Metacity: Design, Data e Urbanity

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Abstract. The Technologies of information and communication in all instances of our daily life change the way we live and think. Urban, ubiquitous, locative, multimedia and interconnected computing generates a large amount of data, resulting in an abundance of information about almost everything in our world. In order to redesign our urban life, it is considered the development of more accessible interfaces made in locative applications (geoapps), optimizing queries to society and making participation more accessible and more direct in the project. The research is based on the study of information and media experience in the urban environment. This article composes the body of studies of the UrbeLab group in the research program of the Centro Universitário Senac in São Paulo. The research aims to extend design process in the cities and to collaborate with the practice of creative and collaborative project involving communities. It presents UrbeLab research, through case studies, urban explorations and interviews, where we can observe our present contemporary condition. The city updated in real time is an urban informational ecosystem of new and infinite possibilities of interfaces and interactions.

Keywords: City · Experience · Complexity

1 Urban Status

The cities permeated by personal, vehicular and environmental sensors acquire sentient characteristics. A citizen-sensitive city can work with individualized day-to-day strategies. The article discusses the role of cities in the complexity of our lives, the interrelationship of physical equipment (hardware), symbolic models (software) and usage patterns (applications), and the design challenges for this global ecosystem of information.

The increasing use of computing has altered our relationships with the city, each connection and each generated data, a new reading of the urban environment. Everything we do leaves a trail, our digital trail. In this ocean of data is our complete profile. Where we live, where we go, what we buy, what we said… everything is recorded and stored forever, be it a smartphone, computers and cars, refrigerators, thermostats, pressure and weight meters, or even tolls and parking lots are designed to be data generators. Cities with control and security systems, intelligent architectures and the use of mobile devices by their citizens can be configured in real time. For architects, urban planners and designers, how we can present or transform data into information can give a new status to what we know of cities.

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When analyzing data and found that there are poles erased in a certain region of the city and that this region has increased crime or even when you monitor their weight, pressure or heart rate by means of wearable devices that allow to establish parameters of good health, you realize that you are using data intelligently. In these examples we can have the dimension of optimized use of information and thus prioritize existing resources to take care of things that have efficiency. We can see the city as a responsive organism, an environment responsive to our needs for new ways of living.

A few weeks before the H1N1 virus appeared in the headlines, Google engineers published a work in Nature that caused commotion among health officials and computer scientists. The authors explained how Google could "predict" the spread of winter flu in the United States, not only nationally, but in specific regions and even states. The company got this forecast when analyzing the most searched terms on the internet. Because Google receives more than three billion searches per day and saves them, the company had a lot of data to work with. (Mayer-Schönberger 2013)

People who have connected devices have become information producers for the system. If before our access was by the desktop computer, today is increasingly mobile. We turn an individual node into the network. The internet was what was missing for all sensors and devices to communicate. We build a global brain that has new functions and access it primarily with mobile devices. The important aspect in looking at the data is that it broadens our senses and increases our ability to perceive the world.

The multiplication of the original space by the networks and the intense flow of data causes the interweaving of physical spatial and digital environments. The idea of excess space constituted by the abundance of information provokes the idea of global shrinkage and of no places (Augé 1994). The city permeated by information becomes fluid space and without limits what redefines the way we live. The human activities cover different aspects of urban space and generate data of different categories: geographic, demographic, economic and social. We never measured so much, everything we do in everyday life is measured and produces huge amounts of data. If we could see them continuously we could observe the city in its nuances. Urban technologies make the city an observable medium of great importance to understand our time. And netnography is an ethnographic process in digital networks, it is an interpretative method of research where we study interactions and experiences that manifest themselves in information and communication technologies, in our clipping, manifestations mediated by urban computing, geomedia and geoapps.

The netnography (Kozinets 2010) proposed in this research uses observation and participation of social interaction mediated by geoapps; analysis and creation of data; definition of immersion contexts and experiences of urban life. It adopts qualitative field research, laboratory activities and interviews, both in physical and digital environments, considered in a multispace of flows, on the relations between users, space and information mediated by urban computing. We focused on the possible modes of interaction generated by mobile devices (geomedia) and applications (geoapps) that allow an increased understanding of the urban environment.

