Virtual Space in Smart Cities as a Public Space
Does virtual space impact urban planning?

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Abstract

Due to the intensive use of ICT technology, Smart Cities are based on a huge volume of data that are exchanged between machines, between humans and between humans and machines. This enormous set of data, interactions and people generate a virtual world, often referred to today as cyberspace, that seems to be far away from physical reality. In this paper, this virtual world is explored to answer two questions: is this world a public space? Do urban planners have to consider it in their plans?
The paper examines the virtual world from the point of view of qualities that identify the public space, checking for each of them if the minimal conditions are met to consider the virtual world a space and then, a public space, in the sense given by architecture and urban planning. Resulted in it is a public space, further analysis is done to evidence the need for new urban planning techniques to consider it as a part of a new kind of urban space, made by both the physical and virtual spaces.

Keywords: Smart city, urban planning, public space, virtual space, cyberspace

1 Introduction

1.1 Research questions and objectives

The research questions explored in this paper are related to the meaning of the virtual spaces generated in a Smart City, although the results can be applied to many other cases.

The first question is about the virtual world generated by the huge amount of data and interactions made by humans and machines in a Smart City. Can this world be considered a public space?

This question is very important for two reasons. First, if it is a public space, it has an impact and social and political dynamics. Second, if it is a public space, should it be considered by urban planners in their plans? And this is the second question. This question is even more challenging than expected because it implies that, in the case, the answer is "yes", a new set of tools and methodologies must be developed to plan considering this new type of public space.

The objectives of the research are a better qualification of the virtual space and the evaluation of the suitability of a new approach in urban planning in Smart Cities. Both objectives aim to define a better capability to support more effectively and efficiently, socio-political dynamics in a Smart City.

1.2 Methodology

The methodology used starts from the definition of virtual space and then recovers from the literature the qualities that make something be considered a space, a place and a public space. For each of these elements and their related qualities, an analysis is done to see if these qualities are met.

After having evaluated all of them and concluded that virtual space can be considered, in many cases, a public space, some conclusions about urban planning are provided.

2 The virtual public space

2.1 Virtual places

The evolution of technologies about ICT has generated, in the last years, a new kind of public space that is not "real", or "physical" but can be defined as "virtual" and is often referred to as "cyberspace". But is it a "public" space?

In Smart Cities, this phenomenon reaches its maximum due to the pervasive and ubiquitous presence of digital elements. And seems to be the driver for the creation of new social groups and then, of new kinds of societies.

If this new kind of space can be considered a public space, it is evident that the urban space has another element of fragmentation. And if this is true, a change in the urban planners' and designers' methodologies could be needed.

What is worth to be considered is not the technological approach to this space but a sociological and anthropological review to include (or not) it in the "public space". The aim is to confirm (or deny) the need for a new approach to urban design and urban planning.

Today there is a lot of attention around Metaverse. Many scholars are studying it and its implications, and it seems obvious that it is a public space. Also, cyberspace has become a largely used term and it is often considered a sort of public place.

But these and other terms are rarely considered "public" after a deep evaluation of their nature. In most of the cases, they are considered obvious, but they are not analysed below the surface. Consequently, urban planners and designers do not consider these forms of spaces in their planning or consider them occasionally and in an approximative way. In most cases, this is because it is hard to consider the virtual space a tangible thing for them. After all, they are used to deal with concrete items.

To approach the problem, we must return to the original definitions of both "public" and "space" to gather their essential and characterizing qualities to check if they are present in the virtual world.

The first trial in comparing virtual and real public space is due to Graham and Marvin (1996). They

proposed a synoptic view between "electronic spaces" and urban places that gave a sense of "concreteness" to the virtual (electronic) space by assuming a correspondence with elements of the real space. This qualification of virtual elements as a different sort of concrete elements caused the capability to describe them, and to involve them in real-world processes. According to them, this allowed to state that the electronic space can be considered a sort of "place" because it can be identified and perceived in terms of a specific identity.

