Effects of the digital transformation on the contemporary city project

Vittoria Bonini, Paolo Galelli, Alessio Minetto, Ilaria Delponte, Renata Morbiducci

Highlights

The project of the contemporary city as a systematic exploration of possible futures. The resilient city to digital transformation. An open-air laboratory where to test technological innovations related to the future of urban space, integrating physical and digital layers. The value of public engagement and the mixed top-down and bottom-up nature of the project. A hybrid model for a more sustainable form of efficiency. The convergence of bits and atoms, systems and citizens that cooperate.

Abstract

According to many sociologists and technologists today we live in the midst of the Fourth Industrial Revolution. The research aims to investigate this paradigm shift that is taking place in the contemporary city to understand how urban design is facing this digital transformation. Starting from the technological and digital innovations that are pervading the field of architecture, engineering and urban planning, this study will also try to understand how these radical changes will affect citizens’ life.

Keywords

Digital-transformation, Industry4.0, SmartCity, Urbanism, Innovation

1. INTRODUCTION

Since their appearance, cities have been a great engine of innovation. Their progress, however, was not linear: periods of stasis were followed by moments of remarkable change, during which the key aspects of our daily life were redefined. From the second half of the eighteenth-century industrial revolutions have irreversibly marked societies and cities; with the transition from muscular to mechanical power, then from electricity to electronics, finally from mechanical to cognitive power, the city has always “reloaded”, changing its configuration every time. According to the most famous sociologists and technologists today we are living in one of these phases, the Fourth Industrial Revolution. It is the era of artificial intelligence and machine learning, of
autonomous vehicles and augmented reality, of big data and Internet of things, of smart factories and cyber-physical systems.

The research wants to take note of this paradigm shift - also known as digital transformation - to study its effects on the contemporary city. The article will, therefore, try to clarify some topics about the effects that networks will have on the city of industry 4.0, the role of the designer and the approach to urban space design. The studio thus becomes an opportunity to reflect on the cities of tomorrow; an awareness of the changes taking place in the urban space design; an attempt to interpret them and understand their pragmatic implications; a research on urban transformation and an occasion to return to talking about the future, because, to use Buckminster Fuller’s words, “We are called to be architects of the future, not its victims” [1].

2. STATE OF THE ART

According to the most enthusiastic researchers, we would already be in the midst of the most technological era of history and using an often abused formula we would live in the future. However, removing the sensationalism of technology from its rhetorical mask, this future that everyone is talking about returns an imaginary in which the keywords are ‘optimization’, ‘simplification’ and ‘acceleration’ of processes that already characterize our lives. As stated by the sociologist H. Rosa the late modernity in which we live would be the modernity of acceleration, not of the future. Rosa describes all this as a frenetic stasis: “Although nothing remains as it is, nothing essential changes anymore” [2].

‘Acceleration’ is the right adjective to describe also the uncontrolled urbanization of the last fifty years, against which R. Koolhaas sided with the essay “What Ever Happened to Urbanism” in 1994, defining urban planning as a discipline on the edge of failure and criticizing the inability of city planners to formally translate the wild global urbanization [3]. In 2010 the historian S. Heller underlined how the first victim of the prevailing nostalgia was precisely our idea of the future, stating that in the past, the future seemed much brighter than it appears now since there was a sense of wonder that curiously no longer exists today [4].

In this condition of ‘loss of future’ architecture and urban planning could not remain indifferent. The economic crisis and the advent of the digital transformation have not only impacted the dynamics that regulate the stock market and the productive assets, but also those that characterize the urban planning discipline, shaking the enthusiasm and awakening the hidden
passion for ‘the future’. If on the one hand we started to design with bottom-up processes, focused on reuse - taking the ‘horizontal’ and democratizing aspect of the industry 4.0 - on the other hand, there has been a growing emphasis on the concepts of Smart City and sustainable city, enhancing the technical aspects linked to well-being and sustainability, where, however, the social and cultural improvements seem to derive solely from hi-tech innovations.