The researches were carried out in three stages - locative, contextual and experiential - identified and evaluated based on the understanding of the use of technology in urban space as support and instrumentation to everyday situations as actions of going

(and coming) from one place to another, locating in the world, do something specific, talk and think about it, collaborate and socialize. These contexts are aligned with processes of evaluation of interactions and usability (Preece, Rogers; Sharp 2007) in which we must consider the ecology formed by user, system and activities, especially in the urban environment, focusing on the challenges that involve the trinomial design, information and technology in the development of 'objects' that can be accessible and usable by anyone to perform tasks involving human cognition.

1.1 Bigdata

Data is continuously generated in volume, variety and speed at different levels. The idea of bigdata has been established with the evolution of methods and systems that shape unrelated or unstructured data. The algorithms allow to organize massive volumes of data processing them according to objective needs such as organization, analysis, synthesis and presentation for its use and possible decision-making in terms of its management.

In essence, bigdata relates to forecasts. Despite being described as a branch of computer science called artificial intelligence it is more specifically an area called "machine learning". This idea is misleading, the bigdata has nothing to do with trying to "teach" a computer to "think" as a human being, rather it is about applying mathematics to huge amounts of data in order to predict probabilities. (Mayer-Schönberger 2013, p. 8)

The bigdata allows us to collect petabytes of data which uses algorithms to analyze what we had never observed. According Joi Ito (Smolan 2014), "Before we had the idea, we wrote it and it became knowledge. The bigdata is the opposite. We have a lot of data that we only saw when we looked at it." It's like trying to analyze something around us but it has structures and patterns that are invisible without the right instruments. All of these data increase our ability to understand our surroundings.

A number of innovations in preparing end user data for bigdata have emerged in recent years, such as Tableau, Microsoft Excell and Qlik Sense, data processing tools that have reduced the time and complexity of preparing data, especially important in the world of large data when dealing with a variety of types and formats. In recent years, visualization instruments have evolved to be able to process a huge amount of data in this way we can observe complex systems in operation - patterns and facts impossible to be seen otherwise and recreate them in any format, practically everything is measurable and quantifiable.

Increased data-processing capacity, incorporated and accessed throughout urban infrastructure, will make this experience somewhat unrestricted in the future. We innovate in the use of video 4k–8k, virtual and augmented reality, the internet of things and multitasking applications. A much more consistent computing experience of the city that can create new forms of interaction, services and information, on demand and in real time (Fig. 1).

We estimate that by 2020 the volume of data will be 40 ZB, to get an idea, if we add all the sand grains of the planet and multiply by 75, would give 40 ZB of information. All data processing over the past two years has outpaced data processing for the last 3000 years. The greater the volume of information, the greater the problems we

