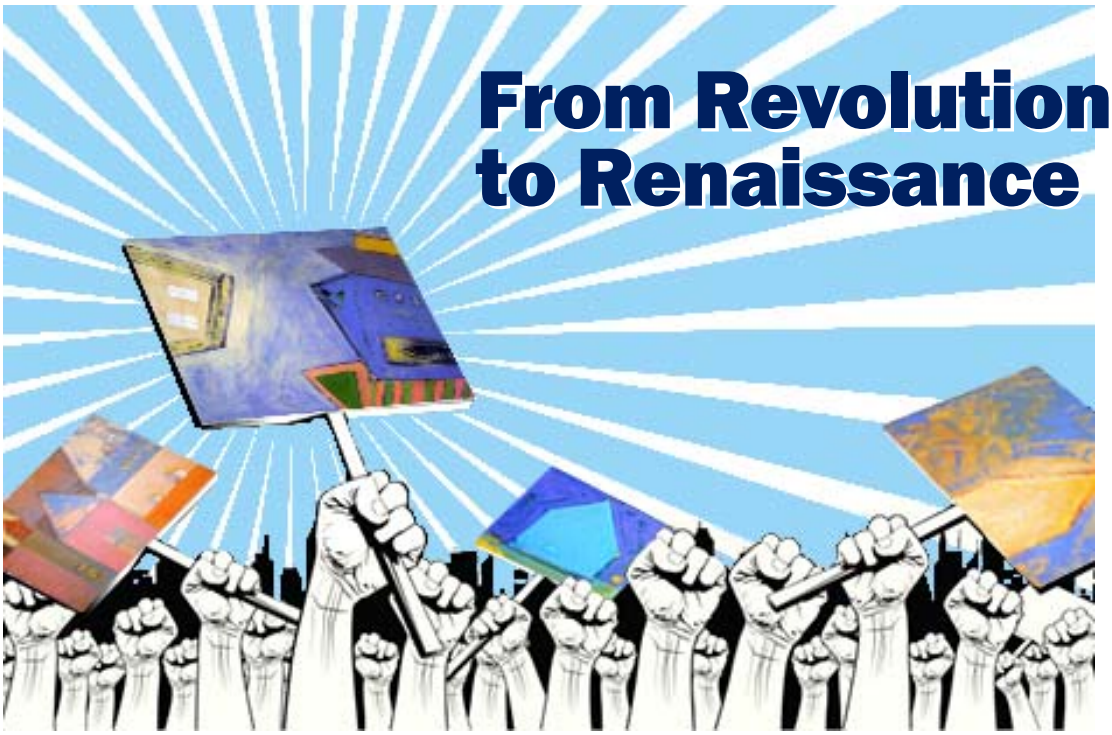

How Intelligent Communities Plan for a Future of Economic, Technological and Environmental Disruption

Annual Theme of the 2016 Intelligent Community Awards

Intelligent Community Forum
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From Revolution to Renaissance

Preparing for the future has never been easy. It has seldom been harder, however, than it is today.

We already live in a world where the largest taxi company on earth owns no vehicles. Where the world's most popular media owner creates no content, the largest accommodation provider owns no real estate and the most valuable retailer stocks no inventory. Those companies are, respectively, Uber, Facebook, Airbnb and Alibaba, according to Tom Goodwin, writing for TechCrunch.com.

Their businesses were made possible by the enormous growth of the Internet, and they are the tip of the iceberg when it comes to the radical changes that this network-of-networks is driving through how we live, work, shop, travel, worship, educate and entertain ourselves. Those changes include a ruthless reduction in job opportunities for those without the knowledge and skills to compete in an Internet-enabled economy. They also blur the barriers that we have long used to distinguish my community from yours, and ease the obstacles of distance and remoteness.

> You can't connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future. This approach has never let me down, and it has made all the difference in my life.
>
> - **Steve Jobs**

The economic area of a metropolis once included just the city and its immediate suburbs. With telecommuting, Web conferencing and e-commerce, the net spreads far wider. A small city hundreds of miles from the nearest metropolis once had little hope of participating in the global economy – except for suffering its negative effects in the form of business disruption and job loss. Today, the barriers to that participation are less physical and more in people's minds and hearts: in their level of education, willingness to change and their attitude to the world beyond their borders.