This ability to identify and perceive can be used to evaluate if the virtual space contains the "thresholds" that, according to (Seamon and Sowers, 2008) cause an individual to perceive his state concerning the environment (in this case the virtual space). People feel in different states depending on their position regarding a space. For example, being inside or outside a place changes the individual's behaviour. These features are reflected in the people's behaviour in their relationship with the real, physical place. Also, the feeling of being deeply immersed in a space or being at its surface changes the state perceived by an individual. About this "depth", it is important to underline that being "deeply" immersed in a space means that we perceive it as a place. This is exactly what happens with most virtual spaces, the person perceives them as "authentical", in the sense that they are "true", that they exist, even if they are made by bits, because actions can be taken, and thresholds can be passed.

An example of this form of perception of the public space as a real space is the current use of virtual conferences or virtual meetings. Participants feel to are in the "same place" even if they are far away. They can talk, exchange documents, and more, recreating in the virtual world an architectural concept like the meeting room. So, "entering" into the meeting room, "attending" a conference and other similar real-world sentences now get a new meaning, that is the same as that was in the real world but with no need for reality.

Digital twins are now spreading and are also a common tool, especially in smart cities. But they are not 2D or 3D reproductions of the city or a part of it, they are also elements by which it is possible to control something. So they are gaining the quality to be another example of a virtual element that can be considered real due to its effect on reality.

In many cases, we can also consider a sort of reality that does not exist, the so-called augmented reality. In this kind of virtual space, the digital twin of something real is empowered by adding many other elements that are not available in the real world. These new forms of virtual space have their language and give the perception of being in a real place.

From an urban planning point of view, the space has to be considered also for the socio-political impact that it has on people.

In this sense, it has to be considered (Habermas, 1991) that a public space is "a domain of our social life in which such a thing as public opinion can be formed". This characterisation of the public space has also other constraints that are the freedom of opinion, the possibility to meet and exchange thoughts, the "rationality" of their discourses (in the sense that they are not random discourses but follow specific aims and paths, even when using irrational elements). All these conditions are also evidenced in Habermas (1994). In a few words, Habermas requires a group of people that can freely speak "rationally" somewhere. This somewhere is a place. In this sense, the virtual space can be considered a place. People meet in the virtual space, in groups, acquiring information from sources (social, digital newspapers, e-books, …) and exchanging ideas and opinions about something.

2.2 Has the virtual space socio-political impact?

Can the virtual world produce the socio-political discourse depicted by Habermas? It is evident that in any social network, this continuously happens. Evolving from Web 1.0, where the communication was mostly a one-way transfer (like books) the virtual space has moved towards Web 2.0, where users hat s

generate content, where this communication has become bidirectional, generating a lot of interactions. We 1.0 cannot be considered a public space in the sense of Habermas while Web 2.0 can. But with Web 3.0, blockchain technology is providing the tools to automate a part of the discourse. So, with Smart Contracts, Decentralized Apps (Dapps) and Decentralized Autonomous Organisations (DAOs), a new form of public space is appearing. Web 2.0 was the digital version of the medieval square, where people could meet and exchange information, thoughts and goods. Web 1.0 was the digital version of Hyde Park's speakers' corner.

In Web 3.0 we have something never seen before in real public space, that is the capability to enforce agreed rules (i.e. Smart Contracts) and build even complex organisations between people that do not trust each other (DAOs). And the blockchain is something virtual because even money is virtual inside it (cryptocurrencies).

So, in Web 3.0 we have both social and political effects that fully cover the Habermas vision of socio-politics, but overcoming limits given by space (remote connections), trust (Smart Contracts and DAOs), physical goods (Non-Fungible Tokens and Cryptocurrencies), but in a form that cannot be considered as already present in the real world.

With Web 3.0 we have the apotheosis of a decentralized structure, fully immersed in virtual space, and this shapes new forms of communities.

The questions now are if it is possible (or mandatory) to redefine democracy and sociality, politics and even economics due to this decentralized and untrusted approach to reality if we need to start thinking of different social structures if we are facing the risk of emarginate some communities due to this virtual world interaction.

Major concerning has arisen around the generational digital divide. But also around the geographical digital divide, where many areas of the world have not been served by affordable and reliable connections.