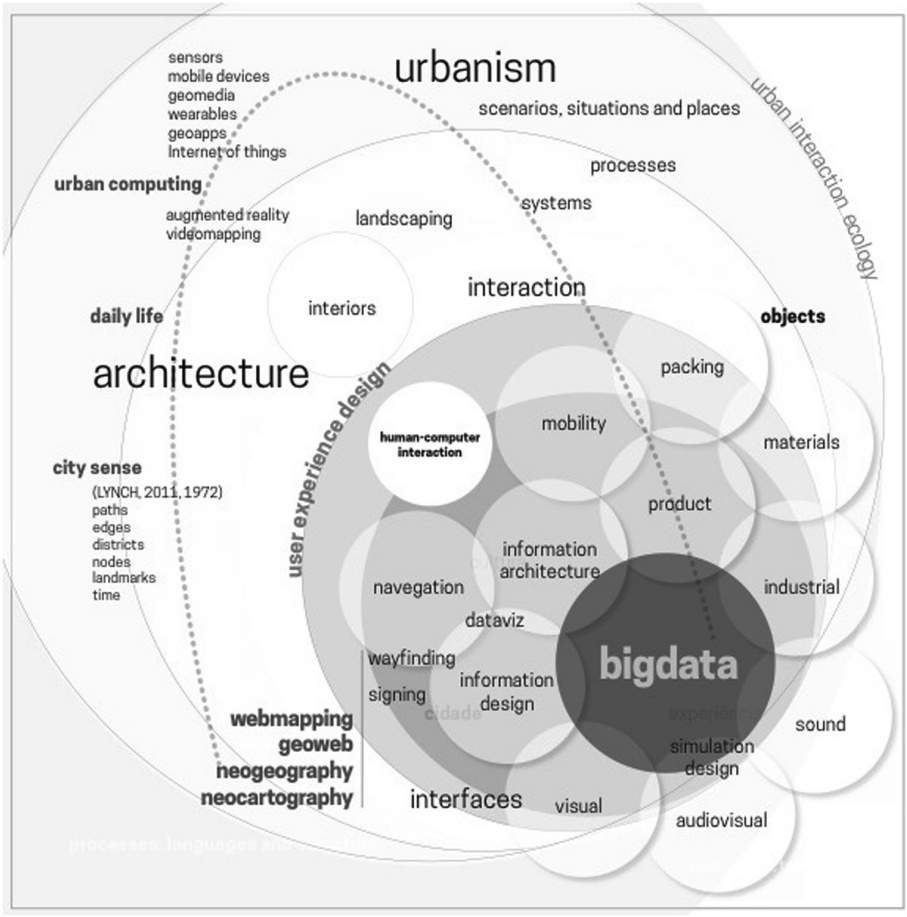

Fig. 1. Urban ambient and bigdata diagram.

will have to solve. Every powerful tool has a shadowy side everything that changes the world is able to change for worse or better is not a one-way street (Smolan 2014).

This is not to say that we can observe all this information, we are still seeing the tip of the iceberg. Most of the data may not make sense until they are interpreted and, thus, we create a narrative. It's almost an investigation to try to trace the traces of the data to the concrete fact. We need to connect everything to make sense and observe the meanings of our existence.

We are witness a world that moves from linear development. A world in disruption. Global warming can already be measured. If we exhaust the planetary ecosystem, there will be a collapse. The economic crises will be increasingly generated by the bigdata. Diversity and inequality appear to be the faces of the same coin. We need to act, the tools we have will enable this. The organizations can analyze their own data in a particular context for new ideas and make decisions that enhance productivity and

efficiency. In the context of city management, visualization initiatives are enabling companies and governments to intelligently manage their assets by providing a more comprehensive and skilled supply of information.

1.2 Space as Information

Throughout the last decades, the planet has acquired different levels of information about the activities that develop on its surface. Numerous layers of information have been established without a global project for its implementation, but which profoundly affect our lives. Traditional cartographic tools are no longer adequate to observe this complexity. Each of its urban aspects generate information that can help us to understand our daily life.

One of the most basic information in the world is, well, the world itself. But most of the time, the area was never qualified or used in the form of data. Geolocation of nature, of objects and people clearly constitutes information. The mountain is there: the person is here. But to be useful, this information needs to be transformed into data. Mapping locations requires a few prerequisites: a method for measuring all square centimeters of Earth's area, a standardized way of doing this measurement, and an instrument capable of monitoring and recording data. Quantification, standardization, collection. Only then can we store and analyze the location not with a place in itself, but as given (Mayer-Schönberger 2013, pp. 59–60).

From the relation between space and objects as a place constructed by looking at an environment configured by information, the city presents itself as an environment of research and analysis of its forms of representation. Historically the union between landscape and perspective, space and representation, related geography to the act of signification. The prefiguration of the built space appeared with the perspective in the Quattrocento and evolves to the present day with the software of 2D drawing and 3D modeling. The evolution of design - from perspective to digital simulation - materialized by the evolution of technical and technological instruments shifted our constructive paradigms to a new conception of urban space, production and the possibilities, not only of representation, but also of the autonomous creation of the environment as concept. These devices, as communication and exploratory instruments, enabled the visualization of the distinct moments of creation, implantation and documentation of the project, helping the understanding of space as a support for reflection and creation. Thus, the construction and manipulation of a three-dimensional model develop and enhance the understanding of the environment as a means of making and evaluating real proposals built by the information. Surfaces and shapes are now transformed into indexed instances of interaction materializing into a new landscape, the digital landscape. A natural path for spatial creation, digital simulation lies between information, the synthesis of images and spaces, allowing the development of sophisticated exploration and analysis skills of interactive and immersive environments. The simulation of informational aspects in the urban environment is the possibility of developing prototypes of experiences that may show us new forms of city uses.