The future is unknowable. But today's best guess is that the current disruptions in technology, the economy and the environment will only grow more intense. That creates a challenge that Intelligent Communities around the world are rising to meet. They know that the physical form of their communities, their competitive advantages as a place, and everything about how citizens and organizations interact with them is undergoing upheaval. Faced with the need to plan, they approach the planning of land-use and infrastructure, economic growth, sustainability and community development in revolutionary ways. And through that revolution, they are creating a new renaissance across the city, the suburb, and the rural region beyond. ■

> If you think in terms of a year, plant a seed; if in terms of ten years, plant trees; if in terms of 100 years, teach the people.
>
> - **Confucius**

Interactivity Changes

The information and communications technologies (ICT) in use today have one thing in common. **Interactivity.** From email and social media to enterprise resource planning and the weather service, their greatest value is not in sheer computing power but in giving us access to vast amounts of information, as well as to each other, in near real time. The database is only as good as the search system through which we interact with it. Email and social media are only as good as the number of human beings who use them. Global navigation and mapping platforms revolutionized the way we get around only when billions of people gained access through easy, intuitive apps.

Interactive, Digital Domain

Interactivity changes the number of people we can relate to, as well as the geographic area over which we can do it. Today, we create and maintain relationships with unimaginably more people in more places than the generation before us. Our personal, career and commercial opportunities expand – but we live with the fear of losing real human connection at the same time.

Our data systems interact with the world, compiling massive amounts of data. Interacting with them, we find our understanding of the world transformed. We track disease outbreaks by Google search terms. Amazon and Netflix make recommendations to you based on the experience of millions of people whose buying patterns show similar tastes. We participate remotely – but with great immediacy – in dramatic events, from revolution to disaster, taking place a world away.

An interactive digital dimension now overlays most of the physical spaces you use in your daily life, and it is slowly but fundamentally transforming what we need from them and how we get it. We telecommute instead of making the daily trek to an office, which transfers our need for reliable power and high-quality broadband to our homes. We can conduct videoconferences uniting people in a shared mission across multiple time zones instead of gathering physically together. We navigate using smartphones, select restaurants using apps, and shop by mobile in one store while walking the aisles of another.

Measurable Impact

The impacts of this digital overlay on the places we live, work and play are just beginning to become visible. Jones Lang LaSalle is a commercial real estate broker

operating worldwide. One of the most common things its brokers do is to advise companies on how much office space they need for their employees. For many years, the rule of thumb was 200 square feet (about 18 m^2) per employee. But in a 2012 report, the company predicted that by 2014, the average space needed per employee would be only 50 square feet (about 5 m^2). That's a remarkable fourfold decline.

The change is the result of the increased mobility of the workforce. In a growing number of industries, employees aren't spending their time in the office. They are visiting customers or suppliers or branch offices. They are working from home or hotel or cafe. They are using the mobile tools of the information age – laptops, tablets and smartphones – to cut the physical tether to the office while remaining connected, accessible and accountable to their companies over broadband.

Consider the impact on demand for office space in the central business district and surrounding suburbs. In a March 2013 Webinar, Norman Miller of the Center for Real Estate at the University of San Diego, examined what would happen if US tenants used 20% less office space. He estimated that the change in demand would create US$250 billion in excess office capacity in a market worth $1.25 trillion.[i]

Population Change

Much has been written about the rebirth of big cities, where a mix of millennials and retirees are drawn by new walkable neighborhoods that mix housing, business and culture. Behind the scenes, however, that rebirth is much less a matter of city design and much more about the transformative power of ICT. As economic competition has risen in a connected world, it has drastically raised the value of skills and relentlessly replaced low-value employment with hardware and software. In the process, it has accelerated changes in population. Cities where digital economies flourish have grown, but other cities – particularly those that relied for too long on a single industry for employment – have seen their populations plummet.

Those downsizing cities are having to explore new ways to rebuild vibrancy and retool their economies for a very different future. Pittsburgh, in the US state of Pennsylvania, is one well-known example. According to *The Economist*:

> Its revival since its steel industry collapsed in the early 1980s is partly thanks to good long-term planning. Under the leadership of Tom Murphy, a three-term mayor, more than 1,000 acres of abandoned, blighted industrial land in Pittsburgh was cleaned up and is now thriving commercial, retail, residential and public space. Once lined with factories, the city's waterfront has been given over to parks. Mr.

