Introduction

Microwaves bounce between billions of cell phones. Computers synchronize. Shipping containers stack, lock, and calibrate the global transportation and production of goods. Credit cards, all sized 0.76mm, slip through the slots in cash machines anywhere in the world. All of these ubiquitous and seemingly innocuous features of our world are evidence of global infrastructure.

The word "infrastructure" typically conjures associations with physical networks for transportation, communication, or utilities. Infrastructure is considered to be a hidden substrate—the binding medium or current between objects of positive consequence, shape, and law. Yet today, more than grids of pipes and wires, infrastructure includes pools of microwaves beaming from satellites and populations of atomized electronic devices that we hold in our hands. The shared standards and ideas that control everything from technical objects to management styles also constitute an infrastructure. Far from hidden, infrastructure is now the overt point of contact and access between us all—the rules governing the space of everyday life.

Picture the places where we live: the parking places, skyscrapers, turning radii, garages, street lights, driveways, airport lounges, highway exits, big boxes, strip malls, shopping malls, small boxes, free zones, casinos, retail outlets, fast food restaurants, hotels, cash machines, tract housing, container ports, industrial parks, call centers, golf courses, suburbs, office buildings, business parks, resorts. In the retinal afterglow is a soupy matrix of details and repeatable formulas that generate most of the space in the world—what we might call infrastructure space.

Buildings are often no longer singularly crafted enclosures, uniquely imagined by an architect, but reproducible products set within similar urban arrangements. As repeatable phenomena engineered around logistics and the bottom line they constitute an infrastructural technology with elaborate routines and schedules for organizing consumption. Ironically, the more rationalized these spatial products become the better suited they are to irrational fictions of branding, complete with costumes and a patois of managementese.1 This familiar confetti of brightly colored boxes nestling in black asphalt and bright green grass—the same in Texas or Taiwan—weaves elaborate, emotional stories about Starbucks coffee, Beard Papa cream puffs, and Arnold Palmer golf communities.

Now not only buildings and business parks but also entire world cities are constructed according to a formula—an infrastructural technology. We no longer build cities by accumulating singular masterpiece buildings. Instead the most prevalent formula replicates Shenzhen or Dubai anywhere in the world with a drumbeat of generic skyscrapers. Computer-generated videos that fly through shining skylines have become a standard signal of aspirations to enter the global marketplace. Here, manifest in these stock specifications, infrastructure is then not the urban substructure, but the urban structure itself—the very parameters of global urbanism.

Operating System

In Notre-Dame de Paris, Victor Hugo famously observed that "architecture [like that of the cathedral] was developed in proportion with human thought; it became a giant with a thousand heads and a thousand arms, and fixed all this floating symbolism in an eternal, visible, palpable form." The novel proposed that Gutenberg's new technology threatened the giant; the printed word usurped architecture as the vessel of cultural imagination and stole its supernatural power. Hugo prophesied, "This will kill that. The book will kill the edifice."

While evidence of infrastructure space within the contemporary city might appear to confirm the death of architecture, perhaps it really only demonstrates that the giant is alive again. Architecture

makes unique objects—like stones in the water—while a constant flow of repeatable spatial formulas constructs a sea of urban spaces. Architects and urbanists typically characterize this state of affairs as disempowering, but if architecture was indeed killed by the book, perhaps it is reincarnate as something more powerful—as information itself. Infrastructure space has become a medium of information. The information resides in invisible, powerful activities that determine how objects and content are organized and circulated. Infrastructure space, with the power and currency of software, is an operating system for shaping the city.

That operating system is something like the "medium" in Marshall McLuhan's famous dictum "the medium is the message." McLuhan highlighted the difference between the declared content of media—music on the radio or videos on the internet—and the means by which the content was delivered. The content, he argued, is like the "juicy piece of meat carried by the burglar to distract the watchdog of the mind."2 In other words, what the medium is saying sometimes prevents us from seeing what the medium is doing. In the urban context, we can identify the singularly crafted building—the stone in the water—as the declared content. Yet, the activity of the medium or infrastructural matrix—what it is doing rather than what it is saying—is sometimes difficult to detect. We might not think of space as an information technology unless it is embedded with sensors and digital media, and there is digital software to generate and analyze urban arrangements. Yet infrastructure space, even without media enhancement, behaves like spatial software. And while we also do not typically think of static objects and volumes in urban space as having agency, infrastructure space is doing something. Like an operating system, the medium of infrastructure space makes certain things possible and other things impossible. It is not the declared content but rather the content manager dictating the rules of the game in the urban milieu.

