Global Smart Cities & Connected Communities
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Contents

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Note from the Editors

As the Dentons Global Smart Cities & Connected Communities Think Tank nears the close of its third year of activity, we find ourselves at an historic intersection of disruption and opportunity. Events of the recent past underscore that we are experiencing a turning point for life on our planet. The turmoil can nonetheless be an accelerator for innovation, allowing us to reinvent structural norms to better the world in which we live, work and play.

In the past year, Mother Nature relentlessly reminded us that we live and work in a fragile environment, one in which punishing disasters -- massive wildfires, earthquakes, dust storms, floods, infestation and disease have challenged society at times to its core. The global economy has sustained a massive hit from the COVID-19 pandemic. National healthcare systems are reeling. Essential supply chains have been interrupted. Much of the world was shuttered at home during the first half of the year, and more than half a million people worldwide have perished from the virus to date.

The death of an unarmed African American man in Minnesota at the hands of public safety officers who were sworn to protect and defend brought forth deeply-emotional reactions to the systemic inequities that have long perpetuated in our society. The global response has caused us all to reevaluate how we relate to one-another individually and collectively to better our societal norms.

These events are critically important to our discussions of smart cities and connected communities. In defining what we mean by "smart" we focus not only on the physical and digital aspects of our cities and communities, but equally on social infrastructure. It is our view that technological developments can be leveraged to modernize all three platforms, simultaneously. The three are inextricably intertwined. It is impossible and unwise to attempt to focus on one without a view to both of the others.

As we have observed the events of this year unfold, we have had occasion to study the essential role that social infrastructure plays in our modern, technologically-enhanced daily lives. It has become glaringly evident that social infrastructure must be given far more attention if we are to earn the confidence and social license necessary to implement the projects and policies that can benefit us all. The learning that we have gained through this experience has prompted us to add two new pillars to the Think Tank: one addressing Crisis and Pandemic Response, and the other on Social Equity. Over the spring and early summer, we held a number of Roundtable discussions on these issues, and will continue to integrate these areas of focus with the initiatives being advanced by the Think Tank. We also will be discussing these issues throughout the sessions of our Third Annual Smart Cities & Connected Communities Summit this July. See https://www.dentons.com/en/issues-and-opportunities/smart-cities-communities-initiative-and-think-tank

In this volume, several of our authors take up issues and opportunities related to modernizing community social infrastructure, particularly as our cities and communities adapt to the changes wrought by COVID-19 and the fundamental shift in notions of equity, inclusion, security and interconnectedness. We also examine a handful of groundbreaking regulatory developments that enable deployment of technologies that can deliver solutions to some of society's most vexing problems. Additionally, a number of writers share insights into what is needed to make sure that all of our infrastructure is secure and affordable.

Our Think Tank has grown to over 500 members world-wide, with thought leaders hailing from government, business, academia, and NGOs across the globe. We hope our readers will find this collection of articles informative and thought-provoking. We invite you to reach out to the Editorial Board with ideas for future topics for exploration and analysis.

Rudy Beese and Jennifer Morrissey
Co-Editors-In-Chief

Articles

In a Post-COVID World, There Will Be No 'New Normal'

by Joe Andrew

Download this article

Traditionalists want to get the world back to normal. Modernists want to get the world to the new normal. What they are both missing is that there won't be a normal — the old one or the new one — for a long time, if ever.

Normal connotes a steady state. Conforming to a standard; usual, typical, or expected. Our perception of normality is about expectations — we expect most things to have some semblance of how they are today when we wake up tomorrow. There is change — as Heraclitus said, "No person ever steps in the same river twice, for it's not the same river and they are not the same person," but we live beside the river of most change, not in it. We expect there to be some constant in our day-to-day lives. But what if the only constant after the crisis is change?

If there is one thing that experts have noted, it is that the crisis we are at the beginning of will accelerate trends that were already happening. What this crisis will change the most are those things that were already changing.

That may mean that things like digitization, globalization and its reaction, nationalism, will all happen faster than they were moving before the crisis. The collective reaction to institutionalized racism, the withdrawal

from world leadership of the United States, terrorism and the increase of human migration caused by all of these challenges will move faster and faster. There is no sense of returning to anything, let alone getting to a steady state. We cannot expect that all things around us will be typical or expected if they are changing faster than we can adapt to them.

But more important than any substantive trend is this process point: acceleration is accelerating itself.

"New dynamic" is probably a better term for our future than "new normal."

Astro Teller, the much admired "Captain of the Moonshots" at Alphabet's X, and his much maligned explanation to Thomas Friedman about the challenge of human adaptability to accelerating change, is more demonstrably true today than it was before we had ever heard of COVID-19. Teller and Friedman posited that with the advent of the easy to use smart phone and the underlying democratization of ideas that came from it and wide use of the internet, that change in most areas dramatically began to accelerate around 2008. Teller and Friedman's observations were maligned by reductionists who always want every theory to be substantive, while they were making a process point.

Our very ability to adapt to all the change happening around us was the key trend of our time. If the crisis created by COVID-19 is accelerating trends, then it is clearly accelerating the trend of increased change.

The age of cellular service coincided with the beginning of what Klaus Schwab, the founder of the World Economic Forum, calls a Fourth Industrial Revolution that has brought the mechanical, biological, and digital sciences together and where the speed of current breakthroughs has no historical precedent. Changes in medicine, physics and technology are evolving at an exponential rather than linear pace. You can make fun of these concepts, but that laughter is hiding the anxiety that we are feeling as we experience the quickening pace of change all around us in the real world, not just the artificial snow of Davos, and we — as individuals and societies — are struggling to react. And that was before the current global crisis.

Those who are in the business of predicting what will happen next, from Teller to Friedman to Schwab, were often too conservative about the rate of change before the current crisis. As change accelerates, we are learning something about the world that lies in wait for us. We are learning that there will not be a next new normal, but rather a new dynamic.

That is why "new dynamic" is probably a better term for our future than "new normal." Rather than a steady state, we are likely going to face constant, accelerating change. Our biggest challenge will be to adapt to this dynamic and find ways to live in the moving river, not beside it, as it overflows its banks and swamps our expectations of what is normal.

While we never know what will happen next, we now know that the challenge of our times is how we adapt to what happens next. We will be surprised, maybe even shocked. The business studies about change management will have to be reimagined to focus not on organizations changing themselves, but how change effects organizations. Brain science, motivational psychology, and behavioral economics will need to focus more on how people adapt to change.

We may try to live beside the whitewaters of change, but we are more likely to succeed if we learn to swim, surf, or sail in this new dynamic.

This article appeared in *The Hill* on 6/15/20.
See https://thehill.com/opinion/finance/502690-there-will-be-no-new-normal

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Dentons Global Smart Cities & Connected Communities Viewpoints

Download this article

We asked Think Tank members to provide their views on progress and challenges related to the development of smarter and more connected cities and communities, particularly given the uncertainties that have arisen in connection with the COVID-19 pandemic and global economic downturn. Following are some of the responses we received.

Question:
There is a lot of focus on the big-picture impacts of smart cities initiatives (e.g., modernization of infrastructure; safer communities; improved transportation; enhanced environmental quality; efficient public services; economic competitiveness; etc.). In your view, what are some less-obvious benefits that will come from becoming smarter and more connected?

Rob Wilhite:

An area that is not always addressed in smart city roadmaps is the urgent need to increase resiliency to major disasters and, more recently, black swan events such as pandemics. The ability for cities and communities to recognize threats and put into place mitigation measures, as well as to recover more rapidly from disasters that have interrupted normal economic and social lifecycles, has moved front and center. The ROI derived from the benefits of investments in smart city technologies and applications will be enhanced by aligning these benefits to disaster recovery planning plans for these jurisdictions.

In addition, there is the socioeconomic aspect of considering the benefits of smart city investments. Different classes of consumers will place different economic value on technology-driven benefits, and therefore will react differently to accepting or valuing these enhanced services. For instance, some smart city efforts and investments will have greater impact to the supply chain for food and agriculture, especially where indoor agriculture is espoused to locally source grown produce and other staples. The value of these investments in smart agriculture will be viewed differently across different socioeconomic classes and it is important for smart city roadmap efforts to recognize that these and other investments need to be seen across multiple stakeholders and actors in the social setting of their jurisdiction.

Mary Ellen Bench:

By making internet available for free and making computers more accessible, access to the digital world becomes available to all. Information can be delivered to residents and businesses quickly, an important benefit especially during emergency events such as flooding and hurricanes when rapid communication is critical. For municipal employees, Smart City connectivity means better ability to work from home, while for municipalities it means a reduced per employee footprint, which can equate to big cost savings. In addition to virtual meeting platforms, some municipalities are exploring options to move employees to a "nomad" concept where they carry what they need in a back pack and have access to touch-down space in the buildings where they work. And of course, tracking services like transit, garbage pick-up, where construction or accidents impact travel time, etc. are all benefits of a connected city.

Fenner Stewart:

Tremendous governance challenges can hinder the advancements of these large infrastructure projects. As projects move forward, innovations in governance are likely to be a collateral benefit of these projects.

Enoch Wong:

Another possible benefit is detachment from a central government currency system. For example, if blockchain technology matures, people will have a more reliable money system that is not subject to currency rate manipulation or inflation due to money printing.

Question:
What are the greatest challenges to a community when seeking to become "smarter" and what can be done to meet these challenges?

Fenner Stewart:

One problem is fragmentation of public opinion. Politicians – especially those highly visible and intimately exposed to their constituents – are responsive to voter demands. When a large majority of voters speak with a unified voice, politicians tend to listen and respond. Similar logic works in the private sector: companies respond to clear consumer preferences. Issues that split public opinion tend to get less traction (unless incentivized by other means). Thus, to promote smart technologies effectively, an advocate must diligently champion the benefits and defend against those that provide disinformation about the dangers. The hearts and minds of community members can present a huge barrier to becoming 'smarter'. In other words, the community itself can be the biggest challenge. Another risk is misallocation of public resources, which could have been used to help the community in more direct ways. That is, promoters may never provide the meaningful deliverables to most citizens, but instead will end up diverting much-needed public funds for urban problems that already have potentially effective solutions, if they were properly funded.

Rob Wilhite:

Sufficient capital is always a barrier, as is having a long-term goal (e.g., reduced GHG, increased green jobs) accepted by multiple stakeholders across the city/community. PPPs, Green Bonds, performance contracting, and other measures that become self-funding can help move programs forward. The value of new sources of funding, including crowdfunding, should also be considered. Business owners need to see clear evidence that funding projects, such as clean energy efforts, can actually save them money and

attract greater demand for their products and services. Activist investors will also have an impact to directing funding for publicly-traded organizations, directing their capital spending towards more socially acceptable directions than they otherwise might have pursued.

Another significant challenge is the continuity of plans beyond the turnover of elected officials every two or four years. Plans would stand the test of time with the formation of distributed steering bodies, made up of like-minded citizens from among local chambers of commerce, economic development agencies, public and private universities, technology incubators, and civic organizations. Such committees would continue to work beyond the roadmap stage, through the entire life-cycle and scaling of these smart city programs. Individual members may rotate over the years, but the governance infrastructure would need to remain in place to transcend changes in governmental leadership of elected and appointed officials.

Enoch Wong:

Decentralization of projects and services make regulation and supervision more difficult. Any regulations should be designed so that they are implemented inherently into the system. It is especially important when it comes to money systems – cryptocurrency for example is likely to be resisted strongly by governments unless there are clear anti-money-laundering procedures which can be used to curtail misuse of the technology.

Mary Ellen Bench:

Funding limitations are a challenge. Many municipalities in North America and Europe rely on property taxes to fund a substantial part of their financial needs, from critical municipal services such as police, fire, ambulance, social housing and social supports, to parks, community centres, libraries and more. However, this tax base may not provide enough sustainable money to support smart city initiatives. Other municipal sources of income are user fees, Payments-in-lieu of

Taxes (PILT) for federal infrastructure and grants from other levels of government. Often funding comes with strings attached, limiting what it can be used for. Public-private-partnerships are popular in some jurisdictions, but do not have the same benefits in others. In Canada, municipalities have been slow to take up this model because they can borrow money themselves at lesser cost, so there is no need to add a third party. Canadian municipalities cannot deficit finance and do not issue municipal bonds at the rate in the U.S., so they tend to have very strong credit ratings. On the other hand, given that the federal and provincial governments are pouring so much money into COVID-19 issues, it is hard to predict if they will fund a stimulus program at the end of this, despite the expected hit on the economy. It may be the right time for municipalities to be reminded about P3s as an option to fund infrastructure.

Question:
What technologies or new developments will be most widely adopted for smart cities within the next couple of years? What is presently receiving a lot of hype but unlikely to be adopted in the near future, if at all?

Fenner Stewart:

COVID-19 has inserted a wild card into the deck. Pre-pandemic, I would have said share service technologies would be widely adopted. Now, I think that global just-in-time supply chain management and delivery service technologies are going to receive more attention – as some efficiency will be sacrificed for security. Also, several new technologies will be needed to make population density safer.

Additionally, COVID-19 has spotlighted the sometimes horrendous conditions, which the elderly must endure in publicly funded, but privately operated, care facilities in Vancouver, Montreal and Toronto. Public outcry will likely lead to demand for technologies that make services to the elderly more humane. To date, lobbyists for these facilities have been able to use the public cost of reforms to create barriers to proper regulation

– at least in Canada. A spectrum of technologies (e.g., robotics) could facilitate 'assisted living', resulting in lower public cost for better services.

Rob Wilhite:

The increased consumer adoption of electric transportation will likely continue to expand, with EEI forecasting (prior to COVID-19) nearly 1M in new EV sales in the U.S. over the coming 3 years, matching the one million total on the roads today. This will not only impact municipal transportation networks, but also the significant need for increased charging infrastructure, public and private. This will also impact personal and business transportation.

One technology that I think is over-hyped is blockchain. It has a lot of promise, but nothing seems to have scaled in the energy sector, at least. It also runs counter to the need to protect personal data and information, given the open nature of blockchain networks.

Enoch Wong:

Depending on how the current global pandemic and economic crisis turns out and how cryptocurrencies perform during the downturn, crypto may gain more attention in the coming year. For example, Hong Kong is still way behind mainland China in terms of electronic payment. The approach taken by the government in Hong Kong is relatively lackluster. True changes can be brought when these services are more aggressively marketed and pushed to the society by regions who have succeeded with such technology.

Transportation and work space sharing will still be big, but immediate expansion will be put on hold due to the concerns of shared space that have surfaced during COVID-19.

Mary Ellen Bench:

5G technology and expanded telecom infrastructure will be top of the list for Smart Cities. This is already being looked at as streetlight infrastructure gets replaced. Sustainable initiatives like hydrogen fuel cell powered buses, and electric light rail are likely to be supported as high priority items that allow for climate change targets to be met.

Driverless vehicles receive a lot of attention, but the infrastructure required to support them on municipal streets is going to be extremely expensive. Big tech companies face backlash from many communities who are afraid of this technology. Liability issues also create hurdles to adoption of this technology. In Ontario, joint and several liability means that municipalities that are found 1% responsible for an accident can end up paying 100% of a damage award. Cities will be reluctant to allow certain technologies unless the risk can be mitigated. Drones and drone delivery are viewed as less risky, but questions like how flight paths will fit with development rights in an era of intensification and vertical neighbourhoods will have to be answered.

By making internet available for free and making computers more accessible, access to the digital world becomes available to all.

**Question:
What aspect of smart cities is not getting enough attention right now?**

Rob Wilhite:

Some programs have focused on the creation of green jobs, although it is not always the highest benefit touted in a smart city business case. Should we find the U.S. economy entering a recessionary period due to COVID-19, we will see an even stronger need to focus on economic growth and, in particular, green jobs as a cornerstone to driving prosperity in our cities.

Enoch Wong:

Traditional markets including investment banking and professional services still do not adapt fast enough. This may come from the notion that it is important to go around and actually meet people to generate business. While that still holds true in many situations, there should be more services that can be implemented online and for these professions to integrate more with a smart city.

Mary Ellen Bench:

Integrated sustainability. As one German planner who works for the Association of German Cities put it to me, North America is fixated on 'Silicon Valley' and is missing the importance of working together to centralize data and opportunities. He also sees a risk in over-engineering things beyond what is necessary and in doing so giving the control of urban development to corporate enterprise. I think there is merit to this. When big opportunities come along, like being part of the testing for self-driving cars / autonomous vehicles, municipalities tend to compete against each other instead of looking to work together to determine if these are a benefit to municipalities or not. In other words, cities can be focused on having more technology and not necessarily asking the questions about impact of this technology on residents.

**Question:
Given the current COVID-19 pandemic, what are some of the lessons we are learning that are applicable to the development of smarter cities and communities? Are there practices or technologies that are being deployed or adopted faster than anticipated, or innovative approaches to common problems that are emerging, because of the crisis?**

Fenner Stewart:

I think that the notion of 'efficiency' may be replaced as the measure of good when a new normal is re-established once the COVID pandemic subsides – at least in the short term. It is possible that 'security' will become the new efficiency. The question "What dangers do you observe that could be addressed with a "smarter" approach?" presents a much different set of answers than "What inefficiencies do you observe that could be addressed with a "smarter" approach?"

Covid-19 is also going to change notions of civil liberties. There may be a swing toward collective benefit over civil liberties presently. History has shown that when governments have exercised greater control over private activities, they tend to be sluggish to relinquish it. It is difficult to know where the pendulum will be a year from now.

Enoch Wong:

We will see a faster adoption of services relating to basic necessities like food and grocery delivery. Online entertainment and streaming services will also thrive in this situation but are likely to last only as long as the virus is still around. Developments in online diagnosis and medical services will also gain more attention due to the outbreak.

Barbara Tyran:

Given possible return of Coronavirus during 2020-21 winter flu season, the relevance of Smart Communities to achieve paradigm shift thinking becomes even greater. We will be likely to see technologies related distanced business and social gatherings, tele-health technologies, and solutions to foster a cleaner environment (think cleaner Venetian canals and reduced air pollution over China) to continue to be deployed at an accelerated pace. In terms of lessons learned, we will continue to examine the impact of the sharing economy (workplaces, vehicles, Airbnb) on contagion. We are learning the detrimental effects of mis-information and the importance the timely, consistent dissemination of accurate information. We also have seen some extraordinary examples of innovation and resilience. Personal resilience is extremely significant for successful quarantining. Many businesses have quickly adapted, staggering store hours for those with compromised health and initiating new home and business delivery systems. Additionally we have seen a re-purposing of manufacturing facilities to meet new/unexpected consumer demands.

Mary Ellen Bench:

In times of crisis, like the current pandemic, a connected municipal services and support network would be very helpful. All levels of government are trying to keep operations as normal as possible and learning just how difficult that is without the appropriate technology and infrastructure in place. Cities are also realizing how important fast and reliable internet is. A huge issue for debate that will likely follow is whether municipalities should have the authority to monitor resident compliance with self-isolation requests by using cell phone data.

One common problem that has been expressed with municipalities in connection with smart city initiatives is the time it takes to go through the planning process, get a building permit and actually be able to start construction. The COVID crisis has shown that this process can be handled much more quickly and effectively than previously thought possible. I expect there will be a lot of questions asked about why the level of service can't be maintained on a regular basis, and if short-cuts to approvals are available during a crisis are the actions cut out really necessary.

We will see a faster adoption of services relating to basic necessities like food and grocery delivery.

Mary Ellen Bench serves as Counsel in Dentons' Real Estate group, where she advises a broad range of public and private sector clients on governance, municipal law, development, infrastructure and related matters. With more than 30 years' experience in municipal public service, Mary Ellen held various leadership roles in the legal department at the City of Toronto, as was City Solicitor for the City of Mississauga. In those roles, she was often engaged on project teams to achieve solutions to challenging problems that garner the support of all parties. She serves on the Government Leadership and Public Policy, Global Best Practices and Transportation and Mobility Pillars of the Dentons Smart Cities & Connected Communities Think Tank.

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Five Strategies to Create Age-Friendly Smart Cities

by Peter Kaldes

Download this article

> *A Smart City modernizes digital, physical and social infrastructure and integrates all essential services for the benefits of its citizens by harnessing advances in sustainable technology to make delivery of these services more efficient, connected, secure, innovative, and equitable.*
>
> - Dentons' Smart Cities & Connected Communities Initiative and Think Tank

The world's population is changing rapidly. According to the United Nations, in just over a decade there will be more people over the age of 60 than there will be under the age of 10. AARP worked closely with the World Health Organization to establish a working definition of what constitutes an *age-friendly* city.

They landed on eight domains of urban life that would create a place where older adults are actively involved, valued and supported with infrastructure and services that accommodate their needs. These include: outdoor spaces and buildings; transportation; housing; social participation; respect and social inclusion; civic participation and employment; communication and information; and community support and health services.

A NATIONAL NEED

A recent Harvard study showed the number of Americans older than 65 grew from 35 million in 2000 to 46 million in 2016 – more than tripling the number of communities with majority older populations.

