

Meeting of the Minds

BLOG

Selected blog posts

CityMinded.org

Volume 1

How Will Driverless Cars Affect our Cities?

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What is Government's Role in Urban Innovation?

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Meeting of the Minds Blog

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*Spotlighting innovations in
urban sustainability & connected technology*

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Meeting of the Minds

September 9-11, 2013

Toronto, Ontario



LIVE WEBCAST

Starting September 10th at 8:30am EDT

From September 9-11, 2013, Meeting of the Minds will convene an international summit of 350 invited urban sustainability and technology leaders in Toronto, Ontario.

We'll explore a rich variety of strategic investments, smart policies and breakthrough technological innovations—all designed to enable cities and regions to better respond to increasingly complex urban planning, design, technology and development challenges.

For the past seven years, we've gather in different cities with a single purpose: to identify tested and untested solutions that can help us build connected and sustainable cities and regions, and to share those solutions with each other. We gather this year at Evergreen Brick Works—a LEED Platinum facility that stands as a remarkable example of adaptive reuse, brownfield remediation, and Toronto's commitment to urban sustainability.

A key component of Meeting of the Minds is enabling innovation. Our events help link urban leaders in the private, non-profit and

public sectors in order to identify and share solutions. Meeting of the Minds will connect you, the innovators, with two often missing ingredients: living labs ready to become early adopters and partners willing to step up with vitally needed support and cutting edge tools.

Our speakers and invited delegates are thought leaders working at the cutting edge of urban systems: economic and environmental sustainability, social inclusion, clean energy and water strategies, advanced technology, and transformational design, planning and policies.

Meeting of the Minds includes hours of programming and networking so you can meet like-minded leaders who are pushing the boundaries of conventional practice. Our goal is for you to come away with breakthrough ideas, inspirational and new partnerships.

CityMinded.org/events/toronto

Uncharted Territory

Urban Innovation and the Role of Government

By Clara Brenner and Julie Lein

Julie Lein and Clara Brenner are the Co-Founders of Tumml, an urban ventures accelerator with the mission of empowering entrepreneurs to solve urban problems. A nonprofit, Tumml's goal is to identify and support the next generation of Zipcars and Revolution Foods. Through a customized, three-and-a-half-month program, Tumml invites early stage companies into its office space to receive hands-on support, seed funding, and services to help grow their businesses and make significant impact on their communities.

We've all seen the headlines: *Uber's Taxi Services Shutting Down In NYC. Should Airbnb Be Regulated Out of Existence?*

With the rise of urban impact entrepreneurs—early stage companies developing consumer products and services that make urban living better—there has also come an increase in tension between those entrepreneurs and existing regulations. Government policy, dating back decades, could not have anticipated the emergence of collaborative consumption, crowdsourcing, or alternative resource management. It's tempting to hope that the conflicts between innovative urban companies and regulators are circumstantial and fleeting. But trends point us in a different direction.

The surge of urban impact entrepreneurs

If anything, we anticipate a surge of urban impact entrepreneurs. 81 percent of Americans now live in cities—and this urbanization is dramatically influencing the way most people live and work. At the same time, we are experiencing reductions in municipal revenues nationwide. So there is a compelling market opportunity for entrepreneurs to step in and tackle some of the most pressing challenges facing the swelling ranks of city dwellers.

Furthermore, success begets success: the achievements of companies like Uber and Airbnb will encourage others to follow in their footsteps. Across the country, we are seeing bicycle sharing companies like Alta Bicycle Share, food truck networks like Off the Grid, and crowdsourced community investment platforms like Fundrise pop up. A new wave of entrepreneurs is rising to solve urban problems.

More urban innovators means more government interaction

Given this rise of urban impact entrepreneurs, we anticipate even more potential interaction with government. They may not be looking to get hired by government or embed themselves within government, but these entrepreneurs are working on issues about which government cares a great deal (think: mobility, waste management, housing, health, and education). Whether entrepreneurs look at these interactions as an opportunity or an annoyance will, in large part, determine their ability to succeed in the marketplace.

Some have argued that these innovative entrepreneurs should not be subject to traditional government oversight, as their very models (peer-to-peer, digital, etc.) encourage self-policing. But, regardless of how you feel about regulation and public oversight, government isn't likely to relinquish the role of consumer protector any time soon.

So it's important for urban impact entrepreneurs to learn to work with government. This way, they can avoid antagonizing powerful interests who can stand in their way. It's not that entrepreneurs can't fight regulators and win; it's just a lot harder to be productive moving forward. Consider the case of Uber, which has managed to clash with several municipalities in its expansion process. The popular app is currently facing a wave of competition from companies who are doing a better job collaborating with city leaders.

The value of entrepreneur/government alliances

Both government and urban impact entrepreneurs can take productive steps to minimize friction—the key is communication. Most entrepreneurs have no idea how to navigate the tricky po-



litical landscapes of cities. And most city officials have no idea how to communicate with entrepreneurs about their priorities and concerns.

Some municipalities are embracing entrepreneurs by creating new offices to accommodate and foster innovation. Examples include the San Francisco Mayor's Office of Civic Innovation and the Boston Mayor's Office of New Urban Mechanics. Hopefully, we will see this trend continue. After all, government officials have incentives to work with entrepreneurs to produce job growth and improve the lives of their constituents.

The harder question is: how will urban impact entrepreneurs approach their relationship with municipalities moving forward?

Most entrepreneurs don't think about

government. After all, early stage companies are busy worrying about product design, customer acquisition, and investors. However, for urban impact entrepreneurs, learning how to interact with government should be as important as learning how to pitch a venture capitalist.

We would like to see new urban impact companies develop legislative strategies so that they can more thoughtfully approach municipalities. For example, Luther Lowe, the Director of Government Affairs & Business Outreach at Yelp, has devised a playbook for expanding into new cities in a "less painful" way. In it, he outlines a strategy of cultivation—both of the general public and of regulators. Collaborating with government to develop mutually agreeable solutions isn't always easy, but

dealing with hostile regulators is worse.

Moving forward

Government isn't going anywhere in the near term. So it's important for urban impact entrepreneurs to embrace government as an important stakeholder during their growth. City officials have access to data, resources, and networks of individuals who can help entrepreneurs effectively address the needs of consumers. But they can also obstruct entrepreneurs and keep them from securing the resources they might need to succeed. Both government and urban impact entrepreneurs stand to benefit from innovation, leading to better solutions for all city dwellers. The question remains how (or if) they will rise to the challenge.

How Will Driverless Cars Affect Our Cities?



By Issi Romem

Issi Romem has a PhD in economics at the University of California, Berkeley, with a focus on urban and real estate economics. He has consulted for the Bay Area Council Economic Institute on matters involving transportation, real estate and the regional economy. Soon he will be joining the team at OnPoint Analytics.

Google is the most conspicuous developer of autonomous vehicles, but it is hardly alone in pursuing this venture. Most automakers are competing to introduce their own driverless cars to the public, and are doing so piecemeal, system by system. The components of the upcoming driverless car are being introduced into current models as ever more elaborate mechanisms to aid the driver, such as self-parking features and automated collision avoidance systems. Recently, a group of researchers at Oxford University developed a self-driving system which can be installed in existing manually driven vehicles, and whose cost is hoped to fall as low as 150 dollars within a matter of years.

