Urban Phenomenology: Incorporating Dynamic Frames of Reference in the Design of Urban OS

Christopher Grant Kirwan

kirwanc@newschool.edu

Abstract. Urban operating systems must incorporate different frames of reference, ranging from the macro to the individual point of view of the end users, each dimension influencing the organizational structure and behavior of the system. In the attempt to create a holistic, interdisciplinary approach to the complex task of designing urban operating systems, this paper applies the philosophical basis of phenomenology, and its schools of thought, to explore a unified theory and approach of the design of cities as living organisms and real-time technological operating systems, integrating human, environmental and technological dimensions.

Keywords: Collective Intelligence, Systems Thinking, Urban Operating Systems, Information Architecture.

1 Introduction

Cities are multi-dimensional, complex organisms, operating on different scales and understood from different perspectives. The physical urban fabric and infrastructure is evolving, requiring constant upgrading to meet the demands of public use and environmental change. Parallel, digital systems are necessary to process urban behavioral data providing critical information to manage operations and achieve sustainable urban systems. Key to how contemporary cities function is the way people are able to interact physically and virtually from both within cities and from outside since cities, now more than ever, are influenced from global patterns and linked to people and information from around the world.

Today, advanced technologies have allowed new possibilities for us to design and optimize the urban operating system, interconnecting the various levels of the system architecture and the convergence of the physical and virtual realms of cities. The intention of this paper is to challenge information architects, urban planners and user experience designers to consider how it may be possible to design complex urban operating systems allowing a holistic multi-dimensional and interdisciplinary approach, interrelating different realms of urban experience in beautiful, functional, and sustainable design solutions. As the theoretical backdrop, I have introduced the underlining concepts of phenomenology, the branch of philosophy that attempts to describe phenomena and how we experience things, to better understand how different dynamic frames

P.L.P. Rau (Ed.): CCD/HCII 2013, Part II, LNCS 8024, pp. 296–302, 2013.

of reference can be factored into the development of the urban operating systems (Urban OS) and the interconnected urban experiences that are both a contributing factor and result of the operating system.

2 Phenomenological Variations

Phenomenology has presented a range of theories that have advanced the Cartesian duality of mind and matter, exploring the complexity of understanding and describing experience from both the objective-empirical and individual-subjective point of view. This epistemological variation is reflected in contrasting investigations of Georg Wilhelm Friedrich Hegel and Edmund Husserl as early proponents of phenomenology. Hegel described what is represented through phenomena as the conscious experience related to the absolute objective understanding of things as a form of gestalt phenomenology. While Husserl explored what is represented as phenomena though consciousness and experienced from the subjective, individual point of view. Later, Maurice Merleau-Ponty defined phenomena as the experience of things unfolding via human intuition and a priori sensing, vis-à-vis the body in space.

Phenomenology has been co-opted for different reasons to describe reality and our perception of how things are experienced, spanning the natural, metaphysical and socio-cultural landscapes of reality. Gaston Bachelard, considered one of the fathers of postmodern thinking and Deconstructivism, challenged the empirical method in science by explaining phenomena through a unique linguistic fusion of scientific theory, mathematics, psychoanalysis and poetry. His works including La Poétique de L'espace (The Poetics of Space) inspired a generation of French philosophers and writers including Michel Foucault, Gilles Deleuze, Jacques Derrida, and Paul Virilio each of whom adapted phenomenology to articulate their own socio-cultural manifesto. Foucault argued that each period in history has possessed underlying conditions of truth that constituted what was acceptable as scientific discourse and that these conditions of discourse have changed over time, from one period to another.

The writings of German Philosopher Martin Heidegger, particularly Being and Time, have had a major impact on contemporary architectural theory and have influenced architects, planners and theorists including Christian Norberg-Schulz, Genius Loci: Towards a Phenomenology of Architecture, Christopher Alexander A Pattern Language and Kevin Lynch in The Image of the City. A common theme amongst their writings is the extension of phenomenology to the experience of place as the interchange between man, nature and the evolutionary patterns and symbolic form of man-made structures as a seamless, interwoven phenomena uncovered through the process of design.

