Sin City to Smart City, or Atonement by Technology: An Introduction

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Abstract

This chapter aims at proving the reader with an overview of the opportunities, challenges, open questions, and threats, inherent in the broad and somewhat ill-defined phenomenon known as the Smart City. A few key domains are identified and discussed: mobility, health and welfare, security and policing, energy, administration and politics, and education. The core of the chapter is preceded by two sections that propose a historical and cultural angle presenting the Smart City as the technology-redeemed offspring of more troublesome ancestors.

1 East of Eden

There is an ambivalence in our view of the city that quite likely dates back from the very earliest times. If from practical, economic, social, and cultural perspectives the city was and still is seen as a uniquely powerful provider of possibilities and opportunities, the artificial, unnatural concentration of people and artifacts, and the progressive separation from the environment—landscapes, colors, smells—that has been the setting of human evolution for millions of years, have been hanging like a dark cloud on the existence of cities and citizens since the earliest experiments.

> And Cain went out from the presence of the LORD, and dwelt in the land of Nod, on the east of Eden. […] and he builded a city, and called the name of the city, after the name of his son, Enoch [1].

In those times few things happened, and never by chance, so we should not overlook or underestimate the fact that the first founder of cities is also the first murderer.[1]

Some ten generations and a deluge after these facts, things were getting out of hand again [2]:

> And they said, Go to, let us build us a city and a tower, whose top [may reach] unto heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth. And the LORD came down to see the city and the tower, which the children of men builded. And the LORD said, Behold, the people [is] one, and they have all one language; and this they begin to do: and now nothing will be restrained from them, which they have imagined to do. Go to, let us go down, and

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[1] I hope it is superfluous to state that here and elsewhere I am using biblical quotes not as historical sources but as witnesses of a *weltanschauung*. As Salustius wrote in *On the Gods and the Cosmos*: *"Now, these things never happened, but always are."*.

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> there confound their language, that they may not understand one another's speech. So the LORD scattered them abroad from thence upon the face of all the earth: and they left off to build the city.

Here we find a few points that appear to be pertinent to our topic. First, the stigma attached to the foundation of cities has not abated: the undercurrent of resentment for the prevalence of settlers over nomads—first symbolized in the killing of the shepherd Abel by the farmer Cain—runs through the whole book, and in a way resonates with our present preoccupation with finding ways of coexisting with nature and our environment rather than recklessly pillaging the former and reshaping the latter. Second, when their impulse to aggregate appears to approach a critical point—a *singularity*, as we might call it today—the God of *Genesis* scatters men abroad as to avert something unwholesome intrinsic to this concentration. More generally, with startling and rather frightening foresight, some twenty-five centuries ago someone realized that "*now nothing will be restrained from them, which they have imagined to do"*; everyone can build his or her own list of what we have imagined to do, and—for good or bad—carried to completion. Finally, it appears that at some point after checking our Babel enterprise, the God of the Old Testament must have given up, leaving us to our own devices.

A hardly more optimistic view on the birth of the city is that offered by the Italian philosopher and philologist Giorgio Colli, who describes how in post-Homeric Greece—in a time frame ranging from the beginning of the VI to the middle of the V century B. C.—the *pólis* was shaped by fierce competition and envy (*phthonos*) as the place where internecine hostility would be free to unravel, a place rapidly turning into a merciless tribunal for the losing; in combination with a disbelief in any kind of finality, this reflected in the practical Greek political mindset, that is, "*in the instability of their political bodies, in the marked prevalence of a destructive impulse, in the frantic renewal of aimless and meaningless hatred"*[2] [3]. The context could not be father from the book of *Genesis*, but the birthmark is no less ominous.

2 A City of Red and Black

Fast-forward through two thousand years that witnessed the splendor of Rome, Byzantium, Baghdad, the spring of Gothic architecture, the Florence of the Medici, and the rise of the dazzling capitals of powerful nation-states extending their tentacles to the boundaries of the known world and beyond, two thousand years during which cities were the undisputed focus of human activity, desire, ambition, endeavor, creativity, a whole era in which ostracism and exile were dreaded like death by active citizens, and in a sense *were* death as far as their higher faculties—political, artistic, or professional—were concerned.