Driverless cars will dramatically affect urban form, in two ways

Many anticipated consequences of driverless cars have already received attention on this blog and elsewhere, such as their impact on the mobility of the elderly, on taxis and car sharing services and on the future of the car industry. A crucial aspect which has escaped attention is the impact of driverless cars on urban form, which I anticipate will follow two broad predictions:

Cities will greatly expand, again: Faster and more efficient transportation will convert locations that are currently too remote for most users into feasible alternatives, abundant with space. Like

“Driverless cars will generate a gradual, but dramatic expansion of cities.”



cities will change—you guessed it—dramatically!

Why will cities expand?

Driverless cars will make it less “costly” for people to travel a given geographic distance, partly because they will be free to engage in other activities while travelling, but primarily because of reductions in travel time. Unlike human drivers, autonomous vehicles will follow optimal routes given real-time traffic conditions without fail. More crucially, as soon as suitable roads such as freeways (or lanes thereof) are declared off limits to manual driving, driverless cars will travel—safely—at much higher speeds than we do today. Gains in efficiency will follow from coordinated traffic management protocols, too. Once vehicles communicate with each other traffic through intersections and merges will flow much more smoothly than permitted by today’s traffic signals, stop signs and merging lanes, leading to substantial gains in travel time (a partial, human-

mediated step in this direction is explored in this article).

If people currently forego affordable, spacious dream homes because the associated commute is too long, a technology that condenses the time needed for commuting along the same route—and allows doing so in the back seat—will make those homes more agreeable. Similarly, businesses whose location depends chiefly on access to appropriate labor or clientele will find that potential locations which are currently too remote will become feasible. It will still be crucial for them to sit “close” enough to their talent pools or their customer base, but because what matters for “closeness” is travel time rather than geographic distance, these firms will be able to reap the benefits of more remote locations without giving up “closeness.”

How far will cities expand?

The extent to which cities expand will be determined by the extent to which travel times are reduced. The more efficient traffic flow becomes the broader

suburban rail in the early twentieth century and the mass consumer automobile that followed, driverless cars will generate a gradual, but dramatic expansion of cities.

Buildings and parking will be uncoupled, freeing up valuable land: After dropping off passengers, driverless cars will independently seek parking (or their next car-share customers) and they will show up for the return ride at the tap of an app. As soon as driverless cars are common enough, the demand for adjacent parking will dwindle and parking lots in areas where land is sufficiently valuable will be ripe for conversion to other land use. As parking in high-value areas is thinned out or altogether purged, the micro-structure of



the geographic range in which living and working becomes feasible.

Will we ever hit a point at which people are no longer interested in the extra space offered by more distant locations? This is unlikely. Today swimming pools and three car garages are common in suburban homes, but who would have imagined that possible before the advent of the mass consumer automobile? Perhaps the current equivalent is the wish voiced by some home buyers—typically just beyond the urban fringe—that neighbors' homes be out of sight. That seems like a lot to ask in today's suburbs, but it could well become the norm looking forward.

When will this happen?

Most estimates suggest that the arrival of the fully self-driving car on the consumer market will occur within a decade. Provided that it will be possible to install these systems in existing manually driven cars—much as hands-free cellphone devices can be installed today—then there will be no need to wait for the entire stock of cars to gradually be replaced, and a much faster process of adoption will ensue. The speed of the process will be determined by people's willingness to give up the driver's seat, and by the adaptation of the legal environment, first to permit driverless cars and then to secure them an exclusive right of way (a separate lane on the freeway). Google and the automakers will go to great lengths to ensure that legal barriers are removed and that the driverless car is adopted quickly. The devotion of a separate right of way may be a more challenging feat, but it will be difficult to reject in light of the gains it will offer.

Following these developments, the gradual process of city expansion will take place over many decades, much as the ramifications of the mass consumer automobile continue to play out almost a century after its arrival.

Is this good news or bad?

Ultimately, the accelerated drift of the city past the current metropolitan fringe implies sprawl on an unprecedented scale. This is unwelcome news for those readers who, like this author, share a romantic view of dense urban life. But there is good news as well.

In his 1991 classic, *Edge City*, Joel Garreau wrote that it is “the suburban home with grass all around that made America the best-housed civilization the world has ever known.” If the widely spaced mansions of the future are to today's suburban home what today's suburban home is to yesterday's urban tenement, then we are in for a glorious improvement in our material welfare. But this grates the city lover's ear and there is good news for city lovers, too.

The uncoupling of buildings and parking

Once most people stop driving manually, there will be a far less compelling need for buildings and parking to be adjacent. This does not mean that all parking lots will be converted to other land use—the total need for parking will only be reduced if other developments like increased car-sharing take off. But it does mean that parking lots on the most valuable land will be available for infill development. Driverless cars will gladly navigate to abundant off-site parking that will substitute for the lost parking on less valuable land.

The places in which infill development takes place will become denser and more walkable. The busiest suburban shopping districts will probably be among the first to see their parking built upon, as will clusters of suburban office towers which often spread out over vast areas. In so doing these areas will attain a more urban feel.

Of course the broader environment will remain suburban, but the local

clusters of walkable density we have today—primarily old town centers engulfed by sprawling metro areas—will be joined by a new breed born of formerly pedestrian-free suburban centers and infill development upon parking. Given that the overwhelming majority of dense walkable areas in this country were built before World War II, a new generation and breed of walkable locations is rather exciting.

And what about the carbon footprint, you ask?

Traveling greater distances at greater speeds will require more energy. Full stop. Car sharing will not undo this in spite of reducing the total number of cars, because car sharing essentially only does away with the time cars spend parked.

Under the pessimistic premise that each car continues to emit greenhouse gases at current rates, the effect of driverless cars on urban form spells out a magnified carbon footprint. But technology is not stagnant. Today's gasoline powered cars are already far more efficient than they were even a decade ago, and the ongoing transition to electric vehicles means that the energy needed for traveling greater distances at greater speeds will no longer need to come from fossil fuels. Instead, cars can be powered by any source of energy used to produce electricity, including more sustainable alternatives.

Contrary to the intuition that associates rapidly advancing sprawl with environmental disaster, persistent progress in sustainable energy could ultimately dissociate the suburban lifestyle from the greenhouse gas emissions it implies today, severing an important link between sprawl and climate change. The crucial question in this respect is whether the greening of our energy will precede the brunt of our cities' future spatial expansion or not.





Distributed Work in the Polycentric City

By Philip Ross

Our cities have historically been shaped by natural resources and human endeavour.

In London, for example, rivers and tributaries of the Thames shaped the urban plan. The river Fleet's valley became Farringdon Road and gave its name to Fleet Street. Marylebone Lane follows the twists and turns of the river Tyburn. Wells and springs shaped the ancient city such as Brook Street; location in an age where physical rivers de-marked boundaries and borders. And man created civilisation on top of this ancient map. Roman roads followed river beds that are now buried deep below the modern city. Utilities and transport networks overlaid this map to create the mix that we know today. Even modern, planned 'grid' cities have a resonance and rhythm, through zones, transport planning and repetitive certainty; a Mondrian approach to human habitation.

The infrastructure has always been about bringing people and goods into the city centre, and the radial pattern that most cities demonstrate creates a heart, a central business district where the commercial hub was found. Districts, nodes and termini create a rhythm of use.