Starting in the 2000s, the city, which has always been the kingdom of urban planners and sociologists, has undergone a growing interest on the part of IT giants, encouraged to invest in technological feasibility and in the expectation of conquering new markets. From then on, cities were increasingly pushed by large multinationals to become ‘smart’ - as if technologically advanced were necessarily synonymous with ‘smart’ and as if the solution to the problems of urban agglomerations were the exclusive subject of engineers and IT - through spasmodic attention to efficiency and comfort. “The Smart City has […] the fascination suffered by urban planners for a long time: if every element of a city is designed with coherence, the whole thing can work perfectly” [5].

In this regard, Koolhaas, in a speech to the European Commission in 2014, revealed some complexities and contradictions regarding the Smart City [6]. According to the architect, urban planning has always been based on the creation of communities and on the constant effort to formally symbolize it. But with the birth of the Smart City, public values have been progressively replaced by the private interests of the big technology companies, under what he defines ¥€$ regime: “this transfer of authority has been achieved in a clever way by calling their smart city - and by calling it smart, our city is condemned to being stupid” [7]. Furthermore, Koolhaas himself claims that the Smart City movement is today a crowded camp, which relies mostly on the rhetoric of the disaster; the effects of climate change, an ageing population and infrastructure, floods and droughts are all problems for which the Smart City always has an answer.

This thought is only a starting point to put designers in front of some not too immediate considerations. The intent is not to be one of assiduous critique and an end in itself, but a provocation to bring together the themes of politics and the city, recently grown into separate worlds. In reality, the definition of ‘smart city’ is not just about technological development in itself, but the ability to use the information and possibilities that new technologies offer. “The full achievement of the digital revolution has built an immaterial space of infinite horizontality. Like a thin veil, now this new layer is laying down, the last in order of time between the successive layers that have shaped our cities over the centuries, on their physical and social structures, spreading in
an innovative way on the most complex, structured, evolved and, at the same time, ancient product created by man”, the city.

3. METHODOLOGY

To understand how new technologies are changing the urban and social structure of cities, it is fundamental to learn how the most recent urban theories were born and developed in the sociological context of the 4.0 city. These theories are all linked by the value entrusted to the digital transformation which, acting in the background, often hidden its real impact on the shape of the city.

The last phase of the urban transformation coincides with the birth of the new connective and multidirectional infrastructure that since the 1980s has led to extraordinary changes: the internet. The world that at the beginning of the 20th century was conforming as the ‘global village’ of M. McLuhan, is now taking the form of an increasingly connected space, closer to the ‘space of flows’ [8] theorized by the sociologist M. Castells. Unlike the unidirectional mass media, the internet and new media are encouraging participation, the sharing of ideas, thoughts and material goods. Therefore, what will be the effects of the flow space have on the city?
According to C. Ratti and M. Claudel, the flow of information consists of three components: sensors capable of collecting environmental data, human and materials flows in real time; algorithms able to analyze the massive amounts of data; actuators, digital control devices capable of reacting to data, affecting physical space. This condition of the contemporary city is often defined as ‘ubiquitous computing’ [9], a condition of widespread informatics. In Ubiquitous City physical space and virtual space converge, and data-driven processes transform the city into a test bed for the application of IoT and Big Data. If in the nineties the theory of widespread computer science had led us to think that physicality would have lost any relevance, today, as “the more we register the desire for connectivity through devices, the more we see a tangible need for concentration of people in central locations of the city, rediscovering the value of human capital and its ability to generate virtuous circles in places and rediscovered spaces “[10].

In this sense, if the term Smart City has by now prevailed over all the others - Digital City, Virtual City, Information City, Intelligent City, Knowledge City and Green City [11] - recently the paradigm of the Sensitive City has received more and more support, throwing new light on the role of the urban planner and on the planning of the cities of tomorrow. The MIT Senseable City Lab, founded by Carlo Ratti in 2004, focuses its research on the interaction between new technologies and cities, shifting attention to sensitivity - the ability to listen and react to the inputs of the population - rather than on the intelligence of the city. It is a “real-time control system” formed by a “sensing”, information gathering, and “actuating” component, implementing it in response to these. For the first time the city would find itself pervaded by sensors and ‘digital layers’ and the ‘sensing’ and ‘actuating’ processes, made possible by new technologies, would open up new horizons for participation. Therefore, it seems appropriate to see how in an era in which the digital sphere has completely enveloped the urban sphere, everyday life has become saturated with electronic services and digitalisation has contributed to increasing safety and well-being. “But is the success of people or technology? Does sustainability have to be reduced to a form of government without conscious participation? “[12]. Where does the disordered city end? Where does the city which includes a hint of chaos and unexpected vitality - of which J. Jacobs spoke enthusiastically in the early 1960s and which allowed the oldest cities to resist empires, monarchies, famines and wars - ends? To give an answer it would be enough to take a walk for Songdo, or within the walls of the control room that IBM in Rio de Janeiro or by observing the management headquarters of Apple in Cupertino. If the Panopticon is a candidate to be the
discriminating metaphor of the Smart City, how enough can the Smart City be defined as a truly smart city?

