Chapter 1

Cities of Our Dreams

EL DORADO, Atlantis, Shambhala, Avalon, Xanadu, and Shangri-La. Those fabled places inspire our dreams. They are fantasies that nourish our imagination, spark our curiosity, and embolden us to envision what could be.

The smart city is a modern myth, a dream for our time. It's an archetype and an ideal, formed in the realm of our collective unconscious. It's a magical place we long for, a vision shimmering in the distance and yet embedded deeply in our psyche.

For those of us who love cities, the smart city is where we want to live, work, play, raise a family, start a business, or simply stroll around on a pleasant day. The smart city inspires genius and originality. It also offers tranquility and peace.

This book approaches the smart city from the perspective of the human spirit. In the chapters ahead, you will learn

about people using technology, rather than about technology itself.

This is a book for dreamers and visionaries. We invite you to dream along with us and to imagine the world your children and grandchildren will inhabit.

Today, more than half of the world's population lives in cities. The most urbanized regions of the world are North America (82 percent of the population lives in urban areas), Latin America and the Caribbean (81 percent), Europe (74 percent), and Oceania (68 percent). Africa remains mostly rural, with only 43 percent of its population living in cities.

About half of the population of Asia now lives in cities. That proportion will surely grow as Asian economies modernize and expand. Asia is still comparatively rural, but that won't be the case for much longer.

Inescapably, we are becoming an urban planet. From 1950 to 2018, the urban population jumped from 751 million to 4.2 billion. By midcentury, two-thirds of us will be urbanites. Cities will grow in size and scale; by 2030, the world will have more than 43 megacities with populations of at least 10 million.[1] Clearly, the world of tomorrow will be a world of cities (Figure 1.1).

Urbanization is not a new trend; people have been migrating to cities for millennia. What's changed? The velocity of migration has accelerated significantly. "Three or four thousand years ago, you needed an oxcart and a brave heart

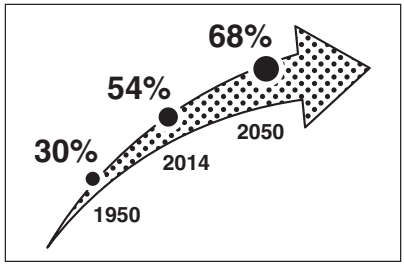

Figure 1.1 Global urban population growth
Source: Population Division of the Department of Economic and Social Affairs of the United Nations, World Urbanization Prospects: The 2018 Revision (New York: United Nations, 16 May 2018).

to make the arduous journey from the hinterlands to the nearest walled settlement," we wrote in *Smart Cities, Smarter Citizens*. "Today, you can take an airplane from practically anywhere and arrive at the city of your choice in hours."[2]

What *hasn't* changed? The basic socioeconomic drivers are the same. For as long as there have been cities, city living has been considered a step up from the countryside. Cities offer more economic opportunities, higher standards of living, more services, better health, and more access to culture than rural communities.[3] That's why people move to cities.

In addition to being generators of wealth, cities possess intrinsic value. Small patches of urban real estate are worth much more than similar patches of land in rural or suburban areas. For investors, city land is a hot commodity.

A detailed study by economists at the University of Illinois and the University of Michigan estimated that 76,581 square miles of urban land in the United States is worth roughly

$25 trillion. That works out to approximately $511,000 per acre. As the study's authors observe, a typical fifth-acre residential lot is worth about $100,000 and a typical parking space is worth $2,000. The most expensive urban real estate in the United States is found in central Manhattan, where land is valued at $123 million per acre.[4]

Part of the reason for the sky-high value of city land is simple economics: The demand for urban space is rising, and the supply of urban space is limited by physical constraints.

The high cost of urban real estate is also driven by desire. Cities work on our emotions and excite our passions. They are magnets for people and businesses; they offer intangible benefits that generations of poets, songwriters, and novelists have tried to capture.

In *The Warhol Economy,* Elizabeth Currid observes how cities "attract the human capital that drives the economy." Currid's book focuses on New York City, yet her insight can be applied globally. In addition to providing ample opportunities for face-to-face contact, cities offer "dense networks of both collaboration and competition" that are necessary for maintaining strong and vibrant economies.