This infatuation for the city and its never-ending eruption of life, wealth, ideas, and human intercourse—which for a long time seems to have effectively silenced the ambivalence I mentioned before—comes officially to an end with the spasms of the Industrial Revolution and the rise of Romantic sensibility. The pace of the revolution and of the urban metamorphosis appears all of a sudden to outstrip the human capacity for adaptation,[3] and a flood of social and economic transformation uproots willing and unwilling alike in a collective upheaval displacing men and women culturally no less than physically. At the opposing pole of a newly deified Nature—the more untamed and unaccommodating, the better—the city appears to Romantic eyes as a place of unmitigated suffering and bereavement, a place of exile and painful longing [4]:

[2] My translation.

[3] Adapting to urban developments was definitely less challenging in previous centuries: as an example, the Gothic cathedral of Reims was completed a little less than ninety years after the first stone was laid. In modern technical terms, we would call it a case of *quasi-static* evolution.

Far from the madding crowd's ignoble strife,
Their sober wishes never learn'd to stray;
Along the cool sequester'd vale of Life
They kept the noiseless tenor of their way.

Let's not miss the Paradise lost keywords scattered in these lines: *sober*, *sequester'd, noiseless,* seem to spring directly from physical sensations of uneasiness if not revulsion for the lurid confusion of promiscuously teeming cities. Again we find the city noise—and loneliness amid crowds—as the distinguishing element of modern alienation in Wordsworth's *Tintern Abbey* [5]:

These beauteous forms,
Through a long absence, have not been to me
As is a landscape to a blind man's eye:
But oft, in lonely rooms, and 'mid the din
Of towns and cities, I have owed to them,
In hours of weariness, sensations sweet,
Felt in the blood, and felt along the heart.

We live in cities as in exile, longing for our lost motherland. And no wonder: when writers less inclined to poetic abstraction enter into details, we find ourselves beholding positively infernal views [6]:

It was a town of red brick, or of brick that would have been red if the smoke and ashes had allowed it; but as matters stood, it was a town of unnatural red and black like the painted face of a savage. It was a town of machinery and tall chimneys, out of which interminable serpents of smoke trailed themselves for ever and ever, and never got uncoiled.
It had a black canal in it, and a river that ran purple with ill-smelling dye, and vast piles of building full of windows where there was a rattling and a trembling all day long, and where the piston of the steam-engine worked monotonously up and down, like the head of an elephant in a state of melancholy madness.

Red and black: the Devil's palette; and coiled snakes, a dead river, demented movement, and—once more—incessant noise.

The turn of the century does not bring much relief, according to a quintessential twentieth-century poet like T. S. Eliot: with his *Preludes* we are back in Hell, albeit of a subdued variety [7]:

With the other masquerades
That time resumes,
One thinks of all the hands
That are raising dingy shades
In a thousand furnished rooms.

A bit further on, the blackness of *Hard Times,* far from having washed away, appears to aspire to universal coverage [8]:

The conscience of a blackened street
Impatient to assume the world.

Unlike in Dickens, though, the metaphysical nature of whatever went wrong elicits some measure of compassion for the city-hell itself:

I am moved by fancies that are curled
Around these images, and cling:
The notion of some infinitely gentle
Infinitely suffering thing.

A few years later, *The Waste Land* makes the connection explicit again with a direct quote from Dante's *Inferno*[4] [9]:

Unreal city,
Under the brown fog of a winter dawn,
A crowd flowed over London Bridge, so many,
I had not thought death had undone so many.
Sighs, short and infrequent, were exhaled,
And each man fixed his eyes before his feet.

The throng of somnambular City clerks[5] of Eliot's vision harks back to *Hard Times* [6]:

It contained several large streets all very like one another, and many small streets still more like one another, inhabited by people equally like one another, who all went in and out at the same hours, with the same sound upon the same pavements, to do the same work, and to whom every day was the same as yesterday and tomorrow, and every year the counterpart of the last and the next.