Without getting lost in neo-Luddites chatter it would be enough to say that if technology can certainly improve the life of the city, it is also true that it tends to make people passive and to control them. It is, therefore, necessary to clarify the priority of an active and productive city, where creativity and fairness are elevated to the level of the final objective. It could be said, as claimed by sociologist S. Sassen, that technology, for example in, has already hacked the city.

But what would happen if the city were able to hack technology - “can cities hack technology?” [13]. Would be valuable if people could hack their cities? For the sociologist Sassen the answer is, without doubt, yes. Starting from the assumption that the city is a complex but incomplete system and that behind that complexity there is the possibility of continually reinventing itself, the practice of hacking could become a valuable alternative to centralized control of the wired city. In the era of ubiquitous computing, almost everything is accessible, appropriated and subversive: the world becomes a hacker’s playground. So how can the practice of ‘positive hacking’ be translated into urban planning? To answer, one would have to go to the beginning, starting...
from Place de la Concorde renamed Place de la Revolution after the execution of Louis XVI in 1793, to reach the Situationist movement’s Unitary Urbanism, up to tactical urbanism of the third millennium. But why link these practices to informatics language with the word ‘hack’? The answer lies in the affirmation of new ways of applying new digital networks on an urban scale, particularly in the vision of a city that is improved not so much by technology as by the bottom-up initiative of citizens.

It could be said that the Open Source Software movement born in the Nineties, evolved in the new millennium with Open Source Hardware, is evolving into Open Source Urbanism, whose bottom-up approach could represent an alternative vision for Smart City, not necessarily in contrast to data-driven urban systems such as Ubiquitous City and Senseable City. With the full realization of the digital transformation, pure optimization soon becomes obsolete; top-down and bottom-up systems are called upon to converge in the name of a hybrid model, which includes a certain degree of disorder and can be equivalent to a more sustainable and democratic form of efficiency. “If hacking takes hold, the productive integration of top-down and bottom-up urban paradigms could help us imagine tomorrow’s city together” [14].

4. RESULTS

Today the challenge of predicting the future continues to thrill and engage, yet this “future often turns into paleo - an obsolete hypothesis that will never be realized”. Is trying to predict the future a valid and productive thing? The objective “is not to correct the present (a challenging task) nor to predict the future (useless effort), but to be able to positively influence it” [15]. Aware of the impossibility of representing tomorrow with precision, the project should be understood as a systematic exploration and seed of possible futures, as a catalyst for change, aware that possible futures are rooted in the present, not in remote visions. Beyond technological advances, the goal of wanting to optimize urban space and the quality of life remains unchanged. If traditionally the theme of the city of the future has been linked to the concept of a “machine to inhabit”, today it refers to a city capable of functioning as an “open-air computer”.

In this regard, is it sufficient for a city to function perfectly to be defined as smart? Is the systematic optimization of resources the most desirable result? Suddenly comes another factor: an improved city vision thanks to the contribution of citizens’ bottom-up initiatives. The first to establish itself in this sense is J. Jacobs [16] who launched in 1961 an attack against the
urban planning methods of the time promoting the concept of interconnected design, convinced that the combination of multiple interactive elements could create an active urban space. This is a bottom-up approach that “starts from the most atomized element to build a system of increasing complexity”, opposite to the top-down one that “starts from a general and universal vision, which is systematically broken down more and more into the detail “[17]. Contemporary cities should be able to allow fusion between the two systems: if pure optimization soon becomes obsolete, a hybrid model can amount to a more sustainable form of efficiency. “It is the convergence of bits and atoms: systems and citizens that interact” [18].