Cities provide the critical mass necessary for generating life-altering opportunities and learning experiences. When we confront other human beings, make eye contact and engage with strangers, we become sharper, smarter, and more confident. That's why city folk often seem to have an "edge." We're proud of our abilities to discern instantly

between someone who is merely odd and someone who is potentially dangerous.

Metropolitan habitats provide the vital sparks that enliven our existences. Jon Jennings, the city manager of Portland, Maine, calls the city's quality of life its "secret sauce." When Portland decided to use advanced technologies, such as radar sensors and artificial intelligence to reduce traffic congestion, its goal was improving the lives of its residents and making it easier for tourists who support the local economy to navigate city streets.

For Jennings, the smart-city movement is about rebuilding trust in government and providing better municipal services. It's also about helping cities adjust to the needs and expectations of a new generation.

"We're all busier. We all lead active lives. We would all prefer to have fewer hassles," Jennings says. "Today, we have expectations that we can get things done immediately, or at least more rapidly than was possible in the past. When we apply new technologies in Portland, we're doing it to make people's lives easier."

What Makes a City Smart?

What is a *smart* city and how is it different from our traditional notion of a city? There is no single definition for a smart city. The term itself is a moving target; no one can agree on exactly what it means.

At minimum, it's a technologically enabled version of what urban activist and writer Jane Jacobs described as a "fantastically dynamic" place, a "fertile ground" for millions of people who hope and plan for better lives.

A smart city encourages people to walk, meet, talk, and congregate on streets, in shops, and in public spaces. It's a place where people interact easily, effortlessly, and joyfully with each other and with their environment. It's a place of random informal interactions, serendipitous meetings, and spontaneous relationships.

Most of all, it's a place where people feel safe—not because they are surrounded by cops and cameras, but because the city's cyber-physical infrastructure is designed intentionally for the purpose of creating an atmosphere of trust, community and shared responsibility.

Smart cities make it easy for people to travel from one neighborhood to another. They provide a mix of transportation solutions that reduce traffic congestion and diminish harmful emissions from vehicles.

They provide seamless broadband and Wi-Fi coverage. In a smart city, there are no dead zones and no dropped calls. Free charging stations are conveniently placed; no one worries about the batteries in their phones dying.

Smart cities take energy efficiency to the next level; they generate more power than they consume. Smart cities grow their own food and manufacture products from recycled

materials. They measure water usage by the drop and conserve natural resources by the ton. They're miserly, yet in a good way—in a smart city, nothing goes to waste.

Smart cities have solar-powered smart trash bins that signal when they're getting full. That might not seem like a big deal, but smart trash bins save cities millions of dollars annually by reducing the costs of collecting garbage.

Smart cities have smart streetlights equipped with sensors that spot potholes, measure traffic flow, listen for gunshots, and help drivers find empty parking spaces.

They have smart systems that make it easy for citizens to obtain permits and licenses without having to stand in line at city hall. They remove the friction and complexity from processes, such as paying taxes, registering children for school, and finding health care for an aging parent.

Cities on a Hill

There's a lot more to smart cities than fixing potholes and providing excellent broadband coverage. Smart cities are living laboratories. They are role models and exemplars. They are explorers and pioneers, navigating a course for the future of humankind.

Smart cities deal head on with thorny modern problems, such as transportation, energy efficiency, education, public safety, public health, citizen engagement, privacy, immigration, economic inequality, climate change, and cybersecurity.

These are problems that cannot be sidestepped, downplayed, or delegated to higher authorities. In many instances, cities and towns have little choice but to step up and create their own solutions. They must do or die.

Smart cities are co-synchronous with *new localism*, a movement based on the belief that many problems are best solved at local levels. That might not seem like a particularly revolutionary idea, yet it's a significant departure from the 20th-century maxim that big government is the answer to all problems, large and small.

Today, the methods of big government are under attack. There's been a shift in thinking, especially in the realm of problem solving. In the decades following World War II, urban planning methods reflected the era's bias for command-and-control hierarchies. Plain-vanilla projects that neither pleased nor offended anyone were built in cities all over the world.

Much of the urban planning from that era was based on a shaky foundation of misconceptions and prejudices. It assumed that crowded streets were bad, that cars were good, and that poor people should live in soul-crushing, high-rise apartment projects. Postwar urban planning was epitomized by legendary figures, such as Robert Moses and Le Corbusier, who sought to eliminate the natural chaos of city life and replace it with something more orderly and manageable.