Many of these communities are in Florida, which is the state with the highest concentration of older adults in the country. For example, in the cities that make up Broward County, which includes Fort Lauderdale, adults over 65 currently make up 23 percent of the population.

Despite the fact that this group is the fastest-growing aging population in Florida, leaders are not preparing for the unique infrastructure, housing and related challenges facing their aging cities. These same

city leaders, however, are leading Florida in creating smart city initiatives. A recent study from the OECD and Bloomberg Philanthropies recognized Miami and Fort Lauderdale as the only cities in Florida that have demonstrated a commitment to local innovation, with investments in infrastructure and technology that will improve outcomes for residents and strengthen communities.

These leaders, like those across the country, however, are not recognizing and incorporating the clear overlap between making cities smart and becoming age-friendly. With some careful planning, the investments a smart city makes in transportation, housing and public utilities can transform it into being age-friendly.

For those cities like Fort Lauderdale experiencing rapid population growth of older adults, leaders should prioritize certain smart city investments to meet everyone's needs as they age. According to a recent study by the Milken Institute, city experts recommend that leaders prioritize healthcare and mobility solutions as the areas of most importance in serving older adults in cities. But all the well-intentioned apps, smart and affordable housing, and autonomous vehicle innovations won't be deployed to help older adults, unless leaders can fund them.

Here are five strategies to create age-friendly smart cities:

Support Innovation – In the aging space, Florida's businesses have thrived thanks to a historically favorable tax and regulatory environment that has yielded innovations in long-term care solutions – almost since the state became a retirement destination of the 20th century. From assisted living communities to personal emergency response systems, successful businesses have provided solutions for older adults.

There is innovation at the federal level too. Medicare's recent updates to its regulations have opened the door for more innovation in aging supports. For example, insurance companies are reimbursing their Medicare Advantage members if they use community-based organizations to support some of their chronic conditions that negatively impact certain social determinants of health.

Leaders can create a legal and regulatory framework specifically targeted towards catalyzing innovations in supporting older adults. Whether it's so-called "innovation districts" – economic development zones free of regulations inhibiting innovation – or supporting aging-focused incubators and accelerators, cities can create the framework for supporting and attracting capital. These aren't new tools, but often overlooked when it comes to supporting the longevity market.

Expand Legislation – If regulatory adjustments to Medicare can spark innovation in supporting older adults, imagine what bold, sweeping legislation could do. The last time visionary aging ideas were turned into law was with the passage of the 1965 Older Americans Act (OAA), which was the first federal level initiative aimed at providing comprehensive services for older adults. It created a multi-tiered system of agencies that currently support 11 million older adults in need of food and transportation, research for remaining independent, support for fighting elder abuse, and coverage for costs of some caregiving.

While the OAA is currently awaiting reauthorization, according to AARP, its $2.06 billion budget has gone up just 1.1 percent annually, on average, since 2001. That pace simply doesn't align with the rate of growth in the older adult population. The fifty-five year old OAA is an important, albeit restrictive, tool for helping the most vulnerable, but there is more to do to address the needs of a 21st-century aging population.

Imagine a Congress that could pass legislation incentivizing employers to expand work opportunities for older adults not seeking retirement, or expanding family medical leave for caregivers, or increasing support for affordable housing and transportation funding, or even securing social security. Smart city leaders don't need to wait for federal legislation to pass to become age-friendly – they can incubate and launch many of these ideas locally in partnership with community-based organizations and other stakeholders.

According to a recent study by the Milken Institute, city experts recommend that leaders prioritize healthcare and mobility solutions as the areas of most importance in serving older adults in cities.

Create Taxing Districts – Traditional economic development tools such as tax incentives or the federal Opportunity Zone program can catalyze development for affordable housing for seniors in cities that need it the most. But age-friendly smart cities need more than critical housing stock – they need to provide community-based organizations with the funding and the capacity to deliver services.

Despite the fact that Florida leads the nation in older residents, it hasn't led the nation in funding the needs of its seniors- particularly its most vulnerable. However, it could replicate a model it uses to fund children's initiatives.

In Florida, where there is no state income tax, county-specific taxing authorities exist that invest public dollars into local children's programs called Children's Services Councils. Florida is the only state in the nation with laws that allow local county leaders and the residents of those counties to create a special government entity whose sole purpose is to invest in the well-being of children and families.

In Palm Beach, where the property tax for this initiative is $0.65 per $1,000 of taxable property value, the Children's Services Council of Palm Beach manages nearly $125million in revenue and nearly 80% of it is returned to the community in the form of grant funding for community-based organizations. A similar system could be set up for seniors. By investing public dollars into local senior programs, cities can decrease dependence on limited state and federal funds that will benefit entire families.

Recruit Philanthropists – Private philanthropy has long played a role in sparking social change. Cities and their nonprofit leaders seeking to create age-friendly smart cities need to boldly ask for more funding and not be timid in demanding support that will create large-scale philanthropic investments in aging.

According to Grantmakers in Aging, less than 2% of all private giving supports aging issues. And that number hasn't changed in 20 years – despite the doubling of the older American population. Moreover, recent changes to the tax code may have dis-incentivized small individual donors from giving to their favorite local senior serving organizations.

Moreover, while states, like New York are offering age-friendly planning grants totaling $1million to their communities, and local foundations, such as those in Broward County are awarding grants totaling about $700,000, these amounts, although appreciated by those they support, aren't consequential in the context of the population, infrastructure and social support systems that need help.

Expand Corporate Social Responsibility (CSR) –
It is effectively CSR-malpractice for consumer product, insurance and other major corporations not to get into expanding CSR to support creating age-friendly smart cities.

In recent years, CSR has evolved from simple corporate marketing campaigns to sophisticated philanthropic and business investments in communities where employees live and work. While promoting employee engagement and volunteerism demonstrates a commitment to local communities, corporations with CSR initiatives that are most impactful are those that align business with social good investments.

Apple recently announced a $2.5billion commitment to tackle housing issues in California, JPMorgan Chase & Co. has launched multi-hundred million dollar initiatives to support economic development and workforce initiatives in major cities, and Comcast expanded its Internet Essentials program, which has provided affordable, high-speed internet for 11 million low income families.

While the oft-cited millennial and Gen-Z socially-minded consumer may drive some of the CSR effort, the senior dollar shouldn't be ignored. According to Visa Business and Economic Insights, consumers over 50 now account for more than half of all U.S. spending. They are also responsible for more spending growth over the past decade than any other generation, including millennials. And they matter to cities – according to the JPMorgan Chase Institute, at least 20% or more of the share of consumer spending in the greater metro areas of San Francisco, Phoenix, Seattle, Miami, and Detroit are by consumers over 65.

While some of these ideas are more ambitious than others, leaders have a variety of tools they can use to efficiently respond to massive population shifts and build age-friendly smart cities.

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REFLECTION

Dentons' Smart Cities & Connected Communities Initiatives

by Branko Terzic

America's cities have been "innovative" and "smart" in the past. They can do so again. I was reminded of this as I attended a "Smart Cities" luncheon discussion sponsored by the Dentons law firm. While at the luncheon I reflected that I had recently seen a screening of the Hollywood movie "The Current War" (2019). The movie recollected competition in the 1890's between the direct current (DC) electric technology of Thomas Edison and the alternating current (AC) technology of George Westinghouse. The competitive market at that time was in bringing electrification to the nation's cities. However the movie failed to note that the primary reason the cities were procuring electric systems was to provide for street lighting, a demonstrated way of lowering crime in urban areas. The city fathers were truly innovating by employing a new technology of distributed electric lighting to fight crime. In this regard they were pioneers in establishing "smart cities."

Dentons defines a "Smart City' as one that : *modernizes digital, physical and social infrastructure and integrates all essential services for the benefits of its citizens by harnessing advances in sustainable technology to make delivery of these services more efficient, useful, innovative, secure and equitable.*

In the 1980s, I served as a Commissioner on the State of Wisconsin Public Service Commission, which regulated electric, natural gas, telephone, and water and sewer utilities. At the time, each residence had individual meters for electricity, natural gas and water, and each utility sent out its own meter reader. I modestly suggested that perhaps a single meter reader could read all three meters. This was not well received by stakeholders, with utility managements, unions and others up in arms. My fellow commissioners convinced me that other issues were more important and at the time, nothing more was said or done on the matter.

As I am reflecting on that perspective many years later, I believe that the key to the potential benefits of a Smart Cities approach is the ability to "integrate." A city is the only entity that can function to "integrate all essential services" to reach the goals of efficiency, economy and sustainability.

Today we have new technological developments in the form of smart meters, personal and mass electric vehicle (EV) transportation, distributed energy resources (DER), distributed energy storage, and demand side management (DSM) capabilities. Retail marketers and public utilities are also offering innovative services in the form of artificial intelligence solutions coordinating energy and water management in home and businesses

and complimentary real time pricing of electricity services. All these developments can benefit from an "integrated" approach at the municipal level as envisioned by the "Smart Cities" definition.

Examples for potential integration benefits are plentiful. Combined heat and power systems (CHP), waste to energy and recycling programs all require coordination with multiple infrastructure entities for success. For example, water utilities have great electric demand at peak times from their pumps but they also have water (and perhaps even energy) storage capability. Many water utilities are already taking advantage of DSM opportunities by coordinating their pumping with electric dispatch. Future surveys of water tank resources or storm water storage tunnels may provide additional hydroelectric type storage capabilities in urban environments. Recent announcements of successful venture financing of "gravity storage" of electricity are based on systems of specially built towers raising concrete weights. Yet, our cities have numerous tall buildings some of which could be retrofitted or initially designed to carry a "gravity" base energy storage load up to necessary heights.

To be sure, cities will experience risk when dealing with new "smart" technologies. One cannot be certain as to which new technologies will work the best in various configurations and situations. But one can be certain that new technologies, when "integrated" and widely distributed, will have a better chance of finding their optimal niche and place. The history of technology advancement is replete with examples where the greatest technological success comes from the lateral transfer of a technology from where it was initially intended to where it, sometimes surprisingly, makes its greatest impact. Engaging all the institutions in a city, as a Smart Cities approach does, will heighten the chance of that success.

The Smart Cities approach, in some sense, echoes the early 20th century Progressive approach to innovation, advocated by such leaders as Teddy Roosevelt, known as the "Wisconsin Idea" in which public universities, government and private enterprise would work together to address critical issues. A century later, Dentons' Smart Cities approach can facilitate that exploitation and success of technologies through integration and introduction to the entire sphere of municipal activities and requirements.

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Five Focal Points for Smart City and Community Development

by Clint Vince and Jennifer Morrissey

Download this article

In the midst of the massive growth in urban populations across the globe, there is tremendous hype in town halls, board rooms, and media about making cities and communities "smarter". Yet the definition of a "Smart City" is elusive. Conversations about Smart Cities often convey complexity, with primary focus on technology. However, while technology is the key enabler for Smart Cities, it is not an end in itself. The point of a Smart City is the betterment of the lives of residents and businesses through application of advanced technologies and data-driven decisions and operations.

The concept of Smart Cities is, in fact, relatively simple and elegant. A smart city uses an integrated approach to coordinate all essential services. It modernizes digital, physical and social infrastructure to make delivery of city services more efficient, innovative, equitable, connected, secure, sustainable and exciting. And in an era where two thirds of the planet's inhabitants are expected to migrate to cities over the course of just one generation, the transition to smarter cities and communities couldn't be more urgent.

Over half of the global population now live in urban areas. Cities produce 80% of global GDP and produce 70% of carbon emissions. The projected growth trajectory for urban environments means that cities will face increasing challenges in all aspects of their operations. Cities are particularly vulnerable to problems such as social imbalances, traffic congestion, pollution and strain on resources, and this will only increase in severity if no action is taken. Viewed more positively, mayors around the world are realizing that integrating smart technologies into planning and sustainability strategies will improve quality of life, which in turn attracts investment and leads to positive growth in cities.

There are many ways to conceptualize a smart city, but any successful initiative will target five basic areas in a holistic and integrated manner: backbone infrastructure, city and community leadership structures, sustainable provision of services, developments in technology and innovation, and community social infrastructure.

Grid modernization is the essential platform for smart development

Modernization of "the grid" as the backbone infrastructure of any smart and connected community will jump-start efforts. Grid modernization begins with the electrical system, then layers on advanced telecommunications, advanced mobility systems and smart buildings as essential foundations for the city as a whole. The grid becomes the nerve center supporting the IoT, AI, EVs and beyond. All of these components become hosts for sensor technologies that will allow the collection of data to support planning, management, and operations throughout the city or community, and privacy and data sharing strategies can be interwoven with the infrastructure as it is upgraded or deployed. Focusing first on grid modernization and advanced telecommunications and transportation also offers the advantage of familiar and proven financing models that will allow a city or community to move its efforts forward, while other aspects of a smart cities plan will require creative thinking and cooperation among entities that traditionally have operated separately.

Leadership, policy and regulation are the drivers for investment and growth

Courageous leadership, forward-looking policy and flexible regulatory structures must be put into place. Scaling up infrastructure to meet the needs of the future in a secure, fair and cost-effective manner requires government officials, policy makers and city and community leaders need to create a new paradigm. Among the greater challenges at the moment are a lack of comprehensive decision-making, obstacles to securing adequate funding, and disparate regulatory authority regarding issues that need to be dealt with in a unified manner. Integration of infrastructure must go beyond the physical technologies to include the institutional structures that inform how the physical structures are erected, funded and managed. City and community leaders, regulators and planners must create incentives for businesses of all sizes to invest in the deployment and adoption of advanced technologies while ensuring the trust and safety of residents.

Sustainable services improve quality of life and reduce financial, health and safety risks

Research indicates a strong correlation between cities' environmental performance and their prosperity. Municipal governments must implement strategies for sustainability and, in some regions, for adaptation to a changing climate. This requires rapid acceleration towards a cleaner, healthier, and more economically viable city growth through improvements in efficiency, investments in renewable energy technologies, and corresponding regulatory reform. It also requires greening of urban infrastructure, transportation, land-use and development policies. Failure to make this shift leads to increased financial, public health and safety risks. Attention must also be given to digital security and safety, as the risks of cyber intrusion are magnified as digital infrastructure expands.

Cities are first and foremost about people. A smart community can only thrive if its members are interacting with and leveraging the resources and services that are provided.

Partnerships with centers of innovation will ensure adoption of best technologies and practices

The notion of "interconnectedness" goes far beyond sensors and apps. Technology, properly used, can help cities to improve the enjoyment of all of the things that communities value – including the parks, neighborhoods, public spaces and economic opportunities. Leveraging advanced technologies does not necessarily mean that everything is new. Advanced analytics can integrate and improve existing systems through data that is already collected for other purposes, thus increasing efficiency and reducing costs in delivery of services, yielding tremendous benefit for residents and cities themselves, which frequently operate under constrained budgets.

Smart community leadership will also leverage relationships with innovators -- technologists, government labs, universities and NGOs that are already working to address the challenges that face cities and communities today and in the future. These entities already serve as test grounds for technologies, practices and ideas that can be shared with community leaders, businesses and inhabitants for the benefit of all.

Attention to community social infrastructure is indispensable

Cities are first and foremost about people. Smart cities and communities programs should be focused on the betterment of the lives of the inhabitants of the city. Whether existing digital and physical infrastructure is upgraded or modernized, or a new city is built where previously there was none, the purpose of the city is as home, workplace and playground to its residents. Building broad community support for any Smart

Cities/Communities program is a complex process that requires significant outreach to and collaboration with community anchor institutions as well as to individual stakeholders. A smart community can only thrive if its members are interacting with and leveraging the resources and services that are provided.

Given the scale of modernization that needs to occur at the physical, digital and social levels, and the extraordinary pace at which new technology is overtaking social infrastructure, cities and communities need to "up their game" with a greater sense of focus and urgency. Most are far behind in comparison to the speed with which the urban migration is occurring. And most are lagging in terms of creating governance structures that can address modernization of urban infrastructure on a holistic and integrated basis and develop financial mechanisms to pay for it all.

Essential projects need to be envisioned and selected through a rigorous public process. Public/private partnerships and other funding sources need to be developed quickly. Privacy and data sharing and other elements of sound social infrastructure need to be established near the beginning of the process. And flexibility needs to be built into the planning structure to allow for rapid change in all aspects of the endeavor and ever-accelerating technological development.

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A Plain English Primer on Cybersecurity for Critical Infrastructure

by Sinan Pismisoglu

Download this article

THE SMART CITY, CRITICAL INFRASTRUCTURE AND CYBERSECURITY

A Smart City's intelligence stems from the analytics performed on the data created by the Internet of Things (IoT) connected to networks throughout the city. In the absence of interconnectedness, a city's intelligence is dramatically reduced, but what level of interconnectedness is acceptable from a cybersecurity stand? Can critical infrastructure be both interconnected and safe? What will happen if the algorithms running the smart grid are compromised? Can a threat actor hack into a network on the smart grid to access or disrupt other, presumably distinct, operations of that critical infrastructure, and if so, how can we protect against this?

WHY IS OUR CRITICAL INFRASTRUCTURE SO CRITICAL?

The Cybersecurity and Infrastructure Security Agency[1], which is a subdivision of the Department of Homeland Security (DHS), designates the infrastructure sectors that are vital to the United States' public-safety as "critical." Sixteen designated critical infrastructure sectors are operating the nation's critical systems, and they all need to be secure, functioning, and resilient. A typical city hosts facilities and structures comprising many, if not most, of the 16 critical infrastructures: hospitals, transportation, energy, chemicals, dams, emergency services, government facilities, water and wastewater systems, among others.

INDUSTRIAL CONTROL SYSTEM(S) (ICS)

Supervisory control and data acquisition (SCADA) systems, distributed control systems (DCS), and programmable logic controllers (PLC) are different versions of ICS[2]. ICS are used to operate critical infrastructure for electricity generation and distribution, water and wastewater systems, oil and natural gas production and transportation, transportation systems, chemical plants, pharmaceutical manufacturers and developers, pulp and paper production, food and beverage production and processing, and discrete manufacturing (e.g., automotive, aerospace, and durable goods). What makes ICS "critical" is that unlike conventional IT systems (e-mail, document processing, payment systems, online shopping), operations controlled by ICS directly affects the physical world. Compromise of ICS may risk the health and safety of human lives (think nuclear leakage at an energy plant or failure of life-support units at hospitals), may cause serious damage to the environment (such as floods from a dam),

1   https://www.cisa.gov/infrastructure-security

2   https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-82r2.pdf

and may have devastating effects on the nation's economy (for example economic depression due to interruptions in manufacturing and production)[3].

THE VULNERABILITY OF CONNECTED ICS

In the 1960s, before the interconnectedness era, cybersecurity was not of primary concern when designing ICS. They were designed to work in a stand-alone manner, and their security relied on air-gapped networks and proprietary protocols for securing the system.

The industrial use of IoT in combination with cloud computing and network connectivity forced an accelerated evolution of ICS, mixing the inflexible, static and centralized architecture of SCADA with seemingly unlimited options under IoT connectivity[4]. Today, SCADA systems connected to IoT are distributed, networked, and dependent on open protocols for the internet, which make them vulnerable to unauthorized access, and cyber-terrorism[5].

THE IOT BACKBONE OF A SMART CITY IS ITS GREATEST STRENGTH BUT ALSO ITS GREATEST VULNERABILITY

IoT is the backbone of a smart city. IoT is a set of electronic and photonic devices (sensors, actuators, cameras, processors, smart cars, smart refrigerators, smart aquariums, smartphones, smart meters, smart grid, eHealth devices, and so forth) that communicate over the internet wirelessly without human intervention[6]. The forecast is that IoT device shipments will reach 10 billion units in 2022[7].

The IoT is the central technology for a smart city. IoT contributes to the three key aspects of a city's intelligence: smart mobility (transportation systems, traffic and parking management, and so forth); smart sustainability (waste management systems and street lighting equipped with sensor technology to optimize usage and monitor conditions); and smart living (e.g., advanced location-based services and CCTV technologies to notify responders and the family members of emergencies involving children, the disabled, or the elderly)[8].

Integrating network sensors is another step towards progress within a smart city. IoT creates big data that is processed to extract useful information through real-time analysis and computing to manage smart city operations and to fine-tune the provision of services. The smart city can use the IoT data to analyze the condition of infrastructure to reduce the maintenance costs and failures and to extract useful information to optimize city operations. The efficiency of IoT data increases through the unification of data from multiple resources and real-time analyses of reliable data through uncorrupted algorithms[9].

Processing of IoT data also enables the smart city to discover, locate, and treat anomalies occurring in urban environments. IoT is the backbone of a smart city but also its greatest vulnerability[10].