The definition of phenomenology therefore has evolved from the absolute conciousness in Hegel's belief to the inclusion of the individual perception and subjectivity in Hussel's view, to an a priori embodiment in Merleau-Ponty's Phenomenology of Perception, to the Deconstruction of empirical understanding and phenomenology's influence on architecture and urban planning in describing a sense of place and

place-making. This evolution of phenomenological schools of thought has inspired the ideas presented in this paper applied to the understanding of urban phenomenology and a call to designers to incorporate the deeper philosophical framework for how we conceive, understand and describe urban phenomena in the design of urban OS.

3 Dynamic Frames of Reference

Operating systems of cities to-date have primarily been conceived and developed based on functional requirements. Therefore, the frame of reference of the system architecture has been objectified into the categories based on urban functions including security, transportation, energy, etc. From a formal standpoint these systems establish the modus operandi and determine the urban system's spatial, organizational constructs and system behavior. As an example, civil and structural engineering follows this logic as the urban infrastructure is built based on the empirical understanding of measurable and scientific principles of urban planning, engineering and construction. In the concept of dynamic frames of reference and the phenomenological approach, urban systems are conceived and designed to incorporate a wider and more complex set of conditions, from multiple sources and points of view including the macro system to the individual user experience, and from the physical infrastructure of the city to virtual networks. The system, therefore, must be holistic, functioning via a combination of the orderly categorization of components in gestalt system architecture, allowing the individual nodes to act independently with their own logic, while harmoniously integrated within the larger operating framework.

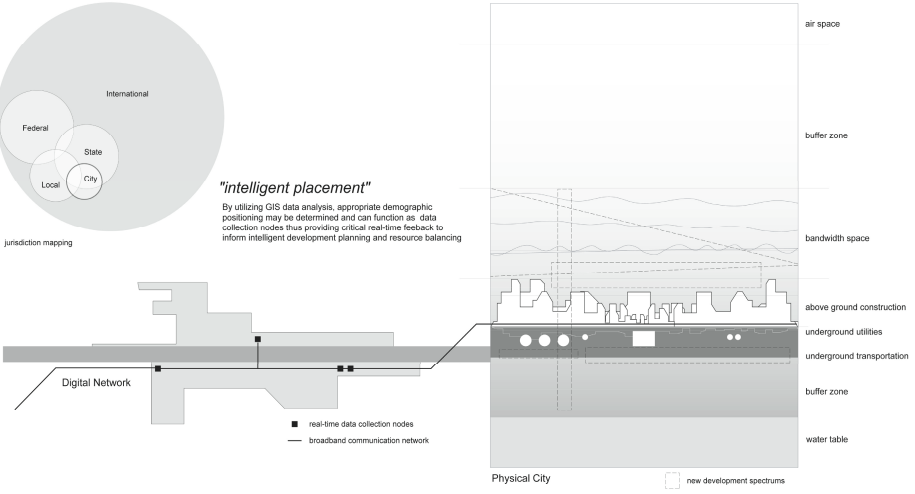

Fig. 1. Urban Spectrum – C. G. Kirwan, 2005

The city can be conceptualized as a metaphorical extension of the representation of the human body and brain[1]. The living city has similar requirements to the human body and can be understood as an anatomy represented by the biological functions of the systems i.e., skeletal, circulation, and digestion. Humans have understood and represented systems (cosmic and others) from a human-centric or anthropomorphic view, from early investigations in the Italian Renaissance, notably by Leonardo da Vinci, where man was conceived as the center of the universe and embodied in the advancements from linear perspective to futuristic cybernetic amalgamations. In the 20th century, Norbert Weiner, in his book The Human Use of Human Beings, defined the language of the control of animals and machines in the research and definition of cybernetics. Based on a mechanical view of the functional apparatus of the human body, responding to environmental stimuli with the brain as the controller, Weiner extended the anthropomorphic to a cognitive system, introducing a cybernetic process that could be connected to external systems, giving rise to the early computer operating systems.