[4] *Inf.*, III, 55–57. Technically, and significantly, we are in Hell's vestibule, where the souls of the pusillanimous are forever bound to aimless wandering.

[5] A processions of brain-dead workers that seems reminiscent of both Dickens's and Eliot's appears in the opening sequences of Fritz Lang's *Metropolis* (1927), the very first image of which is a steam engine piston working "*monotonously up and down, like the head of an elephant in a state of melancholy madness*".

In *The Fire Sermon* section [10], another city takes on the role of signifying perdition when Eliot quotes St. Augustine's *Confessions*[6]*:*

To Carthage then I came

immediately followed—to avoid misunderstandings—by the flames themselves:

Burning burning burning burning.

What centuries of uneasiness did, what modern technology in its aggressive earliest forms exacerbated, can our gentler, leaner and sleeker technology undo? Can the sins of the City be washed away by digitalization, by ever-faster and capacious communication networks, by artificial intelligence? In a way, this is the challenge known as Smart City.[7]

3 The Smart Hereafter

Let us begin this section setting some boundaries to our expectations.

Partly because intellectuals tend to grow tired of keywords as soon as ordinary people start using them, and rapidly turn to busying themselves to invent new ones, and partly because the adjective *smart* ended up smacking of technology a little bit too much, thereby—understandably—becoming suspicious, there has been a tendency among the most enlightened to upgrade the idea of *Smart City* to that of *Wise City*. A noble and perhaps even necessary aspiration, but one that tends to shift the attention from the practical playing field—where engineers and others are willing and able to deploy their newest contraptions—to a higher but somewhat less well-defined level of intervention, if not straight to Utopia [11]:

For wisdom is the property of the dead,
A something incompatible with life; and power,
Like everything that has the stain of blood,
A property of the living.

However, one must not necessarily share Yeats's somber view of human affairs to focus on the more circumscribed arena of *smartness*, where a perfect storm is gathering of powerful new technologies craving for applications, growing user expectations and perceived new needs, aspirations to pressing, if often ill-defined, ideals of sustainability, and—last but certainly not least—colossal material interests that would be harder to channel in the direction of *wisdom*.

Let us then move to outline some considerations about the possible impacts of the Smart Revolution on a few key aspects of cities and society.[8]

Mobility is one of the key pillars of the Smart City paradigm.

On one hand—or *internally*, we might say—our inefficient and even irrational, dirty, noisy and often unsafe way of transporting ourselves and our goods is under universal scrutiny in search for more intelligent, environmentally

[6] Book III, chapter I: "*Veni Karthaginem, et circumstrepebat me undique sartago flagitiosorum amorum*," where once more we find a reference to the unnerving city noise, albeit in a metaphorical context.

[7] I am not unaware of the fact that there is more to smart cities than technology; yet, it is undeniable that the Smart City paradigm was conceived first and foremost in connection with digital technologies, and the EU itself officially adheres to this rather restrictive definition: "*A smart city is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business*" (https://commission.europa.eu/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en).

[8] I trust that the reader who has patiently borne with me up to this point will not be surprised or disappointed by not finding here the usual literature review or overview of existing projects, initiatives and good practices, but instead a stream of free-form musings and open questions. Anyone looking for a wealth of up-to-date information and resources on Smart Cities can refer to the IEEE Smart City initiative web pages (https://smartcities.ieee.org/), while a good look at the technological and scientific state of the art is offered by the proceedings of the annual *IEEE International Smart City Conference (ISC2)*. In both instances, the perspective is that of engineering and information and communication technologies, but then again, that is also the perspective of this book, and its Introduction.

friendly, safer and ultimately inobtrusive solutions. Inevitable and blissful as these developments sound, self-driving vehicles, automatic routing, structural carpooling, and the programmed phasing-out of traditional combustion engines, all contribute to a tendency to take the management of mobility out of the single citizen's hands, which is likely to encounter significant resistance and to become one of the factors exacerbating the chasm between the Smart City citizen and the dweller of lands less affected by *smartification*, a human type that traditionally does not look upon the beehive mindset with much fondness; for future reference, let us file this as a *chasm factor*.