IOT-CONNECTED SCADA SYSTEMS

With the evolution of IoT into industrial systems, SCADA systems have adopted IoT, cloud technology, big data analytics, artificial intelligence (AI), and machine learning. The integration of these technologies has created a real-time environment. Industrial use of

3   file:///Users/spismisoglu/Downloads/the-potential-human-cost-of-cyber-operations.pdf
4   https://doi.org/10.1002/spe.2688
5   https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7445139
6   http://www.internet-of-things-research.eu/pdf/Converging_Technologies_for_Smart_Environments_and_Integrated_Ecosystems_IERC_Book_Open_Access_2013.pdf
7   McClellan, S. & Jimenez, A & Koutitas, G. (2018). Smart Cities: Applications, Technologies, Standards, and Driving Factors. Springer.
8   Ejaz, W., & Anpalagan, A. (2019). Internet of things for smart cities. Springer.
9   Rathore, Muhammad Mazhar & Paul, Anand & Hong, Won-Hwa & Seo, HyunCheol & Awan, Imtiaz & Saeed, Sharjil. (2017). Exploiting IoT and Big Data Analytics: Defining Smart Digital City using Real-Time Urban Data. Sustainable Cities and Society. 40. 10.1016/j.scs.2017.12.022.
10   M. A. Al-Garadi, A. Mohamed, A. Al-Ali, X. Du, I. Ali and M. Guizani, A Survey of Machine and Deep Learning Methods for Internet of Things (IoT) Security, in IEEE Communications Surveys & Tutorials, doi: 10.1109/COMST.2020.2988293.

IoT and cloud computing is revolutionary in smart industrial sectors that provide enhanced automation and information sharing facilities, combining cloud computing, cyber systems, and connectivity.

Today's "fourth generation" SCADA system utilizes the commercial cloud-computing services through the integration of IoT technology into the inflexible and static SCADA design. IoT-enabled SCADA systems are easy to maintain and integrate data accessibility, cost efficiency, flexibility, optimization, availability, and scalability. Among other advantages, IoT data allows prediction of failure cases using interconnected network devices and can efficiently operate in geographically inaccessible areas.[11]

The cybersecurity risk associated with the IoT integrated SCADA systems arises from the use of old inflexible and static SCADA systems on the interoperable IoT networks without employing new cybersecurity strategies that can mitigate the risks on such tremendously large attack surface created by the IoT network[12]. In the digital universe, the term "attack surface" refers to the physical and digital vulnerabilities running on a network that covers all the running software and the devices operating on the network. In brief, each IoT device is a separate entity and will typically possess an attack surface of its own.[13]

With this description in mind, one can imagine the level of vulnerability of a static system being connected to the IoT network comprised of tens of thousands of connected devices: smart meters, light sensors, algorithms, cloud computing, a host of hardware and software devices (i.e., desktop computers, laptops, routers, wireless networks connected to the business network of the ICS operator).

When SCADA systems are integrated into the cloud, they are exposed to the same risks as typical cloud infrastructure. For instance, the ownership privileges of the SCADA systems organization are transferred to the control of the Cloud Service Provider, or an attacker can easily gain access to IP addresses, usernames, and other private credentials when authentication and encryption techniques are weak.[14]

Moreover, because each network connection is an attack surface, the network connections between SCADA systems and the cloud may be exploited and used as backdoors to attack ICS. Overall, the ICS commands and information for the critical infrastructure can be modified, sniffed, lost, or spoofed during communication because the reliance on cloud communication makes the SCADA systems more open.[15]

Expert scientists are working on developing and perfecting responsive intrusion detection systems (IDS), which can alert the system managers about the possible attack on the system and network. These detection systems use a signature, specification, behavior, or machine learning-based models for enhanced security.[16]

Even under the protection of ICS systems supported by AI and machine learning, several attacks on the SCADA systems have been reported. AI and machine learning have not reached the level of advancement to stop advanced persistent threats (APT) attacking a network by exploiting a vulnerability not yet known to the programmer of the software or the operating system (zero-day attacks). APT attacks differ from other kinds of attacks due to extreme sophistication in their design.

11   Yadav, Geeta & Paul, Kolin. (2020). Architecture and Security of SCADA Systems: A Review.

12   Anam Sajid, Haider Abbas, and Kashif Saleem. (2016) Cloud-assisted IoT based SCADA systems security : A review of the state of the art and future challenges. IEEE Special Section on The Plethora Of Research In Internet of Things (IoT)

13   Rizvi, S., Orr, R., Cox, A., Ashokkumar, P., Rizvi, M. R., (2020), Identifying the attack surface for IoT network, Internet of Things, Volume 9, March 2020, https://doi.org/10.1016/j.iot.2020.100162

14   Sajid, A., Abbas, H., & Saleem, K. (2016). Cloud-Assisted IoT-Based SCADA Systems Security: A Review of the State of the Art and Future Challenges. IEEE Access, 4, 1375-1384.

15   S. N. Islam, Z. Baig and S. Zeadally (2019) Physical Layer Security for the Smart Grid: Vulnerabilities, Threats, and Countermeasures, in IEEE Transactions on Industrial Informatics, vol. 15, no. 12, pp. 6522-6530

16   Suaboot, J, Fahad, A., Tari, Z., Grundy, J., Mahmood, A. N., Almalawi, A., Zomaya, A. Y., Drira. K., (2020). A Taxonomy of Supervised Learning for IDSs in SCADA Environments. ACM Comput. Surv. 53, 2, Article 40 (April 2020), 37 pages. https://doi.org/10.1145/3379499

Almost all APT attacks are designed by nation state-sponsored attacker groups with access to technical and intelligence resources.[17]

When defending a network against an APT attacker, the use of conventional detection and protection systems is not adequate. When critical infrastructure is at stake, once the hacker is in, the damage is done. Thus, ICS, primarily when operating critical infrastructure, is protected by a "defense-in-depth strategy" (DiDS) [18]., providing for a holistic approach to cybersecurity.

DiDS is described in DHL's *Recommended Practice Guidelines for Improving ICS Cybersecurity with Defense in Depth Strategies.* The cybersecurity controls for SIDS are determined in NIST Special Publication 800-82 Revision 2 for ICS security.[19]

DiDS foresees seven layers of administrative, technical, and physical security controls working together to protects the ICS[20].

1. **Human Element Layer:** Faces the outer world and connects to the business network. Awareness & Training and Insider Threat Programs are the administrative controls focusing on the elimination of unintentional or malicious threats arising from the human-factor. Various administrative, physical, and technical controls are present at this level (biometrics, physical access system e-mail security, malware analysis, deceptive honey pots).

2. **Physical Layer**: Separates the Network Layer from the business network by a Data Diode (Unidirectional Security Gateway). Data Diode allows only one-way network traffic.

3. **The Network Layer**: Hosts Network Security tools, i.e., IDS, IPS, Enclave Firewall, perimeter firewall, web proxy content filtering, network-access managed, access control lists).

4. **Endpoint Security Layer:** Hosts the patch management, IDS/IPS, control security as anti-virus/malware, and overall enforces endpoint security protocol.

5. **Application Layer** Provides an additional layer of user management and hosts the database monitoring and scanning, as well as the secure database gateway.

6. **Data Integrity Layer** Data is classified, encrypted, stored.

7. **Mission Critical / Safety-Critical Assets Layer,** which is the core of the sphere, and it is protected by another layer of Data Diode[21].

In Europe, a research funded project called Prevention Protection and Reaction to Cyberattacks to Critical infrastructures (PRECYSE)[22] has undertaken studies seeking to define, develop and validate a methodology, an architecture and a set of technologies and tools to improve the security, reliability, and resilience of the ICS supporting the critical infrastructures.

The primary goals for ICS security set out by PRECYSE[23] focuses on the following issues: (i) investigating privacy and ethical issues; (ii) improving resilience through a security architecture; (iii) providing tools for preventing and protecting against cyberattacks on SCADA systems and controlling the reaction to such attacks; (iv) presenting a methodology for identifying assets and their associated vulnerabilities and threats; and (v) deploying prototypes at two sites, one in the transport sector and the other in the energy sector.

17   T.C. Truong et al., Artificial Intelligence and Cybersecurity: Past, Presence and Future, published in Das, S., Lakshmi, C., Dash, S. S., Panigrahi, B. K. (2020) Artificial Intelligence and Evolutionary Computations in Engineering Systems. Singapore: Springer Singapore.
18   https://www.us-cert.gov/sites/default/files/recommended_practices/NCCIC_ICS-CERT_Defense_in_Depth_2016_S508C.pdf
19   https://csrc.nist.gov/publications/detail/sp/800-82/rev-2/final
20   Knapp, E. & Langill, J. T. (2015) Industrial Network Security Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Control Systems. Syngress
21   https://www.advenica.com/en/blog/2019-02-19/what-is-a-data-diode-and-how-does-it-work#
22   https://cordis.europa.eu/project/id/285181
23   http://precyse.eu/

The guidelines provided by NIST, PRECYSE, and DoD are the most effective tools for the operators of the critical infrastructure for building the cyber defenses against the emerging threat vectors.

EFFECTS ON THE PHYSICAL WORLD: STUXNET APT MALWARE ATTACK

Industrial viruses like Stuxnet are global threats to critical infrastructure. They are designed to manipulate ICS to destroy a facility and cause devastation in the physical world. Stuxnet infected at least 14 industrial sites in Iran, including a uranium-enrichment plant, rendering them all inoperable. There have been Stuxnet attacks in several other locations, but most have gone unreported.

Stuxnet's design was so sophisticated that it was able to attack and destroy specific infrastructure. For example, in one instance, Stuxnet only became active when it detected that the ICS was running PLCs for Siemens-manufactured high-speed centrifuges that were commonly used for enriching nuclear fuel. Once activated, Stuxnet would take control of the PLCs and manipulate the data, causing the centrifuges to spin themselves to failure while at the same time sending false feedback to the control room, ensuring that the anomaly remained undetected.[24]

Variations of Stuxnet, such as Duqu, Flame, Shamoon, and Triton, have appeared. Shamoon attacked oil and energy sectors in the Middle East by wiping and overwriting the system files and denying access to the infected computers. Duqu was designed as a key logger to gather information to be used to develop a future attack. Duqu created a local file on ICS to prevent detection and terminated itself after thirty-six days of operations. Triton altered the safety systems in the targeted ICS leaving the ICS vulnerable to a future planned attack.

Threats to critical infrastructure can be so severe that the need for reliability, performance, and security may trump efficiency and privacy concerns related to these systems. In the context of smart and interconnected cities and communities, this raises an important question: what is a city's risk appetite for efficiency versus its desire for security? Can a city be smart and connected and still avoid the risk, for example, of being the next Chernobyl because of a malicious attack on critical ICS on a nuclear power plant? What if an attacker hacks the ICS of a dam or flood control system to inundate a city? What if traffic lights are manipulated to cause a chain accident? These are just a few examples of the kinds of security concerns that a smart and connected city may face.

THE WAY FORWARD: SECURITY BY DESIGN & THREAT INTELLIGENCE

There is no one-size-fits-all solution in the cyber world. The market is full of fancy products claiming they deliver magical results, but none of these products yet has proven to be the ultimate solution against cyberattacks. So, what is next?

Cybersecurity is regulated by standards, not rules, and each operator needs to tailor cybersecurity solutions in a manner that best fits its operations. This approach is called security by design (SbD). SbD advises that every time a new process is to be introduced into the operations of a facility, its design takes into account, or is modified to address, the relevant security concerns. NIST standards, DoD guidelines, and the studies by PRECYSE are valuable resources based on the security SbD principle. These documents do not promulgate any rules or advocate any particular technology. They simply guide stakeholders on the implementation of appropriate controls under a structured methodology fit for securing the relevant ICS.

Smart city leadership can coordinate with private sector operators of critical infrastructure, academia, and stakeholders' operators to explore the adoption of basic cybersecurity principles into the operations controlling the critical infrastructure and to foster a culture of threat intelligence. Threat intelligence or cyber threat intelligence is an invaluable tool for the critical infrastructure operators and city leaders to understand the cybersecurity threats that have, will, or are currently
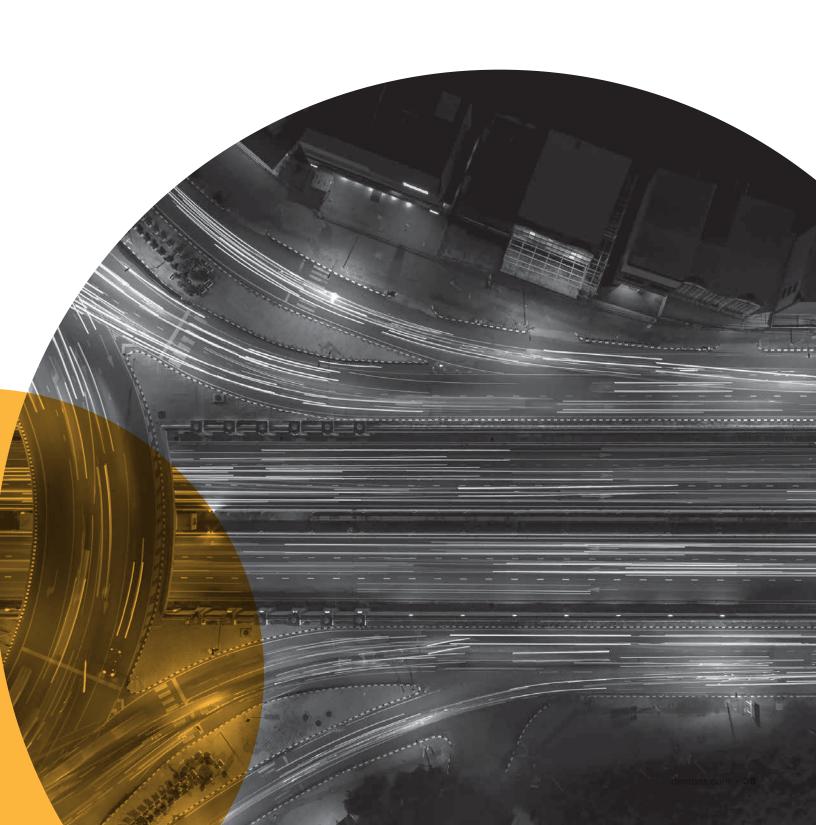
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24   Jon R. Lindsay (2013) Stuxnet and the Limits of Cyber Warfare, Security Studies, 22:3, 365-404, DOI: 10.1080/09636412.2013.816122
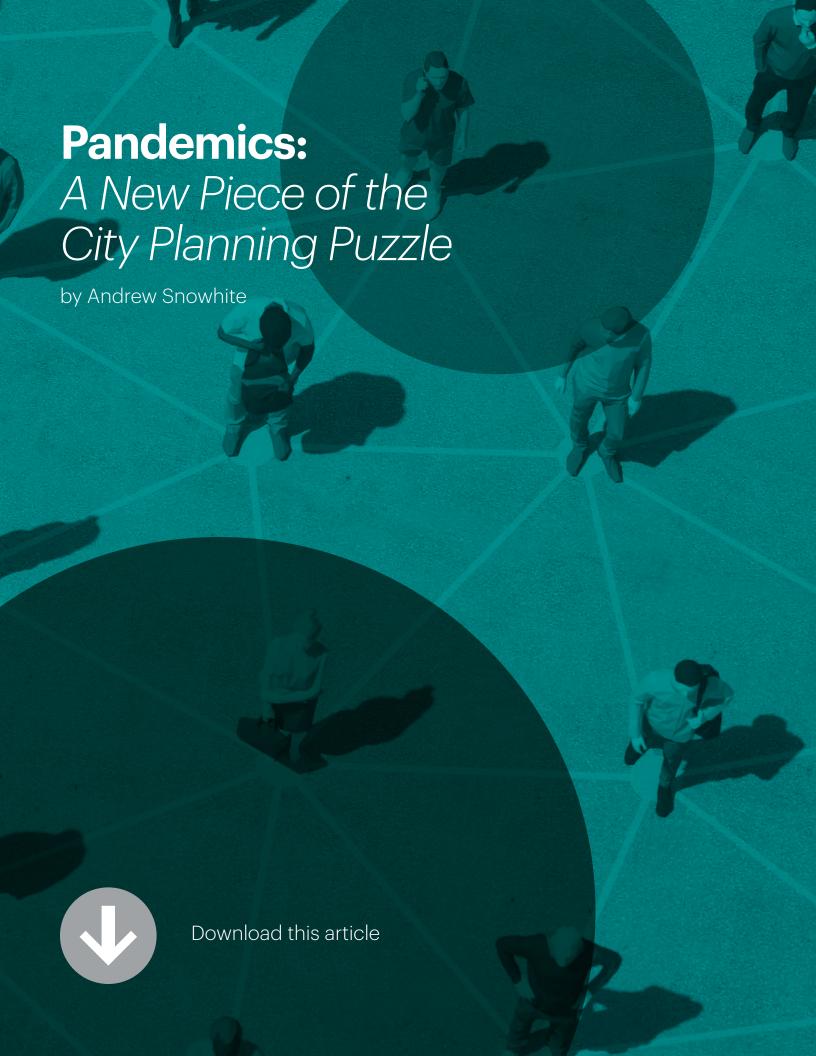
targeting critical infrastructure. This information can then be used to identify, prepare for, and prevent cyber threats and to develop alternative defense mechanisms to mitigate the risks.

One important big step towards such coordination will be to identify the opportunities for smart city leadership to communicate with the Information Sharing and Analysis Center (ISAC)[25] and Information Sharing and Analysis Organizations (ISAOs). ISAC was established in 1998 by a presidential directive, and it is an industry-specific organization that gathers and shares information on cyber threats to critical infrastructure. ISAOs were formed in 2015 by a White House directive to promote voluntary cyber threat information sharing within industry sectors. DHS encourages the development of ISAOs for private companies, nonprofits, government departments, and state, regional, and local agencies. For instance, an ISAO member EnergySec[26] is a threat intelligence platform for sharing Indicators of Compromise through the Department of Homeland Security's Automated Indicator Sharing program, which also provides threat sharing tools to its members operating in the energy sector. EnergySec is just one of many platforms; many other organizations are actively working on developing and improving threat sharing and vulnerability disclosure programs. A coordinated partnership among a smart city, ISAO, and ISAC will be a great tool to create an informed opinion for the smart city leaders on the emerging threats that may affect the safety of their city.

There is no one-size-fits-all solution in the cyber world.

25   https://www.a-isac.com/faqs
26   https://www.energysec.org/

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Pandemics:
A New Piece of the City Planning Puzzle

by Andrew Snowhite

Download this article

Over the last decade, urban planners, designers, developers, and municipalities have begun integrating the concepts of sustainability and resiliency into their city plans. While this is a positive step, it is still not the standard; while often discussed, it is rarely formalized or implemented.

More recently, themes of wellness, wellbeing, and inclusion have entered the conversation. Rating systems are available that define and track benchmarks that meet these goals, such as U.S. Green Building Council's LEED Standard and the International WELL Building Institute's WELL Building Standard. Innovative organizations are embracing these themes as well, and I'm pleased to see NewCities continue to move forward with the Wellbeing Cities Award.

While sustainability and wellness are important additions to the city-planning puzzle, the current COVID-19 crisis makes clear that a different piece still is missing: pandemic preparation and response.

Some cities may combine this thinking into their general disaster planning, while others may manage it separately. Either way, as we see the effectiveness of cities' responses to COVID-19, both positive and negative, we no longer have the luxury of taking a passive approach.

I typically begin all of my writing and presentations with a stark warning regarding the desperate need to design, build and operate new cities and urban areas over the next 30 years to meet the demands of the world's 2.5 billion new urbanites. This population boom is daunting enough considering the impacts that will occur from challenges including climate change, food security, and income inequality. Now we need to add pandemics to the list for existing cities, and as part of the initial planning for the hundreds of new greenfield cities still to be built.

Moreover, pandemics can't be thought of as their own challenge. They are intrinsically connected to issues of sustainability, resiliency, wellness and population growth. Consequently, we need to expand our city design thinking, and our infrastructure and operations planning strategies, with the assumption that the world will face additional pandemics in the future.

… pandemics can't be thought of as their own challenge. They are intrinsically connected to issues of sustainability, resiliency, wellness and population growth.

As urbanization-related industries begin to prepare and respond to pandemics, here are five initial ideas to consider:

Land use planning and masterplans should include flexible areas designated as reaction zones. These could be green spaces or flexible mixed-use areas with established and available utilities that can quickly be converted into temporary hospitals, housing or distribution areas. From a macro perspective, we may also need to reconsider our future approach to urban density.

Design flexible buildings that consider pandemic and emergency preparedness from the start to facilitate the response process. For example, certain buildings such as hotels, dormitories or apartments could be designed flexibly for conversion into hospitals or quarantine areas. Architects can expand their traditional building designs to include areas for quarantining or health-related supplies storage.

Design healthy buildings to not only benefit tenants' wellness and effectiveness but also to mitigate the potential spread of disease. This can be done through proactive design techniques like reducing chemicals, using non-hazardous building materials, using sensors to monitor building operations and employing smart ventilation techniques. An example from a recent study notes that "seasonality should be considered in building operation, so that mechanical systems can be operated to protect occupants against infectious diseases, such as using higher ventilation rates or relative humidity levels during months with high flu incidences."