That postwar approach emphasized grand scale and epic proportions. It assumed that if a project was important, it must be big—and if a project was big, it must be important. That

kind of circular reasoning was used to justify decades of bad urban planning.

For cities, smallness is an asset. Cities are naturally limited in size, which turns out to be an advantage. They don't have to solve problems on a huge scale. They don't have to devise enormous projects. They can afford to think small.

Most of the projects we describe in this book are practical, functional, and human centered. Some of them involve amazing feats of technological prowess, although many of them are small and simple. Several are built on the ruins of previous ideas that failed because they were too grand or too far ahead of their time.

A New Approach to City Planning

Smart cities are beneficiaries of a new method of urban planning that emphasizes collaboration, co-creation, crowdsourcing, and grassroots efforts. The new method combines bottom-up innovation with cross-functional insight to create entirely fresh and original solutions for complex problems. It focuses less on grand strategy and more on tactical solutions.

The new method is informed and influenced by software development techniques, such as Agile and DevOps, and by design thinking, a process that starts by exploring the problems of people in the real world and working backward to develop practical solutions. The new method uses rapid lightweight prototyping, pilot projects, pop-ups, and virtual reality to evaluate, refine, and continuously improve ideas before they're launched.

The new method is firmly rooted in data science, which allows cities to rigorously test new ideas and predict in advance which are most likely to succeed in the real world.

Smart cities use data science to determine the size and location of pocket parks, playgrounds, sidewalk extensions, community gardens, pedestrian malls, bike paths, and traffic circles. Instead of simply guessing where those amenities are needed, smart cities use data to generate predictive models—and then they test the accuracy of the models before moving forward.

Thinking beyond Technology

Smart cities of the 21st century are enabled by modern digital technologies; that is a given. Technology alone, however, doesn't make a city smart. The technology must be fully integrated and deeply woven into the fabric of the city. It can't be an afterthought or a thinly applied veneer. It must be an active component, thoroughly baked into the city's infrastructure and inseparable from the daily experiences of city life.

Technology isn't something bolted on at the last minute, it must be part of an overall solution designed to meet the needs of people. Imagining, designing, building, and managing smart cities is an interdisciplinary effort requiring input from experts and stakeholders from multiple industries and economic sectors.

"It takes more than just cramming technology into cities," says Kevin Fan Hsu, co-founder of the Human Cities Initiative at Stanford University. "It takes intelligent planning to build

cities that are responsive and adaptive. Cities are communities of human beings with distinct needs, hopes, and aspirations. Today, urban design arises from collaboration with communities. It's no longer a top-down vision imposed from above."

Smart cities follow the basic principles of design thinking and human-centered design, which prioritize the needs of people and use science to guide the development of projects. Smart cities favor neighborhood initiatives over grandiose master plans; they know the quality of life in a city depends on healthy streets, vibrant shops, and a diversified economy.

Looking Backward

When we think of smart cities, we tend to think in futuristic terms. We often use the language and iconography of futurism to express our visions of what a smart city should look like. But we should also look to the past for lessons and examples of how previous generations handled the challenges of planning and developing urban spaces.

In the mid-19th century, Baron Georges-Eugène Haussmann transformed Paris from a medieval collection of sprawling neighborhoods into one of the world's first genuinely modern cities. He used the tools and techniques of his day—parks, public squares, large monuments, axial roadways, sewers, water-distribution systems, and standard cornice lines—to complete the city's transformation (Figure 1.2).

At roughly the same time, Ildefons Cerdà, who coined the term "urbanism," was planning the expansion of Barcelona. Cerdà designed an orthogonal grid for the city's new streets,

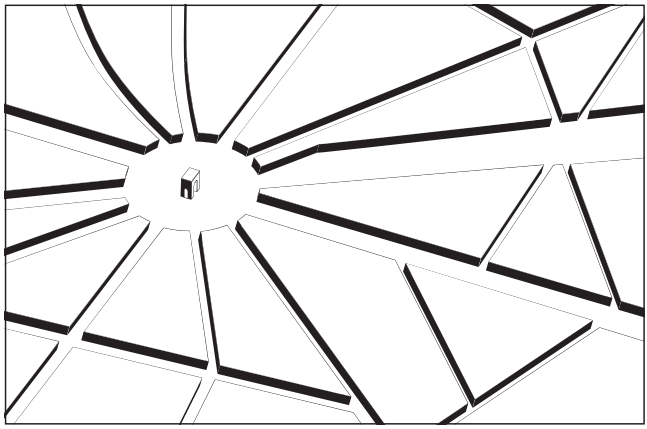

Figure 1.2 Radial street design in Paris
Source: Burt Myers.