On the other hand—*externally*—the tendency is one of reducing the need for mobility, through virtual workplaces, e-commerce, distance learning, and virtual reality. Undoubtedly, there is a significant—if difficult to quantify—share of traditional mobility that could be happily dispensed with,[9] but a non-trivial question arises as to where should we draw the line, both in terms of mandates and of personal choices; dismissing the problem is not advisable, lest we encourage a novel, hyper-connected, secular form of monachism, or the escapist extremes of P. K. Dick's *Perky Pat Layouts*[12],[10] either of which defies the very idea of *pólis*. We will brand this potentially dangerous drift as a *dissolution factor*.

On the front of *health and welfare* the progress of technology promises ubiquitous and continuous monitoring of health conditions and lifestyles, aiming at what we could call—with venial impropriety—efficient *preventive maintenance* of body and mind. Alongside with the economic driving force—preventive maintenance appears to be a sound economic choice for humans no less than for machinery—our aspiration to better and longer lives is such a primeval and primary force that we can consider it a fact of nature not unlike the law of gravity.

However, even if we set aside the inconvenient observation that *longer* and *better* are inherently at odds with each other as the final act unravels—we trust that medical as well as pharmaceutical science will make *better* last longer and the bitter end as short and sweetened as possible—the fact is that long lives make economic sense as long as they are productive lives; or, to say it in a more polite and palatable way, longer lives pose an all-around sustainability challenge.[11] Shall we be ready and willing to contribute our labor to society well in our seventies or eighties? And, if so, what contribution could that be in a rapidly evolving techno-centered work market?

At a more philosophical level, it is worth asking ourselves how much of our right to privacy and even to unwholesome and self-harming behaviors and lifestyles we are willing to relinquish in this bargain. Whether we consider a perfect welfare state, or an unfettered capitalistic, free-market healthcare system, or—more realistically—any intermediate solution, the individual right to *wrong* behaviors and lifestyles must inevitably be conceived as hostile, by taxpayers in the former case, by insurance companies in the latter, with the result that in either scenario healthcare coverage may become contingent on the total disclosure of our real-time physiological dashboard. Here is another potential *chasm factor*, isolating those who fall or willingly drop off the grid.

Security and policing is another field where opportunities as well as threats are rather obvious. Nearly ubiquitous monitoring and Internet of Things—or Internet of Everything—connectivity, coupled with Artificial Intelligence and Big Data analytics, are potentially disruptive technologies in the field of crime prevention. However, a statistical knowledge-based approach for detecting, forecasting and inhibiting criminal behavior implies some degree of

[9] An awareness serendipitously fostered by the recent COVID-19 pandemic.

[10] I do not think it unfair to define Virtual Reality as digital (as opposed to chemical) hallucination.

[11] I have argued elsewhere that humans are *unsustainable* animals. Among other proofs that fall well outside the scope of this chapter, see Richard Fleischer's *Soylent Green* (1973) for an example of perfectly sustainable and perfectly inhuman solution to the problem of population aging.

privacy intrusion and even profiling that is at odds with the fundamental rights of individuals in free societies. We will have to be extremely watchful here: politically speaking, security and crime prevention and repression are an easy sell, but while security concerns are clear and immediate, the side effects and the threats to individual freedom and rights are subtler and likely to become apparent in the medium-to-long term, at a point when reversing the trend could prove very difficult.

