matter as to how designers can design open-ended games has been the focus of some academic studies. The challenge is to design shapes and rules that are solid enough to provide a basis for playing and at the same time not strict enough to restrain players' imagination. If they

[88] Robert P. Minch, "Privacy Issues in Location-Aware Mobile Devices", *Proceedings of the 37th Hawaii International Conference on System Sciences* (2004): 2, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.441.9513&rep=rep1&type=pdf.
[89] Gordon and Stephen Walter, "Meaningful inefficiencies", 327.

allow people to create their own goals and meanings during the game, they can be regarded as open-ended.

> The challenge for open-ended play is to develop designs that are specific and easy to understand but also general enough to encourage imagination and creativity in how to use them. […] Open-ended play designs actively encourage a child's imagination by not determining game rules or a strict process. Just as in improvisation, children in open-ended play are influenced by their everyday experiences.[90]

Designing open forms means to provide the object with ambiguous shapes that do not encourage a few predetermined uses; on the contrary, they need to get in tune with players' subjective experiences, which in this way can be valorised. We can therefore conclude that the first feature of the design concept of creativity is openness (or incompleteness).

However, realising incomplete forms is useless if players have nothing to combine them with, by means of their imagination. A number of open-ended elements need to be created in such a way to be combinable with each other. Openness and combinability by design enable players to connect each element in original manners; in this way, games can adapt to different contexts and stimulate people's creativity.[91] The second feature is therefore combinability.

Finally, the openness of shapes and their combinability can be further valorised when the game in question involves a multiplicity of player, each one with their own imagination and experiences. The opportunity to develop unprecedented combinations of shapes, goals and meanings increases together with the number of interactions among participants. Moreover, the indeterminacy of forms makes the object compatible with any personality, wealth of experiences or type of subjectivity encountered. The third characteristic of the definition of creativity is thus interactivity. The attempt to design for creativity allowed a group of scholars to realise a very simple interactive object, named ColorFlare. It consists of a set of cylinder tubes emitting light at their extremities. Different colours are activated depending on the players' behaviour: if they are rolled or shaken, they change colour; when one is pointed at another, it transmits its colour to the other. The occasion to realise a variety of combinations, "the interaction possibilities of the ColorFlare and its open-ended nature provide ample opportunities for children to use their creativity".[92] The

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[90] Linda de Valk, Tilde Bekker and Berry Eggen, "Leaving Room for Improvisation: Towards a Design Approach for Open-ended Play", Conference Paper (June 2013): 93-94, https://www.researchgate.net/publication/244485371_Leaving_Room_for_Improvisation_Towards_a_Design_Approach_for_Open-ended_Play.

[91] See Raghu Garud, Sanjay Jain and Philipp Tuertscher, "Incomplete by Design and Designing for Incompleteness", *Organization Studies* 29, no. 3 (2008): 351–371.

[92] Tilde Bekker, Janienke Sturm and Berry Eggen, "Designing playful interactions for social interaction and physical play", *Personal and Ubiquitous Computing* 14, no. 5 (2010): 390.

children that participated in the study used this object in a variety of ways: for instance, they could simply roll them to each other or activate one specific colour and send it to as many other tubes as possible.

To sum up, creativity by design can be realised if the artefact or the system in question is made of open forms, allow them to be combinable and occurs in an interactive context. Each one of these elements has the potential to increase the creative opportunities, which are triggered by the presence of a playful subject in the first place. In its working definition, creativity could therefore consist of: people engaging with open forms, combinability and interactivity in order to be able to always create new goals and meanings.