Regulations can be both friend and foe to planners and developers. In the case of pandemic planning, governments may need to consider mandating the innovative and flexible building design requirements noted above, at least in certain areas of a city, to ensure there is available space to respond to a pandemic. This is similar to municipalities around the world that have implemented minimum levels of green building certification for all new building projects (e.g. Washington D.C.'s Green Building Act of 2006). Regulations in other areas could address topics such as food security or enacting strategic autonomous deliveries and mobility services in times of crisis.

Connectivity is at the core of society and the foundation of a city. It is now often defined in the context of "Smart Cities" and the technology used to not only connect people but also devices, services, and decision-makers. Pandemic planning and response need to be layered in city plans to monitor and deliver services, from security to trash, to people's movement. Plans also need to be in place to quickly shift to telework and virtual education while ensuring enough bandwidth is available for online social interactions and increases in media consumption.

These ideas are the simple start of a deeper conversation that needs to occur across the various industries related to city planning. From architects to construction firms to technology companies and elected officials, the COVID-19 pandemic will fundamentally change our approach to designing and planning urban environments.

Our city planning puzzle is now considerably more complicated. However, as we work toward solutions we must document best practices and integrate them into future preparations. Our urban futures depend on it.

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Will Innovation be the Silver Lining of 2020?

by Jay Connolly

Download this article

The current global health crisis is going to leave everyone with lasting memories, and for the majority not the kind we would want. The human impact, and business impact, of the pandemic is significant and continues to grow.

One consequence that is becoming clear is the scale of innovation that is happening in response to the pandemic in service industries, such as in the legal sector. The swift onset and substantial impact of COVID-19 on businesses has been unprecedented, creating an enormous push for businesses to make changes for survival. This innovation survival response may not feel like innovation as we have known it in peacetime, however, it is still innovation. Wikipedia defines innovation as the development of new methods of production; the establishment of new management systems; both a process and an outcome.

In the legal industry, for example, in recent weeks we have seen trial lawyers experimenting with new technologies and a wave of innovation from the litigation support industry, as well as court processes going digital, to name a few. The UK courts have been forced to adapt in a bid to stay operational and although video calling and streaming is not new technology, until now there has not been much appetite for it. And, while in some sectors remote working is often highlighted and discussed, for others, we are only seeing the tip of the iceberg.

The Financial Times recently launched a legal hackathon focused on addressing the challenges and opportunities in the wake of COVID-19. Part of this rich seam of ideas is making service industry sectors more efficient and effective and it is receiving a great deal of attention. Clearly, there is a new level of activity and drive bringing innovation to all aspects of firm activity.

Realizing what needs to be enhanced often does not require in-depth review or analysis

So one key question is, how do we continue to harness this innovation drive in the future?

While the current health crisis will ultimately pass, a return to how things were before is unlikely. And, while the human and economic impact may be devastating, some changes, such as this renewed and invigorated innovation mindset, are likely to be the silver lining. So, what have we learned and how do we keep the innovation momentum?

Firms need to drive a culture that supports innovation in ways that make today's level of change, engagement and focus sustainable. Here are five learnings we should apply:

1. Stop calling it 'innovation'

The word is overused and can often have negative connotations. During the COVID-19 pandemic we have responded and built new solutions, adapted to the evolving circumstances, and worked to ensure our survival. The message was not to go and 'innovate'; it was about urgent, necessary change to enable businesses to continue to function. Ongoing change, development and enhanced approaches will be required for business to continue to survive over the coming months and years. Innovation needs to be replaced with a mindset of faster change and evolution.

2. Make sure everything is on the table

Innovation budgets and resources are often focused on visible and typically consumer or client facing activities. Improving processes or increasing efficiencies are often not the goal. Over recent months, organizations have needed agile thinking across all of their businesses processes in order to be able to function in this changed environment. Organizations need to remember that business survival requires change, innovation, in all areas, whether that's product or process. Everything needs to be on the table.

3. Harness dissatisfaction

Realizing what needs to be enhanced often does not require in-depth review or analysis. Rather than accepting what is not working organizations need

to embrace a culture that harnesses dissatisfactions and focuses on changing them. Dissatisfaction within organizations can provide powerful insights, so capture them and empower action.

4. Clear space for change

Change doesn't happen in a defined part of the organization and organizations need to make space for innovation to be a part of the daily routine. Creating space for innovative thinking acts as a stepping stone, reinforcing the need for change as a priority, business commitment, and helps to put frequent discussions around innovation on the agenda. Set time in the week for thinking about innovation and how you can mobilize and engage the organization to bring it to life.

5. Track progress - success and experiments

Organizations need to track their progress. What ideas are being created, what will they change, where and how? For the ideas that do advance, what is working, and most importantly what are we learning? If things do not go as expected, capture the insights and learnings and make these visible to the organization. Tracking progress will help organizations to build on past learnings and keep innovation high on the agenda.

Now is the time to make change. We are never too busy - we are just making other choices. Change and evolution, aka innovation, need to be part of everyone's mindset for the future and the current pandemic has highlighted how constantly embracing change is going to be required to survive in the new dynamic.

Jay Connolly is the Global Chief Talent Officer for Dentons. He advises the firm's leaders on opportunities to enhance all aspects of talent management including recruitment, performance management, diversity, training and development, and compensation and benefits programs for everyone at the firm. He has lived in the US, UK and Europe and built extensive experience working across the Middle East and Asia.

FCC Action Offers Electric Utilities Once-in-a-Lifetime Opportunity to Accelerate Modernization of Critical Operations

by Rachelle Chong

Download this article

Over the past several weeks, the electric utility and telecommunications sectors have been abuzz with news of a decision by the Federal Communications Commission (FCC) to make six megahertz of low-band spectrum available for the development of critical wireless broadband technologies and services. While this development has been five years in the making at the FCC, the transformation of the desirable 900 MHz band enables private, licensed wireless broadband deployment by utilities and other industries.

The FCC's action is nothing short of a "game changer" with the potential to impact every electric utility in the nation. The FCC order allows 6 MHz of the 900 MHz spectrum to be converted from a voice-only service (currently designated for shorter-distance, narrowband communications) to private, licensed wireless broadband service reserved for use by critical infrastructure and other private enterprise industries. This is particularly significant for the electric utility sector because it gives them the foundation they need to modernize the electric grid and layer onto it the advanced communications infrastructure that is essential for reliable and secure operations. Presently the electric industry relies on a patchwork of fleet dispatch voice networks, unlicensed Wi-Fi spectrum, and leases of commercial mobile spectrum which are connected to the public internet and vulnerable to hacking. Utility companies report that their systems are under constant threat of attack, with hundreds of hits on their systems every day. Private, licensed 900 MHz spectrum is far more cyber secure and will help combat cyber attacks.

The 900 MHz band enables ongoing grid modernization initiatives by utilities. The switch from a one-way grid to a bi-directional or multi-directional grid requires a secure, resilient network that can reliably manage these kinds of flows. Secure advanced technology such as that which the 900 MHz band will enable is key to achieving rapid communications for a modern grid and to integrating distributed energy resources, renewables like rooftop solar and wind, electric vehicle charging, storage technologies, and more.

The faster, integrated wireless broadband network that the FCC order enables will also improve efficiency and foster safety for utility workers. For example, a field operator can send a picture or video of a safety incident on a remote power line to a supervisor who can assess the seriousness of the situation and dispatch a repair crew to the exact location to address the problem before conditions worsen. Of course, a photo or video can be sent with current communications technology, however, the private 900MHz broadband network enabled by the FCC order would be much faster and more secure.

900 MHz technology also would allow for faster and better "self-healing" of issues on the grid. In electric utility operations, the speed and security of the network can mean the difference between life and death. If a remote line were to go down in a storm or wildfire, for example, the line could be de-energized in 1.4 seconds -- i.e., before it hit the ground. San Diego Gas & Electric is already developing this technology. With the availability of private LTE networks, there is now an opportunity for this to become an industry standard.

This benefit should be of extreme interest to utilities operating in California and other western state locations with high risk of wildfire. Wildfire liability in recent years has put California's largest utility Pacific Gas & Electric into Chapter 11 bankruptcy. Adoption of licensed wireless broadband would be extremely helpful in preventing and fighting fires. It could ultimately reduce the need for long-lasting public safety power shut offs which have devastating financial impacts on local economies. In the case of a fire, the precise location of a downed line or portion of a system that is imminently threatened by the fire can be detected, and power can be re-routed around the vulnerable portion of the system, without a total system shut-off.

There are discussions underway right now to establish a public-private partnership of government, utilities, and private tech companies for the express purpose of a wireless broadband network devoted to California wildfire prevention. Leading the charge on this initiative -- dubbed "the Big Idea" -- is a company called Anterix. This company has significant holdings of 900 MHz spectrum and is interested in making private wireless broadband available for electric utilities nationwide. Anterix is speaking with the leadership of California government agencies including CAL FIRE, the Office of Emergency Services, the Controller's office, and the Governor's office about applications that such a partnership would enable. One concept is deployment of mountain-top cameras to constantly monitor vast, rural high fire risk territories. The camera network can use artificial intelligence to spot a fire and quickly alert senior utility executives and fire authorities of the location. Another potential involves deployment of a comprehensive network of wireless sensors throughout high fire risk areas to detect dangerous weather conditions and to continuously monitor moisture, rainfall, and wind.

As a former state utility regulator myself, I believe state utility regulators have an important role to play at this moment. There are a number of significant regulatory hurdles that will have to be overcome in order for utilities to be able to seize the opportunity they presently have while spectrum leases are available. Forward looking electric utilities will want to enter into

long-term leases to obtain the benefits of the 900 MHz spectrum, however electric utilities are usually funded in a three- or four-year rate case cycle. A utility that waits until its next rate case cycle before proposing a new private licensed wireless broadband network for its system may miss the boat. The limited spectrum may be snapped up by other eligible entities whose budgeting cycles and business structures allow them to move more quickly. Regulators and utilities may need to get creative to expedite the process of broadband adoption.

The 900 MHz band enables ongoing grid modernization initiatives by utilities.

There are a few models that might serve as an example for taking up expenditures that arise outside of rate case cycle. In California, there is a mechanism that allows utilities to put certain expenses in "memorandum accounts." These expenses are subject to further scrutiny by the state Public Utilities Commission before they would be recoverable in rate base, but if the underlying facilities are approved in the rate base, then the corresponding expenses in the memorandum accounts are allowed to be placed in the rate base. In Florida, the state regulator implemented new rules that break out resilience services from the traditional ratemaking process. A resilience project can be financed through a specifically authorized customer surcharge, which allows a utility to move ahead with critical resilience projects that would benefit consumers and make the electric grid system safer.

Another issue is the general regulatory treatment of a wireless spectrum lease. Typically, contracts with commercial IT providers are treated as operational expenses. Regulators will want to clarify that spectrum leases for private broadband networks are different from traditional carrier agreements, and will want

to ensure that these long-term spectrum leases are allowed into rate base. Accounting practices should not stand in the way of quickly deploying a secure, private licensed wireless network.

It is important to note that while the FCC reserved the 900 MHz spectrum for critical industries, it is not reserved exclusively for utilities. Other critical infrastructure operators and major enterprises will likely have a keen interest in the possibilities that private licensed broadband networks represent, many of which are unimaginable at the moment. The opportunity is akin to the invention of the iPhone -- we had little idea what all the apps would do when the first iPhone platform was released. Now, a little over a dozen years later, there are more than two million apps available and the variety of ways that they enhance our lives is immeasurable. The utility sector will need to move quickly to maximize the benefits that this once-in-a-generation 900 MHz opportunity offers.

For more details on the opportunity that the FCC order represents, we encourage you to see the May 14, 2020 "Extra Edition" of Public Utilities Fortnightly.

Rachelle Chong is a former board member and current consultant to Anterix, and is a nationally known expert on telecommunications and energy policy. She formerly served as a Commissioner of the FCC from 1994 to 1997, Commissioner of the California Public Utilities Commission from 2006 to 2009, and Special Counsel Advanced Information and Communications Technologies at the California Department of Technology from 2009 to 2011. She also serves on the board of the CalAsian Chamber of Commerce and the California Foundation for the Economy and the Environment, and will be joining the EPRI Advisory Council in August 2020.

REFLECTION

Let's Build Secure, Connected & Resilient Communities
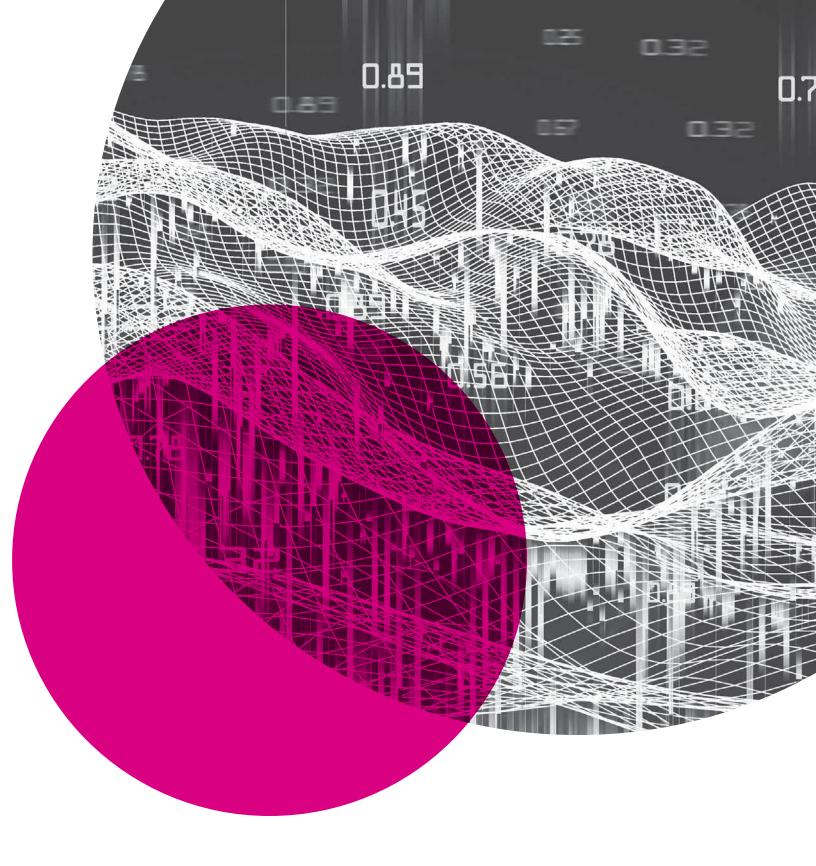
by Lisa A. Brown

Throughout the world, people have increasingly migrated to cities, creating unprecedented demands on urban infrastructure and the individuals who call it home, and new challenges for the municipal leaders of these urban settings. The current global pandemic has also raised new and urgent challenges. While it is not yet clear how it will impact urban migration trends, it is clear that investment needs to be redirected so as to ensure that infrastructure will accommodate advanced technologies to meet the pressing needs of cities and communities. For the past few decades, investment has been directed primarily towards suburbs. Now investment needs to be re-focused to flow to urban cores and to modernize systems to reach a broad slate of communities. The question is how should this be done in a smart and sustainable way, and will the recent momentum continue, now that we are being challenged with new mandates to redesign places and spaces for the recovery of our economic future.

From large metropolitan areas to smaller centralized communities, buildings are evolving to become adaptive environments; ones that must be sustainable, safe and intelligent.
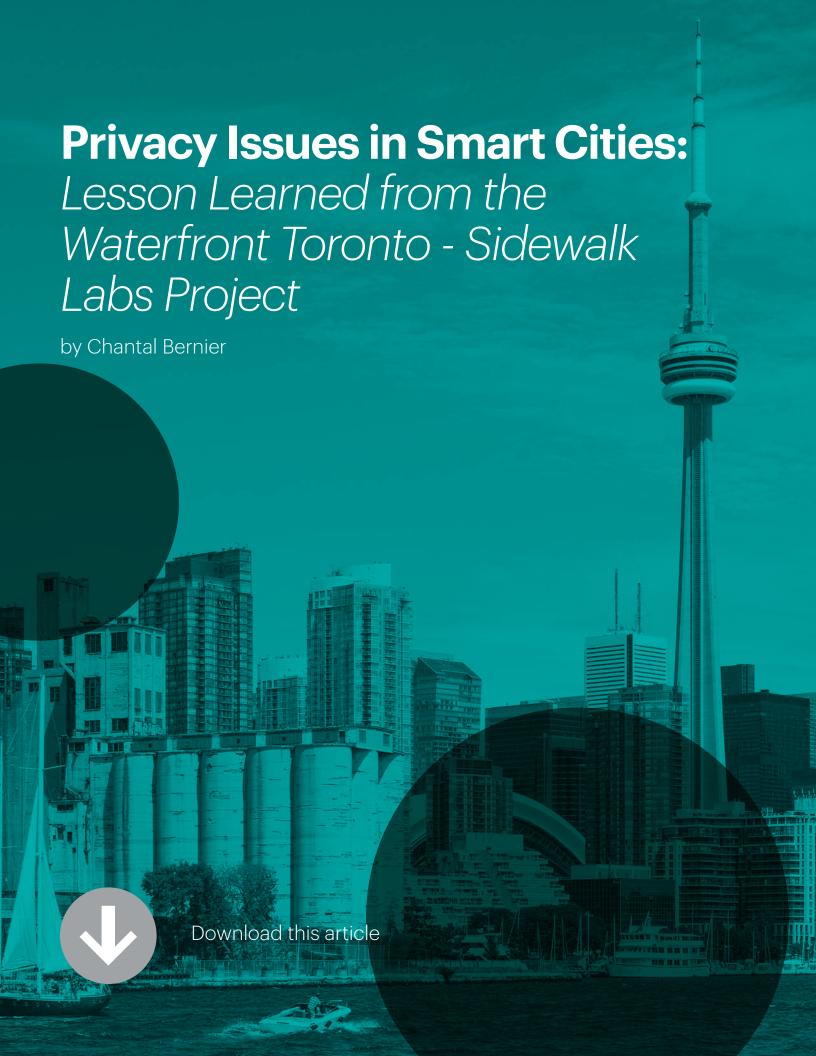
What the inhabitants of these buildings are demanding is truly transformative. By connecting people, the technology they use and the buildings they inhabit, we now have the power to improve experiences while simultaneously keeping people safer and healthier and making cities and communities economically vibrant. Connections offer abundant opportunities to deliver new and improved services and to do it more cost effectively. But we also hear a lot about how technology and interconnection gives us the opportunity to make the environments we inhabit more sustainable. The question is what do we mean by "sustainable"? Does it mean creating socially and economically inclusive work forces? Do we understand it as erecting environmentally friendly infrastructure?

Is it providing access to digital innovations that allow decision makers to make insightful, data driven decisions? The challenge is not only in defining this term but also implementing it in a manner that will appeal to the diverse group of people who live together in urban cores. For example, currently, cities across the globe are reimaging outdoor spaces, such as creating "slow streets" and utilizing other novel concepts that will support health guidelines and allow citizens and visitors to rebuild confidence when working and socializing outside of their homes.

One way of thinking about sustainability is in the context of resiliency. As we enter a new decade, there is a laser focus on this concept. Digital transformation and the rise of secure, connected and resilient communities are closely linked. Intelligent, data-rich infrastructure is at the heart of the solutions municipal leaders are searching for to build resilient communities. Gathering, analyzing, productizing and monetizing that data takes courage. Municipal leaders are intrigued, but many are deeply concerned about the need to balance data privacy while facing demands for more services and efficiencies to retain their citizens, constituents and business owners. This is propelling leaders to search for innovative solutions that help them achieve their city wide goals. Ultimately, they realize that data will contribute to the economic vibrancy of their communities and understand that it is a vital part of the solution to the ecological, social, economic and cultural challenges we face. While our future is uncertain, one thing is clear: our local government and community leaders are embracing more innovation and are determined to create city and community environments that generations to follow will treasure.

Lisa Brown is the Senior National Director, Local Government & Municipal Infrastructure for Johnson Controls. Lisa is a frequent speaker on how cities can harness data to become "secure & connected" and how this relates to climate resiliency, smart infrastructure and economic vibrancy. Lisa sits on the Women of Municipal Government committee for the National League of Cities (NLC), and the Smart Communities Advisory board for the International City Manager's Association (ICMA), as well as serves on the board of Smart City Works, a smart accelerator and the Global Smart Cities Council.

Privacy Issues in Smart Cities:

Lesson Learned from the Waterfront Toronto - Sidewalk Labs Project

by Chantal Bernier

Download this article

Dentons has had the privilege to act as privacy counsel to Waterfront Toronto in the development of the smart community Quayside project with Sidewalk Labs. The experience made clear that no smart city can proceed without social license and that there is no social license without addressing privacy risks.

Risk #1: Surveillance both from the State and surveillance capitalism.

Digital solutions generally create the risk of law enforcement access to the data they collect. Risk mitigation includes publicly available guidelines to assess law enforcement agencies' access requests and public transparency reports on how many requests were received, granted or rejected.