Energy is both a key enabler and a critical piece of the Smart City puzzle. To begin with, clean energy itself, its grid integration and distribution require *smart grids* and energy-hogging computation and data handling, in order to manage and control energy fluxes that—with the increased penetration of renewable energy sources—become more complex, erratic and bi-directional: the shift from the classic paradigm where user-defined *demand* is met practically in real time by the dispatchable *offer* of large conventional power plants, to one in which power generation is largely disconnected from user demand,[12] is a technically daunting revolution in which high-performance computation and big data will likely play a key role. More generally all of the information and communication technology developments and rampant applications point to increasingly intensive computation and extensive data management. While remarkable progress and innovation is underway,[13] flipping the digital coin (a *bit* commutation) comes with an inevitable energy price, and thermodynamic considerations—if nothing else—appear to set an absolute limit to how cheap this price can get [13], indicating that, no matter what brilliant tricks technology will pull, the present and projected exponential increase of computational workload must be mirrored by exponentially increasing energy consumption, sooner or later reaching unsustainable levels.[14] To be sure, before hitting this thermodynamic wall we will have to solve much more pressing technical problems, like for example devising ways to build energy-thrifty data centers, and information and communication technologies will have to prove powerful enablers of clean energy production, energy efficiency and saving just in order to pay their own electricity bill. In this context, *electrification* (e.g., of mobility) is expected to play a major role; however, besides being a last-mile solution that per se does not solve the problem of primary energy production, significant upscaling will require colossal infrastructure investments and pose major technological and supply-chain challenges.

Finally, the economic cost of clean energy, including the need for intensive research funding and government incentives, is liable to be another *chasm factor* dividing affluent countries from developing economies that would in principle be entitled to the cheap-and-dirty approach that made affluent countries affluent in the first place.

Administration and politics will not be less affected than the other sectors mentioned so far.

The process of de-localizing and de-materializing administration and bureaucracy is well

[12] Depending as it does on sunshine and wind speed, for example.

[13] For instance, check https://rebootingcomputing.ieee.org/.

[14] A particularly interesting aspect of this argument [13] is that the ultimate thermodynamic lower bound to the energy cost of a single elementary computational operation stems from the irreversible nature of the operation itself, i.e., from erasing the memory of the state preceding the operation (for example, adding 3 and 5 to get 8 is irreversible in the sense that this 8 might just as well come from 2 plus 6, or 7 plus 1, etc., hence from the sum one cannot infer which were the addends). In other words, some energy must be spent (as dissipated heat) to make output signals independent of their history: the alternative would be admitting the existence of *slightly different* 8's depending on their being the result of 3 plus 5, or 2 plus 6, or 7 plus 1, etc., which in the long run of the computation would clearly become unsustainable. Ultimately, we have to pay a price for the luxury of forgetfulness. Apart from obvious practical considerations, a short story by J. L. Borges, *Funes the memorious* (*Funes el memorioso*, in *Ficciones*, 1944), brilliantly shows the devastating effects of a lossless memory.

under way, with—generally speaking—significant benefits to the comfort and peace of mind of citizens: accessing on-line services with digital identities, for example, saves time, is ubiquitous, and reduces or eliminates the need for synchronization with public servants' (sometimes mind-boggling) office hours. A transparent bureaucracy is likely to rank high in every citizen's Smart City wish list, and the route appears to be clearly set in this respect. Another potential benefit in the interaction between citizens and the administration is the shift from a *radial* model—in which citizens interacts with individual branches of the administration, depending on the problem at hand, as if with separate, independent, and mutually non-communicating entities—to a *cloud* model with a single access point and full information sharing among all branches. However, in a thoroughly virtualized and dehumanized administration glitches may become exasperating if not impossible ordeals for the citizen, unless and until the human ability of coping with the unexpected and the unforeseeable is embedded in the system via advanced Artificial Intelligence or, in the short term, savvy intervention of human intelligence (if not compassion). Even in this reasonably optimistic scenario, however, digitalization is potentially a serious *chasm factor* that threatens to widen age and cultural divides in a realm where no one should be excluded.

