Human Ecosystems

From Conflict to Co-existence in Contemporary Cities

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Abstract. Social networks and ubiquitous technologies have transformed the ways in which we communicate, learn, work, consume, express emotions, relate to each other, create and share information and knowledge.

Major operators create digitally mediated public and private spaces using hardware and software user interfaces, iconic and symbolic architectures, communication strategies and patterns.

This scenario creates private/public spheres in which users leave digital traces which are used to commoditize human behaviour and expression: for marketing, surveillance, social experiments and more, all without explicit participant consent: current modalities are not sufficient in enabling users to control the ways in which their data is used.

Algorithmic production of information is yet another space in which confusion and opacity are created in people's perception of how their information will be used: they are not transparent and accountable, and laws, regulations and habits are not structurally able to confront with their continuous, fluid evolution.

This results in the systematic transgression of multiple human rights and expectations. This scenario describes a critical situation which must be confronted with.

In this article we propose a two-phase methodology whose objective is to find resolutive solutions for the presented context, starting from a focus on major social networks (Facebook, Twitter, Instagram).

The first phase is exemplified through a city-based project called Human Ecosystems which, at the time of writing, has been started in multiple cities (Rome, Sao Paulo, Montreal, New Haven, among others).

The project has four steps: re-appropiation; sharing; education; performance.

In the re-appropriation step, public data generated by users on major social networks is harvested and processed, to understand the Relational Ecosystems of the city, and the topic/emotion networks which are expressed by city-dwellers, thus being able to describe information and knowledge flows across communities.

In the sharing stage, all of the harvested and processed information is made available under the form of a source of real-time open data, released under with a peer-production license.

In the education stage, widely accessible workshops are used to engage the population in the understanding of the implications generated by the availability of such data, and of how this data can be used for citizens' self-organization, civic action, to understand the cities' cultures and communities, and for participatory decision-making processes.

In the performance stage, an inclusive laboratory is created in the city in which students, researchers, public administrators, designers, artists and organizations receive support in building these scenarios, understanding them and their critical implications.

In the second phase of the methodology is the Ubiquitous Commons are defined. They come under the form of legal and technological toolkits which describe a "protocol" used to declare the intended use of element of ubiquitous information generated by users. It is an evolution of the concept of the Creative Commons, in the era ubiquitous information and dealing with the qualitative, quantitative, technical, technological and legal implications of these new forms of data.

Keywords: commons, technology, intellectual property, conflict, innovation.

I. Public Space vs Digital Public Space

In present times, many of our practices have implications in digital domains, causing our relationships and interactions among human beings, communities, organizations and systems to take the form of digital transactions in which data, information, knowledge, emotions and opinions are shared or transmitted.

This phenomenon is becoming so diffused across our daily lives that it is progressively more difficult to discern where physical reality ends, and where the digital begins: ubiquitous digital information influences the actions and interactions of our daily lives just as much as they are the place for generation and exchange of

digital data, information and knowledge, producing what is progressively becoming a continuum.

This has repercussions on the public, private and intimate spaces which we perceive in our daily lives, and in which we perform from technical, legal, practical and cognitive points of view.

We live within a peculiar condition in which major technological services providers – ranging from social networks to ubiquitous technologies, including wearables, bio-technologies and mobile communications – enact great efforts to synthesize the perception of the availability of a digitally mediated public space. Hardware and software user interfaces, wearable technologies, domotics, iconic and symbolic architectures, as well as digitally mediated communication strategies and practices, all combine to form what are perceived to be accessible, usable, open, shared, free, personalizable spaces for presence, identity, knowledge, discussion, debate and, in general, expression.

These are complex spaces, whose characteristics in terms of publicness, privacy or intimacy are opaque.

Here we will focus on the characterization of public spaces.

All of these digital spaces do not manifest the characteristics of Public Space, in its definitions from Habermas, Lefebvre, Arendt, Mitchell and more.

Jürgen Habermas' "The Structural Transformation of the Public Sphere" [1] defined the public sphere as "made up of private people gathered together as a public and articulating the needs of society with the state."

Through acts of assembly and dialogue, the public sphere generates opinions and attitudes which serve to affirm or challenge – and, therefore, to guide – the affairs of state. In ideal terms, the public sphere is the source of public opinion needed to "legitimate authority in any functioning democracy" [2].

According to Habermas the success of the public sphere depends on:

⌈ the extent of access, which should be as close to universal as possible,

⌈ the degree of autonomy, according to which the citizens must be free of coercion,

⌈ the rejection of hierarchy, so that each might participate with equal dignity,

⌈ the rule of law and, specifically, the subordination of the state,

⌈ the quality of participation.

Habermas writes of a "refeudalization" of power, in those scenarios in which an illusion of public sphere is maintained to confirm the decisions of the leaders, and warns about the misuse of publicity, defining it as "manipulative".

Reflecting onto this view, Rutherford concludes [2] that

"The [public] sphere remains a site for the production of public opinion that is given concrete form by surveys and polls which, to a degree, actually fashion the opinion through the process of asking certain questions (and not asking others). Because of an excess of goods and risks competing for attention, the sphere continues to be a contested arena; however, much of the excess is manufactured by people and institutions with money, moral clout, or other forms of power. The mass media play out a double roll here, both as the vehicle for competitive spectacles and as the source of news, a different kind of discourse, though again a monologue and now contaminated by the ubiquity of publicity."

The role of the discursive dimensions of public space constituted the central argument of Lefevbre's definition of the social space. Adding a specific urban element to the discussion, the phrase "the right to the city" captures individuals' rights of access not only to physical public spaces, but also to the public spheres of discursive political participation which are enabled by such sites.

The social space described by Lefebvre [4] is a stratified space, a morphology in which discrete units are embedded one into another in a definite order, and in which interaction among the different layers can be symbiotic or conflictual.

According to him, public space can also be appropriated, it "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, re-appropriated and put to a use quite different from its initial one."

For Arendt, the space of appearance and the common world constitute two different, interrelated and fundamental characteristics of the public sphere.