Infrastructure space is a form, but not like a building is a form; it is an updating platform unfolding in time to handle new circumstances, encoding the relationships between buildings, or dictating logistics. There are object forms like buildings and active forms like bits of code in the software that organizes building. Information resides in the, often undeclared, activities of this software—the protocols, routines, schedules, and choices it manifests in space. McLuhan's meme, transposed to infrastructure space, might be: the action is the form.

Extrastatecraft

Contemporary infrastructure space is the secret weapon of the most powerful people in the world precisely because it orchestrates activities that can remain unstated but are nevertheless consequential. Some of the most radical changes to the globalizing world are being written, not in the language of law and diplomacy, but in these spatial, infrastructural technologies—often because market promotions or prevailing political ideologies lubricate their movement through the world. These stories foreground content to disguise or distract from what the organization is actually doing.

Far removed from familiar legislative processes, dynamic systems of space, information, and power generate de facto forms of polity faster than even quasi-official forms of governance can legislate them. Large-scale spatial organizations like infrastructure projects (e.g., US rail in the nineteenth century, or global submarine cable networks) have long created the need for an administrative authority comparable to that of the state, and they continue to require direction from new constellations of international, intergovernmental, and nongovernmental players. As a site of multiple, overlapping, or nested forms of sovereignty, where domestic and transnational jurisdictions collide, infrastructure space becomes a medium of what might be called extrastatecraft—a portmanteau describing the often undisclosed activities outside of, in addition to, and sometimes even in partnership with statecraft.

For example, the world has dominant software for making urban space: the free zone—the formula that generates Shenzhens and Dubais all around the world. Some version of the zone is found in King Abdullah Economic City in Saudi Arabia, New Songdo City in South Korea, Cyberjaya in Malaysia, HITEC City in Hyderabad, and everywhere in between. Operating under authorities

independent from the domestic laws of its host country, the zone typically provides premium utilities and a set of incentives—tax exemptions, foreign ownership of property, streamlined customs, cheap labor, and deregulation of labor or environmental laws—to entice business. The world has become addicted to incentivized urbanism, and it is the site of headquartering and sheltering for most global power players. So contagious is this spatial technology that every country in the world wants its own free zone skyline.

While promoted as relaxed, open, and free from inefficient state bureaucracy, the politics written into the zone's spaces and activities often diverges from the declared intent. It is usually an isomorphic exurban enclave that, exempt from law, can easily banish the circumstances and protections common in richer forms of urbanity. Labor and environmental abuse can proceed unchecked by political process. Moreover, given its popularity, the zone has become a self-

perpetuating agent in the growth of extrastate urban space—space beyond the reach of state jurisdictions. Yet, at the same time, it has also become an essential partner for the state as it attempts to navigate and profit from the very same shadow economies. In this form of extrastatecraft, far from overwhelming state power, the zone is a new partner that strengthens the state by serving as its proxy or camouflage.

In addition to the zone, the global networks of broadband computing and mobile telephony are another pervasive and consequential field of infrastructure space. Mobile telephony is the "world's largest distribution platform," and the broadband infrastructure that supports it is touted as a resource as important as water. Between 2000 and 2013, the global number of cell phone subscriptions went from 740 million to 6.8 billion phones with over three-quarters of the phones in the developing world.3 East African countries like Kenya have only recently received international fiber-optic submarine cable. They are nevertheless using their large populations of mobile phone users to develop the world's newest business models. M-PESA, an app developed in Kenya that uses the mobile phone for exchanges of money, has become a global banking phenomenon. Advertisements for Safaricom and other telecoms in the region typically show Masai warriors, in full tribal garb, standing out in the savannah with a spear in one hand and a cell phone in the other, able to remotely access the world with an airborne technology.

Still, there is a disconnect between the stories and promises associated with the technology and what the urban space is actually doing. Both urban space and telecommunications are technologies and mediums of information. Fiber-optic cable buried in the ground gives land a new value much like a highway or railroad. Mobile telephony, while atomized and airborne, must nevertheless tap into that physical broadband network, and at these or any other switching points, a bottleneck or monopoly can develop. The position of the fiber in urban and rural areas or the character of new enclaves and roads are all spatial factors with the power to either amplify or diminish the access to information.

As Kenya has become an investment field for global telecoms, the state must also convene a ballooning number of other nonstate actors—intergovernmental institutions, consultancies, and nongovernmental institutions. All are hovering, advising, funding, researching, investing, and potentially controlling the urban space—offering expertise as well as outmoded forms that may foreclose on the real innovations to broadband urbanism. While Kenya is uniquely poised to make those innovations, its version of extrastatecraft must make spatial and digital software work together to enrich rather than obstruct information both realms.