Murphy oversaw the development of more than 25 miles of new trails alongside the river. He helped develop public-private partnerships, which leveraged $4.8 billion in economic development. Even as its population continues to fall, Pittsburgh has reinvented itself as a successful tech and health hub.

Almost one in ten American cities is shrinking – but so are more than a third of German ones, and the trend is also visible in Japan, South Korea and even Asia's economic engine, China. China's total urban population is expected to peak by mid-century, and its older industrial cities are already in decline.

Shrinking cities seek a new future. Growing metropolises reinvent their downtowns and their delivery of services for a new population. The suburban and rural regions around them gain new opportunities for economic growth and cultural richness in a society and economy that operate increasingly online. Seeking urban and rural renaissance, city builders are overturning old ideas to create places with the best chance to prosper in a century producing greater disruption with each passing year. ■

Vision-Driven, Community-Based, Technology-Smart

What is an Intelligent Community? How is it different from a Smart City? And what do those differences mean for the community's future?

Smart Cities

Smart Cities deploy ICT into municipal infrastructure and processes to meter, monitor and automate in ways that save money, increase efficiency and improve quality of service. It may be a network of cameras and environmental sensors that feed into an operations center for day-to-day traffic management or emergency response. It may be GPS units in every city vehicle to improve routing, provide location data and make sure that municipal workers are doing their jobs. It may be smart grid or water metering systems that detect problems early and prevent costly crises from erupting.

These are valuable services that make government run better and cheaper. They significantly improve quality of life and can even involve citizens and organizations more deeply in governing the place they call home. In a word, they make cities *work better*.

Intelligent Communities

Intelligent Communities represent the next step. The work of Intelligent Communities focuses on making *better cities, suburbs and rural regions*. Intelligent Communities work to build inclusive prosperity on a foundation of information and communications technologies. They ensure their citizens and employers have the broadband infrastructure needed in the 21st Century. They work tirelessly to improve the educational opportunities of every citizen, and to grow, attract and retain innovative companies to employ them. They insist on environmentally sustainable development to protect their heritage for the next generation. They strive to involve every citizen –

regardless of income, age or ethnicity – in the broadband economy for reasons both moral and eminently practical. Most important, they make their people and institutions into passionate advocates for the positive changes needed to keep their community strong in an age of technological, economic and social disruption.

Smart Cities start with problems and use technology to solve them in innovative ways.

Intelligent Communities start with vision, build on community and make technology-smart decisions about their future. Most of this work has nothing to do with technology and everything to do with the values of leadership, collaboration, trust and faith in a better future. It takes place in big cities, suburban communities and rural counties. It is the means by which ICT investment can be translated into employment growth, economic vibrancy and cultural richness. It is the way to prepare the place called home for a strong future in the 21st Century. ■

Planning for a Disruptive Future

The work of the city builder is both art and science. Whether that city, suburb or county contains two thousand or ten million people, it benefits from having a plan.

Good urban and rural planning includes consideration of infrastructure, of the efficient use of space and of mobility in all its forms, from car and rail to walking, biking and cable cars. It covers transit-related development, urban intensification, open space and parks as well as environmental sustainability. It considers how to create memorable spaces and conserve heritage, how to integrate buildings and neighborhoods within an urban, metropolitan or rural landscape, and where exactly people fit into the grand design. Ultimately, it is about providing clarity on the goals of the community and offering confidence to investors that the development risks they take can achieve a reasonable reward.

Digital Overlay

The ICT revolution, which has upended business, the economy and culture, has also presented revolutionary challenges to planning. The nature of a place is no longer just about its roads and rails, power and water, green space and entertainment. It is about the quality of the invisible digital web of sensors, information and services that overlays the physical space.

That digital web render obsolete some of the physical infrastructure we have long depended on. In 2014, the City of New York issued an RFP to retrofit 10,000 public phone booths into Wi-Fi hotspots because most people stopped using what used to be important communications infrastructure.

It changes how people use physical infrastructure. Leading-edge transit agencies from Brazil to Taiwan monitor social media closely, because it helps them identify service problems that would otherwise go unnoticed. After fixing the problems, social media monitoring also tells them whether the solution worked.

Digital technologies also create new ways to engage the public in making decisions about the future shape of the city, suburb or county. Important questions can be pushed out for response to citizens and businesses by mobile text or app. Sophisticated digital modeling can present compelling visions of the future and invite viewers to weigh in with opinions and suggestions. By meeting citizens in the online world they live in, planners stand a better chance of making plans that work, and seeing those plans adopted.