The state of appearance is a space of political freedom and equality, and "is formed wherever men share modes of discourse and action" [5] in a "temporary agreement of many wills and intentions", and, in this, it "anticipates and precedes any formal constitution of the public sphere." It, thus, refers to the performability of space, the possibility for aggregation and expression. It forms the basis of the theories of the relationships between visibility and power, shared with Foucault: the common visibility of actors generates power, understood as a potential for collective action.

The common world is a shared and public world of human artefacts, institutions and settings, both material and immaterial, which provide an accessible, inclusive and relatively permanent and durable context for our actions and agency [6].

The state of appearance and the common world, in Arentd's view, are essential for the practice of citizenship, providing space where it can flourish as well as a stable background in which the public spaces of action and deliberation can arise.

For Arendt the public sphere is, first, artificial, constructed, it is a cultural achievement allowing to fashion a world in which free political action and discourse can flourish. Second, it is spatial, located in public space where people can freely meet, assemble, discuss, debate their differences and search for collective solutions to problems: for this people would need to be able to see each other, in this space, transparently. And, third, it is the place where the distinction between public and private interests become manifest, in their differences, where public interests becomes clear in its determination as the interest of a public world which we share as citizens and which we can pursue and enjoy only by going beyond our private interest. It is the place in which a collective identity may take form, to exercise political agency.

Mitchell [7] goes even further in this direction, envisioning a public space as a space marked by freedom of interaction and by the absence of coercion by powerful institutions. They are spaces which can be differentiated using Lefebvre's definitions of representational space (appropriated, lived space; space-in-use) and representations of space (planned, controlled, ordered space). "Public space often, though not always, originates as a representation of space [...] but as people use these spaces, they also become representational spaces, appropriated in use."

Going beyond this distinction, Mitchell notes how public spaces are also spaces for representation, places in which "places in which a political movement can stake out the space that allows it to be seen" and in which "they can represent themselves to a larger population." According to Mitchell "only in public space can the homeless, for example, represent themselves as a legitimate part of 'the public'".

Using all of these (and possibly others) definitions of public spaces and spheres, it is possible to go back to the initial focus and try to use them to understand if any of the digital spaces which individuals, social groups and organizations have available have these characteristics.

We will analyze this from a composition of perspectives through which we will argue how, on the one hand, it is currently impossible to understand the architecture of digital spaces and the implications in terms of freedom of expression, assembly, performance, privacy, surveillance and, in general, to understand how the data, information and knowledge we produce is used; and how, on the other hand, it is also currently impossible to express and control how this data/information/knowledge should be used. Adding up the implications of these two issues, we will show how no currently available digital space – with, possibly, the

only exceptions of borderline spaces, on the edge of illegality and transgression – has the characteristics of a Public Space.

We will then expose a working hypothesis on how to re-appropriate digital spaces in order to be able to produce public, private and intimate spheres which are freely performable.

II. LAW, TERMS OF SERVICE, INTERFACES, ALGORITHMS: OPACITY AND IMPOSSIBILITY

The scenario can be analysed from a variety of points of view.

For example the one of the law (and its many declinations in the various national legislative systems, as well as those laws which regulate international and global transactions), in which a substantial body of legislation regulates privacy issues; publicity of data; handling of sensible information; transparency of data and information within governments and institutions; mechanisms for accessibility and usability of services; surveillance practices; and rights in the public sphere; anonymity among the masses; freedom of expression and assembly; and more, ranging from technicalities to fundamental human rights.

Or we could shift to the space of private contracts, which are also ruled by laws, but which constitute a separate case. Terms of Service agreements are progressively being attached not only to services – both online and offline –, but also to objects, processes, wearable devices, cars, domotics and more, becoming a pervasive presence. SaaS (Software as a Service) techniques are influencing the ways in which products are conceived and distributed [8], radically transforming concepts such as ownership and property, expanding to the Internet of Things and to the ways in which many common objects are commercialized. In this process, Terms of Service agreements rule the limits and extensions according to which the user is able to own and use anything from their home appliances to networked connected prosthetics, including the data which is generated in their usage.

On the popular TechCrunch article "The Internet of Someone Else's Things" [9] Jon Evans describes how "ownership will become a three-legged stool: who physically owns a thing; who legally owns it; …and who has the ultimate power to command it. Who, in short, has root."

This is becoming standard behaviour, with notable impacts on cars [10], mobile phones [11], networking devices [12], agriculture [13], and is spreading quickly across all domains of human activity, so much that authors like Bruce Sterling [14] have started to identify the end of the Internet (intended as the network built upon the availability of open, transparent, decentralized protocols) and to define the insurgence of other subjects which are centralized and enacting this kind of control, directly or through their controlled companies.

This transition is regulated by technological systems as well as by the private contracts which go with them, mostly under the form of Terms of Service agreements.

These contracts, which users have to sign (digitally or physically) when they access a service for the first time are complex legal documents.

Studies (for example in Acquisti [15]) show how even the practice of using detailed terms of service agreements to be undersigned by users when accessing social networks can be considered as being critical, and not capable of enabling awareness in users of the actual usage of their own personal data, whether it is marked as private or public.

Research [16, 17] shows how even basic issues such as understanding privacy settings (not to mention their perception and importance) is a complex issue which is not really helped by the explanations provided in the legal agreements and on the interfaces: not many people, for instance, understand that when they configure their privacy settings on social networks, they are in fact configuring them towards their fellow social networking users, not towards the social network providers, who can access whatever they want and use it for their own purposes.

Continuing in the analysis, we could take this fact to migrate the observation to interfaces, by noting that interfaces exist in different modalities and purposes. There are interfaces which are intended for use by humans (GUIs, Graphical User Interfaces), and by other software products and systems (APIs, Application Programming Interfaces). There are also ones of a mixed types, for example the so-called Social Logins, in which the user logs into a certain website (which we'll call A) using the services provided by a certain other Social Network (which we'll call F). By logging in to the A site, a series of things happen: A learns about the user a variable set of information, coming from F; F learns an undisclosed number and types of information about the user, through his/her activity on A; F can use the information about the user visiting A to website/service B; B could, then, recognize the user without having ever come across him/her before, have the availability of their data (bought from F) without ever having asked for it to the user.