An updated version of The Image of the City (Lynch 2011) for contemporary cities is characterized by real-time information that broadens the different aspects of our

urbanity mediated by the classic concepts of imaginability and readability with primordial issues. (Offenhuber and Ratti 2014)

Information in the twentieth century was all over town, signs and messages, sounds and images, news and orientations, facts, projections and abstractions, a relational multispace. From the telegraph, radio, television and billboards, the 21st century made the information permeate all the space made the city a mediascape. A system that approaches the concept of hypertext in which each of these elements - physical, sensory and digital - can define other forms of connection and specific and individual path. The city in the information age - the media city - has become a reflection of mediated and idealized thinking, as a set of languages that de-automates and alters our senses. The relationship between urban space and information technology allows the possibility of simultaneous readings that broaden the idea of the city as a place of stimulation of cultural production.

The urban landscape is amplified by the informational flows of each of us in a hypertextual and hypermedia cartography. This annotated city is the urban environment with quality of language and movement, expresses the way people use space in many media. When people note the city with their individuality, become agents (stakeholders) of his life active, participatory and collaborative manner. They expand the conceptions of presence, time and space, constructing new realities that provide the current urban fabric, possible places, imaginary and habitable. And it is this new cartography that allows to map a city not only to represent it, but also to give meaning to it.

We may have another perception of this environment with urban computing, all these possibilities of reading the city naturally migrate to the digital medium. With mobile devices, the individual can get information about their environment in addition to traditional graphical forms of representation such as maps of regions or neighborhoods or even the subway. Digital maps allow interaction and sharing of information which helps you experience the city as a learning environment.

The city presents itself as the sum of individual and plural dimensions, a complex experience constantly updated by the use of computing. The annotations generated by geolocated personal assistants (geoapps) show us the city as we experience it, from its individualization. The individualization of these references corresponds to the transformations of time and space in relation to the individual who, as the perceptual center of the world, becomes a reference for interpreting urban life. This accumulation of digital traces captures the daily pulse of the city, an accurate and organic result of urban life, in a city of countless authors. Such information allows people to understand and use the city intelligently and cognitively.

We create and provide information about ourselves and relate it to local information by building a new urban cartography that can give us fresh looks for the place we live. The reading of the urban fabric provides the physical, meaningful and technological interaction that is configured as a fragmented space, full of meaning and information, building at the same time a real and fluid place where we construct our contemporaneity.

The capture and subsequent representation of this information through annotations and mappings, both concrete and rhetorical, should consider the notions of scale and amplitude to capture the accuracy of this insertion. The bigdata allows us to discover

patterns when we point these resources to our daily lives and to ourselves. The various levels of information is a qualifying action that considers the city as an environment composed of the architectural and media infrastructure and the various urban flows. Considering the physical space plus digital information levels, we believe that the individual atmosphere in the city is set from the access to information, as a fluid and momentary place.

1.3 Urban Interaction Ecosystems

We can understand a city physically by the characteristics of its space based on the demarcation of relevant places like monuments, buildings, squares and gardens or by means of the tracing of its streets and avenues. Increasing the imaginability of the urban environment means facilitating its visual identification and structuring. The isolated elements - paths, boundaries, landmarks, nodal points and regions - are the building blocks in the process of creating firm and differentiated structures on an urban scale. (Lynch 2011, p. 106) Lynch established that a city can be identified and understood by elements that make up the structure of its spaces such as paths, boundaries, landmarks (natural and edified), crossings and regions. These elements of architectural, visual and environmental orientation with the design and organization of structured landscapes are largely responsible for a highly readable and understandable urban environment.