Yet another field of infrastructure space, at once more immaterial and more ubiquitous, is able to contact any kind of infrastructure space anywhere in the world. If law is the currency of governments, standards are the currency of international organizations and multinational enterprises. ISO (International Organization for Standardization) is an extrastate parliament of this global standard-making activity. A private nongovernmental organization, convening both private companies and national representatives, ISO oversees global technical standards for everything from credit card thickness to dashboard pictograms, computer protocols, and the pitch of screw threads. Enhancing the influence of a raft of global organizations (e.g., The ITU [International Telecommunications Union], the IEC [International Electrotechnical Commission], the ICAO [International Civil Aviation Authority], NATO, the World Bank, the IMF, and the WTO), standards create a "soft law" of global exchanges.4

ISO's seemingly innocuous technical specifications dictate the world's critical dimensions, yet their most popular standard, ISO 9000, is a management standard that promotes the ritualized incantations of something called "quality." Quality standards do not dictate specifications for a

product but rather offer management guidelines for a process or quality system that may address everything from the environment to governance itself. ISO 9000 has been adopted as an essential credential in most countries of the world. ISO compliance is even a condition for the trading partners of EU countries. The whole world now speaks a dialect of ISO Esperanto, one that often resembles the hilarious, upbeat argot of self-help gurus.

While lacking any specific content or binding requirement, ISO is a perfect conduit of undeclared activities and intentions with potentially dangerous consequences. Companies may be certified as responsible players with regard to labor or the environment without having to abide by any global compact regarding, for instance, worker safety or dangerous emissions. Of all the things ISO addresses, remarkably the organization offers almost no standards that directly address the conflicted global frontiers of infrastructure space—where formulaic urban space confronts sensitive landscapes, failed economies, and complex political situations. Yet both the failure of ISO to create more consequential standards as well as its success in shaping global habits inspires a rehearsal of spatial protocols that join the bargains and offsets of contemporary global governance.

Space

While space may be enormously consequential in these infrastructure developments, private enterprise and other forces of extrastatecraft often speak in other technical languages. The financial industry quants format the housing landscapes, the carbon market regulates rain forest landscapes, informatic specialists shape the mobile telephony technoscape, McKinsey consultants offer econometrics, and ISO intones management jargon. Political and economic data come cloaked in the rationality of science even though they may really present false logics or systems of belief. Despite its relative physical durability—infrastructure space is often only regarded as a byproduct of more volatile markets and political games. Who is treating space itself as information? Who is writing the software or the protocols in which spatial variables take the lead?

The interaction of people and technology in the development of social/technical networks like infrastructure already calls on several areas of theory and scholarship, among these: social sciences, arts, business history, science and technology studies, history of science, organization studies, informatics, media and communication studies, architecture, and urbanism. Some of the most innovative thinkers in these disciplines now insist on stretching disciplinary habits to question the authority of their science or the purity of their master narratives. Rather than reinforcing the presumptions of theory, they want to discover what is actually happening on the ground. Not only the sciences, but also the arts of architecture and urbanism contribute to the conversation at this juncture. In the search for a more complex context, infrastructure space may be a fresh and potent field of evidence.

This book visits three different strata of infrastructure space: the free zone phenomenon, broadband mobile telephony in Kenya, and ISO's global management standards. Each is a crossroads of transportation, communication, management, trade, and development networks. Each addresses a pressing contemporary issue in infrastructure space while also harking back to the late nineteenth century when the growth of international infrastructure, organizations, and corporations began to accelerate and global travel and communication times began to shrink (the Suez Canal and the US transcontinental railroad were both completed in 1869). Each visits infrastructure space in developing countries to find new intelligence on the flip side of this early infrastructure history. And each is a potential test bed for spatial software.

Exposing evidence of the infrastructural operating system is as important as acquiring some special skills to hack into it. Interspersed between evidentiary chapters are more contemplative chapters. Ranging more freely over other examples of infrastructure like rail, internet, and mass-produced suburbs, these chapters dwell on an expanded repertoire of form-making, history-telling, and activism. Together they consider the art of designing interplay between spatial variables—an interplay powerful enough to leverage the politics of extrastatecraft.

Mark Twain, once a steamboat captain on the Mississippi, developed techniques for navigating the river. While the passengers saw "pretty pictures" of landscape scenes, he was extracting information from the changing "face of the water." A little ripple, eddy, or "faint dimple" signaled turbulence or obstacles in a complex and potentially dangerous organization below the surface. These were markers of unfolding potentials or inherent agency in the river—what can only be called its disposition. Disposition is the character or propensity of an organization that results from all its activity. It is the medium, not the message. It is not the pattern printed on the fabric but the way the fabric floats. It is not the shape of the game piece but the way the game piece plays. It is not the text but the constantly updating software that manages the text. Not the object form, but the active form.