The scenario described by all of these types of interfaces creates a false expectation of privacy/publicness which is systematically used by private operators to commoditize human behaviour and expression, to be used for multiple purposes: from marketing, to surveillance, to social experiments and more, all without explicit participant consent.

Currently, none of these types of interfaces allows for transparency, completeness of information, visibility and free performability.

While presenting themselves as mechanisms for free, autonomous interaction, user interfaces and APIs actually offer unexpected levels of opacity.

Starting from user interfaces, a good starting point for the analysis may come from Eli Parser's concept of the Filter Bubble [18]. According to Parser, those same mechanisms which were supposed to allow users to deal with the overload of available information by personalizing the content which users are shown (in search results, social network feeds and more) through their preferences and interests is actually creating a bubble around us. While the narrative of search engines and social networks is to enable users to access 'all' the available knowledge and information, a large part of it becomes actually unreachable, as it is excluded by profile-based filters: they show only what, in their 'opinion' we will like best, or find more relevant.

This fact is not controllable (there is no option on search engines and social networks to switch off the Filter Bubble), and it brings on a peculiar cognitive state: while we are convinced that, for example, through an Internet search we will be able to potentially access all available knowledge, some of it will never be reachable. So much that we will never know of its existence.

This potentially useful mechanism, thus, turns out to be a potentially dangerous one, causing impacts on knowledge discovery and creating an overall homogenization process, according to which we will be tendentially exposed to what is similar to us, excluding differences and our ability to deal with them and value them.

On top of that, the algorithmic domains make the situation even worse.

Bubbles are created not only to allow us to avoid being overloaded by information, but also to allow companies to pursue their business objectives.

Users have no control over such mechanisms, which is all in the hands of operators and service providers, which can intervene in the flow of the information to which we are exposed: just as an audio engineer could move the bands of an equalizer to filter out specific sound frequencies, operators can adjust filters to favour certain promoted contents over others, to allow commercial and even political strategies to take place.

As a side effect, the impossibility to effectively understand how many people – and of what kind – will have accessibility to the data, information or knowledge which we produce is a fact, as demonstrated by studies like [19] and others.

Having control of the content, data, information which is available and/or accessible to specific people, and also being able to control or influence how they are shared, forwarded, discussed and more, constitutes an enormous power.

Researcher Zeynep Tufekci calls this Computational Politics [20]: "big data and computational practices which allow for massive, latent data collection and sophisticated computational modeling, increasing the capacity of those with resources and access to use these tools to carry out highly effective, opaque and unaccountable campaigns of persuasion and social engineering in political, civic and commercial spheres."

Operators like Facebook have no problem in publicly expressing how they conduct not one but "over a thousand experiments each day," [21] and a former Facebook data scientist recently revealed [22] that "experiments are run on every user at some point." A 2012 study in Nature [23] showed that a single tweak modifying an "I voted" button on Facebook increased turnout in the 2010 congressional elections by about 340,000 votes.

Jonathan Zittrain [24] goes even further in this direction, expressing how "... as more and more of what shapes our views and behaviours comes from inscrutable, artificial-intelligence-driven processes, the worst-case scenarios should be placed off limits in ways that don't trip over into restrictions on free speech. Our information intermediaries can keep their sauces secret, inevitably advantaging some sources of content and disadvantaging others, while still agreeing that some ingredients are poison—and must be off the table."

The scenario gets even more complicated with APIs.

As described above, APIs constitute software mechanisms through which it is supposedly possible to capture data from major services. The modalities largely depend on the context: public feeds, users' personal feeds, geo-located public feeds and so on. APIs are at the center of multiple types of business models and strategic interests, as they permit the integration of different services to achieve specific goals. The narrative behind APIs is the one of openness, interoperability and of the possibility of public, constructive, civic usage of data. Potentially, the narrative affirms, anyone with sufficient technical knowledge can use APIs to gather data which can be used to organize citizens, create innovative services and more. Instead, the fact that APIs suffer from major limitations (in the number, quality and characteristics of data which is capturable by using them), as well as the fact that operators maintain the algorithmic control of what data is capturable through APIs, render this narrative only partially true.

Even more, all of these mechanisms of communicated openness and accessibility hide the fact that the actual content (for example on social networks) constitutes only a minimal part of the information which companies and operators are able to extract, none of which is available for public inspection, or exposed in its inner workings to be able to understand what type of information is generated from them.

We have no way to discern what data and information we generate. For example, if we were to post a picture of our holidays in Bahamas, we would not only publishing a picture but also the fact that we could afford to go to Bahamas on vacation; the fact that Bahamas constitutes a desirable target for us; the fact that, through that picture, we would have established a number of relations (with the people featured or tagged in the picture, or with the people expressing appreciation for it); the fact that other people were in Bahamas at the same time, in ways which, put all together, could form interesting patterns; the fact that operators could mix and integrate this information with some other coming from different sources (credit cards, mobile phone usage; tolls; energy usage; biotechnologies...) to gather even more information.

We would also have no idea (we cannot have it) about how all of this information would be used.

Companies like Acxiom [25] constantly perform large-scale data fusion actions of this kind. Other like Zest Finance [26] (claiming to have the availability of more than 70000 data points, including how people type and use their phone) already help banks decide whether online applicants are worthy of a loan. In the crisis-based scenario, people are starting to also volunteer in atypical configurations, to be able to pull off better debt-deals by surrendering their data, as in the case of Lenddo [27]. Other companies are moving on to other domains, starting to include the biological in these kinds of processes, like, for example, 23andME [28], for which Esther Dyson [29] expressed herself by saying that the service is "like the ATM that gives you access to the wealth locked within your genes." Starting from Zest Finance's payoff "all data is credit data", Evgeny Morozov declared [30] "well, if all data is credit data, then all life — captured by digital sensors in the world around us — beats to the rhythms of debt."