Capitalist surveillance particularly arose around the Quayside project because of the link to Alphabet and Google. This must be addressed with procurement contract terms restricting the use of the personal data.

Risk #2: Collection without valid consent.

Smart cities digital solutions often collect data without consent. To respect the right to privacy, this must be restricted to public sector digital solutions that are demonstrably necessary and private sector solutions with a reasonable business purpose and prominent signage. Otherwise, the collection must be optional, for example through an app.

Risk # 3: Excessive collection of personal data.

The breadth of personal data collection in digital solutions in smart city projects makes it difficult to contain it to what is necessary for specific purposes. To address this risk, Sidewalk Labs had proposed privacy protective technology that "locked" personal data into specific purposes and retention times.

Risk #4: Data breach.

Through intensive public consultations by Waterfront Toronto, we heard the acute concern about data breach. Barcelona, to name one smart city, chose block chain to secure its digital solutions and reassure citizens.

There is no social license without addressing privacy risks.

Risk # 5: Data Monetization.

Akin to the issue of surveillance capitalism, the P3 structure generally supporting smart cities creates concerns that the private partner may monetize the personal data collected through the digital solutions. This must be addressed through the procurement contract.

Risk #6: Lack of anonymity for differently abled persons

Waterfront Toronto had the wisdom of consulting differently abled persons. In relation to privacy, they made us realise how a solution that may appear anonymous – for example, one that only captures movement in a residential building – may actually be identifying for the one person who moves differently. The privacy lens in a smart community must reflect varied experiences.

Risk #7: Loss of data sovereignty

With some exceptions, Canadian privacy law does not prohibit cross border data transfers. In the Quayside project, however, the idea that a city's data, through a foreign private partner, would be hosted in a foreign jurisdiction under different privacy laws was identified as a significant privacy risk. Mitigation meant requiring storing personal data in Canada.

In short, as privacy counsel, we learned how pivotal privacy is in realizing a smart city project and how integrating privacy to a smart city opens up its extraordinary potential.

This article also appeared on the Dentons Privacy and Cybersecurity Law blog. To view this and other posts and articles, please visit http://www.privacyandcybersecuritylaw.com/privacy-issues-in-smart-cities-lessons-learned-from-the-waterfront-toronto-sidewalks-project/

Chantal Bernier leads Dentons' Canadian Privacy and Cybersecurity practice group, and also is a member of the Firm's Government Affairs and Public Policy group. Before joining Dentons, Chantal spent six years at the helm of the Office of the Privacy Commissioner of Canada (OPC), where she led national and international privacy investigations in the public and private sectors, as well privacy audits, privacy impact assessment reviews, technological analysis, and privacy policy development and research. She advises leading-edge national and international companies as they expand into Canada and Europe, enter the e-commerce space, adopt data analytics and roll out data-based market initiatives. Her clients include ad tech companies, financial institutions, biotech companies, data analytics firms and government institutions.

Confronting Power, Place and Change

Can cities in the information age create more equity in an unjust world?

by Brian English

Download this article

The COVID pandemic has highlighted in sharp relief the structural inequalities and health disparities faced by people of color, the poor, immigrants and other marginalized communities. Similarly, the pandemic of racism itself, left undertreated for 400 years, wielded its own attacks on the right to breath. None of this should be a surprise, given the legacies of institutional racism, like "redlining" policies, that set in place the gaps in wealth and advantage.

In the information age, this grossly unequal access and treatment that different communities face, is being laid bare in no uncertain terms. The widespread and omnipresent integration of cameras and social media has become a new revolutionary sword, compelling millions of people out of their homes and into city streets to confront power, inequality and injustice.

We frequently hear the concept of "Smart Cities" discussed as a technology play, with focus on street lighting, parking and traffic controls, and such. But what other ways can cities and citizens leverage the inventions of the information age, including the Smart Cities movement, to create more just and equitable cities? And what are the perils that might exacerbate inequality?

Historically, cities themselves are widely considered one of the most important revolutions in human history[1]. Cities emerged hand in hand with the invention of writing some 5,500 years ago in Mesopotamia, marking the transition from prehistory to history, and what is called "the rise of civilization."[2] So it is noteworthy that our ever evolving information and communication technologies of the 21st century are now ushering in a new era of social mobilization, accountability and other checks and balances on the governing of our cities.

Cities are often where power hits the ground, where people and organizations go to gain and amass power.

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1   This idea is captured by Gordon V. Chile's 1950 seminal paper The Urban Revolution
2   The Scope of Complex Artificial Environments, Juval Portugali

Cities are often where power hits the ground, where people and organizations go to gain and amass power. Saskia Sassen says cities have become today's frontier zones where those who are disadvantaged, discriminated or who lack power, can gain "presence vis-à-vis power and presence vis-à-vis each other." These moments of engagement in the body politic are essential encounters to change our relationships in society and the public sphere. These public encounters and amplified voices disrupt the narrative that "everything is fine" and change it by making "legible the local and silenced."[3]

TOOLS FOR RECONSTRUCTION, FROM THE BOTTOM UP

The best course of action to reduce inequality in our cities and nation would be to deconstruct institutional racism. We also need to construct new policies and programs as bold as the New Deal (but remember even this program had policies of exclusions) that can drive significant investments and reforms. After all, it was laws like the G.I. Bill and institutions like the Federal Housing Authority that established an unlevel playing field and set in place the gaps in accumulating wealth and education based on racial divides. While we cannot pretend that innovations of the information age are a substitute for larger reforms, they have proven themselves as powerful tools in social change. Therefore, we must leverage all the tools at our disposal to begin addressing matters now, from the grassroots up. Here are three opportunities for beginning this work now:

1. Get Practical and Tactical

We can begin modifying and improving procedures, recognition, and redistribution aspects of equity. The increased filming and distribution of police violence demonstrates the power of technology to create transparency and recognition of these injustices. But many other similar tools can be used for restructuring the daily workings of our institutions, including from the grassroots up. For example, globally there has been tremendous innovations and uses of new affordable and distributed means of mapping, collecting data and sharing information. This has created procedural benefit of including communities previously left out, whether it's mapping the millions of informal, "lower-caste" communities in India or collecting pollution data by citizens regarding their burden of environmental injustice. These are powerful tools for advocating the recognition and redistribution of resources to address these community conditions.

2. Go Back to the Basics of "Who Decides?"

Cities must stay grounded in the fundamentals of planning and participation when they converge around questions like "who decides?", especially when pioneering smart cities. Since the time of Aristotle, cities, city-states and nations have debated who are citizens and what are their rights and responsibilities. Information and communications technology (ICT) and Smart Cities bring the potential to connect people with resources, information and services that empower them. As such, our focus should be on empowering marginalized communities to become the protagonists of their own development by knowing, exercising or gaining rights and power. This has bearing on all civil rights movements regarding gender, race, and even geography.[4]

If we lose sight of the fundamentals of planning, new forms of technocratic power could grow, dominate urban agendas and repeat legacies of top down policymaking and exclusion that we've seen in the past. In recent years, we have seen developers use the guise of the Smart Cities movement to try and create utopias, starting from scratch in satellite cities or in enclaves of the city. What we have learned is that the notion The first suburban developments of Levittown, are a hallmark of this planning approach that tries to

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3   THE CITY: TODAY'S FRONTIER ZONE, SASKIA SASSEN, Department of Sociology Columbia University, GLOCALISM: JOURNAL OF CULTURE, POLITICS AND INNOVATION 2014, 3, DOI: 10.12893/gjcpi.2014.3.1

4   See Sherry Arnstein's Ladder of Citizen Participation, written in 1969, a powerful framework for moving from tokenism to citizen control.

escape the complexities of urbanism and creating fantasies in a bubble. Ultimately, this approach can be a threat to democracy. History teaches us a lot about what happens when planners divide cities. Just look at Belfast, Beirut, Jerusalem, Mostar, or Nicosia to see the folly of partitioning discordant communities. Rather than creating peace, it destroys the social contracts among residents.[5]

3. Don't lose sight of the goal

Rather than getting snarled by reinventing processes with new tech, we must measure our progress by improvements in equity *outcomes*.
ICT often provides a new way of executing an existing process. While this may constitute progress for "paper reduction acts", what we really need are improvements that address the outcomes we seek. Cities have been swimming with sales representatives from tech companies peddling their wares. If decisions to upgrade or implement new technologies lose site of the outcomes that we seek in our communities, they will lose their fidelity. That said, new ideas and innovations that have been injected into planning and governing systems should be welcomed as an opportunity to transform systems that are not working.

The 'Right to the City" movement, which dates back to the 1960s, questions the commodification of cities and the ability of capitalism to provide equitable access to all that a city offers. This movement has been reinvigorated by many social equity movements and has found recognition within the UN New Urban Agenda and even the City Statute of Brazil's federal law.

In the information age, where information is power, if it is confined by the lens of competition inherent in capitalism, there is a risk to the democratization of information. Viewed through that lens, ICT risks becoming another arm of capitalism that grabs power and excludes those who can't pay. In today's world, we cannot let the business of Smart Cities crowd out innovations and innovators with equity solutions. Social enterprises and B-Corps, "missions with a business," can help with this, serving as collaborative partners for good.

In the end, we must remember that we are not simply planning cities for the information age; we are in the information age planning cities.

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5   Eugenie Birch, Cities, People and Processes as Planning Case Studies (2012), in Oxford Handbook of Urban Planning: Chapter 14, Publisher: Oxford, Editors: Rachel Webber and Randall Crane, pp.259-282

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Economic Recovery Post-COVID-19:
An American Retrospective

by Fenner L. Stewart

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Last week, I was writing a funding grant for a series of e-conferences about economic reflation,[1] while reading [Americana: A 400-Year History of American Capitalism.](#)[2] The overlap of these activities made me aware of a pattern in American history: just after each of the most tragic moments in its history,[3] the United States experienced unmatched acceleration in its economic growth. If history can help predict future happenings in similar contexts, then the economic policies for reflation post pandemic will slingshot America in a targeted direction with tremendous economic force. This thought piece suggests that whether economic prosperity results post pandemic is not in question, just its direction.

The book is impressive, following the golden thread of the American drive for innovation. It traces history from the merchant adventurers of the 17th century to public investment in canals and the rise of New York City to financing the Civil War to the machine-makers of the Gilded Age. At this point in time, the pace of innovation becomes unmanageable to map as the simple march of linear progress. The interconnect of influences becomes too dense, and no single through line can encapsulate happenings. However, the reader can trace a thread, such as the cotton gin to hip-hop capitalist anthems, or the electric light to Google, or the Rust Belt to Chinese capitalism (*sans* democracy), then marvel.

The first question is whether Covid-19 will prove to be comparable to the most tragic moments in U.S. history or will it amount to something less severe.[4] I believe it will prove to be the most tragic event in American history in terms of total economic cost and lives lost since the Second World War.

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1   The funding will support my coming project as a climate governance expert with the [Canada Climate Law Initiative.](#) The e-conferences will bring together top thinkers and practitioners in the field of climate governance and finance – including [William Nordhaus](#) – to provide policy direction for the soon to be devised stimulus packages for post pandemic Canada.

2   Bhu Srinivasan, Americana: A 400-Year History of American Capitalism (Penguin 2017).

3   The most tragic moments in American history are selected in terms of total lives lost and total economic cost: The Civil War, the First World War coupled with the Spanish Flu Pandemic, and the Second World War.

4   Such as the four global recessions since the second World War ([1975, 1982, 1991 and the Great Financial Crisis of 2009](#)).

In terms of cost, it seems assured that Covid-19 will cause global economic catastrophe. Not since the Second World War has real per capita global GDP dropped more than 2.9%. A deeper drop is probable in the short-term. The World Food Program's chief economist warns that Covid-19 is "potentially catastrophic for millions," noting it could bring the total global number of people at the brink of starvation to a quarter billion by year's end. I would count such an event as an economic catastrophe that the U.S. economy cannot avoid.

In terms of lives lost, I will not engage much in the calculus of death, but as a benchmark: 2.5% of all Americans lost their lives in the Civil War; 800,000 died between the First World War and Spanish Flu; and 418,500 died in the Second World War. How many Americans will die of Covid-19? A staggering number of Americans have died – over 115,000, with numbers still rising – with no end in sight. The Spanish Flu killed 675,000 Americans. Could Covid-19 be as savage? It will certainly eclipse the 60,000 mark, passing the total number of American deaths in the Vietnam War (approximately 58,220).

The second question is what follows. After each of the three most tragic moments in U.S. history, tremendous economic growth occurred in the period immediately following. The Civil War sparked the Gilded Age, which represented strong economic growth – substantially higher than during the corresponding years of the late 20th and early 21st centuries.[5] The Second World War thrust the U.S. economy into accelerated growth, taking American affluence to new heights.[6] The same is true for the period after the First World War and the Spanish Flu Pandemic, which seems most like current circumstances.

The First World War pushed federal government spending to levels never seen before. Total federal expenditures were $723 million in 1916, jumping to $12.7 billion in 1918.[7] This period also marked the first time that the U.S. government would take systematic control over all aspects of American life, while pouring billions into innovation and technology.[8] Immediately following this period of unprecedented loss of human life as well as unprecedented federal taxation and spending, an equally unprecedented period of growth and prosperity occurred from 1919 to 1941. This economic expansion was larger than those after both the Civil War and the Second World War.[9] The pace of growth is even more impressive considering the fastest growth was between 1929 to 1941, since it includes the Great Depression.[10]

This pattern of great American tragedy followed by great American economic growth is remarkable. A sound reason for why this pattern exists is that prior to growth, significant progress was made in "scientific, technical, and organizational knowledge," laying the foundation for what followed.[11] In particular, the growth after each World War can be traced to significant public-funded research and development in technologies with commercial applications, which were only harnessed in the post war era.[12]

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5   See, e.g., Alexander J Field, "US economic growth in the gilded age" (2009) 31 Journal of Macroeconomics 173 ("[t]hese data show that TFP [total-factor productivity] growth rates in the last part of the 19th century were far stronger than the narrative we have come to accept suggests, and substantially higher than they were during corresponding years in the 20th century" at 180)

6   Srinivasan, supra note 3 ("[b]y the midsixties, postwar affluence meant that even the American teenager with a part-time job at McDonald's could entertain prospects of his own car, the driver's licence becoming a rite of passage" at 405)

7   Ibid at 299.

8   Ibid at 299-301. For more, see David M Kennedy, Over Here: The First World War and American Society, 25th Anniversary Edition (Oxford University Press, 2004).

9   Field, supra note 5 at 188.

10   Ibid.

11   Ibid ("[t]he rapid progress in scientific, technical, and organizational knowledge during the two generations prior to the First World War laid the foundations for 20th century advance, particularly that remarkable period between the two world wars").

12   Srinivasan, supra note 3 ("[w]ar also proved to be a laboratory, an urgent stage upon which technology advanced in remarkably compressed time frames. Wireless telegraphy... made considerable strides during the war years" at 301) and ("[a]t the same time, war had also shown the central planning could not only coordinate the resources of large economy but also force rapid innovation. The Manhattan Project... was an innovation as anything private industry had ever produced in American history. Numerous militate technologies, including advances in television, jets, and computing, rose from the search-and-development laboratory that was World War II" at 265).

Today, governments are already concerned with economic reflation. Post pandemic, it will be priority number one. The U.S. government, and others, will design stimulus packages. If the historical patterns have predictive power, it will unleash rapid economic growth. The more interesting question is: what direction will this growth take? Actors with a spectrum of interests are – or will be – lobbying to influence these stimulus packages in the coming months. Much is at stake. An English translation of an old Chinese curse is "may you live in interesting times." We certainly do live in interesting times – times, which will be both tragic and transformative.

The more interesting question is: what direction will this growth take?

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Implementing Artificial Intelligence:
Lessons from the Trenches

by Karl Schober, Jawaid Panjwani, Ryan Middleton,
Tracy Molino and Chloe Snider

Download this article

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, including learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions), and self-correction. AI promises substantial benefits to businesses and organizations. Organizations that develop and commercialize AI will likely have significant advantages in an increasingly digital world. AI technologies can improve operations, enhance productivity, and ultimately increase their bottom line.

At the same time, AI applications can pose potentially significant risks for businesses and industry sectors:

- AI-enabled automation threatens to disrupt labour markets and employment;

- Predictive analytics in finance, education, policing and other sectors can reinforce racial, gender and class biases; and

- Data used in AI development and applications are often collected in ways that may violate privacy laws or compromise the accuracy of AI outcomes.

Furthermore, a number of sectors and industries exploring the adoption of AI technologies often have no prior experience with data or data-driven technologies. As both public and private entities contemplate the various implications of AI in the context of their activities, there are a number of considerations and best practices to keep top of mind. Among these are:

- **Algorithmic transparency**: Many AI techniques are "black box" models, meaning it is difficult to relate the input data and variables to the outcome. This is a major disadvantage, as it is difficult to explain to stakeholders, including regulators, how the outcome was actually achieved. For instance, where the AI is used to make a decision (e.g., extend credit or not, hire someone or not), a "black box" model does not allow an organization to defend itself against allegations of bias or demonstrate why the model is accurate. Using a more transparent model provides significant advantages, including the ability to demonstrate to stakeholders that the model is accurate. In addition, a well-trained,

transparent model is often easier to implement, and requires less computing power and, perhaps, even less data to train than black box models

- **Documentation**: It is vital to document all stages of the AI process, as data science is not an exact art, and any two data scientists will take different approaches to the same problem due to their differing experience and knowledge. Proper documentation helps ensure seamless transitions between those working on a given project, as well as provides for higher quality peer review.

- **Verification of data quantity and quality**: A minimum quantity of data is required to achieve statistical significance at certain confidence intervals, but too much data can create "analysis paralysis." Laying out a clear plan at the beginning of data projects will help avoid work that is ultimately not useful. In addition, poor-quality data will only lead to serious errors. Investing time and effort to understand the data properly at the outset – verifying the source, checking missing values, identifying biases, and noting any anomalies – is likely to pay dividends in the form of better quality and more targeted results.

- **Fostering a data culture**: A business should not tackle a data project in isolation. Executive engagement and corporate communication are essential to determine the problems that require solving, set out the metrics that define a project's success, and manage stakeholder expectations. Data scientists, business people and staff need to communicate to understand the challenges of working with data, and what is possible and what is not.

- **Ascertaining copyright**: Before using data, confirm that you have the necessary rights. If a third-party service provider generated the analysis based on your core samples or other property belonging to you, be sure to check the intellectual property clause in your contract. In the case of public sources, check the terms of service for the database, or the website from which the data was obtained to see what is and is not permitted.

- **Respecting confidentiality**: If the data was obtained from a third party, or created in partnership with another company, such as in the context of an option agreement or a joint venture, review your contractual arrangements to confirm whether they require the other party's consent before giving access to an outside AI service provider.

- **Allocating responsibility for analysis**: If the results of the analysis are not up to par, it is important to know who is responsible for making it right. When signing a contract for AI services, responsibility for each part of the job—selecting the data, preparing it for analysis, interpreting the results, and so on—has to be clearly stated. That way, once the source of the problem has been identified, it will be easier to determine who has the burden of addressing it.

- **Training employees**: Ensure that you properly train your staff. They need to understand the software's functionality and limitations to use it properly.

- **Solving the right problem**: Once you have seen AI in action, it can be easy to view data as the answer to all of your business challenges. Avoid the trap of throwing data science at every problem. Sometimes the simplest, non-data solution is actually the right one. Data science is best used under certain specific conditions, such as abundant data, repetitive and measurable processes that can be observed over time, and a real problem that makes a real difference to the end user or business partner.

- **Regular re-evaluation**: The process of deriving benefits from AI does not end when an insight is generated, or a predictive model is built. It is essential to check accuracy against real-world results. Discrepancies can occur for a multitude of reasons: initial conditions could vary from the original data, or a key variable may have been omitted unknowingly from the original analysis. In some cases, the very fact of measuring and predicting can change the outcomes (very common when making predictions about human behaviour). Constant monitoring is vital to ensuring the work remains relevant, useful and accurate.

Organizations that develop and commercialize AI will likely have significant advantages in an increasingly digital world.

The use, value and application of AI will differ by sector or industry, but there are also key commonalities. Many sectors and industries will face opportunities and challenges, including difficulty gathering consistently high-quality data to develop models; industry culture resisting the adoption of AI; reluctance to invest in AI because initial adoption often involves impacts to daily operations and does not yield immediate returns for shareholders; and the high cost of integrating new or upgrading existing technology. Some sectors, such as the mining sector, will generally not be interested in data sets that contain personal information, and as a result, are free from many of the privacy concerns and restrictions facing companies in other sectors such as retail where certain data containing personal information is highly valuable. AI is becoming a powerful tool for analyzing data in operations, ranging from managing transport and logistics, to human resources and supply chain management. AI can identify patterns that are useful in reducing expenses, optimizing resources, reducing waste, improving planning, and increasing return on investment. In short, AI can enable companies of all types to become insight-driven enterprises.