Lynch is credited with the term wayfinding for a spatial orientation or navigation system, a project that involves several visual and spatial elements such as maps, street numbers, directional signs, and other elements he called ‘ wayfinding devices ’. We can also add the scents of the city such as aromas of restaurants and cafes, aromatic plants and flowers or even carbon monoxide in high traffic vehicular routes, useful to people’s navigation. Systems such as these primarily refer to techniques used by blind or visually impaired people as they move from one place to another independently and safely. This terminology was developed by the five main elements of architectural guidance, cited above. Later Lynch added the Time (1972) among these five initial elements allowing us to observe the unfolding of other fluid elements such as urban flows.

Wayfinding is derived from many design disciplines like architecture, landscaping, urbanism, topography, geography, among others. It is the organization and communication of our dynamic relationship in space and in the environment, a system that must meet all users. Designing such a system should develop a plan that will take you from your location to your destination, connecting and arranging spaces through architectural signs and graphics in a safe, unboundaries environments. These projects encompass, in addition to signage, architecture, landscaping, lighting, landmarks and guiding points. They are divided into two categories: guidance and navigation. Guidance is the ability to position with respect to an environment and mobility the ability to safely move, detecting and avoiding obstacles and other potential hazards.

Guidance and navigation systems need to take into account how people with different capabilities interact with the built environment. For the ‘Principles of Universal Design’ it is necessary that the constructed spaces be adaptable for all, these principles

show that the inclusive design can accommodate people with varied abilities. The 'Universal Design Principles' (Lidwell et al. 2003) can be applied to evaluate existing projects, guide the design process and citizens about the characteristics of environments, objects and products most suitable for use. If we follow these principles, we will have a design of great value inclusive with high usability for all and without the need of adaptation or specialized design.

We can consider four main areas in the design of an orientation system: architectural clues, visual communication, auditory communication, tactile communication and four main categories of orientation elements: identification, reinforcement, orientation and destination. In general terms, a wayfinding system enables us to know where we are, where we move, how to get there or recognize our destiny, all done safely and independently.

Systems of guidance and space navigation are validated by the way users experience the communicational elements in the displacement of a point A to a point B, usually they are composed by maps; panels; directories; signals; color coding; floor and bedroom numbering; buildings and sites; interior and exterior views; auditory instructions; built and natural landmarks; logical progression of spaces. We were able to extend this system by adding digital information through the use of geomedia and geoapps during netnographic investigations, which defines a more complete ecosystem of urban information. With urban computing, design should assist users in solving space problems by providing consistent, constantly updated clues.

If we consider that digital information is not always available for viewing by people, can we devise a strategy to guide us through the city permeated by this information? How do we navigate and interact with information in urban space? How can geomedia change the design of information in space? An urban system with characteristics can be exploited through its transport systems, utilities, geographic patterns, historical structures such as information flows and thus provide answers to potential queries even before users have to ask help or even indicate where users should not go. We will increase the viewers of data generated by geomedia changing or increasing a physically signaled space.

The city of the 21st century is an interactive and sentient environment (Shepard 2011). Its spaces are experienced as a meeting place of cultures and communities that reflects modular structure where physical, digital, presential and virtual systems can merge. Through these technological combinations are formed territories that consist of information flows at the intersection between physical and digital city (Lemos 2008). This environment as a place of use, information and everyday interface (Shepard 2011) gives urban interaction levels characterizing themselves as an urban informational ecosystem.

The city as an interface, an immersive and multimedia environment, is composed of people and objects with different levels of interaction. This experience expands our perception and the very language of architecture and design, communication and urbanism. From urban space to the urban informational environment: complexity acts as the main idea in the construction of narratives of the city. This urbanity is the result of a kaleidoscope of geographic, ethnohistorical, sociocultural, and technological diversities, defined by innumerable informational layers that create a constant interaction flow between our body and various urban contexts, our current experiences.

In order to understand the conception of this urban informational ecosystem, consider the data generated by urban computing, in particular the use of the mobile and locative devices previously studied, and the possible user interfaces. The forms of visualization of information in the urban environment, and consequent construction of an ecosystem, are conceptually derived from the urban interaction ecology articulated in Vassão (2008), the mobile and locative experiences in Lemos (2008) the data and its tangibilization in Ishii (2016), our nomadic condition in Beiguelman and La Ferla (2011), and the construction of meaning in Santaella (2010).