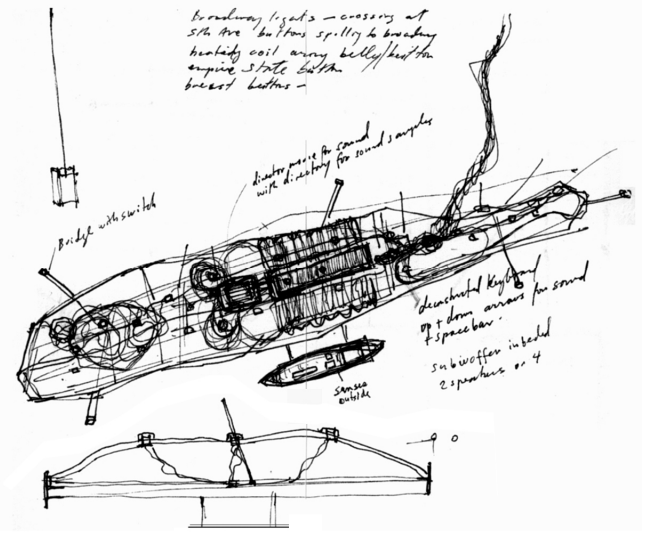

Fig. 2. Manhattan Anthropomorphic Interface – C. G. Kirwan, 1996

The real-time city is not unlike the brain-body relationship in the way that the city responds to empirical data and then adapts and executes actions based on the system logic. This cybernetic process has expanded the physical dimensions of the city to a vast virtual network in which a combination of data sources and public interaction provide real-time feedback, contributing to both the empirical and experiential phenomena of the living organism. The early developers of the ARPAnet understood,

[1] Miele, Paola, Jacques Houis, and Mark Stafford, eds. 2000. Being Human: The Technological Extensions of the Body. City: Marsilio Publishers.

centralized, corporeal based systems can be easily attacked and corrupted hence the advancements of decentralized systems that let to the Internet as a vast interconnected web and decentralized form. The comparison of how the physical city has evolved from early requirements of security and transportation and the virtual city has emerged from similar criteria, both represent metaphors of the city as an operating system yet are realized in completely different formal and experiential constructs. Urban OS have the potential to follow a linear-empirical model or a decentralized-rhizomatic model. The greatest challenge in the design of systems is this juxtaposition of the physical and virtual form and behaviors. Are they compatible? Do they represent the same thing? Does one control or supersede the other?

Today's trend in many professional fields is moving towards an integrated approach. This is especially useful in the development of urban operating systems since the system is now being understood from the combination of the system view and the individual users view. The convergence requires a dynamic frame of reference that must factor in the complexities of the city as a living organism that is simultaneously centralized and decentralized, static and dynamic, and responsive to changing patterns of social and environmental behaviors, each with different evolutionary tempos. The ability to shift frames of reference and to incorporate different methods of analyzing and describing the city and urban systems is a challenge since each professional field or area of research has its own logic and point of reference to understanding the operating system and layers of the city. Truly interdisciplinary practice is actually very difficult to achieve due to the objectives and motivators of each discipline. However, the field of architecture has been a good example as a profession that integrates engineering with design and aesthetics. In a similar way, information architects in designing urban operating systems architecture, must factor in a range of disciplines and methodologies from urban planning to user experience design, to address system-wide functions as well as user-centric applications.

Fig. 3. Urban Media Dubai – C. G. Kirwan, 2009

Urban OS incorporate the social (cultural), physical (environmental) and (technological) dimensions of the city as a form of collective intelligence; a system capable of addressing the extensive challenges required to manage and operate a city. In order to achieve this, operating systems must process massive real-time streams of human and environmental behavioral data. As a component of urban OS, urban interface is a layer of the operating system that is combination of data collection and data visualization, both capturing and monitoring data at the same time generating information that can be reprocessed into useful information and distributed to appropriate audiences

and applications[2]. Infostructure, a term I have introduced in 2009, is an example of this concept of urban interface in which public infrastructure: bridges, tunnels and highways are data mined for relevant and critical data to monitor and manage the infrastructure itself. At the same time, this data can be converted or recycled into useful and engaging information that can support the various users of the infrastructure whether operators or end users, allowing interaction to occur at different levels and serving different users requirements.