Summing up the previous issues, in essence, it becomes clear how, currently, it is impossible for data-subjects to understand how the data, information and knowledge they produce (whether it is on social networks, on their mobile pones, on their wearable device, on their smart refrigerator, etc.) is used, and how it is also impossible to effectively express how they want it to be used. Not only the protection mechanisms are inoperable: also the expressive mechanisms are not in place. Not only you cannot protect yourself (basically because you have no idea of what is effectively going on), you cannot construct with your data, too.

By simple inspection of the definitions of public space given in the previous sections, it is clear that none of the aforementioned approaches ensures the availability of accessible, performable public, private and intimate spaces:

⌈ access is not universal;

⌈ autonomy is not free of coercion;

⌈ dignity is not equal;

- ⌈ the quality of participation is decided by operators in opaque ways;

- ⌈ manipulative processes are present;

- ⌈ public space cannot be appropriated;

- ⌈ visibility is artificially limited, and far from transparent;

- ⌈ spatiality and assembly are limited and manipulated;

- ⌈ the distinction between public and private interests is opaque;

- ⌈ freedom of interaction is ruled in unclear ways by powerful institutions.

It is possible to start connecting the dots in this discussion, to try to confront, once again, with the initial research question: how is it possible to construct meaningful forms of public/private/intimate spaces in the age of the convergence and fluid interactions between physical and digital realms?

III.   RECLAIMING PUBLIC SPACE

In this section we will use the considerations performed in the previous sections, to describe a possible hypothesis for the configuration (spatial, philosophical, legal) of public, private and intimate spaces, across physical and digital domains, and, then, we will introduce a technological and legal solution which uses these approaches and which may be used as a working prototype of the desired outcome, in answer to the initial research question.

I. The Third Infoscape

Gilles Clément describes the Third Landscape [31] as an uncoded space, the space of biodiversity which is able to host the genetic reservoir of the planet. The Planetary Garden it a space for the future, for the emergence of possibility [32]. It is also a connective tissue composed by the unison of residual spaces which assume fluid forms, which are able to escape form and governance. They are places which cannot be preserved through administrative dimensions, which would destroy their characteristics. Barrell's Dark Side of the Landscape [33] comes up to mind, and his description of the ways in which the natural landscape of cities derives from the imposition of the point of view of a single social class. Clément, instead, speaks about a light side, as the Third Landscape does not represent an exclusive model, but an inclusive one, a shared fragment of a collective consciousness. It is a multiplication of narratives, a planetary remix (brassage) in which perennial mutating spaces incorporate the presence of multiple representations: syncretic maps which describe the geographies of the mutation of the city.

Clément also tells us about the need to educate our gaze to recognize the Third Landscape, to recognize emergence and to transform it into shared knowledge.

This is similar to the concept of ruin expressed by Marco Casagrande.

A ruin represents the progressive reunion of objects and architectures with nature: nature and human beings ruin buildings and objects, transforming them into ruins.

From a different point of view, these actions bring objects and buildings in a different state. A ruin is also the evidence of the history of human and natural action, of the daily usage patterns. From this point of view ruins expose everyday life, in all of its complex manifestations.

Therefore, ruins can be considered as the progressive layering of stories, as a source of information and knowledge.

Casagrande uses the concept of the ruin to define the Third Generation City as the «ruin of the industrial city» [34] and as the «industrial city ruined by people – human nature as part of nature.» [35]

The concept of Open Source infiltrates in the text:

«Like a weed creeping into an air-conditioning machine the industrial city will be ruined by rumors and by stories. The common subconscious will surface to the street level and architecture will start constructing for the stories – for the urban narrative. This will be soft, organic and as an open source based media, the copyrights will be violated. The author will no longer be an architect or an urban planner, but somehow a bigger mind of people. In this sense the architects will be like design shamans merely interpreting what the bigger nature of the shared mind is transmitting.»

In this vision the city assumes the shape of a body in perennial mutation, including both architectures and the constant and emergent layering of stories and knowledge which originate from the daily lives of citizens and nature.

At this point, it is possible to go back to our original narrative, to the concept of ubiquitous and emergent knowledge, and to connect it to this vision, to Clément's and Casagrande's vision.

The new types of information, the ones which converge in our perception of the city and, thus, into our interaction with human beings, architectures, spaces, places and organizations, be them emotional, semantic, linguistic, relational, relative to the possibility to identify multi-modal and multi-layered patterns which can be localized anywhere in space-time, whether they are generative or algorithmic, whether they derive from sensors or other interactions… all of these instances of data, information and knowledge, today, often have digital form and ubiquitous manifestations.

We experience them through smartphones, applications, social networks, interactive services and systems which are disseminated, distributed or even pulverized through space and time. Through them we

can interact with the world, express ourselves, collaborate, work, express emotions, consume, study, entertain ourselves.

Following the previous examples it is, thus, possible to attempt the definition of the Third Informational Landscape: the Third Infoscape.

The First Infoscape refers to the information and knowledge generated through the modalities of the pre-industrial city. The Second Infoscape refers to the information and knowledge generated in the industrial city (the Second Generation City, the city of infrastructures, transactions, sensors…).

The Third Infoscape refers to the information and knowledge generated through the myriads of micro-histories, through the progressive, emergent and polyphonic sedimentation of the expressions of the daily lives of city dwellers.

The vision of the new paradigms of interaction with the city are centered on the Third Infoscape.

II. A Scenario for Future Cities

What is the role of transgression in the smart cities?

On september 2014, Architect Rem Koolhas in his talk[1] given to the High Level Group meeting on Smart Cities critically asked to Europe: "Why do smart cities offer only improvement? Where is the possibility of transgression?"

Myriads of micro-histories in the city massively recombine, interfere, interact, interconnect, forming the life of the city in its continuous mutation, innovation and transgression.

People constantly transgress, reprogramming spaces, time and relations, creating a level of tactical cultural biodiversity which can happen only in the dense urban environments, and which constitutes the wealth and richness of the city.

Elizabeth Grosz defines this process as spatial excess, a new dimension which is able to go beyond preconceptions, prejudices and worries about utility, "beyond the relevance for the present, looking towards the future." The revelation and discovery of this excess depends on the possibility for transgression.