which created a sense of order and clarity. He also had the sidewalks cut at a 45-degree angle at street intersections (known as "chamfered corners"), an innovation that created mini plazas with shops and services all over the new part of the city (Figure 1.3). Cerdà was a transportation expert, and

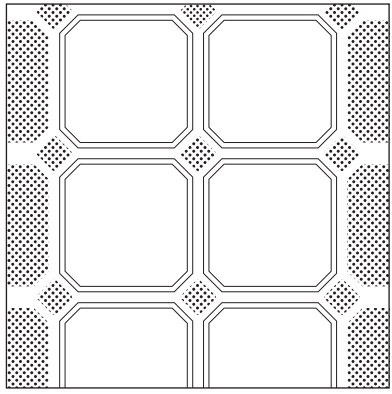

Figure 1.3 Chamfered corners in Barcelona
Source: Burt Myers.

he planned the streets and avenues of the expansion with traffic in mind.

Visionary planners such as Haussmann and Cerdà serve as vivid reminders that smart cities are created by smart people. Both men had a deep understanding of the cities they were tasked with redesigning, and they used the tools at hand to bring their visions to life.

In today's cities, "smart" and "high-tech" are not necessarily synonymous. Most smart-city projects don't require advanced degrees in engineering or terabytes of computing power. Our research shows the primary requirements for creating successful smart-city projects are deep knowledge of local problems, imaginative thinking, thorough research, good planning, bold action, and persistent follow-through.

Bicycle-sharing services in Madrid, 100 miles of running trails in Portland, Oregon, banning automobile traffic in New York's Central Park, and providing free public transit in Tallinn, Estonia, are all examples of smart-city projects driven primarily by local governments or community groups responding to the needs of citizens. In most cases, technology is an enabler, not a motivator.

Smart by Necessity

The island of Singapore learned early that it could leverage science to control its destiny. Formed as an independent republic in 1965, the industrious city-nation is home to more than 5.9 million people.[5] Singapore has few sources of fresh

water and depends on nearby Malaysia for most of its drinking water. That's a problem because Singapore's contract to import water from Malaysian state of Johor expires in 2061. By then, water demand in Singapore will have roughly doubled from its present level of 430 million gallons per day.

Soon after its formation, Singapore began experimenting with water reclamation to produce "industrial water," which is nonpotable water used by businesses. Singapore's experiments have since blossomed, resulting in an ongoing series of innovative techniques and processes for reclaiming water, ranging from desalination of seawater to meticulous recycling and rain catchment. "We attempt to catch every drop of rain that falls in Singapore," Peter Joo Hee Ng, chief executive of PUB, Singapore's national water agency, told Nick Michell of *The Source*.[6]

In 2003, following many years of experimentation and development, Singapore introduced NEWater to the public. NEWater is ultraclean water recycled from treated sewage in a "rigorous three-step purification process involving ultrafiltration/microfiltration, reverse osmosis (RO), and ultraviolet (UV) disinfection," according to an article published by the World Economic Forum.[7]

NEWater is pumped into the city's reservoirs, where it's mixed with rainwater before being treated and made available for direct consumption. Singapore expects water from its NEWater and desalination plants to meet up to 85 percent of its future water needs.[8]

Meantime, Singapore isn't standing still. The city-nation continues to refine its water processing capabilities, and sends promising students to doctoral programs where they can learn the newest techniques for treating and reclaiming "used" water.[9]

By necessity, Singapore has become a global leader in water reclamation science. Yet water purification is only one of many areas in which the city-nation applies innovative technologies to help its citizens.

With ongoing projects for improving and transforming health care, transportation, education, public safety, housing, and elder care, Singapore is justly called the "smartest of smart cities." It's also consistently ranked among the top nations in the Human Development Index,[10] a data-driven study produced annually by the United Nations.

Singapore's careful calibration of the social, economic, and physical needs of its residents is a key part of its remarkable success as a nation and a city.