As citizens (netizens) become more and more active in the evolution of the virtual city, the internet and social media is shaping new urban frames of reference. In the paper Crowdsensing in the Web: Analyzing the Citizen Experience in the Urban Space, the authors elaborate on emerging social media frames of the city in which the city has begun to construct a virtual representation of itself with consequential reactions that in turn influence the evolution of the physical city[3]. Here lies the conceptual and phenomenological potential as dynamic frames of reference of the spatial, linear, physical city converge with the non-linear, rhizomatic, virtual city, combined to create a new hybrid urban reality.

Are there cites that are better at the convergence of the physical and virtual city? Is Seoul, for example, a good example of an integrated city since the city is both the center of the technology industry and at the same time a homogenous culture that has easily adapted to new media not to mention being the center of Smart City research & development? Or is São Paulo better at this convergence, as the city is rapidly emerging as a leading world economy with a growing and diverse population, sprawling urban developments, and with the upcoming FIFA World Cup driving advancements in media, technology and the promotion of the city as a leading destination. In fact, both cities offer different experiential opportunities, for the fusion of the physical and virtual, that uniquely combine dynamic frames of reference of spatial organization, physical architecture, virtual networks and urban media shaping the urban OS and phenomenological experience of the city.

4 Cities as Interdisciplinary Platforms – Design as Catalyst

Design plays a key role in establishing an open source, iterative process that allows for ideas and collaboration to stimulate interdisciplinary solutions that can simultaneously incorporate both macro systemic points of view and micro descriptions within the same framework. This is due to the organic nature of the design process. Unlike many other disciplines, design is able to adapt itself to each scale and context and to form a language inherently connected or drawn from that unique combination of

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[2] Foth. Marcus, Laura Forlano, Christine Satchell and Martin Gibb. 2012, From Social Butterfly to Engaged Citizen: Urban Informatics, Social Media, Ubiquitous Computing, and Mobile Technology to Support Citizen Engagement, Chapter 13 Urban Media: New Complexities, New Possibilities—A Manifesto, Cambridge, MA: MIT Press.

[3] Foth. Marcus, Laura Forlano, Christine Satchell and Martin Gibb. 2012, From Social Butterfly to Engaged Citizen: Urban Informatics, Social Media, Ubiquitous Computing, and Mobile Technology to Support Citizen Engagement, Chapter 19 Crowdsensing in the Web: Analyzing the Citizen Experience in the Urban Space, Cambridge, MA: MIT Press.

factors. Likewise, System Thinking[4] is an open-ended approach that the design process can utilize effectively as a methodology to conceptualize relationships and propose comprehensive solutions to complex urban problems. The design of cities and urban operating systems require this comprehensive, open-ended, integrated planning and design methodology that draws from strategies and expertise across different disciplines including urban planning, sustainable design, ecology, sociology & behavioral sciences, computer programming, media and interactive design.

Today, the expanded role of design and the emergence of social media and public interaction are having a profound effect on how cities are understood and planned. Social media has become an important real-time tool for citizens to be engaged and new urban behavioral patterns and lifestyles are forming as a result of urban populations connecting and sharing information via new affordable mobile technologies. The role of interdisciplinary planning and design, incorporating dynamic frames of reference, linking macro system-wide frameworks with the individual subjective user experiences and the physical city with the virtual, is now more possible by the advancements in new media technologies where potential seamless transitions can be delivered through new urban interface applications that combine mapping, streaming data, contextual content, augmented reality, and smart environments delivered via ubiquitous and artificial intelligence systems. Therefore the role of design and the application of a phenomenological approach can function as the bridge between empirical understanding and individual perception, macro-micro scales, and physical virtual dimensions in the design of the urban operating systems.

Acknowledgements. I am pleased to acknowledge the many students and faculty at Parsons The New School for Design, MFA Design & Technology Program and Tsinghua University, School of Art & Design for contributions to the research represented in this paper and in particular professors Zhiyong Fu and Sven Travis, faculty collaborators in ongoing research and design projects at both institutions. Finally, I would like to thank my father, Ernest Kirwan, AIA for his generous time as my advisor and intellectual sounding board.

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