Excess is in the "problematic", which is full of potential.

Transgression creates a level of tactical cultural biodiversity which constitutes the wealth and richness of the city. The clandestine, the unacknowledged, the unofficial find their survival – beyond crime – in the transgression of social norms and limits. Those same limits which have excluded them in the first place. The

recycle trash, appropriate spaces, invent communication channels, create styles, fashions and trends. They don't cross borders: they move on them. Moving, they innovate.

Using a term from cultural anthropologist Massimo Canevacci Ribeiro: innovation is the possibility for methodological indiscipline.

To access and understand transgression in the city a peer-to-peer ethnography of the city must be established: a diffused participatory observation in which the myriads of public micro-histories of the daily life of the city are be collected, transformed into a commons, and performed through art, education, citizen engagement and tactical usage.

Graham [36] wondered how it could be possible to imagine a real time city by taking in consideration the ways in which telecommunications reconfigure our notions of time and urban space. This goes in the direction of the definition of a communicational environment, a diffused cloud of sense and meaning which goes beyond the dynamics of screens, and which is not virtual anymore, but impalpable and mental.

This atmosphere is found in the spaces which are in-between, interstitial, ubiquitous. It is not an idealized representation, but a mobilization of imperceptible urban matter, manifesting itself through pervasive computation which is both automatic and relational.

To all effects, with the development of wireless sensors, of smart dust, and with the possibility to engage human beings in urban sensing processes, the dimension of virtuality collapses. Heading towards a state which is basically comparable to the one of telepathy (among human beings, human beings and machines, machines and machines…), reconfiguring urban ecologies so that mapping virtuality or physicality would not be needed anymore, and replacing this need with the possibility to create recombinant inventories of the telepathic migration of dusts, of the myriads of pulverized sensors which are disseminated, diffused.

This telepathic form is, thus, a form of invisible communication which describes the ways in which the city talks to itself, circulating messages and reprogramming urban ecologies.

The circulation of messages represents and moves physical shifts and transformations. The city itself moves, as phenomenon and meta-phenomenon. A feedback loop, thus, is created, in which we find ourselves simultaneously immersed and unaware of the – telepathic – exchanges which surround us.

We can imagine information mutating into landscape, delineating an urban space which is not determined by distance and time, but from the transformation of densities and presences.

Gabrys [37] states that:

1 http://ec.europa.eu/archives/commission_2010-2014/kroes/en/content/my-thoughts-smart-city-rem-koolhaas.html

«The wireless city is a space for the production of dust in all its modalities. The city abounds with compressed and errant signals. Yet instead of dissolving urban space, as so many writers suggest, these communication and sensing technologies fill it with signals.»

It is interesting to note, after all, how it is not important that messages arrive to destination and accurately assemble themselves, but that it possible to understand how these are filtered by noise and dust, and the ways in which the most relevant and valued composition come into being.

It is interesting to note, after all, how it is not important that messages arrive to destination and accurately assemble themselves, but that it possible to understand how these are filtered by noise and dust, and the ways in which the most relevant and valued composition come into being.

«This is the telepathic imperative. Data exists everywhere in excess. In the wireless city, it floats and settles in a hazy surround. Sifting through the modalities of dust to sense and communicate through the urban medium will ultimately require a well tuned telepathic sense.»

In his Amusing Ourselves to Death [38], Neil Postman hypothizes how the realization of these complex media ecologies would expose us to this type of issue: for the quantity and quality of information; for their structural configuration (in the sense of the type of media and, within it, of the architecture of information); for their shape (this hypothesis was even more strongly confirmed in Informing Ourselves to Death). The problem, according to Postman, is not in the availability of information, but in the possibility to extract meaning from information.

This type of problem has been highlighted multiple times, and defined as information overload, data smog, spam, or under the constructivist form of the attention economy described by Davenport and Beck [39]. The technological solutions at this level are also problematic, at least when they are not oriented towards providing usable, accessible and inclusive mechanisms for content classification, filter and for the expression of their relevance. And – also in these latter cases –, the algorithmic dimensions of these processes isolate us from the possibility to comprehend the meaning of information, however remixed.

Technical solution apart – and their corresponding algorithms, systems, interfaces, constantly more advanced to be able to enormous amounts of data, information and knowledge – the most interesting results come from the transmedia character of information, and from their participatory performability.

From the first point of view, following Jenkins' [40] definitions, transmediality allows us to simplify the extraction of meaning from enormous amounts of information, and making its access more immersive and accessible: content which is sharable; spreadable; which offer opportunities for mutual interconnection, across different media.

From the second point of view – which becomes important also evaluating the first one –, the problem of overload and of the impossibility to extract meaning becomes easier to confront to when messages are freely accessible and performable, and when the ways in which they have been generated is transparent and also accessible, just as the way in which it should be possible to intervene in the flows of of their generation, processing – and remix/recombination –, and their propagation.

In synthesis, this equals to the need to create legibility for the relational graphs related to the generation, processing and propagation of data, information and knowledge, and to make accessible – in ways which are inclusive – the possibility to intervene, infiltrate and add in any stage of the process: enabling information to be performable.

Both mechanisms require intellectual property management techniques which are more refined, advanced and just, if compared to the ones we have available now, from legal and perceptive points of view.

In the next parts of this section we will describe a solution which mixes legal and technological toolkits to use the conceptual approach of the Third Infoscape and a commons based approach to ubiquitous data/information/knowledge re-appropriation under the umbrella of a diffused high-quality relational model to create an autonomous, inclusive, participatory space which can be used to realize public, private and intimate spaces, for one's self, and for communities.

III. Human Ecosystems

The first part of the working hypothesis presented here is constituted by the Human Ecosystems [41]. In the following sections we will refer to it as HE.

This is a city-based project (with some experimentations also happening in rural areas) which takes place over a number of different phases.

The overall objective is to reclaim the public data landscape, and to turn it into a commons, addressing the issues introduced in the last section.

The project focuses on the capacity to capture the ever changing essence of the Third Infoscape, harvesting its continuous, emergent data and, thus, by transforming into a commons, making it legible and accessible in inclusive ways.