As a living text, cities are becoming a great book where at every connection they are rewritten with new data. An environment in which information can be accessed in a customized way according to the needs of this user-citizen. With the data generated daily we have the opportunity to experience our daily lives in other ways. This geomedia user can find any type of information related to their specific environment. An information system that can guide us through the city giving information in real time where we are, the best way and time of arrival or what happens around us. Urban cameras and sensors, geoapps like GoogleMaps, ARsense or Urbotip, have expanded the information of the urban environment to allow us to think about a new perspective on the city (Offenhuber and Ratti 2014). A communication system that harnesses the data generated collaboratively in personal (sensor citizen), urban (cameras and sensors) and social (social network data) levels. A succession of strategic clues - physical and digital - that activate our sensory system formed by visual, audible, tactile and olfactory elements that establish active urban interfaces.

The city permeated by computing urban allows us to create new everyday interfaces. It is the fabric urban transformed in an urban ecology of interactions (Vassão 2008). And the information accessed in real time transform the city in an Metacity, the idea of a city updated by citizens in each connection, an environment daily sensitive that allow new forms of use and design (Fig. 2).

If a traditional system provides information to users such as correct direction, origin and destination, location and orientation within a building or in an external environment, with a guidance system can we anticipate potential situations or hazards (and escape safely in case of emergence), to obtain additional information about where we are, to search for historical content, to identify alternative paths or to define customized approaches to information. How can we note daily life in the great global center, the dematerialization of socio-economic-cultural exchanges and the consequent alteration of human activities in urban space? The geomedia and geoapps are our measuring instruments, annotation and location to give our everyday journey to the requirements we use the city in amplified form.

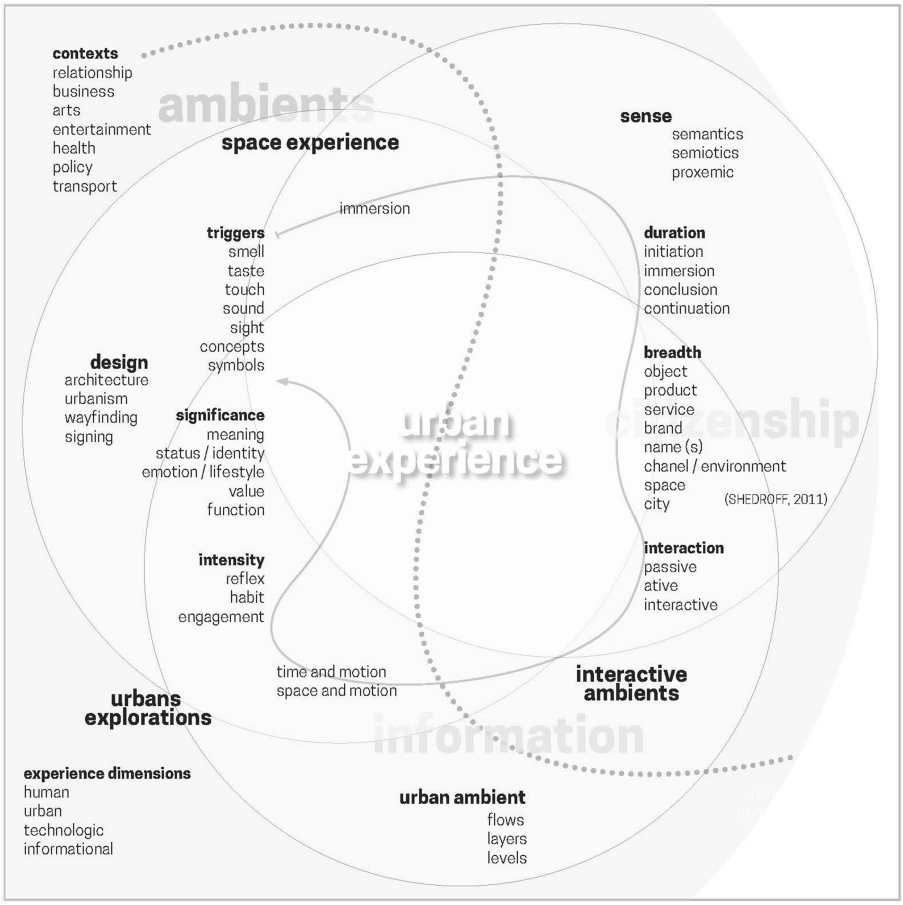

Fig. 2. Urban experience diagram.