For many years citizens have been thinking that the virtual space will allow a sort of direct democracy, letting them vote from home or implementing complex DAOs over the blockchain. But is this true? Telematic frauds have been evidenced in many cases, and attacks on ICT systems are a daily war that is reported by all media. DAOs are more robust than previous forms of virtual organisations but are far from supporting the needed complexity for a modern use case.

But, anyway, all these elements confirm that the virtual space (from Web 1.0 to 3.0) has socio-political effects. This implies that it is also a public space.

In any case, this new kind of public virtual space must be analysed to assess its risk. This is true from sociological and political perspectives, then it can interest urban planners who often must support some forms of sociological and political dynamics.

These dynamics mandatorily need a deep analysis of the impact of ICT on social and democratic life. However, this analysis can be conducted only as a qualitative one, not quantitative. Television, first, and smartphone last, have been accused of generating a social decline, driving people towards individualism, egoism and more. This single-individuals society has led to the erosion of social awareness and also to political indifference. This can be a risk also for any generic virtual environment.

These environments are often seen as post-industrial products that are used by consumers, to acquire their goods, but also from minorities or "losers" (i.e. oppressed people) that can find in this cheap and extended place a way to communicate, organise, and exchange information. But, over time, their impact has become evident because they generated a transformation that revealed itself in the real social structure, reproducing both already known and existing social dynamics.

With the COVID-19 pandemic, the struggle against the so-called "fake news" and the Twitter files

released by Elon Musk have demonstrated how powerful can be virtual space and how dangerous can be its misuse, from the social and democratic point of view.
Many communities have been born on the Web but they also have a real-world presence. An example can be the Italian "Cinque Stelle" movement, which started from a blog and spread up to the entire country up to the Italian Parliament. It promised direct democracy, and strong virtualisation and got enough votes to form a government.
Another example could be an anti-globalist movement that started on the Web and now is developing a strategy called "glocalization", a proper combination of both local and global.
Both behaviours show that these communities are performing their acts in both spaces: virtual and physical, and that no one of these spaces can be considered more important than the other. They have become a sort of meta-public space composed of both virtuality and reality.

2.3 Identity of a place

According to scholars, a place can be qualified by the ability to have an identity, that distinguishes it from the generic space and, at the same time, is provided by the users of the place. For example, according to Tuan (1977), "a place is a kind of object where values are concentrated". According to him, the "meaning of the place is built through a reciprocal and embedded process that involves both the single human being and the collective intelligence of the users of the place".
Continuing with Tuan, "emotions and thoughts are determined through the individual experience of place". The experience is defined by him as the result of sensations and perceptions. Tuan considers this "experience" as mediated by the five senses, but this concept can be widened to fit the virtual space where mostly viewing and hearing are allowed, although other forms of interaction are emerging nowadays. Due to this limitation, the virtual world cannot be considered a "meaningful place" according to Tuan definitions, preventing it from being considered a physical place.
But Tuan is not the only one. According to other scholars, is the community that defines a "place". So, the meaning and the existence of a place are defined by the collective action of the community. The meeting of people and their actions generates a social interaction that happens in a space, and this space can be considered a place. This causes that identity to be built among people sharing the same space, in the sense of the same portion of ground but can be extended to the same portion of the virtual space. This identity, built on sharing and interacting in a common environment, defines places and these places can be referenced as public places.
Another important element that characterizes the place is its stability. A place must be still, must be stable (Lefebvre 1996), and must be the opposite of something moving. The place is different from the space, and Lefebvre states that a place (and not a space only) allows people to generate an "oeuvre". The oeuvre is the work, the effect, resulting from the collective identity existence. It is realized, according to Lefebvre, within the daily rhythm of life. And this rhythm is also combined with rhythms and practices generated by political elements (Lefebvre, 1996).
A virtual environment can be very different from a political project, it can be a simple sort of social aggregation, but in any case, it delivers new behaviours (habits and rites) that apply to a social environment, but also to political and even cultural spheres. This seems to suggest that a virtual community could be redefined, following Lefebvre's definition, a sort of generator of oeuvre. To check if this assertion can be considered true, we must consider the impact of this "virtual oeuvre" on reality. In a virtual community, its members experience a sense of freedom and a sense of power that, even if not always, in many cases has a direct impact on the individuals' behaviours in the real world. This impact, which sometimes is an illusion, often is concrete and gives stability to the virtual community, identifying the virtual space as a place.