Examples from the Top7 of 2015

The following are examples from the development experience of the Top7 Intelligent Communities of 2015, each addressing a different aspect of the ways

that ICT transforms the community, enhances its quality of life and better engages people in vital decisions.

Arlington County, Virginia, USA

Bordering on Washington DC, Arlington draws most of its economic energy from spending by the US Federal government. It is home to Federal facilities including the Pentagon, the National Science Foundation and the Naval Warfare College, and to plenty of contractors, consultants and associations serving the government. Its biggest development challenge in 2015 stems from Federal decisions to close military bases and consolidate offices at new locations outside the county, with the expected loss of 17,000 jobs and 2 million square feet of office space. The affected space is the oldest and least desirable in Arlington, which makes it hard to lease up again. Compounding the effect is a more mobile workforce that needs less office space, which the County estimates as reducing demand by 15-20%. It's a perfect storm of economic development challenges that the County is attacking in many different ways.

Connect Arlington

One strategy involves connectivity. ConnectArlington is a project to construct a 10-mile dark fiber network in the commercial district, which the County will lease at attractive rates to carriers, business and government. Both business and government are eager for gigabit capacity to support data-intensive operations.

The County's real estate community has committed to billions of investment in bringing old office space up to today's requirements. The County is supporting them with a big marketing push to site selectors, with cultural programs that bring trendy restaurants, bars and galleries into former industrial areas, and with development programs like BizLaunch, with helps young companies identify gaps in their offerings and connects them with organizations that can help fill those gaps. Its latest success is in recruiting Hispanic staff and focusing BizLaunch on the Latino business community.

Tandem NSI

Arlington's traditional economic development focus was on attracting Federal agencies and big companies. Today, it is increasingly about stimulating the founding and growth of new companies that serve the Federal government and its major contractors. The most interesting example is a new venture called Tandem NSI, which stands for National Security Innovation. It is a public-private venture founded by a local venture capitalist who is highly committed to the county.

Tandem targets program managers at Federal agencies who are intensely frustrated over their inability to create change in technology and processes. It began by hosting workshops, funded by the Commonwealth of Virginia and organized by Arlington Economic Development, and inviting program managers as speakers on such issues a cybersecurity and Federal procurement. These speakers attracted a mix of new tech innovators and established government contractors. From a few hundred people at first, it now has a network of thousands and has more than a dozen Federal agencies participating.

Tandem's next venture is a service that will establish a permanent procurement vehicle Federal agencies can use to meet short-term needs for expertise and longer-term need for product development. Right now, it can take so long to get permission to hire an outside expert that agencies typically give up and use contractors already in the system, regardless of their expertise. Tandem will make its procurement vehicle available to agencies that need to bring in the best expert in a given discipline for short periods to advise them, or for companies that can quickly create a product to solve a problem.

Tandem and the County believe that this venture will make it possible to build an ecosystem of innovative companies specializing in national security, which will also help retain the agencies and contractors already there. There are three reasons they are likely to succeed. The concept could solve a big problem for the Federal Government. Because it focuses on national security in a world of cyberthreats, it targets a major growth market of the future. And it leverages in an imaginative new way the economic advantages that Arlington County has long possessed. From these revolutionary responses to crisis, the County is laying the foundation of a new renaissance in the local economy.

Columbus, Ohio, USA

Intelligent Community of the Year 2015

Go to the App Store on the iPhone or Android and search for MyColumbus. Downloading this app (rated 3.5 out of 5 by users as of June 2012) will put the City of Columbus, capital of the state of Ohio, into the palm of your hand.

MyColumbus started out as a student project at Ohio State University. Students worked with the IT department of the city to identify publicly-accessible databases that could provide the most up-to-date information on city services, location of facilities and schedules of public events. They then built an app to access the data and turn it into easy-to-understand information.

From Students to City

The city's IT department was so impressed with the result that, with the students' permission, it hired a software company to expand the app and put a professional gloss on it. Since its introduction, it has been downloaded more than 20,000 times.

The resulting MyColumbus provides:

- MyNeighborhood (location-based mapping and information about community resources, refuse collection and health inspections)
- GetActive (links to events, bike and trail maps and healthy lifestyle tips)
- GreenSpot (with information on sustainability)
- 311 (where residents can log service and information requests)

Service requests submitted via MyColumbus are resolved 3.3 times faster, on average, than telephone requests. Why? Because users can submit photos and GPS coordinates with their service requests, which helps maintenance workers show up with the right tools and materials to get the job done.