Distributed Work

But can or does technology now challenge this norm? Will the move from an analogue world to a digital one challenge the assumptions of city plan and the lives that people within it lead?

When Frances Cairncross wrote the *Death of Distance* she predicted an era

where distance would have no cost. And so this has come to pass. The city's fundamental *raison d'être* is now being reconsidered. Co-location is no longer the most efficient way to minimise costs for the corporation as technology allows people to connect and collaborate from anywhere. Markets no longer require physical presence to trade and function. Agglomeration has no purpose in a global economy. Distributed work is challenging the nature of the metropolis.

Potable devices that are increasingly sophisticated and light, blistering wireless telephony and connectivity with 4G LTE and WiFi/WiGig, the cloud and SaaS as well as a host of other innovations are changing the nature of where, when and how work gets done for a large proportion of the population.

And at the same time that this agile workforce is changing the rules, a number of other forces are at play.

We have a perfect storm of ingredients to challenge our cities: population growth, transport constraints, carbon reduction and new technology.

Overlay the corporate desire to cut costs and a realization that offices are underutilized assets that can be shrunk to reflect the real demand for workspace and you have a scenario that has the potential to reshape our cities.

There is a growing realization that cities will eventually become immobile as a forecast 6bn people become city dwellers worldwide by 2050. We will have to rethink patterns of use of the city.

City 2.0

And so the perfect storm presents the vision of a polycentric city where there is no centre or heart but a series of interconnected nodes—much like the internet. City 2.0 will be a digital urban landscape, where people are connected with ubiquitous connectivity, no longer tied to the ancient meanders of rivers or termini or transport.

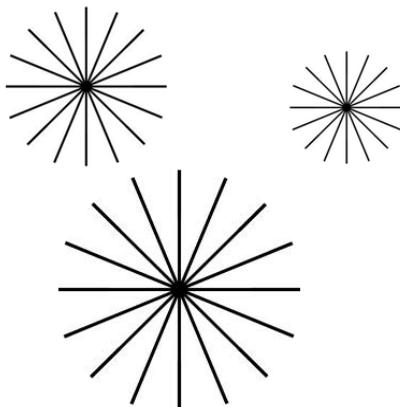
City 2.0 will redefine how we live, work, consume leisure and come together. It will be a staccato city, no longer in motion but peaking and troughing as new patterns of behavior emerge. Polycentricity will allow new clusters and communities, a new sense of localism and freedom to choose work settings away from the 9-to-5 commute that dominates today.

Third Space

Already we have witnessed a dramatic growth in co-working space; new third spaces for work that are shared between like-minded people—a return to the guilds and scoulas of ancient times. Third space will begin to redefine destination in the city as people form new networks and clusters.

Moving bytes around the modern city is not just an iteration. We will slowly witness a transformation of our urban landscape as radical and impactful as that created on the back of the last industrial revolution. The digital era will shape our cities and buildings and define a new set of behaviours. With it will come a new definition of the corporation, much like Charles Handy predicted... doughnut companies inhabiting a doughnut city.

Philip Ross is founder and CEO of UnGroup—comprising UnWork.com and Unwired. He is an author, commentator and adviser on the future of work, the workplace and cities.





In Deep Water

How Today's Technology Can Localize and Restore Urban Water Infrastructure

By Brian Young & Emma Stewart, Ph.D.

Brian Young is the Sustainable Infrastructure Program Manager and Emma Stewart is the Head of Sustainability Solutions at Autodesk.



Many of us have experienced the growth of the “buy local food” movement in recent years. We’d like to propose an even more effective movement: “drink local”. (For you barflies out there, we’re referring to water, not beer).

Many municipalities today have put themselves “in deep water” by simultaneously centralizing water systems while underinvesting in water infrastructure. We’re then surprised when the inevitable rationing, flooding, or sewage overflows occur (these should really be no surprise in the US, where a water line bursts every two minutes and pipes typically leak 16% of the water they transport). To reverse this trend, we need to focus on localizing urban water systems and restoring water infrastructure, both of which can be accomplished with today’s technologies.

Why are local water systems more economically and financially sustainable? Due to the high cost—economically and environmentally—of transporting and treating water, municipal governments and water utilities should “seek out every drop on hand before looking afield,” reusing and recycling water to the greatest extent possible. Before transporting water from one state to the next, they could consider conservation policies, leak repairs, and water recycling. In lieu of dams or desalination plants, they could evaluate alternatives to water for cooling or fracking. Instead of discharging stormwater or black-water from a site for

treatment by utilities—requiring huge networks of expensive sewer and sanitary pipes and pump stations -- real estate owners could reuse it onsite for irrigation and other non-potable water needs. In all of these cases, localizing the water system allows for better service and reliability with lower infrastructure cost.

Why are we underinvesting in water infrastructure? In part, government austerity measures view water infrastructure as a painless place to cut. The US government’s proposed 37% cut to the Clean Water and Drinking Water State Revolving Funds for 2013 punctuates a steady decline of federal support for water infrastructure projects since the Clean Water Act of 1972. This year, these low-interest loan programs will cover only 2% of the estimated \$98B need. Meanwhile, private investors hesitate to back centralized water supply and sewer projects because of their high costs and vulnerability to droughts and energy security risks. And ratepayers who enjoy cheap water and rarely consider the pipes behind their bathroom wall see no reason to pay more.

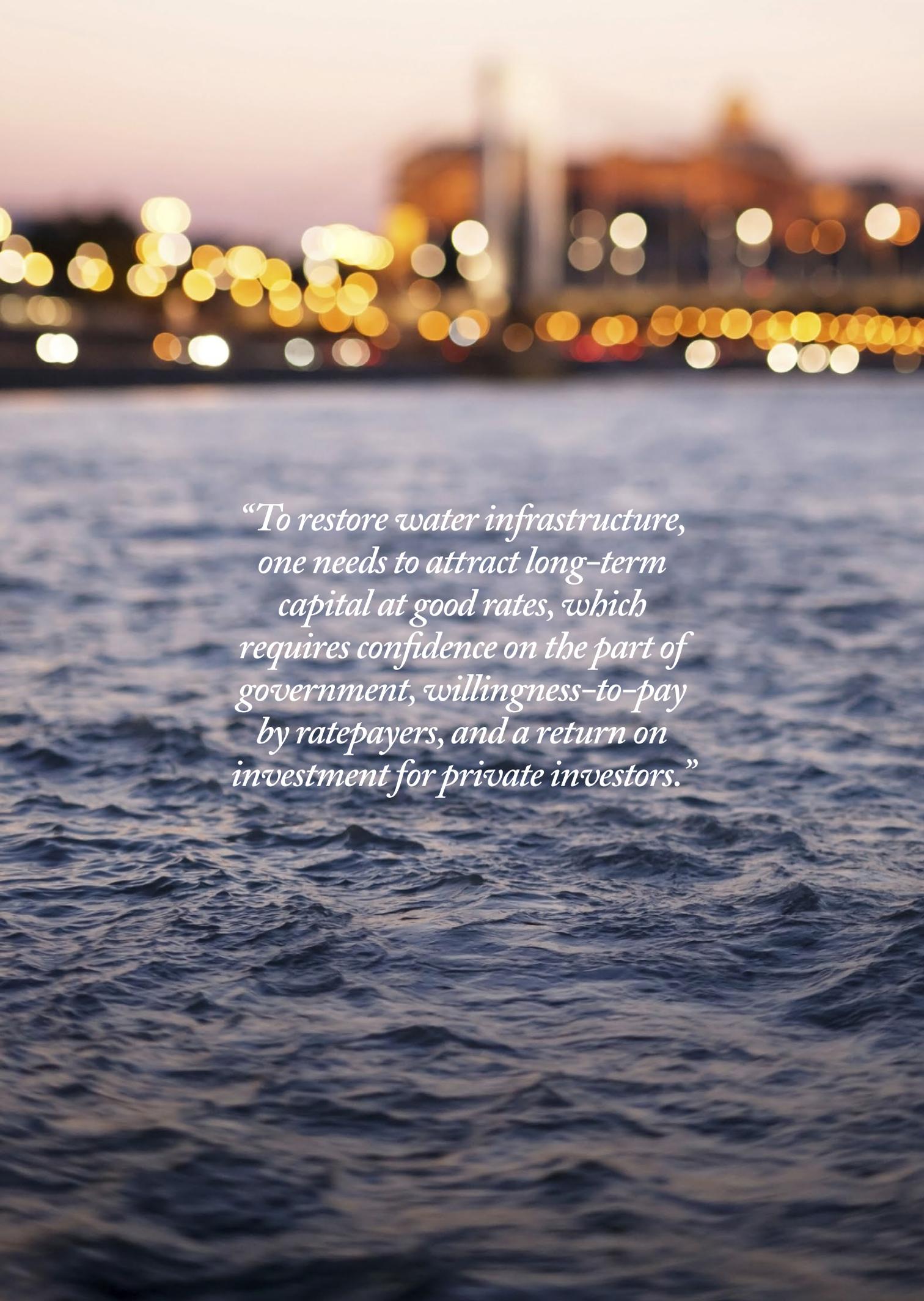
To localize an urban water system, one must first gain a comprehensive understanding of the watershed surrounding the city and the ability to design and analyze new possibilities in context. That involves unifying data on existing conditions and analyzing designs, as these groups have done:

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- To preserve Fairfax County's freshwater supplies, Dewberry installed 5 miles of purple pipe to deliver treated wastewater to nearby parks for irrigation and a local waste-to-energy facility for cooling purposes.
 - To protect local stream ecosystems, Clark County Public Works added 15 rain gardens in a subdivision with undersized stormwater facilities. These biomimetic design features absorbed and filtered polluted runoff that would have otherwise discharged into the surface waters.

To restore water infrastructure, one needs to attract long-term capital at good rates, which requires confidence on the part of government, willingness-to-pay by ratepayers, and a return on investment for private investors.

- To complete the environmental permitting process for a client's new development in Virginia, Timmons Group restored the affected waterways and habitats for local flora and fauna. In addition to the environmental benefits, the client's decision to invest in natural infrastructure reduced costs by over 50 percent by eliminating the need to purchase mitigation bank credits.
- To attract private capital, the City of Buffalo offered American Water a contract to upgrade, operate, and maintain its underperforming water system. American Water easily surpassed expectations and saved the City \$21 million with cost-effective efficiency improvements such as online management systems for customer records and work orders.
- To win stakeholder buy-in for a new water reclamation facility, AECOM shared 3D visuals of its design at public hearings in the Town of Davie, Florida. Ratepayers and government officials concerned with the plant's impacts on the local character could see how the facility preserved the rural atmosphere while protecting their water supply. The \$101M project was approved much earlier than expected.

As these projects exemplify, while many cities have been heading in the wrong direction when it comes to their water infrastructure, the creative application of today's technology—and don't forget a healthy dose of political will—can reverse that trend, with lasting positive impacts on the local environment and economy.

A blurred city skyline at night, with warm lights reflecting on a body of water. The lights are out of focus, creating a bokeh effect. The water in the foreground is dark blue with small ripples.

*“To restore water infrastructure,
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Parking Tech

An Accelerator to the Connected City

By Zia Yusuf

After years of imagining, the Internet of Things (IoT) is finally here.

The Internet is no longer limited to your laptop or smartphone. It's connected to your body, regular household items, car, and so forth. Wish you could turn on your lights remotely? Done. Wouldn't it be great to warm up your house on your way home? Got it. And devices like FitBit that are aimed at improving health by monitoring key activities are on the rise, as well.

But consumers and B2C companies aren't the only ones to reap the benefits. Many successful large B2B corporations are banking on the IoT. Take GE, which put a \$15 trillion price tag on what it calls the Industrial Internet.

The Next Revolution: The Internet of Things for Cities

The biggest impact that the Internet of Things will have on our lives and businesses seems to be remaining quietly in the background, waiting for us to realize its significance until it begins to crawl up on us and become seamless in our daily lives: our cities.

I'd like to refer to the Internet of Things for cities as "the connected city." What exactly is the connected city? It's where sensors detect critical information about our environment and pass it on via advanced networks so that cities will automatically know what's happening as well as be able to take action. They will see when a streetlight goes out; air pollution levels are high; trash capacity so garbage trucks only go to optimally filled cans; real-time parking availability and trends; and more.

Cities are where the true impact of the Internet of Things is witnessed and benefits can be realized. That's because a city places a direct impact on consumers and businesses—they set the standards, technology, policies, and so forth to be in place to obtain these goals. But even more so, the way cities are

organized and share information plays a critical role in our day-to-day lives.

Smart Parking: The Foundation to the Connected City

Companies like Streetline have a vision to make cities connected so that city leaders make better, informed decisions that minimize economic and societal impacts. We're starting with parking.

Smart parking tackles some of the largest challenges our society faces: traffic and emissions. Drivers searching for parking cause thirty percent of urban traffic, so you can only begin to think about what the reduction in people circling for parking can do from both a pollution and quality of life standpoint.

If you haven't heard of it, you're probably wondering what makes parking smart. Smart parking is about connectivity, real-time data, and analytics. It's about using technology to take a mundane daily task—parking—that has several ripple effects and must be managed with data behind decisions—for both cities and drivers.

I'm proposing a strong statement: smart parking is both the accelerator—and foundation—to the connected city. I say this for a few reasons:

- Smart parking is one of the only intelligent initiatives that actually result in increased revenue after it's been implemented. So it's not just reducing costs; it's actually generating additional funds for the city. As parking is typically the second highest source of city revenue, these additional funds can be helpful to prevent budget cuts.
- Once the network is in place, other additional sensing pieces can easily be added on to various

elements throughout the city to measure critical elements and make the connected city a reality.

- The benefits meet many public transit goals: reduce traffic congestion, air pollution, and improve the local economy, foot traffic to merchants, and quality of life for citizens and visitors.

Cisco, the Internet of Everything, and Parking

Along with Streetline, Cisco seems to agree that the connected city begins with parking. We've collaborated with the networking giant to bring smart parking to San Mateo and San Carlos, both located in the heart of the Bay Area.

Cisco is taking the Internet of Things a step further: the Internet of Everything (IoE). The IoE connects people, process, data, and things, and like GE's \$15 trillion estimation, Cisco estimates a number in the same ballpark: \$14.4 trillion. The company assigns IoE asset utilization as \$2.5 trillion of this pie, which is the place where managing parking via analytics and real-time data falls into.