For each technology in infrastructure space, to distinguish between what the organization is saying and what it is doing—the pretty landscape versus the fluid dynamics of the river—is to read the difference between a declared intent and an underlying disposition. The activities of a technology may be difficult to see even though, given the ubiquity of infrastructure space, they are hidden in plain sight. Examining each one, each active form—like each dimple or ripple on the water or each bit of code in the software—makes it more palpable. Detecting and developing the active forms that shape disposition is an essential skill of the urbanist in infrastructure space, and it is the topic of a chapter following the discussion of free zones.

Examining the power of the stories, persuasions, or ideologies that accompany a technology also helps in detecting disposition. For instance, infrastructure has often been groomed as either an instrument of militarism, liberalism, or universal rationalization. Yet we might question the dominance of these stories in organizing history. The pyrotechnics of war may distract from other more insidious forms of violence; theories of economic liberalism may ironically generate profound constraints on freedom; and dreams of universal rationality may sponsor their own special forms of irrationality. Well-rehearsed theories, like those related to Capital or neoliberalism continue to send us to the same places to search for dangers while other concentrations of authoritarian power escape scrutiny. Moreover, the less dramatic or upstaged histories—regarding the growth of international organizations, the division of the radio spectrum, or the creation of satellite, fiber-optic, and mobile telephony networks—have often been treated as bureaucratic or technical footnotes, despite the long-term impact these developments have had on our lives. Shaping and managing the story is then also an essential skill in infrastructure space. A chapter about these persistent ideological stories follows the examination of broadband.5

Following the discussion of ISO, the final chapter considers an enhanced repertoire for political activism tuned to more effectively address the powers of infrastructure space. The most familiar forms of political activism demand declaration. Yet, while there are moments in which to stand up and give it a name, dissent is often fooled by the sneaky way the world works, as the real power players maintain a currency in undeclared activities. Infrastructure space constitutes a wilder mongrel than any familiar Leviathan for which we have a well-rehearsed political response. The things that make infrastructure space powerful—its multipliers (e.g., zones, cell phones, spatial products), its irrational fictions, or its undeclared but consequential activities—are perhaps the very

things that make it immune to righteous declaration and prescription. The rational, resolute, and righteous, while cornerstones of dissent, are sometimes less consequential than the discrepant, fictional, or sly. Infrastructure space tutors a shrewder, cagier counter to the lubricated agility of most global powers—an alternative extrastatecraft.

1For a discussion of spatial products, see Keller Easterling, Enduring Innocence: Global Architecture and Its Political Masquerades (Cambridge, MA: MIT Press, 2005).

2Marshall McLuhan, Understanding Media: The Extensions of Man (New York: McGraw-Hill and London: Routledge & Kegan Paul, 1964, 2001), 19: "For the 'content' of the medium is like the juicy piece of meat carried by the burglar to distract the watchdog of the mind."

3"A 2010 Leadership Imperative: The Future Built on Broadband" (ITU, The Broadband Commission for Digital Development, 2010); Mohsen Khalil, Philippe Dongier, and Christine Zhen Wei Qiang, "Overview," in Information and Communications for Development: Extending Reach and Increasing Impact, ed. World Bank Development Data Group and World Bank Global Information & Communication Technologies Dept. (Washington, DC: World Bank, 2009); ITU, "World Telecommunications/ICT Indicators Database, 17th Edition," June 17, 2013, at itu.int.

4Nils Brunsson and Bengt Jacobsson, "The Pros and Cons of Standardization—An Epilogue," in Brusson and Jacobsson eds., A World of Standards (London: Oxford University Press, 2000), 171; Peter Mendel, "The Making and Expansion of International Management Standards: The Global Diffusion of ISO 9000 Quality Management Certificates," in J. W. Meyer, G. S. Drori, and H. Hwang, Globalization and Organization: World Society and Organizational Change (Oxford: Oxford University Press, 2006), 137–66.

5This discussion of the stories that attach to infrastructure space gestures to a few terms (e.g., script and narrative) already in play in a highly developed discourse about the reciprocity between social and technical networks—one that will be more fully engaged in the course of the book. For just two of many titles that contribute to this discourse, see Bruno Latour, Reassembling the Social: An Introduction to Actor-Network Theory (Oxford: Oxford University Press, 2005) and David E. Nye, Electrifying America: Social Meanings of a New Technology (Cambridge, MA: MIT Press, 1990).