A version of this article also appears in the Dentons Data Summit 2019 Whitepaper. The full Data Summit report is available at https://www.dentons.com/en/insights/guides-reports-and-whitepapers/2019/november/29/dentons-data-summit-2019-whitepaper

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See https://www.dentons.com/en/insights/guides-reports-and-whitepapers/2020/may/22/dentons-data-covid-19-restarting-your-business-privacy-and-data-toolkit

REFLECTION

A Student's Reflection on Smart Cities

by Mitch Radakovich

I have been aware of my love for Data Science since the 10th grade. The idea of collecting information about our world, finding patterns and properties and extracting value from them has always been so exciting to me. While the technology and strategies of the field stem strongly from math and computer science, applications are present in all sectors of society.

In our modern vernacular, the words 'data', 'insights' and 'analytics' are catalogued in the realm of business: tools to increase profits, improve supply chains, and convince the general public to buy more stuff. We have all been subjected to online advertisements that cater directly to our demographic and interests. It is not an accident that businesses know exactly what we want – it is a result of algorithms, computer science, and big data.

But I don't want to use data simply to sell stuff. I desire to use new technologies to impact the fields of education, transportation, healthcare, and government – using data to improve the lives of all. We have petabytes of information about our population. Why not use it to make the world a better place?

My name is Mitch Radakovich. I am a Third Year student at Ohio State University studying Data Science, City Planning and History, with the aim of becoming a Data Scientist for Social Good.

Data.gov is one of my favorite websites. Since its inception in 2009, this open-source government-administrated data catalog has grown from nothing to over 230,000 datasets. The information available has breadth and depth, with topics ranging from airplane landings to zoo attendance. The beauty of the site is its availability. Because the information is free and accessible, people from all over the world have the opportunity to dive in headfirst, utilizing their technological tools to solve the world's problems. In the past year, I have used data from data.gov for school projects, coding practice, and hackathons. These projects include modeling animal populations at shelters, fighting parking violation injustice, and visualizing fish migrations in the great lakes. The applications are endless.

So... where do Smart Cities come into this? We have data. We have passionate and knowledgeable people who can put the data to beneficial use. Now, we need organizational support to get big projects off the ground!

In the past decade, the field of Smart Cities has advanced by leaps and bounds. As is evident on data.gov, information collection has improved tremendously, and additionally, money is being allocated for data-centered action. For example, my home city of Columbus, Ohio was fortunate to receive $40 million in DOT funding with the goal of shaping what it means to be a 'smart city'. By leveraging already existing data and technology, the city has been able to improve public transportation, address issues of inequity in access to healthcare, education and employment, and to modernize its energy grid.

By partnering with The Ohio State University, the program has fostered innovation while providing an incredible learning opportunity for students and faculty alike. Programs like Smart Columbus will certainly continue to grow as our population's data literacy and appreciation for new technology gain maturity. This is a future I am excited for and most certainly want to be a part of.

Students in universities around the world are busy learning new technology, methods, and applications in the field of data. While learning, we are also dreaming about the future and all of the possibilities of data-driven advancement. Our collection processes, data storage, computing power, and analytical strategies will all improve, leading to even greater opportunities for societal application. The fact that I can take classes like 'Urban Transportation Demand Forecasting,' 'Data Science and Public Policy,' and 'The Data of Healthcare' indicate that I am not alone in my goals. Students and professors are working hard to advance the applications of technology in society.

So, as we live our lives in this ever-changing world, it is important to keep an open mind to new ideas and trends in technology, to listen to the inputs of people in all areas of society, all socioeconomic statuses and all backgrounds, and especially to be open to input from students, thinkers, and dreamers. They all have ideas for how to improve the world, and chances are, there is something in the data that we have available to us to point us in the right direction.

Mitch Radakovich is a student at The Ohio State University, pursuing a degree in Data Analytics with a specialization in Business and Logistics and a double minor in City and Regional Planning and History. He has received numerous awards including two Hack OHI/O awards for creating impactful apps that enhance safety on roads and in warehouses, and the Data I/O Smart Columbus Challenge for his analysis on structural bias in the city parking system. Mitch came to the Dentons Smart Cities & Connected Communities Think Tank while conducting research on data uses in government, business and NGOs to make society work smoother under a grant from Ohio State's "Second Year Transformational Experience Program."

Artifical Intelligence in Smart Cities and Connected Communities:
A Roadmap for Developing Best Practices

by Nick Graham and Monika Sobiecki

Download this article

The trend of rapid growth of urbanisation[1] is expected to continue as a result of rising populations in major cities, coupled with expansions of regional cities.[2] This will lead to pressure for: (1) sustainable environment initiatives, with demands for more and better infrastructure in the diminishing space available; and (2) improved quality of life for city dwellers at a more affordable cost. The interconnection and interworking of "Smart City" technologies can help to meet these challenges and improve quality of life in a variety of ways, including reducing crime, lowering health burdens, shortening commutes and lowering carbon emissions.[3] Devices producing data and connecting to high-speed communication networks, computers processing the data, and people interacting with the technologies all occur simultaneously to create the Artificial Intelligence (AI) that can generate predictions and provide workable solutions for specific problems.[4]

1   https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

2   https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

3   https://www.mckinsey.com/~/media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.ashx

4   https://www.mckinsey.com/~/media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.ashx

HOW CAN ARTIFICIAL INTELLIGENCE FACILITATE THE DEVELOPMENT OF SMART CITIES?

To function, Smart City technologies require the processing of enormous quantities of data, or "Big Data". Big Data has been described in terms of the three "Vs" as "high-volume, high-velocity and/or high-variety information assets"[5] which means massive datasets, processed very quickly (through the use of algorithms) and the use of different data sources, including combining different datasets.

Big Data and artificial intelligence (AI) are interlinked. AI refers to various methods "for using a non-human system to learn from experience and imitate human intelligent behaviour".[6] AI can efficiently sift through large quantities of Big Data to generate data predictions and cost-effective solutions to fuel Smart City technologies.

The way this works depends on whether the AI is supervised or unsupervised. In supervised learning, datasets and target values are created to train AI networks to find specific solutions in the collected raw data. The AI will then carry out programmed tasks and actions, whilst exploring new opportunities and possibilities that may provide better outcomes than current solutions. In unsupervised learning, non-labelled and non-classified datasets are used to train and ask questions of AI networks, which will then find latent characteristics and hidden patterns in the data.[7]

While there are innumerable possibilities for AI in smart cities, some of the immediate use cases include:

- **Public transit.** Cities with vast transit infrastructure and systems can benefit from applications that harmonise the experience of its riders. Passengers of trains, buses and cars can provide real-time information through their mobile apps to communicate delays, breakdowns and less congested routes. This may, in turn, encourage other commuters to alter their choice of travel routes, and free up future congestions. Collecting and analysing public transit usage data can also help cities make more informed decisions when modifying public transport routes and timings, and allocate more accurate infrastructure budgets.[8] For example, Dubai has completed a number of Smart City projects, one of which monitored the condition of bus drivers. This monitoring contributed to a 65% reduction in accidents caused by exhaustion and fatigue.[9]

- **Public safety.** The same networks of sensors and cameras can be used to save lives and lower crime. Traffic lights and congestion data can be used by emergency services to get to their destinations quicker and more safely. Cities can gather data on accidents or choose other factors to measure in order to develop predictive and preventative measures for the future.[10]

- **Building automation systems.**[11] Sensors can be placed in strategic building locations that will help to gather information on energy usage and predict consumer behaviour. For example, store owners and retailers can use sensors to track the peak times that individuals enter and use the stores, as well as towards which areas the public gravitates. Through the use of AI, the data generated can help to produce consistent predictions and track daily, weekly and seasonal differences.

- **Power grids.** AI and Smart Cities have the potential to enhance the safety of power grids and improve performance management. Smart grids (power networks, such as generation plants, that are embedded with computer technology) can make

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5   https://www.gartner.com/en/information-technology/glossary/big-data

6   Pg 6, Information Commissioner's Office Draft Guidance on the AI Auditing Framework https://ico.org.uk/media/about-the-ico/consultations/2617219/guidance-on-the-ai-auditing-framework-draft-for-consultation.pdf

7   https://reader.elsevier.com/reader/sd/pii/S0140366419320821?token=F2AE20F02C1B4B0AC9B42D70819F6A8C5B79EED130DD8545A37E3413256CF58BE0E561437241CFF922E80FF163F2FA38

8   This is from the McKinsey paper coupled with some general web research and footnote from No.5; but phrased in my own language.

9   https://www.intelligenttransport.com/transport-news/79089/dubai-public-transit-ai/

10   https://emerj.com/ai-sector-overviews/smart-city-artificial-intelligence-applications-trends/

11   https://emerj.com/ai-sector-overviews/machine-learning-in-real-estate-trends-and-applications/

smart meter readings of large quantities of data to assess and predict demand response and load clustering. Prediction models can be set up on these grids to forecast the price and demand for energy for specific periodic intervals. Research conducted has found that these models can surpass existing methods in terms of accuracy of price and load forecasting.[12]

LEGAL AND REGULATORY FRAMEWORKS FOR IMPLEMENTING AI

Vendors developing future Smart City technologies leveraging AI systems (and national and local governmental organisations procuring those technologies for their cities) will have to consider how to navigate the current legal and regulatory frameworks which govern the development and deployment of AI systems. These frameworks, to the extent there are any, will vary from one jurisdiction to another. For example, just a few months ago the European Union released a white paper on "Artificial Intelligence – A European Approach to Excellence and Trust" exploring both the opportunities presented by AI and the possible requirement for a future regulatory framework.[13] In 2019, recognising the potential for AI and for public-private partnerships, the UK government tested a new set of AI procurement guidelines[14] which were developed by the World Economic Forum. It will become increasingly necessary for all governments to have robust frameworks in place in order to ensure that the products they are procuring are beneficial for their citizens.

The use of AI raises a number of data privacy and other risks. The data collected and processed by systems may include personal data, such as facial recognition and biometric systems for monitoring and security purposes. How and whether this data may be used will vary significantly from one jurisdiction to another. There may also be risk associated with developing and deploying an AI system. In Europe, the High Level

Expert Group (HLEG) on Artificial Intelligence, set up by the European Commission, is working on non-binding "Ethics Guidelines for Trustworthy AI,"[15] calling for AI systems to be lawful, ethical and robust, and to meet certain criteria in order to be deemed "trustworthy".

AI industry experts and academics are also working on developing best practices. They have produced a white paper that provides recommendations on how to improve the auditing of claims about products developed by the AI industry.[16]

OTHER RISKS IN IMPLEMENTING AI

In addition to general cybersecurity best practices associated with sensors and devices connected to the open internet, and the risks inherent in processing personal data, AI may pose challenges regarding the fairness and reliability of the algorithms used. For example, with facial recognition technologies deployed for policing and public safety, the dataset for "training" the technology should have access to a sufficiently broad range of demographics so that it can correctly and reliably identify people of different racial and ethnic origins. Purchasers of these technologies should be asking the developers what steps were taken to ensure that the AI avoided either creating or reinforcing unfair bias in the design of the system (for example, whether the algorithm was designed with the dataset it would typically be processing (such as the citizens of a diverse metropolis) in mind and whether processes were in place to test for potential bias). On deployment, there should be governance mechanisms developed to ensure that any potential unfairness can be flagged by citizens, including bias, discrimination or poor performance of the system.

Transparency in AI is a major challenge in Smart Cities. For example, municipal leaders must consider whether and how to inform citizens moving around a Smart City *when* they are interacting with AI systems. In some cases, there may be onerous requirements that may be

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12   https://www.mdpi.com/2071-1050/11/4/987
13   https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf
14   https://www.gov.uk/government/publications/draft-guidelines-for-ai-procurement/draft-guidelines-for-ai-procurement
15   The Ethics Guidelines for Trustworthy AI are accessible here: https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines#Top
16   Toward Trustworthy AI Development: Mechanisms for Supporting Verifiable Claims, accessible here: https://arxiv.org/pdf/2004.07213.pdf

impractical in an urban environment. In other instances, there may be no written prescriptions, however it may be necessary to obtain informed consent, or a social license, from the public in order to implement a project. It will be advisable to develop signage that may include the use of commonly recognised signs and symbols, along with interactive signs and QR codes which can allow the individuals to access fuller information (i.e. a layered approach to fuller privacy information available on the internet).

Finally, there is the challenge of establishing appropriate human oversight mechanisms. For those involved in the procurement of AI systems, what is the appropriate level of human control for the particular "Smart City" infrastructure? There are a number of different models that could be considered, but the volume and velocity of data moving through these Big Data systems make it challenging to identify where meaningful human supervision can realistically be introduced. In any event, there will need to be a mechanism in place to facilitate the system's auditability.

HOW DO ORGANISATIONS OVERCOME PRIVACY AND OTHER AI HURDLES?

There are a number of evolving best practices to aid organisations in addressing privacy and other AI risks. The following are based on experience with these issues in Europe in light of the EU General Data Protection Regulation (GDPR), but offer best practice suggestions that will be applicable across other jurisdictions globally:

- **Data Protection Impact Assessments (DPIAs)**: The use of novel technologies and the processing of integrated data sets using AI may trigger the requirement to conduct a DPIA in some jurisdictions, but even where not required, it is advisable, particularly where the data in question has a personal nature (e.g., where is might lead to profiling data subjects on a large scale, or where biometric or genetic data is involved). A robust impact assessment will include criteria that considers characteristics of AI systems such as transparency, robustness, bias reduction, accountability. In larger-scale projects, municipal leaders may also want to

assess the impact of AI on fundamental rights and equity considerations of relevant stakeholders.

- **Enhanced transparency**: In order to ensure lawful, fair and transparent collection and processing of data, organisations seeking to use AI in Smart City technologies may wish to develop a "layered" approach. This could range from posting signs and symbols around the urban landscape, to reviewing current privacy notices and embracing an enhanced transparency standard.

- **Internal policies**: Organisations should be prepared to demonstrate accountability by adopting and implementing rigorous internal policies that set out rules and responsibilities concerning the explanation of AI-enabled decisions to individuals.

- **Privacy by design and by default**: Embedding privacy by design and default in the deployment of the AI should help to ensure that the organisation is moving towards good data governance. The implementation of techniques such as:

  - *data minimisation measures*, to ensure that only data which is strictly necessary for the purposes is being collected, processed and retained by the system;

  - *purpose limitation measures*, such as segregating datasets to ensure that they are used for the purpose they were collected for; and

  - *security measures*, such as the anonymisation or pseudonymisation of data where possible and the implementation of access controls, audit logs and encryption.

- **Solely automated decision-making**: Finally, it is important to recognize that AI that processes personal data and is deployed for use in solely automated decision-making (including profiling) with no meaningful human involvement in the decision-making process may still have a significant effect on individuals. One example is the prioritisation of emergency services calls in a city based on data relating to the citizens making emergency calls. Organisations will have to ensure that they have

an appropriate legal basis and social license to carry out the solely automated decision-making. In many cases, the data subject's explicit consent may be required, and there will need to be suitable safeguards, in particular a right of appeal against the decision to a human decision-maker.

In summary, while the use cases of Smart City technologies promise to revolutionise the way we live in our urban areas, both organisations in the public sector procuring these systems and in the private sector developing them will need to take account of the unique implications of this new technology and navigate the data privacy and AI risks with good governance measures.

For those involved in the procurement of AI systems, what is the appropriate level of human control for the particular "Smart City" infrastructure?

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Healthcare Cybersecurity Concerns During COVID-19

by Tesch West

Download this article

Cybersecurity is a continual concern in the healthcare space. Hospitals are particularly vulnerable due to complex systems and medical devices that offer multiple entry points for cybercriminals to exploit. In the past four years, 1,500 healthcare entities have been attacked by ransomware designed to prevent access to critical systems in order to extort payment. Studies estimate that the attacks affected 6.6 million patients and cost $157 million. The majority of attacks (74%) targeted hospitals or clinics. In October 2019, the Food and Drug Administration (FDA) warned healthcare providers about a set of 11 cybersecurity vulnerabilities that may pose risks for certain medical devices and hospital networks.

Unfortunately, as with so many things, cybersecurity issues have been exacerbated in 2020 by the COVID-19 pandemic. Crowded hospital emergency rooms and ICUs are particularly vulnerable. In February, a California hospital paid a $17,000 bitcoin ransom to unlock its data following an attack. In April, a nonprofit critical access hospital in Colorado lost access to 5 years of medical records when its database was infected with ransomware. As of June 16, the hospital had not paid the ransom and continues to attempt to regain access. In March, a Kentucky Hospital was attacked but was able to rely on backup systems to restore operations. This trend has escalated to the point where Interpol issued an alert this past April to all 194 member countries warning that cybercriminals are targeting healthcare organizations (hospitals in particular).

Concerns related to cybersecurity also extend to medical devices. On March 3, 2020, the FDA warned that cybersecurity vulnerabilities may allow an unauthorized user to wirelessly crash, tamper with, or access functions of certain Bluetooth-enabled medical devices. Examples of vulnerable devices include pacemakers, blood glucose monitors, and insulin pumps.

This is not the first time the FDA has issued cybersecurity warnings about insulin pumps. Insulin pumps are used by people with type 1 and type 2 diabetes to deliver insulin continuously throughout the day and in anticipation of meals. Insulin pumps work by using wireless radio frequencies to communicate with other devices, such as blood glucose monitors and glucose sensor transmitters. The pumps also come with remote controls that allow caregivers or medical professionals to administer medication from a short distance.

On June 27, 2019, the FDA alerted healthcare providers to a recall of 11 Medtronic MiniMed insulin pump models due to cybersecurity risks. The recall was prompted by security vulnerabilities that would allow an unauthorized person to wirelessly connect to a nearby MiniMed insulin pump and change the settings. The unauthorized user could over-deliver insulin to a patient, leading to unconsciousness and severe hypoglycemia; or stop insulin delivery, leading to a coma from high blood sugar and diabetic ketoacidosis. Such interference with the pump could be life-threatening.

Medtronic was first made aware of potential issues in late 2011 when concerns were raised that the pump's radio frequencies were not encrypted. In August 2018, two researchers gave a widely publicized talk attempting to raise awareness about the issue. Then, in 2019, a research group demonstrated to the FDA a

proof of concept smartphone app that could override the insulin pump's settings and repeatedly give a patient doses of insulin or withhold insulin. Medtronic issued the recall a week later.

The FDA's 2019 recall was likely the first time a medical device has been recalled because of a cybersecurity risk. However, it is unlikely to be the last. The FDA's 2020 cybersecurity warning stresses that connected medical devices have inherent risks, and software to exploit these vulnerabilities is publicly available.

Cybersecurity in this context is important not only for the wearers of medical devices and hospital healthcare professionals and patients, but also for those designing our interconnected cities and communities of the future. When we consider the "Internet of Things," we think about smart phones, laptops, billing systems, traffic sensors, and parking meters; we don't often think about healthcare or the host of devices that also depend on a smart and secure system.

In February, a California hospital paid a $17,000 bitcoin ransom to unlock its data following an attack.

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Tackling the COVID-19 Pandemic with Equal Parts Collaboration, Participation, and Transparency

A Pittsburgh Story

by Pete Tseronis and Ian Magazine

Download this article

As global economies have paused due to the COVID-19 pandemic, it is time to reimagine, reinvent, and reconfigure the manner in which we work, communicate, and coordinate. Regardless of how you examine the current situation, be it "glass-half-full" or "glass-half-empty," the reality is we are living in unprecedented times. Our cities, communities, municipalities, and neighborhoods are all part of the fabric impacted by COVID19, not just here in the United States but throughout the world. It has touched every one of us, both professionally and personally.

In this time, we have a unique opportunity to leverage the evolution, advancement, and promise of technology, teamed with vast amounts of data, to afford actionable insights throughout our critical infrastructure sectors, e.g., Energy, Transportation, Health, Manufacturing, Water/ Wastewater, to name a few. More importantly, though, we need to harness the power of collaboration, the human component if you will, to accelerate solutions to address the pandemic at hand. Government, industry, academia, and entrepreneurs are in the midst of an "all-hands-on-deck" situation to convene, individually and collectively, to forge new public-private partnerships for the greater good.

And as we blaze new trails, we will not only mitigate the COVID19 pandemic, but also will coalesce as a global community to view this point in time as an accelerant for reimagining Smart, Secure, and Sustainable Cities for ourselves and generations to come.

Some relevant history on the importance of data in a health crisis: In 1854, London was under a siege of Cholera. At the time, the cause was commonly attributed to air pollutants. Physician John Snow, however, tracked information from one hard-hit neighborhood and was able to plot the mortality rates on a map to show that the sickness was not emanating from some invisible miasma in the air, which would have caused a uniform mortality rate across the city. What John Snow illustrated was that the mortality data when plotted on the map formed an amorphous shape clustered around the Broad Street water pump. By visually representing the data, Snow was able to show that the foot traffic around the pumps had the most reliable link to mortality. In doing so, he depicted the reflection of the social environment and behaviors of individuals and revealed patterns

that unveiled the epidemic's true nature. He took his data and findings to city officials to convince them to remove the handle from the pump. The cholera outbreak in that area stopped almost immediately. Technology, even in the 19th Century, was an enabling agent of discovery!