Rich Data, Mobile Plan

MyColumbus is so effective because of the rich data that Columbus's IT department makes available to it. The city's geographical information system (GIS) has hundreds of layers and supports applications including a Utility Dashboard, Capital Improvements

Planning, Fire Hydrants Inspection/Maintenance, and that all-important function in snowy southern Ohio, Snow Removal. An online system called Accela has automated the permit, asset management and licensing functions for property development. The data derived from databases, sensors and GPS flows through to operations managers, planners, businesses and citizens in a never-ending stream.

Many cities the size of Columbus have mobile apps. What is distinctive about MyColumbus is that it is the public face of a comprehensive plan. It includes hundreds of Wi-Fi connected laptops issued to police cruisers and public utility field staff, more than 700 smart phones put in the hands of city management, and 100 tablets for the health department and members of City Council. The city's business, particularly for personnel interacting with the public, is done online from wherever staff happen to be.

By making the city more efficient and accountable, ICT contributes something exciting and new to the quality of life in Columbus, helping to differentiate it from other midsize cities. And by putting information literally into the citizen's hand, MyColumbus is revolutionizing the relationship of people and organizations to the city they live and work in.

Ipswich, Queensland, Australia

In 2011, the city of Ipswich published a 20-year economic development plan. It predicted revolutionary changes: the addition of 292,000 new residents to its current 182,000, who will require an additional 120,000 jobs and will live in a network of distinct communities interwoven with centers of employment, recreational facilities and green space.

The plan responded to future challenges but also to past ones. Ipswich is located 40 kilometers from the central business district of Brisbane, the capital of Queensland and Australia's third-biggest city. Because Ipswich offered affordable housing and an attractive lifestyle, its population was growing rapidly in the booming economy of 21st Century Australia. Yet the decline of industrial employment in the 70s and 80s had left the city with legacy of long-term unemployment and bred unacceptable levels of crime and social dislocation.

Broadband Incentives

Carrying out the plan, Ipswich was quick to seize multiple opportunities. The Australian government's National Broadband Network, announced in 2009, opened the possibility of attracting significant investment into the region. Ipswich City Council partnered with surrounding city and regional councils to build a case for NBN rollout of what it termed the Western Corridor National Broadband Network. The governments mapped current and proposed broadband infrastructure, developed joint policies and solicited support from business and industry groups. Their work was rewarded in 2010, when NBN announced that two locations in the region would receive the first deployments of fiber to the premise.

A similar strategy has driven 3G and 4G mobile deployment. Governments combined to conduct independent testing of availability throughout the region, which sent testing vehicles across more than 2,300 kilometers of roads. The effort paid off by letting governments bring objective data to their negotiations with carriers about where towers should go to provide the broadest possible coverage. But Ipswich has been as ready to partner with the private sector as to pressure it. Acting as intermediary, Ipswich has coordinated between property developers and NBN to direct NBN investment in fiber conduit to areas where property developers or the city are launching construction, which saves all parties time and money.

From Digital Hub to Digital Enterprise

Infrastructure, however, is only the start. To encourage adoption, Ipswich has introduced a wide range of courses for citizens on digital applications and built a Digital Hub demonstration center where citizens and businesspeople can experience the most advanced technologies. Training has reached more than 2,000 people, many of whom in turn become technology trainers for community groups. A Digital Enterprise Program has offered training seminars to hundreds of employees from small-to-midsize businesses and nonprofits.

Ipswich has just commenced a major redevelopment of its city center, where digital technologies will be used to attract commercial and residential tenants and to improve public safety through video monitoring, license plate and facial recognition software. Green standards will make the city center one of the most sustainable in Australia. When it is completed in 2031, it will mark the emergence of a city of still-modest size that serves as a national model for development.

Mitchell, South Dakota, USA

Mitchell is a city of 15,000 people on the plains of South Dakota, at the center of region that has lost 30% of its population over the past 70 years. The biggest building in downtown Mitchell speaks volumes about its traditional economy. The Corn Palace is a tribute to the region's contribution to the $167 billion worth of annual corn produced in the United States.[ii]

For Mitchell and many other rural communities in the US, however, agriculture is a blessing and a burden. Government subsidy schemes ensure long-term stability despite the typical boom and bust cycles of agricultural markets. The trouble is that modern agriculture is good at producing wealth but not at creating new employment, because automation from farm to store has been so effective. The success of agriculture does breed jobs in other sectors, mostly retail, food service and accommodations. But it is not employment that can sustain a prosperous middle class.