The project has already been started in several cities around the world such as Rome, Sao Paulo, New Haven, Berlin, Lecce, Bari, as well as some others which are in the process of being started.

When HE is started in a city, a massive harvesting process commences, capturing tendentially all of the public data which is generated in the city.

'Public', in this case, is a difficult to define. As we have seen in the previous sections, whether we're dealing with social networks, Internet of Things, network connected devices, sensors, wearables or other things, defining whether a certain element of data or information is public, private or something else is no easy task.

For this reason, we adopt a very simple definition, opting for the possibility to enact (even radically) different practices using Ubiquitous Commons, described in the next section. Our working definition of 'public' data/information is that contained in those communication elements (messages, comments, bits of sensor data, etcetera) which is fully accessible with no barrier, without requiring any authentication, identification, or qualification process to be accessed; data/information which can be accessed by anyone – as long as they have the technology and literacy to do so – because the user who published it, published it in a way which required no identification for it to be accesses. For example, if you mark a certain Facebook or Twitter post as 'readable by anyone', meaning that you wouldn't even have to log it to Facebook or Twitter to read it, that would be public data in this sense. Data which, when you're publishing it in that way, it's as if you were publishing it on the New York Times, or some other major news outlet.

Even this simple definition is not enough, as it turned out in a number of occasions.

For example, people do not always realize how exactly they are publishing information on social networks: they may not realize the implications or effect brought on by a certain publishing technique or by the usage of a certain privacy setting, and the examples could continue indefinitely. We confront with this issue in two ways: first, by addressing it in an education process (see below); and, second, we include in the representations of this data experiences which are intended to question and critique this type of scenario, in order to transform it into a public, performative, inclusive matter of discussion.

Summing things up, when HE starts in the city, a massive data/information harvesting process begins, capturing in real-time public data and information from major social networks, sensors, energy, land registry, mobile activity, Open Data, and more. All of these sources of data are stored and processed in a number of ways. Here we will give a short, non-technical, explanation of the harvesting and processing processes. For a more detailed, technical explanation it is possible to look at [42].

The data is processed in multiple ways. First of all, it is geo-referenced, wherever possible. This can be done by using the GPS coordinates of smartphones and network connected devices generating the information, or, for example, by recording the positioning of sensors and devices, and associating this geographical position to the incoming data generated by them. Further possibilities for geo-positioning come from the natural language analysis described next.

Wherever data and information includes textual data (such as in social networking messages), this is processed using natural language analysis. This includes a complex set of techniques and technologies whose purpose is to analyse text in order to infer from it structured data, such as the indications of what topics the text is dealing with, the emotions expressed, the language it's written into.

The first technique of this kind which is applied falls under the category of discourse analysis techniques. Here, a structural analysis of the text is used to understand how it splits up into relevant chunks such as complete sentences, questions, answers, Yes/No questions and answers, and more. This allows the software to understand the overall structure of the texts, and to infer many useful information about it, such as the possibility to understand the flows of information. For example, if during this stage of analysis it turns out that a certain text produced by user A constitutes a question on a certain topic, and that, later, another user, B, provides an answer to this question, and the answer is appreciated by A, we could infer that B is an information provider to A about that certain topic.

The second technique which is applied is called Named Entity Recognition (NER), with the sub-category of Geographical NER (GNER). These two techniques allow to recognize (through the structure of sentences and phrases, through the use of vocabularies and more) whether the texts mention proper names: of people, events, places, restaurants, etc. This allows building information about the contents, understanding what people were mentioned in them, what places tey were talking about, how the users related to them (was the user in a certain place? Going there? Returning from there? etcetera). This is another source of information for the possibility to spatially locate information.

The third type of technique is Latent Semantic Analysis [43]. Latent Semantic Analysis (LSA) is a theory and method for extracting and representing the contextual-usage meaning of words by statistical computations applied to a large corpus of text. The underlying idea is that the aggregate of all the word contexts in which a given word does and does not appear provides a set of mutual constraints that largely determines the similarity of meaning of words and sets of words to each other. For this type of analysis large reference datasets are used containing words and concepts and their relevance to certain topics. One of these datasets is Wordnet, in which the concepts are called synsets. If we imagine the synsets laid out in an n-dimensional space whose axes are related to how these synsets are relevant to certain topic, we could imagine to

lay out the words of a certain sentence according to these axes, under the form of an n-dimensional vector whose coordinates match how relevant the single word is to all the observed topic or modality. We can, also, imagine to take all of these representations for a certain sentence, and add the vectors up (vectorial sum). In this way, we would have defined a way in which it is possible to represent any possible sentence. These sentences, thus, represented in this way, would end up in a certain area of this n-dimensional space. As shown in [43] certain areas would form which are more relevant to certain topics. We could assume that sentences whose LSA representation comes close to these areas, the sentences would be relevant to the correlated topic. Using this method it is possible to perform accurate topic analysis, when the topics are already known, and to perform topic discovery processes, once we realize that a number of sentences fall consistently into a certain area of this space and, by visual inspection we choose a name of the relative topic, thus defining it.

In this way, it is also possible to perform the emotional analysis of texts. If axes like arousal and comfort/discomfort are chosen, it would be possible, thus, to understand how sentences would be relevant to them and, thus to the variables which constitute the basics of emotional analysis (for example using the axes of the circumplex model of emotions described in [44]).

The last process which is applied is that of network analysis. Data and their relations (for example the relations established between users while using social networks) are analysed and expressed under the form of a graph whose nodes are the users and the links are the relations between them. These, their patters and their transformation in time constitute what we define as the Relational Ecosystem of the city. The Relational Ecosystem is also the tool which allows to understand the models according to which data, information, knowledge, opinions and emotions flow across human networks, allowing to define mechanisms of influence, amplification, bridging among different communities and more.

All of this data and information constitutes the Third Infoscape of the city and, in the next phase, is released under the form of a source of real-time Open Data. This is a very important step as it includes the first part of the construction of a public space, for its accessibility, performability, legibility and usability.