What we can learn from this storied exemplar, in light of the pandemic today, is that technology platforms, information aggregation, and actionable intelligence can capture and understand the social, behavioral, environmental, and cultural aspects of communities and guide appropriate policy development.

Today, digital communications afford researchers the chance to distill data at rates unimaginable in years past. While notebooks, pencils, and rulers are not entirely extinct, high-performance computing platforms, cloud service providers, and, of course, the Internet, represent revolutionary (and continuously developing) tools facilitating geolocated mobility, social media channels, and transmitting secure sensor data so that our cities and communities have become a good bit "smarter" since 1854. However, as with the London Cholera epidemic, merely collecting data is not enough. You must link the data to the social and behavioral dynamics that lead to the emergence of what happens at the population level, and then visualize the data in the proper way to communicate the story.

Collecting and aggregating data in today's day and age, while evolutionary, is exponentially as diverse as the people that comprise the geographical locales of which the policies are being created. The volume, variety, velocity, and veracity of data generation is a good problem to have but one that depends on machines to present qualified and quantified insights.

Curated datasets require linkages across multiple disciplines to create an interconnected system that goes beyond simply reflecting the impact that disparate system components have on other applications. This calls for the inclusion of integrated social, behavioral, environmental, and cultural resources specific to a population and its geography. With these factors commingled, policies can evolve, and a resulting standard set of principles can align with any geography.

For example, as the United States examines varying social distancing strategies, accounting for differences in timing, demographics, industries, and location among different populations, data collection requires the infusion of social fabric context encompassing the cities and communities nationwide. The University of Pittsburgh has developed such a technology platform! Representing the tenets of open government, e.g., transparency, collaboration, and participation, this platform is being utilized by stakeholders from city government, industry, and academia, to understand the various outcomes of relaxation strategies of various mitigation measures taken in response to the COVID-19 pandemic. Bridging intellectual savvy and experience spanning multiple generations, this community of stakeholders seeks to "connect the dots and build the bridges" so that we not only are able to mitigate the COVID19 pandemic but also that we learn from the experience to better prevent and manage a future outbreak … and there will be another.

… we need to harness the power of collaboration, the human component if you will, to accelerate solutions to address the pandemic at hand.

The platform is called a Framework for Reconstructing Epidemiological Dynamics (dubbed "FRED"). It was developed to simulate outcomes that capture the social, behavioral, and environmental implications of different policy options. FRED collects the social dynamics of locations across the United States and enables the distribution of risk factors across populations and geographies, attempting to uncover social distancing strategies. In a true team effort, the Pittsburgh contingent has engaged the Allegheny County Health Department, Pennsylvania Department of Health, the local health systems, University of Pittsburgh, Carnegie Mellon University, Epistemix, and Dots and Bridges LLC to collaborate and share information, and derive acumens to forecast COVID19 future phases across Pennsylvania. Epistemix, the University of Pittsburgh, and Carnegie Mellon are migrating the FRED outputs and leveraging the capabilities of the National Energy Technology Laboratory (NETL), along with the Pacific Northwest National Laboratory (PNNL) to visualize, communicate, and represent the results of the various social distancing strategies. With the data shared across stakeholders, the FRED platform enables the social, behavioral, and environmental dynamics to combine with the best-available information on COVID19, the health systems' resources and capacity, and the policies which the State of Pennsylvania is considering. Teaming with the NETL and PNNL will serve to reach a broader community of stakeholders to mitigate the pandemic's spread worldwide. Dots and Bridges LLC is handling the communication/outreach efforts to educate, inform, and translate how the story is evolving.

With the increase in understanding of the emergence of the epidemic and its epidemiology, the Pittsburgh research community is integrating several modeling resources to reflect further the economic and social impacts of various policies on local neighborhoods. FRED maintains a capability to scale to any geography in the country, which in turn, can enable policymakers to inform policy for the social distancing response needed.

FRED represents but one option for COVID19 mitigation, especially concerning the aggregation and curation of social, behavioral, environmental, and cultural dynamics to better inform policy. Using the same formula, other epidemics, e.g., opioids, or any public health challenge connected to social determinants, can be modeled and simulated in new and innovative ways. As more datasets emerge across multiple sectors, the chance to interconnect data will only help to fuel the Pittsburgh initiative to unlock insights benefiting local economics, urban planning, and critical infrastructure.

One can only hope that the participatory, collaborative, and transparent efforts underway in Pittsburgh will engender additional research and development spanning public, private, and academic partners to create new solutions and advance Smart, Secure, and Sustainable Cities. In the interest of our global residents, the "human side of this pandemic," it is the people that matter. And while the journey to tackle COVID19 will unearth smart technologies, foster intelligent policies, and secure smart infrastructure, the objective is to safely improve the technology, humanity, and culture of our global community.

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Inclusion and Diversity Accelerate Innovation

by Kate Broer

Download this article

We live in an era in which the pace of change is unprecedented and unrelenting, and requires us to keep innovating all the time.

Just this past spring, I wrote an opinion piece for *Canadian Lawyer* magazine's March edition on the topic of inclusion and diversity as an innovation driver. Inclusion and diversity accelerate innovation, particularly in a disrupted world where resisting change is not an option. At the time, perhaps none of us could have predicted (or wanted to predict) that we would find ourselves facing the greatest challenge of many of our lifetimes, where change is upon us in a unprecedented way; the need to innovate has never been greater; and it is all happening at breakneck speed.

Virtually nowhere in the world do we have the luxury of defaulting to the comfortable and less risky routines and sacred ways of doing things that we relied on in the pre-COVID-19 era. Working across skillsets and experiences to source different ideas; identify fresh approaches; and develop new solutions is now a necessity.

At the forefront, but by no means unique in the need for new solutions, has been the transition to agile working where we have all had to quickly learn and adapt with leaders setting the tone by communicating about their own experience; actively listening to learn of the challenges that others face; and creating safe places for essential discourse to support productive change.

The critical role that inclusive leadership plays in fostering solutions cannot be overstated as we navigate our way to our next normal.

We have and do spend a great deal of time in the Innovation Age talking about technology and digitization disrupting industry. We all feel the challenges as the world grows increasingly complex and as we learn to coexist with technology in ways we couldn't have conceived.

We live in an era in which the pace of change is unprecedented and unrelenting, and requires us to keep innovating all the time. We also live in an era of unprecedented opportunity to innovate and succeed on a

grander scale than ever before. The key, though, is to turn that demand into energy in environments that encourage productive discourse and sharing of ideas, which in turn, breed new ways of doing things.

The overwhelming evidence supports that, effectively actuated through inclusion, diverse teams are more productive, process information more carefully, and perform far better than homogenous teams. This is now so well known it has become almost uncontroversial. But how do we ignite the power of inclusion and diversity in order to innovate?

Orthodoxies stemming from an organization's culture can keep it operating and making decisions in the same way, and can lead to stagnation. External orthodoxies can also hamper progress, keeping entire industries mired in the way things have always been done. These can create "a reassuring but false sense of security, even as the sands of disruption shift beneath the organization," as Bansi Nagji and Helen Walters wrote in "Flipping Orthodoxies: Overcoming Insidious Obstacles to Innovation."

Those equipped to treat every aspect of what they do as open to scrutiny and who see challenge as a positive action are the ones most likely to emerge as industry disrupters and leaders. Inclusive and diverse teams can help challenge orthodoxies and break free from the old ways of thinking and acting.

By challenging accepted views, inclusion and diversity can help build resilient, flexible and creative organizations that are better positioned to succeed in the constantly evolving marketplace. Truly inclusive and diverse organizations have the advantage of bringing multiple perspectives and broader knowledge to bear on both routine and complex decision-making.

Most industries also recognize that subjecting proposed solutions to critical analysis reveals their strengths and weaknesses. Subjecting ideas to the kind of discourse that truly tests their strength is more difficult in insular environments where the scope of inquiry is limited by uniform experience and knowledge.

Diverse teams bring substantially more raw knowledge on more varied topics and can offer new ways of looking at the same issues. An inclusive mindset invites a range of ideas to the table, along with the opportunity to combine approaches, values and experiences into something new. These new concepts are, in turn, subjected to deeper critical analysis from the many perspectives testing their validity.

Those who tenaciously pursue an inclusion and diversity strategy are reaping the benefits, with people at all levels engaging in more meaningful discourse and driving better outcomes. So, why isn't everyone doing it and why are some organizations better at it than others?

It can be hard work. Ensuring discourse does not quickly and irreversibly turn to discord when different views are introduced requires each of us to work outside our own comfort zone, and accept and embrace the views of others. Tension and discomfort are the hallmarks of a productive group, where diverse views are aired and examined, and brought together to shape something new.

When formerly sacred ways of doing things are questioned, perhaps for the first time in an organization's history, and when ideas are challenged, our first inclination may be to defend those sacred ways for fear that the inability to continue to support them will leave us looking foolish for having stuck with them for so long. This alone can create tension that can be perceived as conflict. Even when someone asks "why" — simply to understand rather than to challenge — the potential for misunderstanding rather than learning emerges. Many shy away from conflict, and the presence of diversity within the group can exacerbate this tendency where there is uncertainty about how different genders and cultures may express and handle conflict. It is a natural reaction and we have to challenge ourselves to ensure that conflict can be seen as a positive condition.

We also must consider that people are generally resistant to change, particularly in a work environment where routine is comfortable and less risky. Those suggesting new approaches are not always welcome; and presenting and dissecting new ideas takes courage. Given the many risks involved with just staying afloat in a competitive world, it is no wonder many organizations are reluctant to invite the complexity, uncertainty and tension that come with greater diversity and inclusion. However, in our disruptive world, where innovation has become an absolute necessity, resisting change is not an option.

Learning to harness the tension into productive energy by actively listening and communicating to reduce misunderstanding and create safe places for constructive conflict are essential. Leaders must set the tone through words and actions, impressing on everyone how critical diversity and inclusion are to success, establishing inclusion and diversity as a pillar of their business strategy, and drawing a clear line to support implementation.

The article below, with a few minor modifications, was originally published in the March 2020 (44.02) issue of Canadian Lawyer magazine.

Kate Broer is a Partner in Dentons Toronto location. She leads the firm's global client engagement and development program, including leadership and oversight of the firm's client listening initiatives around the world. Working closely and collaboratively with clients and with the Dentons innovation and Nextlaw teams, she is focused on supporting and advancing innovation in service delivery strategies and approaches. She has received numerous awards and recognitions related to leadership and advancing diversity and inclusion.

P3, Change-Management and Data-Driven Opportunities:

A conversation with a traditionally non-technology company about implementing smart technologies

by Karl Schober and Jody Becker

Download this article

The elephant in the corner of the room of just about any discussion with city and community leaders about deploying smart city technologies and infrastructure modernization is the looming question: how will we pay for it? The public-private partnership, or P3, model is frequently on the list of options, but there are challenges to adapting this model for smart and connected communities. **Dentons Canada Senior Associate Karl Schober** sat down with **Jody Becker, Chief Strategy Officer and SVP International & Digital Services and Sustainability of EllisDon** to examine how P3 models have become static in today's rapidly changing world of technology, the difference between leading edge versus bleeding edge technology, and the transition of a traditionally non-technology company to a rapidly-evolving data-centric landscape.

Karl Schober: Smart cities initiatives often involve collaboration with other organizations, in particular the public sector. Do you feel that the P3 model is the appropriate model for smart city initiatives, or do you think we have to look beyond that?

Jody Becker: I think the P3 model has been very instructive in terms of how we should think about technology going forward. What is has forced my industry to do, is to think about the long term life of any asset that we build. Traditionally, a contractor may have simply built what was specified in the documents without really thinking about the long term life of that asset. Through the P3 model, we've been forced to think about that. As an operator of those types of assets through the P3 model, it's become much more important to us. We now require that our facility management teams and construction teams work entirely collaboratively through that process.

The challenge that I see with the P3 model is that it is too static for the rapidly changing world of technology that we live in today. We have to think about how we're going to approach that going forward. The specifications that are created for our projects often are developed two to three years in advance of when

we begin to build. Then, the construction process may take three or four years. By the time that the technology is handed over to the operator, it may be completely obsolete.

So, I think the P3 model has to become more dynamic in order to address that changing technology. We may have to look at different ways to refresh that model, from a technological point of view, and we have to think about how we specify the technology that's going to go into those projects. There's a lot of concern about technologies being too "bleeding edge," and a lot of public sector clients, through the P3 model, are uncomfortable with that bleeding edge technology. They want to have something more tried and tested.

Karl Schober: What are some challenges you faced as you oriented your company toward a more digital world, and what advice would you give others making the same kind of shift?

Jody Becker: For a construction company, we are one of the furthest types of industries from technology in the traditional sense. I think McKinsey ranked us just above hunters and farmers in terms of growth from technology. It was a real challenge to start looking at

how we could transform the company into a digital company -- from a traditional company using blueprints to drawing blueprints in 3D, but also using 3D models to facilitate construction and to operate those buildings. It takes a lot of "change management." What I think has been most important to our organization in that change management has been to focus on it from a values perspective. We have a number of values that we hold sacred both from an employee-stakeholder perspective to what we deliver to our clients, including, most importantly, transparency. And so from a change management position it was very important that everyone we work with understands *why* we are doing things in addition to how we are doing things. And when we go to our clients, we take that same values-based approach. This has allowed us to be able to talk to our clients about what is leading edge and what is bleeding edge, and why they have to have a particular type of technology in their buildings -- why it is important to their business. This has allowed us to build trust with those clients.

Karl Schober: Have you had opportunities or challenges in determining where data can become a revenue stream for your organization? What advice would you give other organizations trying to identify revenue streams with data?

Jody Becker: I think the first principal that we come to the data question with is: How do we protect our own data? How do we make sure the data of our clients is protected? In terms of monetizing our data, we are developing, and have developed over the last number of years, a product that is focused around evaluating the effectiveness of our subcontractors. We've now worked with a developer to take that data, anonymize it, and work with the data of a number of our competitors and partners to do the same thing, in order to create a subcontractor evaluation tool that can be used not only by general contractors, but also by the surety market and the insurance industry to consider how to evaluate [subcontractors]. It's a tricky question for us, we didn't set out to monetize that data, that's not the particular focus, it was really around a business objective for us, but if it has the additional benefit of having a financial benefit, that works as well.

Karl Schoeber is a Senior Associate with Dentons' Privacy and Cybersecurity group, and Transformative Technologies and Data Strategy practice. He is a former officer with the Office of the Privacy Commissioner of Canada, as well with the Competition Bureau. He provides advice on all matters related to privacy law and data governance in the emerging technology sphere, including wearable devices, smart homes, connected and autonomous vehicles, smart cities and the Internet of Things. Karl is a distinguished international speaker, and writes about developments and tips on privacy, as well as anti-spam issues.

Jody Becker is the Senior Vice President, Emerging Markets and Chief Strategy Officer of Ellis Don, where she oversees strategic planning. She leads the company's International Division, overseeing all commercial and operational functions in the Middle East and South America. She also oversees the EllisDon Sustainability team. She is a co-founder of the Construction Sector In-house Counsel Forum and was a recipient of the Canadian General Counsel Association's award for "Tomorrow's Leader".

The FCC, Spectrum, Autonomous Vehicles, and Everything

by Todd Daubert, Eric Tanenblatt, Lauren Wilson, and Crawford Schneider

Download this article

Unlocking the full potential of autonomous transportation will require smart, forward-looking decisions about how to manage the spectrum on which driverless vehicles will rely. Ongoing policy debates at the Federal Communications Commission, led by Chairman Ajit Pai, shows the United States is preparing for an autonomous future. Prior to the COVID-19 pandemic, in December 2019, the FCC revealed next steps for re-allocating the 5.9 GHz band for both unlicensed uses and transportation-specific applications with an eye to autonomous vehicle deployment.

In an effort to provide predictability for automakers and broadband providers, the FCC voted unanimously in December to initiate a process that would open up the 5.9 GHz spectrum band for new uses. After an extension of the comment period until April 27th the Commission is now reviewing information provided by various stakeholders.

By way of background, the agency first set aside spectrum in what is called the 5.9 GHz band to support transportation uses in 1999. Under current FCC rules, the 5.9 GHz band is reserved for dedicated short-range communications (DSRC), which facilitates both vehicle-to-vehicle and vehicle-to-infrastructure communications. Because DSRC has been around for three decades, some automakers and localities had begun to equip vehicles and roadside infrastructure with DSRC-based technologies. However, predictably, technology has advanced since 1999, resulting in several alternatives to DSRC, the most noteworthy being cellular vehicle-to-everything (C-V2X) communication that offers vehicle-to-vehicle, vehicle-to-infrastructure and vehicle-to-pedestrian communication.

To address technological advancements and the underutilization of the 5.9 GHz band to date, Chairman Pai proposed allocating the upper 20 MHz of the 5.9 GHz band for a new automotive communications technology, and specifically C-V2X, while saving the lower 45 MHz of the band for unlicensed uses like Wi-Fi. Additionally, the FCC sought public input on whether to allocate the remaining 10 MHz in the band to C-V2X or DSRC.

According to Pai, C-V2X would use standard cellular protocols to provide direct communications between autonomous vehicles and other vehicles on the road, in addition to infrastructure, cyclists, pedestrians and road workers. C-V2X is also expected to support new, advanced applications as cellular companies transition to faster, more responsive 5G networks. Opening the band to C-V2X it is backed by large automakers as well as wireless carriers and wired broadband providers, who support the proposal for its commitment to both C-V2X and unlicensed.

Notably, while many on Capitol Hill celebrated the proposed changes, others remain skeptical. In January thirty-eight lawmakers, all members of the House Committee on Transportation and Infrastructure, signed a letter in opposition to the proposal. The letter noted that the DoT believes the shift in policy "jeopardizes the significant transportation safety benefits that the allocation of this band was meant to foster."

Industry organizations have also weighed in on both sides of the plan. In a letter dated June 23rd, groups representing the freight industry and passenger transportation sectors called on a Senate panel to direct the FCC to reconsider the proposal to shift a portion of auto safety airwaves for broadband uses.

On the other side of the issue are those with an interest in opening up the band to non-transportation uses, including leading edge companies, wireless infrastructure providers, and cable operators. Some stakeholders that supported the FCC's proposal to free up the lower 45 MHz of 5.9 GHz spectrum for WiFi, and are now going further, calling for the other 30 MHz to be available for WiFi uses as well. However, at present, that suggestion is not under formal consideration by the FCC.

Now that the comment period has closed, next steps would involve evaluating comments from interested stakeholders and developing final rules on which the Commission would vote. Even if the final rules adopted by the FCC are similar to the Chairman's current proposal, it will still take years for the auto industry to coalesce around and implement C-V2X. As such, consumers may not feel the practical implications of this decision for years and possibly decades. Nonetheless, carving out dedicated space for C-V2X will give the industry much of the assurance it needs to invest in an autonomous future.

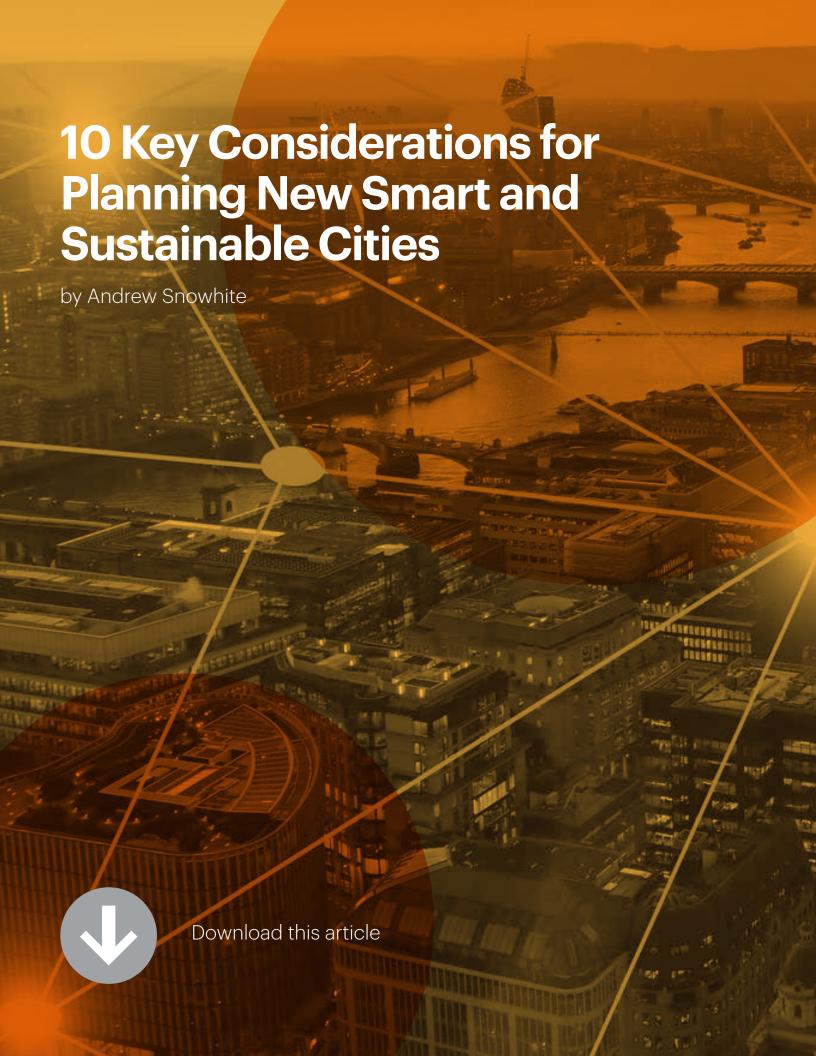Smart cities digital solutions often collect data without consent.