2.4 Is urban space evolving through virtual space?

Today, at the beginning of the XXI century, urban space in the city has been influenced and constrained by new dynamics generated by capitalism and technological evolution. ICT infrastructures have become a driver of the definition of the urban form, for example, due to the need to build where broadband connection is available.

Today, any city requires an adequate set of ICT services, mainly broadband and high-speed processing but also qualified workers. To provide these workers, for example, it is needed the development of specialized technical schools and universities. Songdo's experience (a Korean famous smart city built from scratch as a smart city) shows that workers and entrepreneurs must be attracted by the place and that it must be suitable also for their families. Modern cities are becoming important due to the number of PhDs and universities because they can provide support to industries based on communications and computer science (almost any kind of industry, today).

These new trends of industry planning, and their impact on residential and service areas, changed the patterns used by urban planners. Good ICT facilities, small office spaces, and teleworking are dramatically reducing the need for large buildings and today's working groups in companies are becoming virtual groups. Team members are far from the company, working remotely. The consequence is that many services like parking or transportation, like accommodation or food services are not needed anymore. Intensive information processing companies moved from the city centre to suburban or even, rural areas, sometimes causing city centre degradation. The key factors for this displacement are mainly good connections.

Consequently, local governments are trying to provide fast and reliable ICT services. This can lead to the rebirth of peripheries, and to assign to city centres different functions, mainly leisure and art, changing city centres into spaces more public than in the past.

People using ICT for their work will have more time for recreational activities, and this changes their behaviour.

In a few words, changes caused by virtual spaces have led to the need to change urban planning and design approaches.

2.5 Is there a new mission in urban planning and design?

The participation issue has always been a key strategy in urban planning. Today an individual is more oriented to avoid participation or change it into violent forms (riots, rallies, …). The contrast between building and dwelling (Sennet, 2018) has led to a loss of participation. In this sense, the participation needs to be reinforced and even empowered. Virtual spaces, on the one side, increase participation but, on the other side, they accentuate individualism and poor results. It is, then, mandatory finding for new ways of planning making it part of the democratic life (and participation in general) of modern societies. This means that, without distinguishing the concepts from the methods, some guidelines on how to act must be sought out, redefining, if needed, some aspects of urban planning and design professions.

One guideline can be the one that Habermas defined as "communicative action". Although his studies are not enough detailed, they identify such action as an important element of human action that involves participatory democracy.

Communicative action is a kind of action composed of the acts of the members of an inter-communicating community. He states that communicative action is the "island in the sea in human praxis" (Outhwaite, 1994).

This viewpoint has been hardly criticized because it seems to be based on a consensual position, meaning that it ignores conflicting forces (class, race, gender and culture) as drivers for participation in

Marxism states (Healey, 1998). Healey considers planning as a form of action that can be done only after a conflict (discussion). Healey also states that this debate should be managed by discussing "moral dilemmas". Anyway, Habermas's claims of comprehensibility, integrity, legitimacy and truth (1991) remain mandatory for this process.

Participation in planning has emerged following criticisms. These critics caused a change in the concept of planning from a top-down technocratic approach to one democratic bottom-up where participation is not an issue but the real focus of the process. Consequently, the planners' role has changed into a shaper of alternatives suitable for different social groups.

Participation is a challenging issue to be dealt with in a political analysis framework. In the information age, public participation is made easier, and the use of information tools (including virtual spaces) can be one of the searched guidelines to empower it.