Using this data, and, thus, the Third Infoscape of the city, a museum is created, called the Real Time museum of the City (RTMC). The RTMC is constituted by a series of experiences in which visitors can understand about the life of the city, in all its captured complexity, in engaging ways. They can learn to ask questions to the city, receiving massively polyphonic answers, and to interpret them in meaningful ways, using information visualizations, devices, interactive experiences and more.

Critical visions are also offered. For example, among the other experiences, the possibility of finding ones self is offered to visitors. By performing a social login using major social networks, people can find themselves in the representations, connected to their relations, topics, emotions and more. This can be an intense experience, and quite an upsetting one. In this context "Why am I in a museum?" instantly becomes an interesting question: people might not desire to be featured in the museum; they might not understand how they ended up there in the first place; they might want to understand how to leave being represented in the museum; or, on the other hand, they might wish to appear more, or to understand how to establish more connections, and who the other people are, and if they are relevant to them. The experiences are designed in ways which can suggest critical reflection on all of these issues, including considerations on privacy and surveillance, as well as the possibility to learn techniques with which to modulate digital presence, protection and promotion.

The RTMC makes the Third Infoscape usable, performable and fully interactive.

The last stage of HE is constituted by a wide, inclusive, education program.

The program takes place in the RTMC, and is intended to be as inclusive as possible, being available to children, teens, adults, elderly, artists, designers, researchers, public administrators, entrepreneurs and, in general, to citizens. In the program people learn how to use all of this data for their own purposes, through workshops, laboratories and mentorships. Whether it is for creating generative artworks, new services, data-driven toys, to foster participative decision making processes, to understand more about the city, to create collaborative practices, research, shared policy shaping processes and more, the education program shows people, using different methods, how to use the Third Infoscape, how to perform it.

A number of usage cases have already been activated, and can be found with full documentation on the project's website [41], including a selection of published scientific publications describing them in detail.

Uniting all of its elements, HE transforms the Third Infoscape into a commons, making it accessible, usable and performable, and opening up to the second stage of the working hypothesis, dedicated to creating a transparent, clear, trusted, high-quality relational environment dedicated to co-managing this novel form of public space.

IV. Ubiquitous Commons

The commons are composed by a Common Pool Resource (CPR) and by a High Quality Relational Environment (HQRE) [45].

The CPR can be material or immaterial, scarce or abundant, physical or digital.

The HQRE represents the network of relations contributing and participating to the self-management of the commons.

The commons do follow a regime that figures out an alternative to the management of public properties, communal owned resources and private goods. They are owned by no-one and are managed by communities, in dynamic or adaptive, flowing, emergent ways.

The existence (and sustainability) of the commons depends on the existence of the HQRE, which all evidence shows as being the only thing allowing to avoid the Tragedy of the Commons [46] (and the emergence of the Comedy of the Commons [47]).

Ideally, the commons emerge in local communities, facilitated by a CPR whose boundaries are well defined, sustained by a relational environment (allowing to self-organize dynamically and emergently adaptive forms of governance, as well as cheap and easily accessible forms of conflict resolution), supported by the effective supervising possibilities of monitors who are part of (or accountable to) the commoners, and with minimal interference of the institutional actors.

In the global society it is easy to see how very few (or none) of these structures actually take place.

Interesting opportunities arise at local and trans-local levels, with the possibilities to use technology in order to generate peer-to-peer networks, which might eventually be able to create these pre-requisites. Current Information and Communication Technologies (ICT) can technically enable these processes.

The transition creates a parallel between the current (and historical) commons and the Ubiquitous Commons (UC) [48].

Ubiquitous Commons is a shared global research effort dedicated to understanding the transformation of data, information and knowledge in the age of ubiquitous technologies and networks. The project aims to create a legal, technological and philosophical toolkit transforming the ownership of data into a relational concept, in which individuals and communities can actively cooperate in the attribution/definition of rights/duties of access to the data through digital interactions (from social networks, to apps, sensors, wearable technologies, devices, Internet of Things, CCTV cameras, security and surveillance schemes, algorithms and processes of various types and so on, consciously or unconsciously).

The first prototype of the technological toolkit is dedicated to social networks and web/online services. It is a browser plugin combining encryption, p2p networks (the Block Chain, the p2p network behind BitCoin, the most popular digital currency) and a mechanism for "user generated license". Once installed, the plugin intercepts the content we are to publish, encrypts it, and allows you to generate and apply the desired license and,

only then, sends it to the service. Both the decryption keys and the licenses are distributed on Block Chain, meaning that people can decide by whom and under what conditions the content may be used. The result is a cooperative, relational and totally p2p mechanism in which individuals, communities, institutions, companies and organizations - beyond the unspoken "law of Tos" (Terms of Services) established by the service providers - can have their say about how their data are used, creating new types of licenses: civic, for research, commercial, for a fee, or entirely personal, based on an open, interoperable and inclusive protocol.

If the traditional commons depict, as it has been said, the strong relation between the material CPR and the HQRE, the UC highlights the strong relation between the immaterial CPR and the HQRE created by establishing a peer-to-peer network (P2P).

It is a double transition:

⌈ from the scarce, material resources to the abundant, immaterial resources;

⌈ from the physical relational environment, to a relational environment that can be either physical, digital or hybrid, and which is expressed through a P2P network enacted through person-to-person relationships, social networks, Internet of Things (IoT), sensors, network connected devices, databases and processes, using the Ubiquitous Commons and keeping the quality standards.

It is here, in the P2P network, that the purpose of social conscience, imaginary and sense of responsibility – which are typical of the HQRE – are enacted, and here is the place where they form the feedback loop to P2P network itself, constituting a second-order cybernetic system.

It is here that the identities can be expressed, in multiple forms (anonymous, individual, collective, nomadic, temporary).

It is here that all of these identities can express their will and desires.

It is here that access and experience do start.