Here we want to take the Canadian project ‘Sidewalk Toronto’ as an emblematic case, an excellent example to understand the context in which the designers work today, as it highlights the significance of rethinking the relationship between technology and urban planning, between engineering and architecture. Born from the partnership between Waterfront Toronto and Sidewalk Labs in order to redesign the East Waterfront of the Canadian city, the project focuses on the concept of resilience not only from an environmental but also a digital point of view, as a capacity to adapt to the changing needs of citizens, increasingly driven by new technologies. The intervention takes the opportunity of regeneration to transform the city into a sort of open-air laboratory, where to test innovations related to urban space, integrating physical levels (built, public space, mobility, utilities) and digital. In this perspective, for example, the project acts on the “invisible level” of the utility infrastructure, designed since the start as an accessible and monitorable infrastructure, guaranteeing time and cost savings for their future “upgrade”. Just as computer and smartphone operating systems allow devices to function without inhibiting the possibility for users to develop new apps, so the digital layer should be imagined; a layer of sensors through which the city would be able to “feel” what it needs and “act” accordingly. Think of the potential usefulness of sensors that measure air quality, noise pollution, light input, microclimates; or sensors and cameras capable of monitoring the flow of vehicles, people, bicycles, objects or structural behaviour in response to seismic shocks and other atmospheric agents.

An effective digital platform, like that of Sidewalk Toronto, should then be based on four essential components: Sense, Model, Map, Account. To these, one could add a fifth: Actuate. With Sense we mean the sensor network to collect data in real time, allowing us to measure, understand and interpret them. Model means data analysis and reports modelling. With Map, reference is made to the graphics display of the information collected. The Account
component should then provide a highly secure and personalized access portal through which each resident benefits from public services, keeping himself constantly informed. Finally, the Actuate component! should encourage citizens to actively participate, propose solutions based on the analysis of the data collected and test them in person.

Each new urban intervention presents itself as an opportunity to acquire a digital infrastructure capable of accommodating the opportunities provided by emerging technologies. Physical spaces can be designed according to the advantages offered by technology, rather than being forced to update slowly, at a high cost, later. By combining the physical and the digital as the principles at the base of the design of new urban areas, the possibility would be given to act in parallel with the technological change, to adapt to what will be the future challenges of the cities, which nobody can anticipate today.

Figure 3. Map of the Quayside neighbourhood (sidewalktoronto.ca).

5. CONCLUSIONS

Every day new applications add new accessibility tools to our devices, new technologies simplify our lives and on-demand services mitigate our desire to (re)act. We live in the era of instant gratification, of the people who stand, staring at their devices, “looking like standing stones” would sing Damon Albarn. For subjects as old as arch and stone, such as urban planning and architecture, it is not at all easy to keep up.

A prophetic Koolhaas had predicted this in 1995, a time when technologists and computer engineers were taking the place of urban planners, whose failure to react would be the trigger for the birth of cold and anonymous cities. The call to action of the Dutch architect is more relevant than ever, especially now
that the forces at play in the contemporary city allow citizens to take part more closely in the design (to the hacking) of the city, the top-down systems do not are more than enough. In the words of Carlo Ratti, “there can be no smart city, without smart citizens”. It is not enough for a city to function perfectly to be called intelligent; the role of the citizen has changed as well as that of the designer, who must now take a more ‘tactical’ approach than ‘planning’.

If in the 20th century the certainty of being able to rationally plan urban spaces prevailed, the research underlines the failure of this conviction. And here a growing need for utopia returns in the reflections of the contemporary city; if the utopia of the Modern built scenarios in the confidence of being able to design the future, today the projective drive remains anchored to the real scene by proposing a sort of “utopia of the real”, based on the ability to graft ideas of the future with regard to the conditions of the present. A situation in which old and new, large dimensions and human dimensions, transformation and attention to the territory, modernity and conservation, reach a perfect balance.

So how to move in a revolutionary context like the current one? How can hardware, industry 4.0, work without suitable software, the city 4.0? Technological innovation has provided us with countless increasingly smart and sustainable tools, but is the contemporary city ready to put them at the service of a new community, transforming itself into a 4.0 city?

Yes, but with conditions. That is if the citizens will understand the importance of their role as an active participant in the city project; if the designer begins to add increasingly sophisticated digital layers to increasingly accessible physical layers; if the urban planner will understand that he no longer has to design the city of the future, but the future of the city.

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