Public-Private Partnerships

Smart-city planning depends on strong and healthy relationships between the private and public sectors. "Planning should be defined as public action that generates a sustained and widespread private reaction," writes Alexander Garvin in *The American City: What Works, What Doesn't*.

As Garvin correctly observes, a project cannot be considered successful unless it has a positive impact on the community around it. Cities are complex amalgams of public and commercial enterprises; smart-city initiatives must be designed with both constituencies in mind. Many of the examples described in this book are the results of public-private partnerships, which are absolutely essential to the development of smart cities.

Public-private partnership is not a new idea. New York City's first subway system was a public-private partnership. Haussmann's rebuilding of Paris was financed through public-private partnerships.

In addition to providing alternative methods for raising capital, public-private partnerships can accelerate the pace of developing and implementing smart-city projects. The Dallas Innovation Alliance, for example, has successfully launched nine projects in the city's West End District, a historic neighborhood that had experienced a deep economic downturn in the early 2000s.

The alliance focuses on gathering data and presenting it to city officials to speed their decision-making processes. "We try to get all the players together in a room and we take a 'best minds' approach to solving problems," explains Jennifer Sanders, co-founder and executive director of the alliance. "As a free-standing nonprofit, we're able to move quickly. We don't get caught in the shuffle that often slows down projects. One of our main roles is providing evidence that justifies larger-scale deployments of smart-city projects."

In 2017, the alliance created the Smart Cities Living Lab for the West End district. The lab is a test bed for smart-city initiatives, providing a transparent and repeatable process for evaluating projects. One of its most successful projects was the installation of small beacons that measured pedestrian traffic in the district.

"We were able to measure foot traffic and share the information with members of the local business association. The beacons revealed unexpected spikes in pedestrian traffic, which enabled local businesses to adjust their hours and tweak their marketing to attract more customers," Sanders says.

Another project involved replacing the district's sodium halide streetlamps with light-emitting diodes (LEDs). In addition to saving energy and increasing safety, the lights can be controlled remotely.

"There's a popular restaurant in the district with a patio. One of the new streetlights was shining directly on the patio, making patrons uncomfortable. We called the city, explained the situation and they reduced the intensity of the light by 30 percent," Sanders recalls. "Some cities have had situations where streetlights were shining into apartment buildings, making it difficult for residents to sleep. With the LEDs, cities can dial down the intensity, allowing people to sleep better at night."

The LEDs send signals when they're broken or in need of replacement, which reduces the amount of time city

inspectors spend looking for broken bulbs. The new LEDs lower the city's labor and fuel costs, and diminish the city's carbon footprint.

The aggregate impact of the Living Lab has been positive, Sanders says. Residents and visitors to the West End feel safer and more connected, local businesses are serving more customers, and the district's spirit has become noticeably more upbeat.

"Public-private partnerships are becoming increasingly critical at the city level," Sanders says. "They help cities move initiatives quickly and implement high-value infrastructure projects at city scale, without relying on traditional approaches." The goal, she says, is executing projects that involve limited upfront capital expenditures, which then allows cities to focus on optimizing operations.

PPPs, as they are called, are emerging as essential components of smart-city development. In the past, financing capital projects required cities to borrow large sums of money, usually by issuing municipal bonds. PPPs allow cities to leverage private capital without the encumbrances and delays associated with traditional methods of municipal financing.

Open Data

Open data, which is any kind of public data that can be easily downloaded and analyzed by any groups or individuals, also plays an important role in smart cities. Open data includes

building permits, unsealed court records, real estate transactions, government spending, water usage, air quality, and census data.

Vision Zero, a global project for eliminating all traffic fatalities,[11] relies primarily on the rigorous analysis of public data on traffic accidents. Smart cities in Europe and North America use Vision Zero strategies to make streets and roads safer for walking, cycling, and driving (Figure 1.4).