I was honored to kick off Cisco's Internet of Things World Forum Steering Committee last month, and showcase what we're doing together to lay the IoE foundation in these two cities. Our parking sensors, gateways, and repeaters use Cisco's advanced network to connect and deliver the information to a suite of applications for cities in real-time, as well as the information directly to drivers on the web and smartphones. We're also in conversations with several car manufacturers to get this real-time parking data into in-car navigation systems.

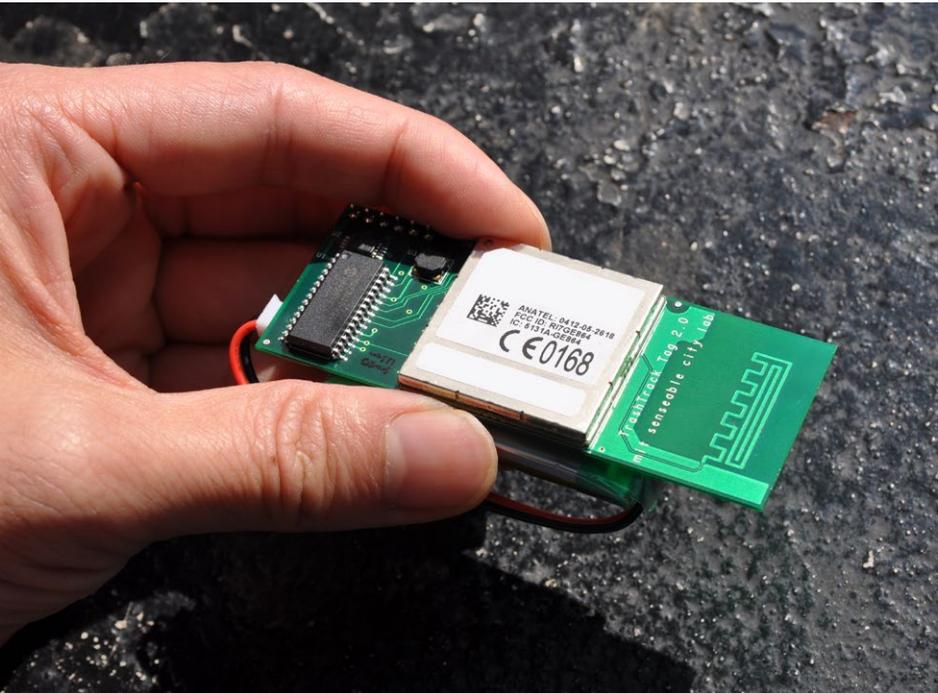
The connected city may be the next revolution for our world today. And, it may just start with parking.

Zia Yusuf is the CEO of Streetline, the leading global provider of sensor-enabled smart city solutions.



Smart Trash

By Daniel Obodovski



I was recently asked, “What makes you excited about the Internet of Things?”

Some analysts predict that the IOT will grow to 50 billion devices by 2020. In GE’s recent study, Industrial Internet, it forecasts that the Internet of Things will generate trillions of dollars in productivity savings.

I don’t know about you, but it is not the numbers that get me excited. For one thing, there is a high probability that these numbers will prove to be wrong. They are either going to be too high or too low compared to what will actually happen in reality. If we look at similar predictions about the future of technology from the past—the numbers will most likely be too conservative. Most technology growth forecasts prove to be too optimistic in the short-term and too conservative in the long term.

In the meantime, as the technology community is wondering which year is going to be the breakthrough for the Internet of Things, a lot is already hap-

pening quietly in the background. Here are just a few examples of the explosion of the IOT economy or Smart Cities:

- Connected Homes
- Connected Cars
- Smart Parking Systems
- Smart Transportation Systems
- Smart Lighting
- Building Automation

And they are all affecting the way we live in our cities today.

Smart Trash

Last, but not least, there is Smart Trash—or the monitoring of the “removal chain” in Smart Cities. That’s what I want to talk about today.

Several years ago, I was working on a dedicated GPS-tracking product at Qualcomm. The team was getting close to the commercial launch when somebody approached me and told me about a project the MIT SenseableCity Lab was working on. It was about tracking trash and I was asked if we were interested in supporting it.

My initial reaction was: “Of course not. First, we are extremely busy getting ready for a commercial launch and second, who on earth wants to track trash?” Yet, I met with the MIT team and that meeting changed my perception of what technology can do for our environment.

“Are you aware what a big deal supply chain management is and how much money is spent annually on its optimization?” one of the project leaders asked.

I responded that, even though I did not know the exact amount, my assumption was that it was rather substantial.

“That’s right,”—continued my counterpart—“now imagine the removal chain or what happens to things as they are being disposed. Do you think they just disappear?” I had no answer. “Don’t you want to know where the trash goes after it has been disposed and how much time it spends there or which routes it takes?”

Well, he definitely got my attention with that and the potential of this project quickly became clear to me.

Efficient Piles of Garbage

As cities become larger and more populated and as the population becomes wealthier, our consumption grows dramatically as well—leading to disposal of more and more stuff. It takes more and more energy to deal with all the piles of garbage. As we increase the share of what can be recycled, understanding the efficiency of garbage removal and disposal becomes more and

Daniel Obodovski is currently finishing work on a book co-written with Daniel Kellmerein of Detecon USA called The Silent Intelligence—The Internet of Things. Previously, Daniel was Director of Business Development at Qualcomm, where he led commercial launch of multiple M2M products and businesses. In 2011 he co-founded, and currently co-chairs, M2M SIG at CommNexus San Diego.

more critical.

And by garbage removal and disposal we not only mean the green garbage truck that drives around your neighborhood once a week and can be tracked by GPS, but also the individual pieces of waste—electronic, toxic, recyclable and non-recyclable items like old TVs, batteries, Styrofoam cups, plastic and many other things. What happens to them after they disappear in the belly of that garbage truck?

We agreed to support the MIT project and as a result had the chance to work on one of the most exciting things in our life. We agreed to put several thousand tracking devices onto pieces of trash and track them in real time with cloud-based software.

Project Results

The project also had a nice side-bonus for us. In lab tests, our tracking devices demonstrated several months of battery life but testing battery life live in the field was cumbersome, especially with so many devices. The TrashTrack project gave us that testing opportunity. I remember asking my MIT counterpart how much battery life he expected out of the devices. His answer was, “I don’t think that trash needs more than 2 months, but who knows.”

In reality, no one knew, because no one had ever before tried to track trash in real time. Imagine our surprise when 5 months after disposal some devices were still sending position reports.

As a matter of fact, we discovered that electronic waste travels all the way from Seattle to Florida to be disposed, just because Florida has state sponsored e-Waste facilities. That seems very counter-intuitive and inefficient.

We also found out that although 80% of trash disappeared in the landfill within the two weeks, 20% continued to move around for quite some time.