At a higher level, as Science and Artificial Intelligence progress to approach a status of unassailable authoritativeness, and the Smart City becomes the living laboratory where their brave new solutions are experimented, what room will be left for *politikà* in the *pólis*? Will Information and Communication Technologies be used to enhance political *participation*, or will the prevailing trend be the fusion of citizens into Big Data, and digital-twinning of our cities, a trend arguably incompatible with the original idea of citizenship itself? As far back as in 1958, Hanna Arendt very clearly pointed out a potential drift toward tyranny that our technocratic future may have a hard time dispelling [14],

> *when everything that is not everyday behavior or automatic trends has been ruled out as immaterial.*

Once more, we find the re-emergence of currents that have been recognized and feared for a long time, and would therefore be extremely unwise to dismiss:

> *[…] although statistics, that is, the mathematical treatment of reality, was unknown prior to the modern age, the social phenomena which make such treatment possible—great numbers, accounting for conformism, behaviorism, and automatism in human affairs—were precisely those traits which, in Greek self-understanding, distinguished the Persian civilization from their own.*

The evolution of the *pólis* into a Smart City, the fusion of what used to be irreducibly individualistic into Big Data, the translation of the "*least conformable body politic known to us*" into a digital twin for the sake of efficiency, convenience, comfort, and in the name of the "*harmony of interests*", may well lead to the end of politics as we know it:

> *Statistical uniformity is by no means a harmless scientific ideal; it is the no longer secret political ideal of a society which, entirely submerged in the routine of everyday living, is at peace with the scientific outlook inherent in its very existence.*

To classify this as a *dissolution factor* may turn out to be an understatement.

Finally, if the Smart City were a room, I believe *education* would be the elephant in it. Can a city be smarter than its citizens? Unfortunately, yes, with dystopic consequences once again pushing toward a *dissolution* of the true idea of citizenship (a happy user or consumer is not per se a citizen). Two aspects in particular are worth pointing out.

First, the educational divide is likely to become the most critical *chasm factor* of all. In spite of the spectacular—and often sinister—feats of genetic engineering, the *Brave New World* [15] description of dystopia—conceived at a time where the Marxian idea of *class* still appeared to make sense, and based on state-controlled reproduction and breeding—is, as

of today, neither likely nor necessary to harbor suspicions on our social future: education much more than chromosomes is likely to be the main dividing factor and ranking criterion. The good news is that education is something we can handle—in principle—more easily and better than other social factors, if we just set out to do it. However, such an *education*-driven approach to social mobility and efficient use of human assets requires massive long-term investments that do not pay quick and visible political dividends.

The second aspect has to do with what *kind* of education we will need. Regardless of which cultural field or human activity domain we may consider, as technology progressively displaces the human brain and pushes the meaning of "menial task" to higher and higher levels—to the point where what is today the job of a good integrated circuit designer, or that of a good medical doctor, will be considered menial—education will have to become ever more critical, historical, philosophical, lest it become a mere commodity. Taking one step further, humans will become outdated and ultimately useless in the formation of scientific and technical *consensus*—our ability to memorize, fetch, sort, and process data is far too limited to compete—and the one, last, irreplaceable human asset will be our potential for heresy. If this is the case, we should ask ourselves if our present educational system and our culture at large are a good breeding ground for heretics, or else tend to favor the cultivation of inquisitors: my own answer to this question is not very optimistic.

4 Conclusions

I have argued in the previous section that in each one of the several domains examined the Smart City evolution carries, along with unprecedented opportunities for our lives as citizens, potential *chasm factors*—creating or widening divides among city dwellers, or between citizens and non-citizens—and even *dissolution factors* threatening the very fabric of the City as we know it and the idea of citizenship itself. While *chasm factors* can and should be mitigated by enlightened supervision, foresight, and education, *dissolution* may be inherent in the smartification process itself: as the workplace, the marketplace, the *agora*, tend to get blurred in the physical domain and are replaced by their virtual counterparts, as the *social* aspects or labor, of commerce, and of carrying off the business of our lives in general tend to vanish in the process, what will be left of the *distinctive* character of the thing we call a City? Will we end up defining a city on the basis of some arbitrary threshold of population density, with boundaries invisible to the eye and to the perception of inhabitants? In other words, the Greek *pólis* and all the subsequent incarnations of the idea of City were founded on a very clear idea of who and what was excluded as much as of who and what was included. Since powerful economic, social, and environmental drives, no less than an aspiration to equality, advise to steer toward inclusion rather than the other way, we are left with one final question: will the ultimate Smart City be no city at all?

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