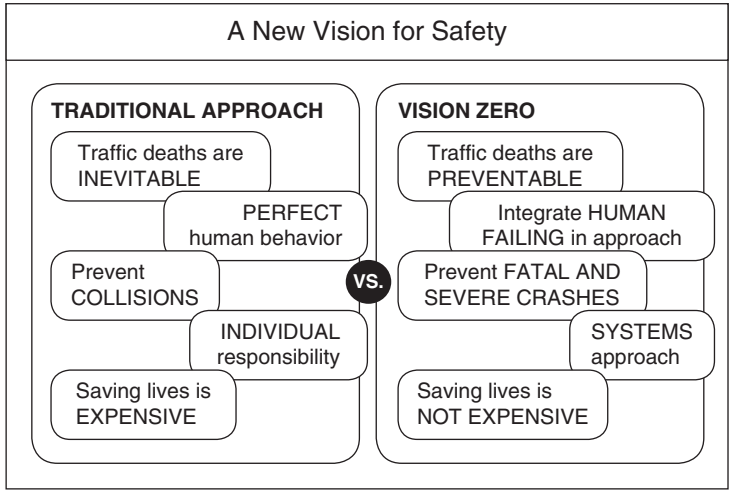

Figure 1.4 Vision Zero strategy for reducing traffic fatalities
Source: Vision Zero.

Open data is also reducing deaths from home fires in the United States, where three of every five home-fire deaths occur in homes with no smoke alarms or no working smoke alarms.[12] In Washington, D.C., data scientists from DataKind, a global nonprofit based in Brooklyn, New York, partnered with the American Red Cross to develop the Home Fire

Risk Map,[13] an online resource that targets high-risk homes for smoke alarm installations and fire-safety education.

The map began with a DataDive—a weekend during which volunteers from DataKind partner with a nonprofit to solve a problem. In this case, dozens of DataKind DC volunteers partnered with eight American Red Cross staffers on what eventually became a yearlong project fueled by open data from the American Community Survey and the American Housing Survey (aggregated and collected by the Enigma Smoke Signals project[14]), data from the National Fire Incident Reporting System,[15] and Red Cross home-fire preparedness and response data.

Here's a brief excerpt from a DataKind blog post describing the project:[16]

> *First, our volunteers built a model that predicts which communities have the least amount of smoke-alarm coverage. Then we went a step further by assessing home-fire prevalence to see where fires are most likely to occur in the future. Since we especially want to protect inhabitants, we built a third model that predicts the likelihood of an injury or death when a home fire does occur. All of these models are encapsulated within the Home Fire Risk Map.*

Organizations, such as DataKind—which has chapters in Bangalore, San Francisco, Singapore, the UK, and Washington, D.C.,—are key players in an emerging ecosystem of people, processes, and technologies supporting the smart-city movement.

They also represent a new style of hands-on citizen engagement and civic commitment occurring at the grassroots level. For years, community activists have held bake sales, car washes, rallies, and parades. In smart cities, they'll also hold hackathons, coding fairs, and DataDives.

Skin in the Game

Smart cities are at the vanguard of the new approach to solving urban problems. They are far more flexible, agile, and responsive than national governments. If there are solutions to the world's hardest problems, smart cities will find them first.

In almost every imaginable way, smart cities are the antidote to the rigidly planned cities of the mid-20th century: cities in which high-rise towers surrounded by dead space spawned ghostly neighborhoods where citizens dared not tread after dark.

"The physical and the social are deeply connected in cities," write Richard Sennett and Ricky Burdett in their preface to *The Quito Papers and the New Urban Agenda*. That connection was broken by principles of urban planning conceived in the 1930s and applied relentlessly for the next six decades.

The smart-city movement redirects the trajectory of urban planning. Smart cities are platforms for a new kind of urban development. They put the tools and techniques of planning into the hands of more people, giving them skin in the game.

They also empower a new generation of architects whose toolbox now includes software for visualizing the complex interplay between buildings and their surrounding environments in greater detail than ever before.

Even as design and construction techniques evolve, architecture will continue to shape the destiny of cities. Smart-city architecture is likely to reflect the fluid and turbulent nature of modern life. Architectural development will be iterative—a nonstop journey of experimentation, feedback, refinement, and innovation. The forms and structures around us will create what Sennett describes as "a strong sense of a process unfolding."[17]

While it is unlikely that we'll see "agile" architecture any time soon, the idea of adaptability has become increasingly relevant for urban architects and their firms. "It's hard to change the basic form of an existing building. But the best buildings are adaptable to new uses," says James Von Klemperer, president and design principal at Kohn Pedersen Fox Associates.

Adaptable buildings don't need to be torn down when the society around them changes. In Manhattan, for example, some of the trendiest neighborhoods are in former warehouse districts. In addition to being ruggedly built, the old warehouses had spacious floors, high ceilings, and broad proportions—making them perfect spaces for galleries, lofts, and stores. The buildings remained essentially unchanged, even as their function evolved into something completely new.