The actors can take the form of one of the possible UC types of identities:

⌈ *anonymous*: a participant to the P2P network whose identity may be undisclosed for particular reasons;

⌈ *individual*: a participant whose identity is associated to the one of a certain, single, legal person (e.g.: John Smith, or ABC Ltd.);

⌈ *collective*: a participant whose identity is associated to a concept describing a set of subjects (e.g.: farmers, citizens of town X, the people associated to the Y association) or a goal

(e.g.: civic action, ethical scientific research, ancient seeds cultivation);

⌐ *nomadic*: a participant whose identity is associated to a shifting set of legal persons, one at the time, for particular reasons (e.g.: first it is John Smith, then John Smith passes it on to Mark White, then Mark White passes it on to ABC ltd, etc.);

⌐ *temporary*: a participant (of the anonymous, individual, collective, or nomadic types) whose identity is limited in time, for particular reasons (e.g.: for an event, for a project).

Each identity corresponds to a public/private crypto-key:

⌐ the members of the identity have the private key (whether it is the single member of the individual identity, or the multiple members of a collective identity);

⌐ it is up to the responsibility of the members of a collective identity to keep, share or manage their collective private key.

These subjects enter the P2P network through a trust mechanism creating that sense of responsibility that fuels the entire relational environment:

⌐ the trust mechanism can be enacted in multiple ways, for example by direct inclusion, through reputation mechanisms, through "citizenship" mechanisms (e.g.: each new citizen receives the "private crypto-key to the city", thus becoming effective part of the collective identity of the citizens), and more;

⌐ these actors are related through a set of relationships that express, for the scope of the P2P network, one or more purposes or goals (e.g.: collaboration, research, business, consumption); goals can evolve and change over time;

⌐ these actors generate or access a variety of types of immaterial products: data, information, knowledge, networks, processes, recipes, insights, wisdom;

⌐ these immaterial products can be produced/ expressed through a variety of means and media, including social networks, databases, transactions, sensors, IoT, network connected devices, smartphones, biometrics, and more;

⌐ these types of immaterial products, when produced, are shared on UC together with one or more "relation", which also indicates a scope and a purpose (for example, I could share my data of type X with individual identity Y, with

the collective identity "citizens of my city" or "Innovative Farmers X", with a temporary identity for a certain event, etc.);

⌐ using the UC mechanisms, the actors indicated would be the only ones to be able to access the information;

⌐ if any improper use was made, it would be up to the quality of the relational environment to handle the situation, and to solve the conflict;

⌐ this is one of the parts of the model where the HRQE becomes evident and needed, highlighting the dependence of any commons-based model on it;

⌐ so, immaterial products are shared through the Block Chain and self-governed through the P2P network;

⌐ immaterial products become accessible and usable, in this way, for several scopes and relations, and can be harvested (in realtime or offline, as needed) through the Human Ecosystems - HE (for example, the mayor of a city could use HE to fetch through UC "all of the civic relevant messages shared on social networks by the members of citizens of city X collective identity, shared for this purpose", without having to pay social network providers and suffer their limitations, and reclaiming the data/information which was generated for public/civic purposes);

⌐ all of these immaterial products therefore, can be used to create Apps, visualizations, maps, services, gadgets, artworks, designs, games, education processes, researches, public screens or anything respecting the expressed purpose;

⌐ on the Block Chain every transaction would be logged, so that it could become fairly easy to track down any improper use of it;

⌐ the transactions can also have validity as micro contracts, since they are certified and encrypted through strong crypto-keys;

⌐ since the transactions live on the Block Chain, which is also the P2P infrastructure meant to handle Bitcoin transactions and providing the possibility for paid transactions, the whole system would be fairly easy and direct (e.g.: "free for collective identity citizens of city X, paid 0.005 bitcoins for all the rest.").

This model can be instanced in multiple ways. It can be specified and designed for:

⌈   a series of types of actors/participants of the P2P network

⌈   their relations and purposes

⌈   the types of immaterial products they produce/experience, and where they are found (social networks, databases, IoT, Apps, devices, networks, processes..);

⌈   the logics (relations + purposes + flows) according to which these immaterial products are shared in the commons;

⌈   the description of the outputs of the process, and how they are used (an App? a service? a visualization? a process? an action? an event? …).

IV. CONCLUSIONS

In the discussion about the Planetary Garden, Clément proposes specific questions regarding property which are of fundamental importance in all of this discussion. Ecological dynamics assume the restructuring of the applicability of private property, from the point of view of a mutation of the concept of value, and from the point of view of the emergence of what can be described as the dreaming economist, guarantor of a dynamic, mutating and mutant landscape, not a definitive one.

«Emergent ecosystems could be a source of wealth, but being misunderstood by the system, they are misunderstood by us, as well.»

These dynamics attribute a central role to knowledge and to its free accessibility, recombination, remix, both in terms of usage and in the ones of imagination, education and sharing.

The redefinition processes for the concept of property (intellectual, in this case) – and on its implications on accessibility, inclusiveness and usability – become necessary when objects themselves undergo radical transformation.

Complex mutations have already happened to be able to confront with entire market disruptions brought on by the diffusion of mp3, videos, images and other simple media (simple, in the sense of mono-media). Thus, it can become intuitive how even more radical transitions and transformations will be needed to adapt these concepts to data, information and knowledge which, now, are of a completely different type.

Services like Google, Facebook, Twitter, Amazon, Apple, produce data, information, knowledge, identities which are diffused across different and multiple devices and modalities, interacting in profound ways with the things we know – and that we can know – about the world, its inhabitants, and with the ways in which we experience places, events, monuments, schools, restaurants, workplaces and a lot more.

Messaging applications reach us ubiquitously.

Devices, sensors, gadgets, wearable technologies, prosthetics and, soon, entire body and neural extensions interconnect bodies, emotions, health information, movements, gestures, sensations, exhibiting them on social networks and sharing them – knowing or unknowing, whether we like it or not – with diverse types of services and processes, with human beings and machines.

Furthermore, algorithms create additional dimensions, in which each gesture, movement or action can be recombined with others, and transformed into information and knowledge.

These are territories for which there are no maps, yet. We find ourselves within a grey area in which laws, regulations and people's perceptions are not defined.

In this scenario it could be desirable to actuate a shared, open and inclusive effort to define the Ubiquitous Commons, the commons in the era of ubiquitous technologies.

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