2 Metacity

Our everyday imaginary has deconstructed the relationship between the sensory and the individual utilitarian by presenting the contemporary space as an informational system in this fluid and potential reality. The verification of the informational status of cities allows us to discuss the exercise of design for new and potential urban experiences. The areas of project knowledge were brought into question when modern thinking was deemed limited to meet the longings of contemporary societies. Natural domain of engineering, architecture, landscaping, urbanism, the city by the designers look can be thought of at levels customized for the individual, community and society, citizens and city dwellers. For design, the balance between several areas of knowledge and practice allows us to create conditions for change. Design can unite heterogeneous fields of thought by redesigning processes with each new data, with each new

information. Thus, we must reinvent our conceptions of city with tools of perception, design and interaction of an extended urban environment.

Adapting to uncertainty (Morin 2000) is to be prepared to act with quality in the projective process in a qualifying environment that allows the observation of the urban world in its latent state. This social experience allows us to incorporate into the projective processes the continuous learning of the history and experience of the community involved by the make-use-interact of a space in eternal change. The urban environment may seem out of the reach of a designer, but its projective process can approach the themes of the city in depth, because part of its performance and training, broad and general, is attentive to the individualities of people. People incorporated into the project are at the heart of the process, generating more accurate decision support. The radicant quality (Borriaud 2011) of the condition of its inhabitants permeates the urban environment of a volatile nomadism materialized as accessible information at any time and place of its human history.

Designers add value when working on an urban scale. Although the design has helped create the world we know, projects like the iPhone or Google search algorithm have the desire to make it simple and easy to use something unknown and complex. Urban design encompasses important issues for the city on a different level, its proximity to market, people, and citizen's everyday issues, enabling it to address certain issues from a different perspective.

Although the way to organize and construct the information continues with the modern basis of thought, the forms of expression, the digital tools, both hardware and software, have allowed to work in a more fluid and much more open design. Common projective methods, such as problem solving, prototyping and use testing, can be applied to help cities empower urban agents to increase infrastructure, governance, and quality of life.

Uncertain, unpredictable or turbulent environments call for a better understanding of their hidden dynamics, tendencies, and structures (Pizzocaro 2000). When designing for cities, we will certainly face a number of challenges to overcome. Design can help simplify objects and services, products that are easier to understand, more accessible and more relevant to our daily lives.

Redesign everything, the whole city, its objects and processes. When design operates in a world expanded by digital media, interfaces can venture beyond the physical space and technology, as well as the urban individuality itself. No more interaction between user and computer, but between many people and a common environment. We can act on several project fronts, whose construction of meaning and the structuring of new experiences will form this new reality. If our interactions in the city are mediated by networks, devices and applications, they acquire an expanded sense of human culture. The look is for the planet, but with urban eyes (Fig. 3).

The design of this city requires that we articulate different levels of knowledge by making the intellectual limits less rigid and the contents more accessible. This complexity cannot be experienced from within the boundaries of disciplines. It is experienced precisely at the intersections of various disciplines and fields of knowledge. From space to environment: the city is composed of narratives by the informational complexity, interaction, navigation and usability in its construction. In this sense, we can point out that design joins these processes of change capable of eliminating the