A quick review of the social, cultural and political evolution of cities in our age, discloses the political content of urban planning and design. The Internet-based communication technology lets local identities evolve to be more political and global but, on the other side, it creates many fragmented localities in the urban space. The 3D reality is now overcome by the n-dimensional virtual space and, consequently, urban planning and design requires a review to be more politically focused (hopefully in the sense of democracy, but in many cases some oligarchic and technocratic forces try to harness them, like in the past regime architecture). But we can go further in this approach forcing us to consider social issues in the spatial context more than in the past, changing urban planning and design into a policy-making process.

Even if it is almost always considered that the virtual environment cannot be a real replacement for physical urban space and face-to-face relationships, we must remark near all technological changes with serious impacts on social, cultural and economic relationships are in the context of virtual environments, that impact on physical space reducing its importance. E-commerce, E-mail, social networks, and teleconferencing, just to give some examples, have led to the construction of a new interpretation of the public sphere. This public sphere on one side causes an involution of the individual over itself, increasing individualism, but on the other side causes the birth of new kinds of relationships, in many cases used as a child (e.g. maniacally publishing selfies on Facebook) but in other cases creating new experiences that were impossible before.

This new concept of the public sphere is ready to be deployed to combine social justice and cultural differences in the urban context. Also, it is leading to new forms of virtual-real projects that can have an impact on public space and future planning and design of urbanity.

This evolution is leading to a new concept that has been proposed by some scholars that state that the protagonist of modern city building is not planners, but the "spaceless logic of networks" (Uçkan, 2000). This idea is surely applicable to the Smart City where networks have been present since its foundations. But networks must not be considered only in the sense of real, concrete nets like streets, cables, wireless, or computer networks. The network concept is extended to virtual environments where the possible combinations are almost infinite.

This issue should be not considered only in a social and political analytical framework, but also in the sense of a more practical and pragmatic perspective, due to the evolution of the profession of urban planners and designers caused by new (types and shapes of) urban dynamics. The "fall of public man" (Sennet, 1992), impacts the public space, leading it into a crisis, but this crisis is not the consequence of formal or spatial issues, but mostly because a new type of activity has generated activity-based criticalities. It should now be evident that urban planners and designers must take into account ICT (continuous and fast) evolution to redefine activity patterns in urban public spaces. The present time is forcing

all of us to merge physical and virtual spaces into a new concept. In this context, a relevant driver is an activity, whose design becomes a mandatory exercise especially, for example, for urban designers who are in charge of revitalizing or recovering urban space. This evidence implies that, while urban-architectural design can be even performed individually, an effective activity-based design needs public participation. But this, often, implies altering the behavioural patterns of different types of the space's users. Such change is a hard task, particularly today where immigration, urban culture fragmentation, family kernels collapse, and other social changes are increasing cultural diversities and, consequently, enhancing this problem.

Consequently, urban space design should promote real and effective negotiation among different types of user groups, because social diversity is considered an important element of urbanity (Butina, 1993). It should be underlined that it is expected that persons are interested in issues that impact their everyday lives and, consequently, in short-term planning decisions. Given this assumption, urban planners and designers should consider that trying to involve people in long-term macro planning decisions can be useless while staying close to their everyday lives both disciplines (but urban design in particular) can not only result in being very effective but also in helping to establish public participation.

The urban transformation has demonstrated that the idea of "using computers for planning" has changed into "using planning for computers" since the end of the former century (Batty, 1995). With the aid of computers planners and designers understood and analysed urban structures in more effective and complex ways. In a Smart City, this phenomenon has exponentially grown and, given that with computer-aided urban planning and design the urban space has become computable, including numerous social, economic, political and spatial variables and their relationships together, a Smart City this feature goes far beyond the design and planning phase and is extended to the entire city life cycle. With the ability to read urban environment as a "datascape" and "infoscape", but especially through the immense data lake generated by a Smart City, it is now not only possible to avoid deterministic and static paradigms of urban planning and design and configure realistic and dynamic urban strategies, it is also possible to adapt to fast-changing requirements and technologies. By going beyond the traditional relational database paradigm, data has become easy to store and has been made available to a large public, enabling them even in a new form of the participatory process up to the decision-making stage and even further in change reaction steps.