3.7 The identification of potential value tensions

As we have seen, the values in question often end up conflicting with each other; indeed, that is also the case of the two values we are dealing with. Our theoretical investigations have shown that the greater the level of privacy, the less the individual has their behaviour steered towards predetermined paths. In this sense, we might be led to conclude that the greatest level of privacy protection cannot but safeguard people's capacity to develop their personal creativity. However, we have also seen that digital technologies also provide great opportunities for creativity, as the fragmentations of reality allows to recombine its elements in an infinite number of possible ways. That is why in our alternative conception of smart city the flow of data should not be entirely stopped (otherwise, there would not be a smart city at all); on the contrary, it needs to keep flowing as long as it does not affect citizens' privacy. In sum, the balance we are looking for requires that on the one hand the data available are not invasive enough to pose a threat to people's privacy; on the other hand, data need to be various and consistent enough to give citizens the possibility to freely combine them in order to have meaningful experiences. The value tension between creativity and privacy, here analysed from a conceptual point of view, will also need to be dealt with in the following technical investigation. Empirical investigations may also be useful to adjust the conflict in accordance with stakeholders' preferences.

3. Empirical and technical investigation

As we have seen in the previous paragraph, this study does not require a large involvement of stakeholders during conceptual investigations. Empirical investigations can only be useful for identifying stakeholders and balancing the value tension. However, during the whole technical investigation stakeholders' presence is consistently needed to help assess whether the key values have been effectively embedded into the smart bridge. In fact, some of the specifics cannot be

properly evaluated until the technology under study is deployed and used, as stakeholders might interact with the artefact in some unpredicted ways. Specifically, empirical investigations may be needed in order to scientifically verify whether privacy and creativity levels are actually increased, or to let stakeholders express any possible subjective concern, unease or advice. Furthermore, empirical investigations are needed to refine the balance between the conflicting values on a technical level. Even though the inclusion of concrete empirical studies falls outside the scope of this thesis, their presence along the whole technical investigation and development should be taken for granted.

Technical investigations will be here more consistent than empirical investigations. Their aim is to find technical solutions for embedding values into the technology under study. Namely, we want to translate the discrete characteristics of each working definition into technical features. First of all, we will imagine how the smart bridge could incorporate the value of privacy; second of all, we will refer to the same system and try to valorise creativity. A useful compromise between the two values will be continuously sought throughout the course of the investigation.

In our conceptual investigation, privacy was defined as the manner and extent to which people can control how personal data are collected, stored, used and shared with other parties. We will try to find technical solutions for each one of these features. With regard to the collection of data, people need to have the possibility to choose whether information about them can be collected. In other words, people need to authorise the extraction of data. However, as several scholars have claimed, the sole individual consent is not enough to legitimate an action; in fact, the subject might be forced to give consent or be not fully aware of the consequences of their authorisation. For this reason, in the course of another study involving VSD in the development of a system for cookie management, Friedman et al. considered the idea of informed consent to include: agreement, voluntariness and competence.[93] Now, as the sensors mounted on the smart bridge are built to automatically detect the presence of passer-by on the surface, it would be cumbersome to ask everyone whether they wanted to have the data about their crossing collected by the system. Moreover, the flow of people is likely to be too intense to allow the smart infrastructure asking everyone's permission. We can therefore imagine a system similar to that of cookie management, where people are usually notified that by remaining on the website, they automatically authorise the collection of browsing data. Similarly, the extremities of the bridge could be equipped with billboards providing all the information necessary to enable a fully informed consent. Not only should the sign alert people about the automatic extraction of data, but it should also provide comprehensible information on the purposes of the collection, the way in which data

[93] See Friedman, Kahn and Borning., "Value Sensitive Design", 69-101.

will be used, stored or shared and the presence of any benefits or risks for the individual. In this way, citizens would be enabled to take an informed and autonomous decision.

Once data are collected, precautions need to be taken with regard to the way in which they are managed and stored. There exist a number of possible ways to protect the integrity of data and the privacy of the individuals concerned. For instance, information can be fragmented and stored in different datasets. Alternatively, personal data can be encrypted or protected by means of pseudonyms.[94] As the information collected by the bridge does not consist of personal information from the beginning, only the fragmentation of data might be needed in order to protect data against malicious activities.