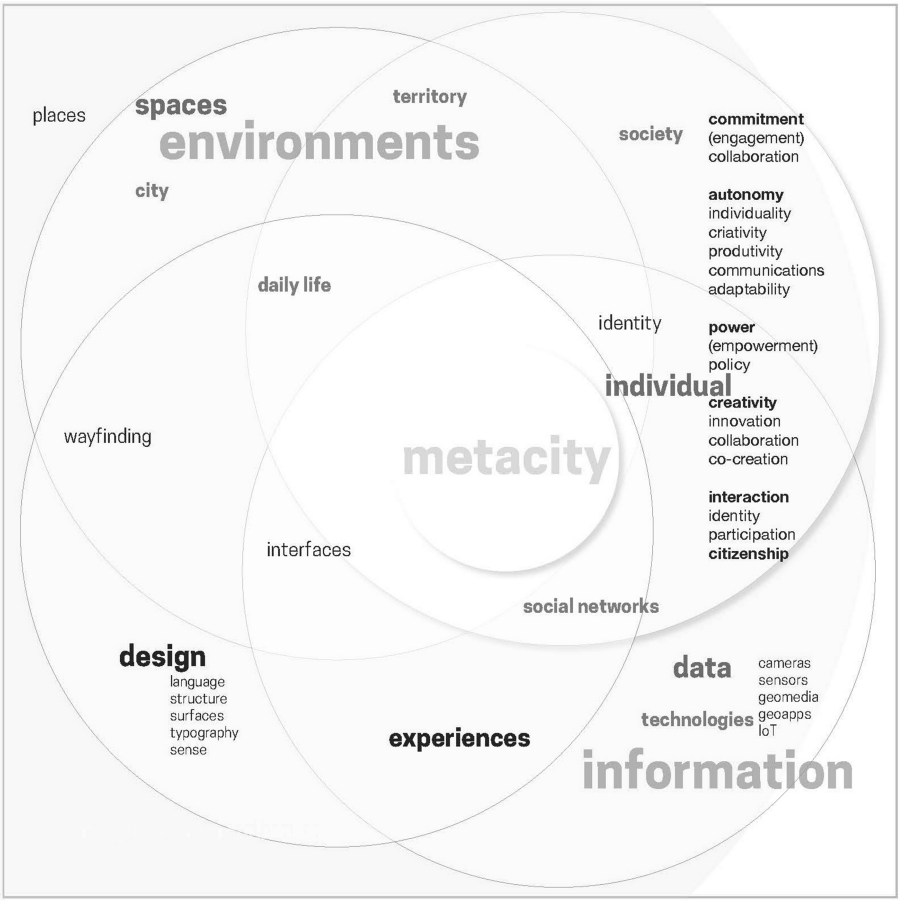

Fig. 3. Metacity, design, data and urbanity diagram.

boundaries between the natural and social sciences and the technological sciences. Design in its most basic form, the act of designing, can meet what we want in a city. In the environment, innovation involves variables, not restricted to the market: it articulates processes, supplies, materials and technologies (Pizzocaro 2000).

There is a great accumulation of technologies and we do not know where cities can go. What is expected of people's action is the occupation of this urban environment. From the metadata to the information we can use the sensing of the urban fabric to better understand our world, organizing, visualizing and articulating the knowledge of each person on Earth. The goal is to build new, instantaneous looks, enabling multiple observations of the bigdata contained in urban environments.

What else do we want to discover out of our lives from subsidies? In this urban environment, where geographical references and time are relativized, spaces fragment

and regroup momentarily in environments in which human culture is modified by building our urbanity.

The urban structures keep all the necessary information so that we can attend to the questions that are presented, they are places of action and reflection of its own original design added to the bigdata. The idea of Metacity incorporates the city as a propositional environment of diversified everyday realities, as a space in perpetual process of multiplication and expansion of its layers of meaning. Metacity is the environment of projective explorations that uses abundant urban data as a source and is permeated by information. It is the city whose physicality is increased by information flows to the intense technological evolution.

Metacity is what we imagine for our cities in the near future. An urban space, continuous and interlaced with information, new materials and projected forms; reflection and exercise of design for an urban informational ecosystem, whose object is the soaked space by the bigdata, shared at every moment and of political action. It is the opportunity for us artists, designers, architects and engineers to imagine an enlarged and responsive daily life for our personal needs. Metacity as our second nature is an urban process that is just beginning.

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