The People Vote "No"

Seeking another path to prosperity, Mitchell in 1997 put to public vote a project to issue bonds and create a municipally-owned broadband network to deliver the triple play of telephone, Internet and television. It was the brainchild of one of the city's two institutions of higher learning, the Mitchell Technical Institute. The business community was heavily in favor. But the public, fearing high costs, voted down the initiative.

The failed vote looked like the end of the story, but it turned out to be the beginning of a new chapter. It is a surprising thing, but when a municipality demonstrates real hell-for-leather resolve to bring broadband to its citizens and businesses, it has a way of changing the investment equation for the private sector. The cable television company found that – while an old coaxial cable network had seemed appropriate for the Mitchell market before the vote – that same market now justified an investment in optical fiber. The incumbent telephone company put Mitchell on its list of communities to receive a wireless upgrade to 4G service.

Focus 2020

The Mitchell Technical Institute (MTI), whose vision had sparked the vote, built a Technology Center to serve students and the community. It attracted the attention of competitive local exchange carriers in the region as a place to house their equipment. MTI applied for and won a grant to build a Network Operations Center (NOC) in the Technology Center as a service platform for private-sector carriers. It was not long before a competitive local exchange carrier (CLEC) won a low-interest loan from the Rural Utilities Service of the US Department of Agriculture and began constructing an end-to-end fiber-to-the-home network.

On this foundation, institutions, business and government have collaborated intensively to drive economic development. As part of a strategic plan called Focus 2020, they work cooperatively to promote digital literacy and supply the highly trained workforce in increasing demand by area businesses.

The school district launched a 1:1 laptop program for secondary school students and a pilot program in "mass customization" of learning, which aims to give students education appropriate to their individual abilities. It opened a Career and Technical Education Center in partnership with MTI and Mitchell's Dakota Wesleyan University to equip secondary school and MTI students with the skills in greatest local demand: agriculture, health care, energy, construction and communications.

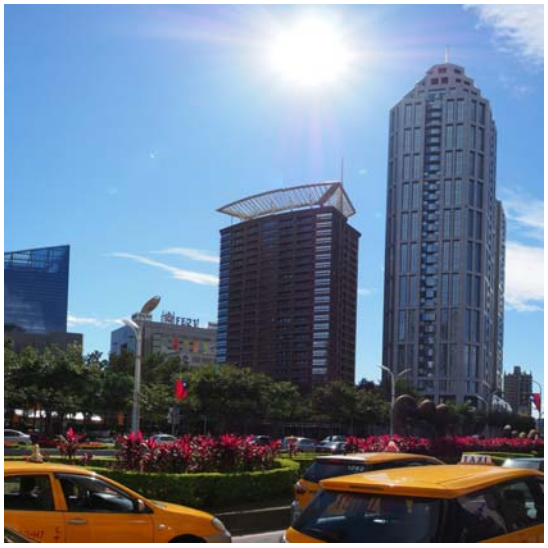
Two hospitals merged to create Mitchell's largest employer, which draws staff from the combined 100+ graduates leaving Dakota Wesleyan and MTI each year. The broadband build-outs have led to the formation of three new engineering, consulting and software companies that employ more than 500 professionals and technicians, with two new start-ups being incubated by the community. With new tech-centered office properties rising and hundreds of citizen volunteers engaged in promoting its vision, Mitchell is leading a rural renaissance that turns the disruptive forces of the modern global economy to its advantage.

New Taipei City, Taiwan

New Taipei City (NTC) is a donut-shaped municipality that was once the county surrounding Taipei, the nation's capital. That torus shape is important to keep in mind, for it means that NTC consists of a great variety of districts and big variations in geography, from mountainous aboriginal areas where tourism is the principal industry to advanced science parks and a bustling downtown. Government policy attempts to bridge two needs: to ensure that each district preserves a distinctive local character and identity, while providing infrastructure and services that bind districts into a single city.