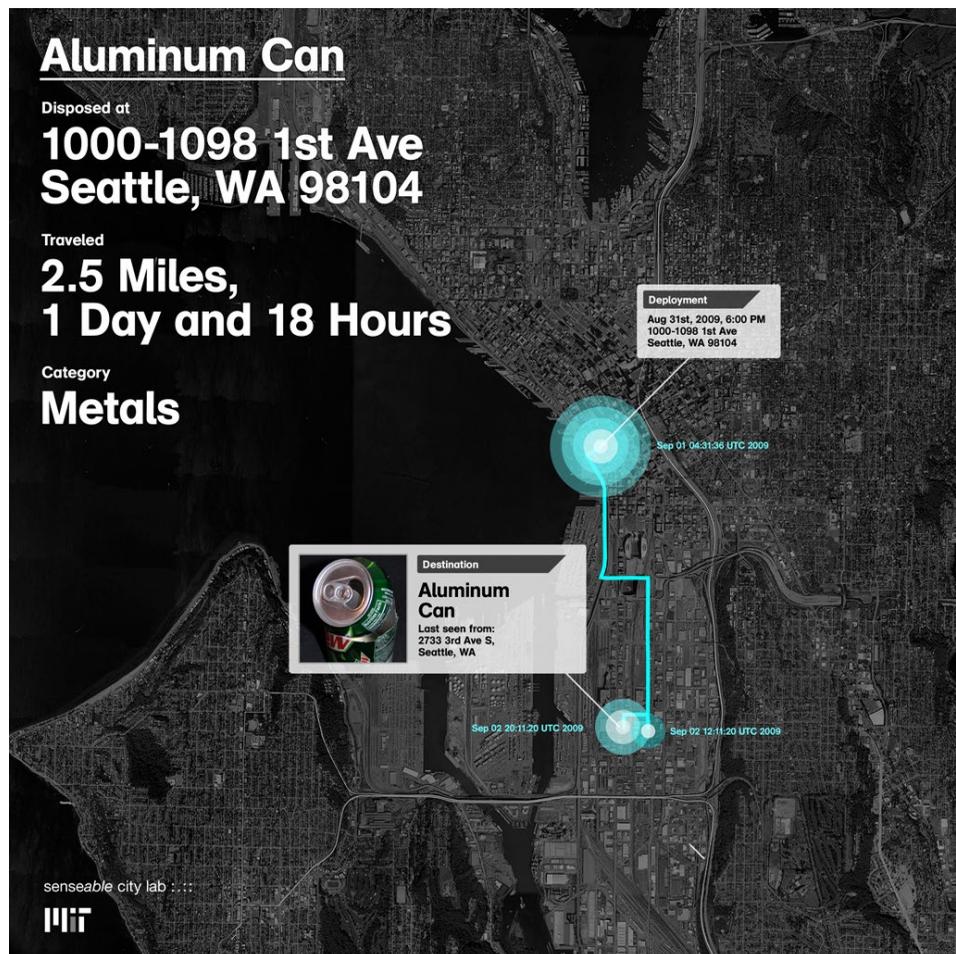
Some went from Seattle to Chicago and then to the Mexican border to be disposed.

The MIT team built a powerful computer visualization demonstrating the paths that different types of garbage took across the country. The results were published in Science Magazine and received a prestigious National Science Foundation award in 2010. But most importantly, it drew the attention of millions to the issue of what is happening with our trash once it is out of sight and how to optimize its flow and to accommodate growing consumption.

For us, it also demonstrated the power

of technology in solving everyday problems, removing guesswork and providing hard data one can make decisions on. It also opened the world of opportunities for creating smart devices—devices that sense their environment, act upon the information, and share their findings with the cloud and the public.

So, going back to my original question—what makes me excited about the Internet of Things? I would say it is the opportunity to change our lives for the better, to learn about our environment and ourselves and, finally, to take a peak into our future.



How Is Technology Impacting Social and Economic Divisions in Cities?

By Charles Rutheiser

In his insightful meditation on the emergent nature of technology, *What Technology Wants*, the author Kevin Kelly makes the provocative assertion that our conventional ways of understanding and talking about technology are much too limited. Instead, he coins a new term the *technium*, to refer to “the greater, global, massively connected system of technology vibrating around us,” as opposed to specific “gear and gadgets.” The technium, he argues, “behaves more like a very complex organism that often follows its own urges” and “is now as great a force in the world as nature.”

Urbanists have long thought of cities as kinds of organisms bestowed with a kind of sentience or even personality. They have also described global urbanization as an inexorable, almost natural force. Since the dawn of the urban age, cities have been dependent on clusters of technologies to build and sustain them. Cities stand as perhaps the most readily visible monuments of our ability to create or drastically modify, if not predict and control, our immediate environment. As the rates and extents of urban growth have increased, cities have become increasingly dependent on more, better and faster technological fixes. The multiple relationships and interdependencies between technology and urbanization make it alluring to think that the answers to all the problems of the latter are to be found in the former. While this vision is tempting, it reflects at best only a more partial and limited truth.

Reading and listening to various experts and visionaries, talk about how new technologies are driving profound changes in the ways in which we build, organize, govern, and live in cities, one can come away with the impression that there is almost no problem that the application of science and technology cannot solve. The vision of the city they



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offer is of a sleek, toned and genetically modified cybernetic organism. What they often fail to notice is that this bright and shiny thing is to be built upon a living and profoundly uneven social foundation that, in the case of many of our coastal cities, is likely to be partially underwater by the end of the century.

Forty years ago, the designer Horst Rittel and the planner Melvin Webber observed that:

“The professionalized cognitive and operational styles that were refined in the first half of the [20th] century based in Newtonian mechanistic physics are not readily adapted to contemporary conceptions of interacting open systems and to contemporary concerns with equity.”

Rittel and Webber called such problems “wicked” as opposed to “tame” problems that could be solved through the application of the paradigms of science and engineering. By calling them wicked, they were not making any judgment about the moral or ethical dilemmas the problems posed but the impossibility of defining and solving them because of their interconnectedness to other problems, as well as their recurrent nature, extreme context dependence, and the lack of shared interests, values, and goals among stakeholders. The latter is a crucial point, for the true wildness of wicked problems lies not with the difficulty of figuring ways of achieving a goal, but in sorting out which goals should be prioritized.

The notion of wicked problems experienced a brief vogue in the 1970s and generated a host of related concepts—social messes, super wicked problems, adaptive challenges—before receding into the maelstrom of ideas and concepts. Outside of software design and the evolving discourse on resilience, relatively few people talk explicitly about the wickedness of pro-

blems anymore. The implicit assumption appears to be that advances in science and technology have made the notion of wicked problems obsolete, a quaint exhibit in a museum of dead ideas. While it is undeniable that we have made much progress in identifying, forecasting and influencing, if not controlling, various kinds of open systems of near ridiculous levels of complexity, our willingness, much less our ability,

in extent and deepen in intensity. In fact, in the United States, disparities in opportunity and virtually every life outcomes measure have increased dramatically over the last forty years. This inequality is most apparent in our cities and metropolitan regions, which have become increasingly fractured and socially isolated places along the lines of race, ethnicity, class, gender, generation and a multitude of other identities and in-



to deal with questions of social equity, fairness, justice, and what used to be called the public good, has not kept up. In fact, it has regressed. As the late historian Tony Judt lamented in one of his last works, *Ill Fares the Land*, these questions are often longer being asked.

No longer asking a question is a way of answering it, but it is not a satisfactory solution when the problems that sparked the question in the first place not only continue to exist but expand

terests.

It has become commonplace to refer to cities as “systems of systems.” It is an appealing, but way too tidy notion, one that emphasizes the tame over the wicked nature of social problems. Our cities are forests, riots, crazy carnivals of systems with different imperatives, rhythms, and logics, which are embedded within still larger systems that link cities with their immediate environments, hinterlands, and the world

beyond.