2.6 Conclusions on the Impact of Virtuality on Physical Reality

The questions to be answered, are:

- Does virtual space realize a form of the public sphere?
- Does it provide the notions of a collectively constructed place?
- Does it present the politically defined aura of publicness?

Answering "no" will mean that all ICT and other technological elements of modern society are just technicalities and have no impact on the socio-political components of our future.

If the answer is "yes", then it is possible to infer that such technologies have a socio-political impact and must be considered in the future evolution of societies and communities.

But answering "yes" generates concern about the side effects of these social and political impacts, about lights and shadows that can arise from them.

To approach this question, two extreme positions are available: the pessimistic one and the optimistic one. The pessimistic view sees only the shadows (i.e. the risks and the dangers) and opposes change. The optimistic one sees only the lights and has total faith in the goodness of development.

The first results in the wide use of virtual spaces (social networks, the Web, virtual reality, …) have demonstrated that mankind is acting as a sorcerer's apprentice and uses these technologies ignoring or

not fully understanding the risks. Many advantages have been delivered by virtualization as many as new problems.
Even if in this phase both pessimistic and optimistic views have numerous supporters, what can be stated now is that there are no clear-cut answers about trends of the impact of ICT development on socio-political contexts. This element is even more uncertain in Smart Cities where the obsessive use of ICT enhances reasons for extremely pessimistic and optimistic reasons.
An example is Amersfoot, a town of about 150 thousand citizens in the Netherlands.
Amersfoort will not become a smart city, because citizens concluded that the risks are too high.
Amersfoort wanted to be one of the smart cities in the Netherlands, but the Amersfoort Smart City program was stopped at the beginning of 2023. Citizens have been feared when thinking about smart streetlights, Wi-Fi tracking, and algorithmic behaviour prediction. The municipality wanted to create an open "living laboratory" where to experiment with technologies, provided that no one could become a sort of guinea pig.
But suddenly Amersfoort cancelled the entire project because the costs and risks proved to be too high and too great.
The (former) project manager of the Smart City project, De Stadsbron, has gone beyond stating that, in his humble opinion, the smart city paradigm will not be applied in any other part of the country.
The first issue was the Wi-Fi tracking of people. This technology has repeatedly been the subject of privacy concerns. Enschede, another 150 thousand citizens' town, had already introduced WiFi tracking with the result of a fine of hundreds of thousands of euros to the municipality. The reason for such a fine was that in the city centre of Enschede, passers-by were counted using sensors. According to the Municipality, these counts were carried out "anonymously". Nonetheless, the personal data authority fined the municipality €600,000. According to the authorities, the citizens' privacy was not adequately protected, as they could be traced unnecessarily. In addition, the use of WiFi tracking is in itself a serious violation of the AVG (the Data Protection Regulation in the Netherlands), the authority said.
In the case of Amersfoort, the pessimistic perspective has prevailed but, on the other side, in the context of ICT, it seems reasonable to make optimistic projections about a sort of "new public man" concerning the social, political and spatial characteristics of virtual spaces. Such a perspective enables us to rethink the virtual sphere in a positive perspective considering the democratic vitality of the public way of life in real urban space as well.
The syntactic structure of the virtual environment has evolved and is moving away from the original conventional space conception. Today's spatial metaphor is secondary in the virtual environment due to the birth of a new spatial language derived from ICT technologies.
Abandoning this physical syntax, the phenomenon of the virtual space has been increasingly tied with the activity patterns that it supports, initially ruled by commercial and entertainment spaces, but now related to other forms, sometimes not existing before, of social and political activities.
It is time, now, to reconsider planning and design, defining them as socio-political actions, that integrate virtual space into the process of planning and design, supporting a social transformation that integrates into the public sphere both real and virtual environments. Considering the tools of cyberspace in the planning and design process widens the impact area of planning, increases the flexibility of the results, and improves long-term participation, including the "new public man" (the XXI century's citizen) into all phases of the feedback mechanisms, dynamically and continuously, in near real-time.
This will mean that not only the integration of both spaces must happen in technical terms, but also that is now possible the integration of the fragmented localities in urban space, which can now have a

democratic voice in the decentralized virtual environment, in social and political terms.

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