Then, people's privacy needs protection with regard to the way in which information is used and interpreted. Once data are collected and stored, they can potentially be used in a variety of manners, for instance in order to manage traffic or to monitor people. In order to protect individual privacy, the regulations meant to support the construction of the smart system need to explicitly state that the data will only be used to monitor the structure of the bridge and show the location of anonymous groups of people on a screen. As we had suggested in the first paragraph of this chapter, the bridge could be connected to a large dataset including all the information collected by the smart city. We imagine that this second feature might be useful to encourage citizens' creativity: the position and the activities performed by other people could be an important source of inspiration for original decisions. In order to protect the privacy of the people appearing on the screen, it could avoid showing the presence of specific individuals as multiple spots; instead, it could simply show the presence of groups of people in the form of blurred, changing stains. In this way, the system should prevent people from using the screen to follow the movements of other people. The way in which data are used is strictly connected to the manner in which they are interpreted. Since recent studies have shown that individuals can be identified by means of their sole footsteps,[95] it is important for the bridge's regulation to prohibit this kind of activities.

Finally, we need to take precautions on the way in which data about people are shared or disclosed. Again, the bridge's regulation needs to ensure that the data collected will not be disclosed to third parties for purposes other than those mentioned above. Data can be made available only to the smart bridge's personnel and to the institutions responsible for the management of the system for promoting creativity. The ideas mentioned above represent possible technical solutions

[94] See Nathan G. Freier et al., "A Value Sensitive Design Investigation of Privacy for Location-Enhanced Computing" (2019), https://vsdesign.org/outreach/pdf/freier05values_workshop.pdf.
[95] Masato Miyoshi et al., "Personal Identification Method using Footsteps", SICE Annual Conference (2011): 1615-1620.

to protect the privacy of the smart bridge's stakeholders. In the remainder of the paragraph, we will analyse the specifics needed to promote creativity.

The three main features of creativity's working definition are: openness, combinability and interactivity. Before conceiving a system capable of translating these conceptual characteristics into technical specifics, we will briefly see how digital objects would easily lend themselves to have them incorporated. According to Kallinikos et al., digital objects are editable: the elements they are composed of can continuously be rearranged, while new elements can always be added or deleted. In short, the modular character of digital technologies makes them open and versatile. Their infinite power of editability and combinability makes the borders of a digital object always questionable and never determined once and for all:

> Digital objects are borderless. In comparison to packaged and single media like books, they lack inherent borders that bound them as obvious entities. […] Furthermore, distributedness makes possible various combinations out of a larger ecology of items, procedures, and programs, a condition that renders digital objects fluid and crucially transfigurable.[96]

Their adaptability and indeterminacy make their function constantly indefinite. The openness and the combinability of their forms allows them to be continuously reinterpreted and reshaped in their meaning. Whereas non-digital objects hardly allow for manipulation and for a large variety of uses,

> digital interfaces, by contrast, can accommodate a much wider spectrum of functions […] and are, not infrequently, designed to be function or product agnostic […]. The attributes we ascribe to digital objects are further associated with their granular constitution […]. Granularity refers to the minute size and resilience of the elementary units or items by which a digital object is constituted.[97]

As already mentioned, digital objects are the result of the fragmentation of reality; their granular, atomistic nature makes them capable of interacting with each other and with the subjective motivations that can allow for unprecedented combinations. Thanks to their resilience, each fragment can easily interact and resonate with different personalities. The digital system of the smart bridge needs to behave in the way described above; we need to conceive it in such a way to valorise the creative potential of digital objects. Every piece of information needs to have open and changeable borders, which allow for a variety of interpretations and utilisations. Also, it needs to be endlessly combinable with other pieces of information collected by other parts of the smart city.

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[96] Jannis Kallinikos, Aleksi Aaltonen and Attila Marton, "The Ambivalent Ontology of Digital Artifacts", *MIS Quarterly* 37, no. 2 (June 2013): 360.
[97] Ibid.

Finally, it needs to be designed in such a way to allow each piece of information to interact with each user in a personal, unique manner. In this way, this endlessly reconfigurable amount of data can be translated into a creative flow of knowledge.

The creative smart system that we have briefly described above could be made of a screen capable of connecting to a large dataset, which should include all the information collected over the years by the whole of smart infrastructures. We can imagine that the system users can access these data and combine them as they please, depending on their curiosity, interests or desires. We can suppose that the absence of predetermined purposes and the ease with which information can be recombined could encourage at least some of the users to develop a creative attitude towards the smart the city. Now we will refer to the features of creativity's working definition in order to envision the possible specifics of the system.