Some of these systems, especially those that drive the essential infrastructures of urban metabolism, like water, power, sanitation and provisioning, that make such large and dense agglomerations of people possible, are relatively straightforward to identify, if extremely challenging to improve or integrate. These are systems that can be designed, planned, and optimized to be more

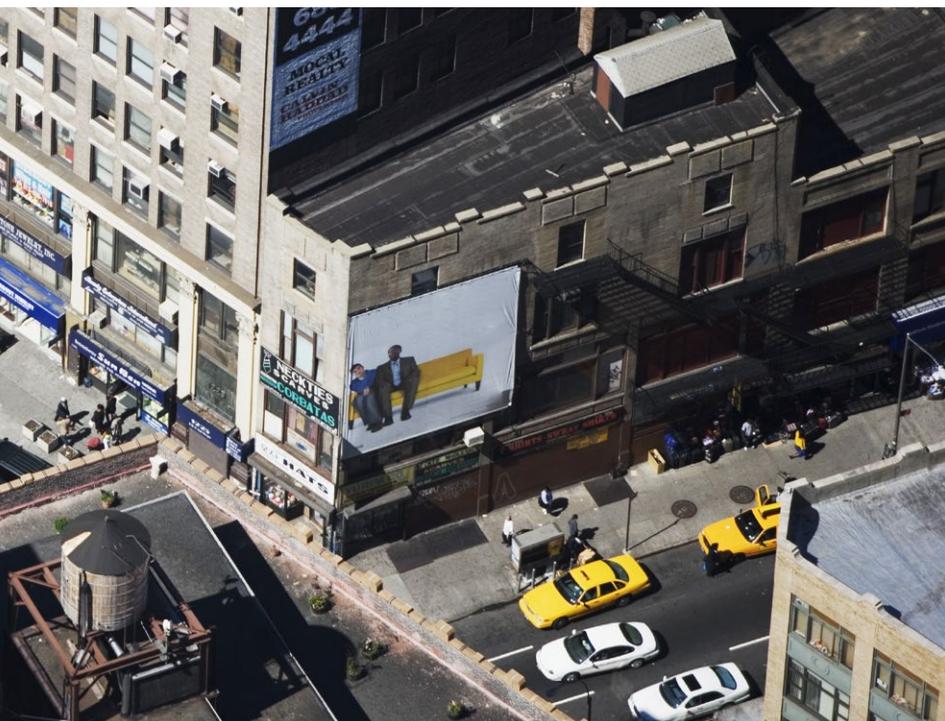
much more resistant to merely technical fixes. When these systems crash, as they have in far too many US cities, the results can be just as catastrophic as the failure of physical infrastructure, but the effects are often so spread out over time and so unevenly concentrated in space that they can be practically invisible to those who are not directly affected.

But the city is home to a far more

New technologies to capture, aggregate, and analyze the digital traces of formal and informal social systems—Big Data—have amazing potential to allow us to visualize and understand the complex interactions, patterns, and leverage points of the many systems within cities. I, for one, look forward to the day when I am no longer constrained by the limitations of Census and American Community Survey data and the disconnects between data organized by census tract, zip code, and other incommensurate geographies.

The amount of data that is available today is simply mind-blowing, even before we move to a full-fledged “internet of things.” We, or at least data miners and refiners, will know more about some people than they know themselves—where they are, everything they purchase, say, and do online. But the issue is that, while a lot more will be known about some people, less will be known about those who do not participate in our increasingly cyber-mediated world. In fact, we may not even know that they are there and we are likely to not even recognize that we don’t know this.

We are used to thinking about the digital divide as an issue of access, but there is the potential that it can become a matter of existence. If we are not conscious and intentional about it, Big Data has the potential to create whole new categories of administrative invisibility for those who are already excluded from opportunity. As Emily Badger asks in a recent article in *Atlantic Cities*, “How do we avert a world where beneficial new digital tools perversely wind-up reinforcing real-world inequality, obscuring some communities while portraying others in-depth?” I’m not sure what the answer is, but it seems that a good place to begin is by recognizing that this is not just a potential, but a very present and wicked problem.



productive, efficient, or resilient—although only up to a point and usually not all three. And it is good they can be tinkered with in some reliable fashion, to be made smarter, for if these systems fail, the results will be widespread, catastrophic and immediate.

Other kinds of urban systems, public safety, education, criminal justice, and other institutional systems, can also be subjected to rational planning and implementation, but have proven to be

diverse array of social institutions and systems that are not formally designed—those formed by the networks of networks that link and divide people by family, friendship, occupation, and shared geography and experience, as well as more invidious systems of patronage, corruption, and criminal enterprise, to name only a few. These systems are even less visible to those who are not part of them, but this does not make them any less there.

Using Smart Technology to Combat Power Failure

By Dan Probst

The importance of replacing the outdated U.S. electrical grid with smart grid infrastructure can't be overstated. The benefits include energy efficiency gains, reduced greenhouse gas emissions and increased opportunities to bring innovations that benefit cities and businesses alike. Those motivations are more than sufficient to warrant rapid deployment of proven technologies, but the most compelling reason for upgrading to smart technology is defensive: The existing grid is breaking down.

This can be seen in the skyrocketing cost of power outages. The Department of Energy calculates that outages cost Americans \$150 billion annually—nearly \$500 per person every year. Other estimates in recent years have put the cost at \$50 billion to \$180 billion, depending on what impacts are included in the equation. But everyone agrees that the cost is mounting rapidly.

- The annual number of blackouts affecting more than 50,000 U.S. customers increased from 140 during 2000-2004 to 303 during 2005-2009, and the trend has continued with 52 such blackouts in 2010 and 109 in 2011, according to Massoud Amin, an electrical engineering professor at the University of Minnesota.
- Electric customers spent 43 percent more to maintain and repair existing infrastructure in 2011 than in 2002, but the average customer still spent 112 minutes without power in 2011, a recent Associated Press study of utilities found.
- When outages due to weather events are removed from the equation, the number of grid related failures has decreased slightly over the past decade, but

the average recovery time is longer, AP reported.

How does reliability-oriented power loss cost cities and businesses? Consider the largest outage of 2011, which affected nearly 7 million people. Originating from a technician's error in repairing a capacitor bank, the system failure knocked out switching stations like dominos across five utilities in Southern California, Arizona and Sonora, Mexico. Economic damage included four-hour commuter delays and numerous car accidents from failed traffic signals; contamination of beaches and unsafe water supply as sewage treatment plants failed; and a host of problems for hospitals, grocery stores, restaurants and other businesses—not to mention lost productivity for millions of workers.

A functioning smart grid would reduce the cost of power failure in several ways. First, outages caused by faulty equipment would be greatly reduced, as smart systems are able to identify weakening components before they fail. Also, local failures would not have the opportunity to spread across multiple grids, limiting the scope of problems when they occur. Finally, smart grids have the capacity to repair themselves, reducing the period of time people are left without power.

Amin of the University of Minnesota calculates that smart grid technology would save businesses and families \$49 billion annually by avoiding power loss, plus another \$20 billion due to energy efficiency. The \$20 billion in energy efficiency would be saved mainly by utilities, which pass through most of the savings to (commercial and residential) electrical customers. Other sources note that annual investment of \$20 billion to \$30 billion would bring about a fully functioning grid within two decades, and would pay for itself many times over during that time. This argu-

ment leaves aside an achievable 20 percent reduction in carbon emissions from smart grid efficiencies.