Telecom Park

This orientation is visible, among many other places, in the massive investment going into expansion of the passenger rail system known as the MRT. NTC is designing the new rail lines to circle Taipei rather than move people and goods into and out of the center, so that it binds together the city. But each MRT station has a different architecture to reflect its neighborhood, and local managers compete to get riders to vote their station the best.



It is also visible in the Taipei Far Eastern Telecom Park, developed by the Far Eastern Group, a conglomerate of 9 listed companies in everything from ICT to hotels and retail. The Telecom Park is on the site where Far Eastern was founded. The company decided to consolidate multiple buildings throughout Taipei into a single facility: mixed-use office, residential and healthcare with a major data center linked to the Chungwha national backbone and submarine cables.

When Far Eastern began to develop the park, it approached NTC for help in assembling a contiguous property. NTC agreed on the condition that Far Eastern turn it into a public "eco-park" incorporating a library and hospital to provide public benefit. The result was a business, government and university collaboration that designed the park along environmental lines with green roofs, a big tree-planting program, stormwater management, a butterfly house and a design that creates wind corridors to reduce temperatures. All buildings are green-certified. In the minds of the developers, the Park represents a new standard for urban development in Taiwan: a people-centered, high-livability environment.

Hot Spots Analysis

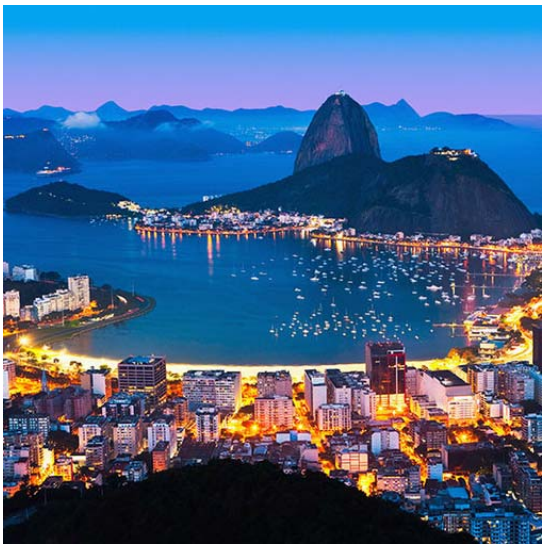
One of NTC's most revolutionary projects, with great potential to unite the city, takes place behind the scenes. The city's Research, Development and Evaluation Commission has introduced a system called Hot Spots Analysis. It draws on posts to the city's Web portals, the logs of the emergency response center and traffic on social networks to identify issues that, raised frequently by citizens, are not being properly addressed. Monthly meetings of the heads of all city departments review known and new Hot Spots and determine what actions the city should take to solve them. Going one step beyond, the decision-makers examine why the problem was

not being addressed: whether a single agency was at fault or the issue was one that crossed over the boundaries of multiple agencies. Each Hot Spot is developed as a case, from identification of the problem to its solution and the lessons learned, and each case becomes an online reference document accessible to both government officials and citizens.

In one example, citizens repeatedly flagged a problem on express buses bringing commuters into the city: the lack of enough capacity to handle rush hour passenger traffic. Investigating the issue, the city found that its own regulations prevented the buses from loading more passengers than they had seats for when the buses would be traveling on freeways at high speed. The city was unwilling to relax this safety regulation, so it instead negotiated with the bus companies to offer a different service: shuttle buses operating on routes that connected outlying areas to train stations. This encouraged more passengers to take the train, which in turn reduced rush-hour wait times on the express bus routes from an average of 20 minutes to less than 10.

There is nothing sexy about this IC application. Quietly and consistently, citizens receive better services. Government addresses its real problems and avoids unnecessary investment in services or infrastructure. From a set of disconnected districts, a unified city emerges.

Rio de Janeiro, Brazil



Rio de Janeiro is a city of nearly 7 million that is making a revolutionary transition from third-world to first-world status. With an estimated 40% of the population functionally illiterate – yet working in a large informal economy – it has extremes of wealth and poverty, knowledge and ignorance, living and working side by side.

Its current mayor, Eduardo Paes, has proven to be a man of rare energy and determination, willing to take chances that would make a more cautious politician blanch. His decision to bid for and win the rights to host both the 2014 World Cup and the 2016 Summer Olympics are just two examples. Balancing the willingness to take risks, however, is a devotion to mastering detail. The city has engaged universities in the US and Europe to develop performance measures and training programs in the functions

of government. Every department sets annual goals and is evaluated against them every 90 days, and every individual is encouraged to take training relevant to achieving those goals. If a department exceeds its goals for the year, every member of that department receives an extra month of wages. Truly stellar performance is rewarded with two month's wages. In a bureaucracy where it is almost impossible to terminate an employee, these incentives have proven highly effective.