Since the system needs to incorporate openness, the shape of the data available has to be simple and unspecific. As we have seen, digital objects tend to have changeable borders and to be easily editable by anyone. For instance, if we consider the general parameter of "illumination", we can see that it can assume different shapes, depending on the way this idea is framed or is combined with other parameters. We might for example be interested in the levels of light pollution measured by the smart city over the last five years: in that case, in the system we should select "illumination", "pollution" and "2014-2019". Alternatively, we might want to find out how street lamps illuminate the city, for instance with regard to the colour of their light. While each single parameter is per se undetermined, the context in which we consider the idea of illumination will eventually give it a specific shape. Openness should also concern the goals of these researches. In our system the aims are not already predetermined; users do not necessarily have to look for information in order to better manage traffic or to conceive solutions to make the city more sustainable. Rather, they are encouraged to combine elements in accordance to their intentions.

The second feature of creativity is combinability. As we have seen, this characteristic is strictly connected to the previous one. In order for users to develop a prolific knowledge, data needs to be easily combinable with each other. The smart city fragments the traditional city in a myriad of disparate data; these data can subsequently be recombined in order to give birth to countless interpretations, which in turn are meant to endlessly reshape the traditional city. Consequently, the parameters of the system need to be combinable with each other. For example, if I wanted to watch falling stars with a few friends, I could use the system to find dark, isolated areas where to lie down together. In this case, I would probably combine parameters such as illumination, crowding, green areas. The anonymised data on people's position, which are collected in real-time by other similar infrastructures, could be useful in this occasion. As for the toys

conceived in the study mentioned before, the presence of openness and combinability alone is supposed to stimulate users' imagination. Furthermore, we can see that the system could be used both for theoretical and practical purposes.

The third characteristic of creativity by design is interactivity, both between users and the user and the artefact. With regards to the latter, the openness and the combinability suggested above should allow each user to interact in their own, personal way. As the data available can be combined in accordance to individual expectations and desires, users' subjectivity should be valorised as a result. With regards to personal interactions, we can imagine that the bridge would often be used as a means to find other people in the city. Indeed, it would be easy for the system to show the presence of crowds, the occurring of particular events or simply gathering spaces hosting various activities. Moreover, as the screen is mounted on the bridge, people might often aggregate around this or other similarly equipped infrastructures and create communities.

There is not a particular reason why a specific infrastructure like a bridge, whose purposes are in principle quite definite, should be equipped with such a particular system. However, conceiving alternative uses of smart technology so as to reinterpret the urban context and its purposes was one of the aims of this thesis. The smart bridge could be just one node within a network of various smart infrastructures built with analogous aims. In this way, the data extracted from citizens and from the city they have built can be given back to them and serve purposes different from those of surveillance and control. Specifically, as bridges are meant to connect two opposite sides banks, the smart bridge in question might represent the capacity to overcome the strict boundaries possessed by unquestionable truths. By *bridging* the gap between well-defined knowledges and practices, by letting the data flow break the levees established by efficiency purposes, reality can go through a process of hybridisation and reconfiguration. Even if this is probably not enough for giving rise to authentic forms of resistance, it could be useful to stimulate the imagination of some citizens. Once they have witnessed the infinite potential for creativity made possible by this alternative kind of smart city, they might become able to look beyond the smart city of surveillance and power.

CONCLUSION

In conclusion, we will briefly recapitulate the accomplishments of this thesis, while repeating the advantages and limits of VSD in its application to the smart bridge. In general, as VSD is a method that allows to incorporate human values into the design of technology, it can effectively bridge the gap between ethical theory and design practice. Moreover, as it does not only provide limitations as to how technology should be developed, but it also aims at promoting some positive principles, it represents a proactive approach that has few equals in the field of applied ethics. With specific regards to this project, VSD was therefore effective in incorporating the values of privacy and creativity into the design of a smart infrastructure.