Everywhere you look, the societal value that a universal smart grid can unlock is increasing rapidly:

- As data centers and other mission-critical facilities use an increasing share of electricity, the cost of power failure and the value of reliability and resiliency are increasing geometrically. Data center capacity is increasing by about 10 percent per year.
- As more utilities and companies turn to strategies such as demand response and distributed generation, the smart grid makes these strategies more effective.
- Large companies are turning to smart-building systems to improve energy efficiency and prevent power failures across their portfolios. The best of these systems duplicate many of the benefits of a smart grid on a smaller scale: 18 to 24 percent energy savings, the ability to manage energy portfolio-wide from a centralized location, automated diagnostic and adjustment capabilities, and short payback periods on implementation costs. The availability of a smart grid would expand these benefits significantly.

Businesses are starting to outpace cities and utilities in capturing the benefits that smart systems offer. Smart portfolio monitoring and control systems such as Jones Lang LaSalle's IntelliCommandSM use cloud computing and algorithmic calculations to help corporate facility portfolios run at peak efficiency while minimizing downtime



risk. These systems don't need smart infrastructure to work, but a smart grid would supercharge the value of current technology and would open the door to a new world of innovation.

To understand how today's smart building automation is ready for smart grid implementation, look at onsite power generation. Many facilities with heat-intensive uses, such as manufacturing plants, are already investing in co-generation, while facilities such as data centers are exploring combined heat and power (CHP) strategies. With the focus on energy efficiency and carbon reduction, distributed power strategies are expanding to other types of facilities.

Smart grid infrastructure would provide a market for excess energy generated at the site level, and would

reduce the amount of energy lost in transmission. It is estimated that about 10 percent of energy from power plants is lost on the way to its destination, but the loss factor increases as the distance between the source and the end-use increases.

The U.S. Environmental Protection Agency, via its ENERGY STAR program, estimates that the country's 4.8 million commercial buildings spend about \$108 billion on energy, and 350,000 industrial plants use another \$85 billion. ENERGY STAR also notes that about 30 percent of that energy is wasted. That's potentially \$65 billion a year that could be saved from better monitoring and management of energy in commercial buildings.

The reduction in greenhouse gas emissions is a bonus for cities, where

governments are concerned about the effects of climate change. Cities also care about efficiency. But more than any other issue, city leaders are continually focused on competitiveness for business attraction and expansion. Cities that work with their utilities and business communities to accelerate installation of smart grids stand a good chance of winning in the future.

As Chairman of Energy and Sustainability Services, Dan Probst is responsible for developing and delivering products and services that help clients reduce energy costs and their real estate related environmental footprint through innovative portfolio and occupancy strategies, workplace standards, and operating practices.

The Lower Don Greenway

Enhancing Toronto's Urban Watershed



Most world-class cities have iconic features that set them apart. Often it's expressed in stunning architecture, such as Sydney's Opera House or Mumbai's Taj Mahal Hotel.

A city's natural spaces can be just as distinguishing. There is plenty to see in New York City, for example, but a stroll through Central Park is a must for any tourist, not to mention a cherished retreat for those who make their home in busy Manhattan.

Toronto's claim to fame is surely its ravine system—the largest of any urban centre in the world. Weaving together multiple neighbourhoods, these ravine landscapes connect both rich and poor, urban and suburban. “The ravines are to Toronto like what the canals are to Venice, hills are to San Francisco and the Thames River is to London,” wrote Robert Fulford in the *Accidental City*. “They are the heart of the City's emotional geography, and understanding

Toronto requires an understanding of the ravines.”

Strategically located near the city's port lands, the Don River Valley features approximately 36,000 hectares of green space, and is an essential artery in Toronto's ravine system. But more than a century of heavy industrialization left the valley's landscape degraded and polluted. Although rail lines and expressways bring thousands of Torontonians through the valley every day,

By David Stonehouse

An urban planner, David Stonehouse was instrumental in Toronto's early efforts to revitalize the Don Valley—coordinating of the Task Force to Bring Back the Don in the 1990s, and then supervising the sustainable design, planning and construction of Evergreen Brick Works. He has been an advisor on many other urban restoration projects around the world, including Cuba, Bolivia, the United Kingdom and the United States.



public access remains limited, and the region's natural features have often gone underappreciated. This is particularly true for the Lower Don—the last six kilometres of the watershed that bisects Toronto East from Toronto West, and empties into Lake Ontario.

Over the last two decades, efforts to re-naturalize the Lower Don and revitalize it to its full potential have been gaining steam. The Task Force to Bring Back the Don, a citizens' group spon-

sored by the City of Toronto, spearheaded the original campaign to clean up the Lower Don watershed, and since then a much larger collection of government agencies, citizen groups and non-profits have pitched in to expand the effort.

In 2010, Evergreen Brick Works opened to the public after a ten-year project to reclaim the Don Valley Brick Works, an industrial heritage site located at the heart of the valley. The century-old factory had produced the bricks that built Toronto, but when it closed down in the late 1980s, all that was left was a damaged ecosystem, crumbling buildings and contaminated soil.

Evergreen, a charity based in Toronto, worked collaboratively with a long list of partners to bring this adaptive-reuse project to life—especially the City of Toronto and the Toronto and Region Conservation Authority (TRCA), who had earlier converted the site's quarry into a natural area and park. Today, Evergreen Brick Works is a dynamic venue for exploring ideas and leading-edge green technologies, and a vibrant public space where visitors can engage in a broad suite of hands-on environmental programming. It is also an international showcase for green design and urban innovation, which is why Evergreen Brick Works has been chosen as a key partner for the next Meeting of the Minds event in 2013.

Spurred by the momentum of Evergreen Brick Works, and also driven by forces behind waterfront development plans and planning for the 2015 Pan Am Games, the Lower Don is emerging as a strategic asset for Toronto.

The surrounding area has attracted thousands of new residents in the last five years—part of a high-rise construction boom fueled by rapid population growth across the city. This trend toward higher density is sure to continue, with

more than 70,000 people expected to arrive to new waterfront neighbourhoods surrounding the Lower Don. There has never been a better time to make the Don a natural destination for residents and visitors.

As part of its CityWorks initiative, Evergreen is looking to seize this historic opportunity to improve the area even further. With its key partners, the City of Toronto and the TRCA, Evergreen is engaging other stakeholders and communities in the Lower Don in an effort to enhance access and connections throughout the region. The project will involve an extensive public-engagement process, and will complement the City's master plan for development throughout the Lower Don region.

By linking sites along the corridor with the waterfront and adding iconic art installations, the Lower Don Greenway will connect Evergreen Brick Works with other heritage hot-spots, such as the Distillery District and the recently revitalized Regent Park and Riverdale Farm. The greenway project will transform the Lower Don into a prime destination in the city; a place to celebrate, admire and appreciate the ecological significance of Toronto's ravine network.

In other cities around the world similar projects are underway and proving to be a great success. From the High Line in Manhattan's West Side to Vancouver's extensive Greenway Network, cities are revitalizing previously underappreciated spaces and reconnecting the natural and the built environment—all while driving tourism dollars, neighbourhood gentrification and tax revenues.

Expanding and enhancing the Lower Don Greenway would act as a catalyst—driving awareness of Toronto's ravine network, engaging people and communities within the natural landscapes of their city.