"These buildings are sustainable…we can reuse them and avoid the cycle of constant rebuilding that is destructive to the planet," Von Klemperer says. "They are 'agile' in the sense that they allow different activities to flow through them."

Ideally, smart cities would require buildings to be designed and constructed with adaptability in mind. For instance, cities could set higher minimums for floor-to-ceiling heights when new parking garages are built, so they could be more easily converted into offices or apartments. Smart design and construction of new buildings would effectively future-proof them against obsolescence. Theoretically, an adaptable building could be repurposed continually for centuries.

Follow the Dream

At the beginning of this chapter, we compared smart cities to the fabulous cities of legend. We invited you to share our dream and to envision a world of smart cities and smart towns.

But smart cities aren't imaginary. They are not abstractions. They are real. In the months we spent researching and writing this book, we encountered naysayers and pessimists who told us that smart cities were a bad idea and an impossible dream. We disagree with the cynics.

Smart cities are gaining traction in every continent on the world. Legions of technology providers have already lined up to battle over shares in a market for smart-city solutions and services that's projected to exceed $1 trillion within the next five years.

The smart-city movement is part of a larger digital revolution. Digital technologies aren't simply transforming business and industry—they're transforming each and every aspect of our lives, including the places where we live. We are experiencing a genuine shift of paradigms; a new world is being born.

Like newborn infants, smart cities will experience growing pains. No two smart cities will be exactly alike. To varying degrees, smart cities will reflect the cultures and habits of the regions or nations in which they are located. Attempts to create one-size-fits-all models, cookie-cutter templates, or strict formulas for smart cities are unlikely to succeed. Smart cities will not be machines; they will grow and evolve, adapting like biological organisms to the changing environments around them.

Smart cities are not a panacea. They will not solve all the world's problems. Some will be more successful than others. Some will thrive and others will fail. There will be crime. There will be homelessness. There will be wealthy neighborhoods and poor neighborhoods.

But smart cities will engender hope. Their citizens will have a palpable sense of community. They will feel inspired and energized. They will be proud of their smart city. They will strive to keep it safe and clean. They will enjoy the wide variety of experiences and opportunities offered by the city. They will participate in governing their city and make their voices heard. They will be smart citizens.

We believe that cities have redemptive power. People choose to live in cities because they offer a social dynamism that's hard to find in small communities.

Cities are places where people can walk out their front doors and immediately begin having conversations with friends, neighbors, and even total strangers. They talk, they exchange ideas, and maybe they agree to start a business together. Or maybe they decide to have lunch, visit a museum, see a movie, or go for a walk down an avenue lined with shops.

Smart cities will offer the same opportunities, and more. A smart city will know when you're sick or injured and automatically dispatch emergency medics to help you. A smart city will turn on the lights when you enter a park at night – and turn them off when you leave. A smart city will remind you when it's time to renew your driver's license – and then help you renew it from your mobile phone. A smart city will help you find a good rehabilitation center if your mom slips and falls on the sidewalk.

In the chapters ahead, we describe smart-city projects of varying scale and complexity. We explain how smart cities are "systems of systems" and introduce key concepts, such as interoperability, open standards, resiliency, and continuous improvement. In addition to writing about smart cities, we share stories of smart towns, counties, regions, and nations.

We hope this book will become an indispensable resource as you engage more deeply with the smart-city movement and become more involved in planning our shared future.

As citizens, our roles in the development and evolution of smart cities will change continuously. One day we are observers, the next day we are active participants, adding our voices to the chorus. We hope you decide to play an active role and that the information in this book helps you become a smarter citizen in a world of smart cities.

Endnotes

1. Population Division of the Department of Economic and Social Affairs of the United Nations, *World Urbanization Prospects: The 2018 Revision* (New York: United Nations, 16 May 2018).
2. https://www.oreilly.com/iot/free/smart-cities-smarter-citizens.csp
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14. https://labs.enigma.com/smoke-signals

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16. http://www.datakind.org/blog/american-red-cross-and-datakind-team-up-to-prevent-home-fire-deaths-and-injuries

17. The phrase "a strong sense of a process unfolding" appears on page 13 of *Building and Dwelling* by Richard Sennett, in a reference to a description of Siena in an earlier book, *Architecture Without Architects*, by Bernard Rudofsky.