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10 Key Considerations for Planning New Smart and Sustainable Cities

by Andrew Snowhite

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As populations increase exponentially across the planet, there are two approaches to meet the demands of billions of new urbanites. The first is to modernize and expand current cities and infrastructure. The second is to build new cities from the ground up. Each method presents its own set of challenges and opportunities and both currently are being implemented, but not fast enough, especially large-scale greenfield developments. While serving as Chief Innovation Officer at Gale International, I was fortunate to work on our marquee development, Songdo, South Korea and also explored dozens of other real estate projects around the world. This experience provided me with deep insight into greenfield urban developments, the future of smart and sustainable cities, and how difficult it is to plan, build and operate cities of the future.

THE URGENT NEED FOR NEW URBANIZATION

By most estimates, the world will welcome at least two billion new urbanites by 2050. This will increase the percentage of people worldwide that live in urban areas to almost 70%. The effects will be profound, impacting every aspect of society and our planet. Our cities currently face major challenges and it is staggering to consider how we will welcome and integrate these new citizens into productive, healthy and vibrant urban areas.

Of this population boom, almost 90% of the growth will occur in Asia and Africa, with three countries, China, India and Nigeria, combining for almost a billion new urbanites. Already the United Nations identifies 33 megacities (cities with at least ten million residents), 27 of which are located in the less developed "global south"[1]. Regardless of location, all of these megacities struggle to serve their current residents and to plan for future growth.

In the next decade, at least ten more cities will expand into megacities.

1   United Nations, Department of Economic and Social Affairs, Population Division (2018). The World's Cities in 2018—Data Booklet (ST/ESA/ SER.A/417). https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

And growth won't be concentrated simply to the megacities and megalopolises. By 2030, the UN projects that 28% of people worldwide will reside in cities with populations over one million.

Many cities are actually much larger than the parameters used by the United Nations might indicate. Measurement of urban populations is sometimes limited to the city proper, while other times it may include an entire metropolitan region, which can include millions more people (a "megalopolis"). For example, within the city limits of Seoul, South Korea live almost ten million residents, but the larger Seoul megalopolis is about 25 million people. Due both to sheer size and to multiple layers of governmental and regulatory structures with jurisdiction over a region, the challenges faced by a megalopolis are amplified well beyond those faced by a city proper (especially for a megacity).

In addition to the general population boom and migration waves that are occurring, the planet's inhabitants are aging rapidly. The United Nations estimates that by 2030, people over the age of 60 will outnumber those under nine years old, and that by 2050, there will be more people over the age of 60 than adolescents and youth between the ages of 10-24 years.[2] This means that not only will cities need to accept more people, but also that they will need to be designed and operated to accommodate an aging population that will require new health and mobility solutions for large groups of people who have transferred out of the workforce.

In order to accommodate this increased population and shift in demographics, dozens, if not hundreds, of new cities and urban areas need to be quickly designed and built. Some may need to be megacities, while others may house hundreds of thousands or only tens of thousands of residents. No matter the size, history has shown that creating successful new urban areas of any magnitude requires considerable time, money and multi-stakeholder commitment.

SONGDO: A PIONEERING CASE STUDY

Songdo is a fascinating case study. Songdo was the brainchild of the Korean and Incheon City governments. It was executed in partnership with New York's Gale International as the master developer. In less than twenty years, in the midst of a massive global economic downturn, a new city rose from the sea and is now home to hundreds of thousands of people and over a thousand businesses. Songdo has hosted global sporting events. It houses multiple universities and is the site for billion-dollar innovation facilities. It has the highest concentration of green certified buildings in the world and is the location of the Green Climate Fund's Secretariat.

Songdo is not the only new city project undertaken in the last few decades, but it is arguably the most successful. It provides a wonderful case study for best practices, as well as an opportunity to explore and to learn from what could have been done differently.

Through my work with Songdo and other new city projects, I have identified the following key elements for consideration when planning and developing new urban environments. These can be utilized by all stakeholders, from governments and private developers to financers and regulators to planners, architects, engineers and citizen groups.

10 KEY CONSIDERATIONS

1. Purpose & Positioning

Every new city should begin by defining a clear purpose for why it is needed and how it will be positioned. This needs to be informed by market factors and feasibility studies. Often governments or developers decide they want to have a specific type of new city, such as an "innovation city" or "entertainment city," without doing adequate research to determine if that is in fact the positioning required to meet market demand (both economic and human needs). To be

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2   United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Ageing 2015 - Highlights (ST/ESA/SER.A/368). https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015_Highlights.pdf

successful, the market must drive the process. Leaders and planners should make decisions based on market data that identifies and supports the project both in terms of economic viability and needs of the people and businesses that will inhabit it. Most importantly, greenfield cities should be planned and built for tomorrow and decades into the future. Simply building a massive new urban development neither ensures it will be populated nor its economic success.

2. Visionary Leadership

There are a myriad of reasons why creating new cities is challenging. They take years of coordination, massive human and financial capital resources, and political will. Visionary leadership is required in the early stages to define a city's purpose and to launch the planning process. It is also needed throughout the construction and into operations to ensure the development is done according to plan. Korea and Incheon City provided the initial vision for Songdo, but the passion and tenacity of Gale International Chairman & CEO, Stan Gale were foundational elements of Songdo's growth and success. Importantly, Gale recognized the need to engage world-class subject matter experts and built a core team of firms that each provided best-in-class expertise and aligned with a key element of the Songdo city plan. Among these firms, KPF led the masterplanning and design process; ARUP provided engineering expertise; Cisco served as the smart city partner (a cornerstone of its Smart+Connected Communities initiative); and Nicklaus Design was responsible for the anchor sporting and business amenity the Jack Nicklaus Golf Club of Korea.

3. Location

A new city's location is fundamental and is a key element in informing its purpose, its inherent benefits and its anticipated challenges. Key factors that need to be determined upfront include how energy, water and transport will connect in and out of the city, and how the associated current and future costs will be met. Songdo's strategic location was key to its positioning. It is less than a half hour drive to Incheon International Airport and within a three-hour flight of a third of the world's population. And while located

within Incheon City and the Incheon Free Economic Zone, it is also directly a part of and connected to the Seoul megalopolis.

In addition to the general population boom and migration waves that are occurring, the planet's inhabitants are aging rapidly.

4. Regulations & Rule of Law

In order to sell a project's vision to attract businesses, residents, and, importantly, investors, a clear and enforceable regulatory framework needs to be established and implemented upfront. This includes how the new city will operate within existing federal and regional governmental structures and any special regulations (e.g. tax, data ownership, etc.) that will be adopted to help facilitate investment, development and ongoing operations. During the Songdo planning process, an international hospital was included as a key asset of the masterplan both to fulfill the positioning as a global city and meet the expectations of potential foreign tenants. Potential partners were identified, however, local regulations were not adjusted to allow for the approval and addition of an international hospital partner, and to date it has not been built. As with any ambitious, multi-billion dollar project, clear legal and regulatory structures are essential to attracting investment, especially foreign investment. This has inspired some countries and municipalities to create entirely new autonomous zones, such as the Estonian Free Trade Zones, the Astana International Financial Center and the Zones for Employment and Economic Development ("ZEDE") system in Honduras.

5. Financing

Financing is always one of the greatest challenges to any large-scale real estate project. In the case of development of a new city, the planning process alone requires tens of millions of startup dollars. Base infrastructure can cost hundreds of millions, if not billions, of dollars. Songdo's success was predicated on the Korean and Incheon City governments' massive investment in infrastructure, from land reclamation to smart technology infrastructure to the 21km Incheon Bridge. Financing needs to be planned for and addressed throughout each phase of a project and may require a mix of public and private funds along with development aid.

6. Resiliency & Sustainability

New cities need to be resilient and sustainable. Current and future climate change consequences must be addressed at every stage of development of a new city, along with other challenges such as pollution, habitat loss and a host of security issues (ranging from food to digital to diseases). In Songdo, Incheon City built and maintains the "U-City" platform, which tracks city-wide services including traffic, weather, waste, safety and disaster management. It also has the highest concentration of green buildings in the world due to an early commitment to utilize the U.S. Green Building Council's LEED green building certification. It is home to the first LEED certified exhibit hall in Asia and the first LEED certified school and hotel in Korea. The Songdo International Business District, with 40% open space including a beautiful central park, was designed to be walkable and incorporates a variety of innovative technologies such as an underground pneumatic trash system. Energy is derived from multiple sources, from an LNG-powered combined cycle power plant that also powers a district heating and cooling system, to rooftop solar and tidal power. In 2012 Songdo was named the headquarters for the Green Climate Fund and now also houses offices for numerous international environmental and social organizations. Early focus on sustainability was the right decision not only from the perspective of liveability and the environment, but also from the perspective of attracting businesses.

7. Design and Infrastructure Planning

New cities require planners to utilize current market data while looking well into the future. From mobility to open spaces to buildings, the masterplan and its required infrastructure dictate how and when all development will occur. It is imperative that the planning aligns with the project's positioning and purpose as well as with its financial and resiliency goals. A District Urban Plan ("DUP") was created and adopted in Songdo that permitted key zoning elements upfront in order to facilitate near and long-term construction. Furthermore, as the world faces unforeseen challenges, like the novel COVID-19 virus, city planners need to expand their design thinking to facilitate disaster and major disruption response and relief.

8. Phasing & Activation

A phasing and activation strategy allows a new city to grow in a manner that creates critical mass and economic viability. Songdo was phased in a manner that concentrated initial construction to its urban core and "quality of life" foundations. The first assets built at Songdo were a beautiful Central Park with a canal and open space and an adjacent convention center and hotel—all to support the initial residential and commercial space. Activating these assets simultaneously provided a concentrated area of activity and a "pulse" for the project. The Jack Nicklaus Golf Club of Korea was an early asset that brought important businesspeople and decision makers to Songdo, while creating buzz around global sporting events (in 2015 it hosted the Presidents Cup, the first time this event was held in Asia). For reasons ranging from the global economy to local politics to challenges with business partnerships, Songdo's DUP and phasing plans did not all come to fruition. For example, initial construction phases resulted in the establishment of many key infrastructure and building assets, especially around the Central Park urban core. However, over time, some plots of land have been developed out of alignment with the DUP. These structures don't fit the overall "future city" design and feel of Songdo. However, they do not necessarily indicate a failure. Rather, Songdo became somewhat of a victim of its own success. It became such a popular residential destination that some local

developers (including Gale's Korean partner) opted to focus heavily on off-plan traditional residential offerings, which are a solid business proposition in Korea as all buildings are pre-sold before they are constructed.

9. "Smart"

If you ask a hundred people what the term "smart city" means, you will receive a hundred different answers. Manufacturers look at it through a product placement lens, a utility focuses on grid modernizations and transmission and tech companies dream of advances tied to 5G and future connectivity revolutions. More so, what is considered "smart" in one country may be a futuristic dream in another. For example, it is challenging for a government to think about autonomous flying vehicles when they are not yet able to provide clean water or reliable power to their residents. "Smart" needs to be defined broadly in the context of planning new cities and tailored to each location and city's purpose. It is a holistic definition that encompasses a broad range of best practices. Through my experiences in Songdo and working on various other new city projects around the world, I define a "smart city" as: In the case of Songdo, it might be defined as an urban area that is planning for and integrating flexible new technologies and methodologies to create a more connected, sustainable and resilient community that spurs innovation and increases the quality of life of its citizens.

10. Livability & Inclusion

Perhaps the most complicated challenge of planning and developing new cities is creating places where people want to live and where they will thrive. Our great cities typically grow over decades if not centuries; however, we don't have that luxury of time going forward. The needs of residents, workers and visitors must be at the core of all planning and placemaking decisions. As we have learned from the "ghost cities" phenomenon, especially those in China, simply building a place doesn't guarantee people will want to live there. All aspects of the human experience need to be accounted for, covering the diverse spectrum of who we are as people, from age to gender to ethnicity to ability to social class and well beyond.

LOOKING FORWARD

The considerations highlighted above barely scratch the surface - an entire article or book could be written about each. The challenges of planning and developing new smart and sustainable cities are immense, but given global population and urbanization trends, it is a necessary process that will require partnership across disciplines and stakeholders. Time is running short so let's get started!

Andrew Snowhite focuses on the intersection of urbanization, sustainability, experiences, and storytelling. Through his firm, Snowhite Strategies, and as a Senior Advisor to NewCities, he provides strategic advice, connections, and management services globally to a variety of organizations and initiatives. Andrew was the Chief Innovation Officer at Gale International, the master developer of the Korean smart city Songdo, and led America's participation at Expo 2012, Yeosu South Korea and Expo 2017 Astana Kazakhstan. More recently he advised the Kingdom of Saudi Arabia on numerous "gigaprojects" including NEOM. He has served as an OpenGrounds Fellow at the University of Virginia and as a member of Samsung Electronics' Corporate Citizenship Advisory Council. Andrew received a degree in Environmental Science from the University of Virginia where he was a National Science Scholar.

REFLECTION

Equity and the Promise of Smart City Technologies

by Noah Schwartz

America presently finds itself at a technological, economic, and cultural crossroads. As the country confronts a deadly and indiscriminate public health crisis that also threatens our economy, it, too, faces the cultural lightning rod represented by an urgent, nationwide movement over racial injustice. The coronavirus crisis and protests have underscored not only widespread inequities in America, but also have highlighted the possible opportunities for emerging technology initiatives to be put to work for the benefit of all members of society. The technological promise of "Smart Cities and Connected Communities" holds great potential to help solve the equity disparity in America, and must play a pivotal role in rebalancing American society for all stakeholders.

What started as a protest aimed at a heartbreaking extrajudicial killing of a civilian by a police officer -- one of many demonstrations over the past few years against all too familiar cases of police brutality -- has erupted into a national and international conversation about equality as millions joined protests across the country and around the world. True, some protests in the wake of the killing of 46 year old George Floyd did turn violent with a period of rioting and looting in the intense, emotionally charged weeks that followed; however, most demonstrations have largely been peaceful. The protest movement, the largest in the nation's history, has evolved to include far more than police brutality, examining the history of racial inequality in the United States and challenging the nation to create equity for minority groups in American society into the future. The movement has been joined by businesses and their leaders pledging to no longer be silent on Black Lives Matter, and to come together to find solutions to enact lasting social and racial change.

The dialog has also spotlighted uses of emerging technologies in response to these issues. For example, even as a national conversation was taking place on police reform, new and expanded technological tracking was being implemented in many locales to predict and track protests. Sensor technologies have been touted in recent years as a means of improving delivery of municipal services, controlling traffic flows, and enhancing public safety, among other uses. During some recent demonstrations, law enforcement officers utilized some of these technologies in manners that made many uncomfortable. Federal agencies such as the FBI and Department of Homeland Security, as well as various police departments, scraped and shared information on demonstrators from social media platforms. Sources included RSVP lists of Facebook events, Slack channels, and even posts in encrypted messenger apps such as Telegram. The New York Times reported that in addition to internet research, "the Department of Homeland security deployed helicopters, airplanes and drones over 15 cities where demonstrators gathered to protest the death of George Floyd, logging at least 270 hours of surveillance..."[1]. These modern methods of widespread tracking raise the specter of possible privacy concerns if proper procedure and privacy legislation is not enacted. Use of emerging technologies represents substantial positive value for society, but current events from the protests to pandemic responses have shown the importance of facilitating conversations and trust between communities, government and industry about the implementation of such technologies.

Smart technologies promise to revolutionize society, creating new and innovative efficiencies, from sensor-optimized traffic and parking, autonomous vehicles, drones for delivery and

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1	https://www.nytimes.com/2020/06/19/us/politics/george-floyd-protests-surveillance.html
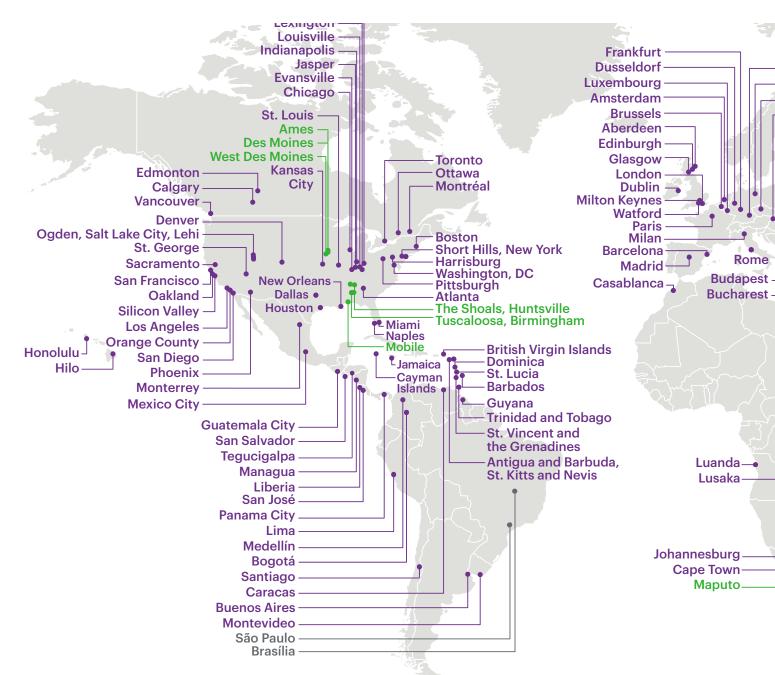
assistance, smart contracts, improved resource allocation, increased sustainability, and more, all powered by predictive analytics, artificial intelligence, machine learning, and big data. With so much data collected, however, come huge privacy and equity concerns. Who will monitor, collect, and store the data? How will it be used? And how and where will technological advancements be rolled out? Can it be done equitably, so that whole groups are not excluded from the benefits that technology promises? And how can we ensure compliance with rules and norms so that smart city advancements create equity for historically excluded groups and do not increase existing gaps?

The answers to these questions should be carefully considered collectively by business leaders, regulators, legislators, consumer advocates, community leaders, and residents themselves. The current crises can be leveraged into a positive force of change to drive critical, long-overdue conversations. Smart cities are poised to be a catalyst to provide the foundation to rebalance society and create a fairer, more equitable economy and culture, especially for the most disadvantaged groups. Emerging Smart Cities technologies hold great promise of societal benefits including remote education in areas previously unavailable, predictive analytics to detect viruses before they spread

and track them when they do, delivery of medical supplies to areas using drone technology, and so much more. But the promise can only be realized if safeguards are implemented, so that these technologies can act as accelerators for a better future.

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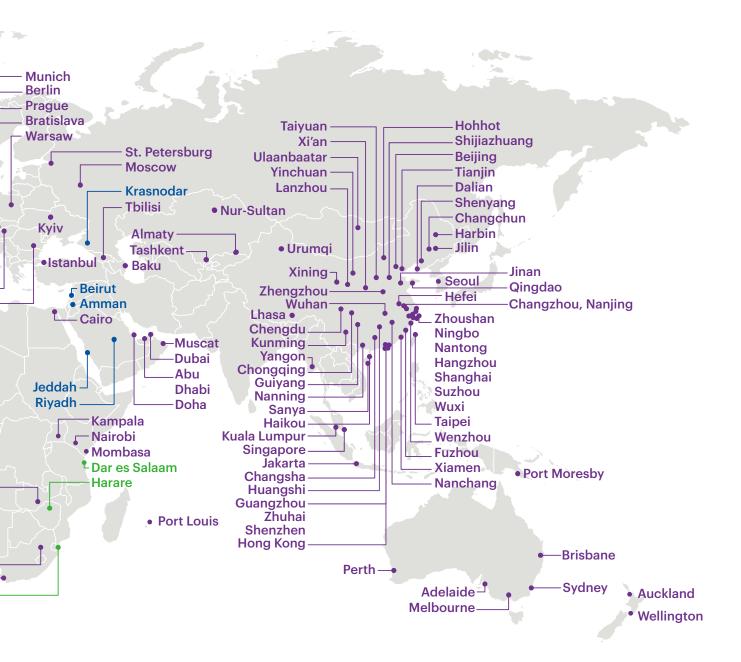
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