However, we have seen that VSD also presents some significant limitations. First of all, even if this method is usually applied to ICT and other similar artefacts, it has never been concretely applied to complex systems such as smart cities. Even if its implementation in these contexts would be theoretically possible, it would require a massive amount of work and the involvement of a variety of institutions. However, as the aim of this thesis was to show that by means of VSD the values of privacy and creativity could effectively be incorporated into a smart infrastructure, we did not consider the smart city in its entirety. We have instead imagined a fictional smart city surrounding the smart bridge, where all the other smart infrastructures have been built in such a way to protect individual privacy and allow citizens to access data for developing their creativity. It is important to bear in mind that in a real project all these elements and relationships would need to be taken into account and properly addressed.

The second limit of VSD and all those design projects whose aim is to encourage specific uses is the distinction between design and use. Regardless the purposes for which an artefact is conceived, people can always use it in a variety of ways. Even though the studies conducted on the design of toys have shown that the creation of open-ended shapes and goals is likely to encourage children to conceive creative ways to use them, it does not mean that every one of them will always act in accordance with the designer's intentions. The same goes for the creative system we have imagined as part of the smart bridge: even if it is meant to encourage the development of creativity, some people might use the available data in conventional ways. After all, not only do power relations shape the physical environment, but also and especially people's personality. In some cases, the common way of conceiving smart cities might take over and undermine the attempt to encourage the development of alternative forms of life.

The third limitation of VSD concerns the power relations surrounding the design of any artefact, which risk being unnoticed, unquestioned or even reinforced. For instance, how to make sure that the bridge is actually able to incorporate privacy, if the whole smart city context were designed for purposes of surveillance and control? Even though the smart infrastructure is conceived for alternative purposes, once it is actually deployed and installed it might risk being absorbed into the context of dominant power relations, which might end up being reinforced as a result. Furthermore, we have seen that even privacy by design cannot be regarded as free from the net of power relations. As the process of commodification that affects data is also supposed to affect the design practices with which personal information is protected, designing for privacy risks reinforcing these underlying power relations. In order for people to develop authentic forms of resistance against power, protection against surveillance and control is not enough; the free subject needs to critically question the power relations that are supposed to underlie any design practice, whether it be for surveillance or privacy.

An analogous issue emerges with the promotion of creativity: in order for this value to be part of the design of the bridge, it needs some given foundations that allow for its expression. These foundations are the features that characterise the design of the infrastructure. However, since they are the elements that *allow for* the development of creativity in the first place, they cannot be involved themselves in the creative process. As they are the solid bases for openness and combinability, they are not themselves open and combinable. Rather, they remain the invisible and unquestionable design features the creative subject cannot interact with. They are the borders of the sand box within which the kid is allowed to play, whereas the borders themselves are not part of the game. The borders of the sand box are instead what determines the rules and the elements of the game; yet, the game in question is actually a game of power.

Even if the creative subject is faced with a multitude of possible realities that may broaden their horizons, there is no guarantee that this playful kind of creativity evolves into its resistant, critical version. If creative individuals limit themselves to playfully combine the elements at their disposal, if they are not really aware of the horizons of meaning within which their creations occur, they cannot be regarded as authentically free. In order to develop this resistant attitude, they need to critically question the way in which their every day practices take shape. By critically reinterpreting the way in which their life is "designed", the resistant subject can develop the most authentic form of self-care envisioned by Foucault. In short, not only the design for surveillance and control, but also that for creativity needs to be questioned by the resistant subject.

In conclusion, the virtues of Value Sensitive Design and of design as such coincide with their limitations: the solid methodological bases they provide in order to proactively promote some

desirable values also constitute themselves as intrinsic limits that cannot be questioned "by design". The resistant attitude that is able to do so cannot be designed; rather, it belongs to the critical subject that constantly questions any work of design, either concerning their life or the surrounding urban environment. Even if Value Sensitive Design can represent a useful tool to develop citizens' creativity and broaden their horizons, this resistant attitude is still needed to challenge the powers that shape smart cities. As power manifests its presence also by designing the urban social space, any work of design can in principled be questioned by resistant subjects, even that which aims at promoting privacy and creativity. In this way, the conception of alternative kinds of smart cities will always be possible.

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