Three major Rio projects in particular represent a revolutionary break with the past that is creating a renaissance that becomes more visible by the day.

Bus Rapid Transit

The first is the bus rapid transit (BRT) system, an idea invented in the Brazilian city of Curitiba and now widely imitated. BRTs combine the best features of a train – pre-ticketing, operation on dedicated roads that bypass traffic, boarding only at raised platforms – with the low cost of buses. The BRT buses travel on dedicated lanes and stop only at platforms. Rio introduced its first BRT line in 2014 and second one in 2016. A third line is scheduled to open in time for the Olympics.

The lines are managed from a central Operations Center, which closely controls the 400-bus network that currently serves 600,000 riders per day and is expected to serve 1.5m riders at 140 stations by the end of 2017. All buses are equipped with GPS that feeds a mobile data system transmitting data every 20 seconds including video from the inside of buses. They monitor every bus on every route, both express and local, to maintain proper schedules. Two staff members monitor social media at all times. They respond quickly to complaints and share useful feedback with the network's manager, because it identifies problems that their other monitoring systems do not reveal.

The impact on ordinary Rio residents has been profound. Commuting times and costs have plummeted, with big impacts on the labor mobility and take-home pay for the working poor and middle class.

Knowledge Squares

The centerpieces of digital inclusion in Rio are the Nave de Conhecimento or "Knowledge Squares." A typical Square consists of a ground floor set of workstations in rooms dedicated for very young children (tablets) to school-age kids (PCs used largely for gaming) to an online education room used mostly by adults. A digital gallery in another room displays information on the Olympics, on the neighborhood, and fun stuff like a Surface table with Google Earth access.

The upper floors may be computer labs and classrooms, video production suites or local radio stations. English-language classes are popular: the Squares teach English using an in-room moderator who motivates and coaches the

students while a Canadian or American teacher comes in over Webex in an arrangement funded by the Sequoia Foundation in the US.

The plan for the Knowledge Squares predated the World Cup and Olympics, but these events have been big drivers of their expansion. Cisco is managing the technology for the facilities while Embratel provides the connectivity. They are supporting the educational initiative because the lack of incoming talent to their organizations is seen as a major risk. Cisco will introduce Cisco Academy training, with a goal of training hundreds of low-level network admins to volunteer for the Olympics and gain employment thereafter. One Cisco strategy is to install Telepresence systems in all of the Squares and to use them to connect citizens to the Games, with interviews with star athletes and political leaders brought into the Squares. After the Games, this network will be used to connect citizens in the Squares with government for the delivery of services.

Porto Maravilha

Rio is redeveloping its former port district in the downtown core, which had decayed significantly over past decades. The total project is expected to take 50 years, with all the infrastructure work completed in the first 15.

All new buildings must have environmental certification and construction materials and practices must meet green standards. A massive tree-planting program will add materially to Rio's green space.

Some of the development is what you would expect: high-rise condos (with heights controlled by the master plan) as well as office buildings such as the Brazilian HQ of Loreal and a 3-km-long promenade offering access to an art museum, science museum and aquarium. The most revolutionary aspect of the project, however, concerns its relations with a favela or slum that is at the heart of the derelict port and where a large low-income population lives.

In a typical redevelopment project, the poor would be shoved aside to make room for the rich. In the Port district, the favela is excluded from the redevelopment zone, so it will not be directly threatened by new construction. Because the favela is of such long standing, more than half of residents own their homes despite their poverty. The city has decided to offer debt forgiveness for any building owners that renovate derelict property and put them into use. Many small touches also make a difference: the project consults with residents on where they would like healthcare and other public facilities located and asks for input to design decisions. Most significant are the skills training programs that are being offered to residents to prepare them for construction and other work in the redevelopment. Career counseling, promotion of micro and small business creation, and public campaigns for volunteer cleanups and dengue fever reduction is building civil society.

Such policies mark a revolutionary break from the past and contribute to a renewal of a city that was once the political capital of the nation.

Surrey, British Columbia, Canada

Surrey grew up as a suburb of Vancouver. Twenty years ago, its economy was about cheap land, light manufacturing, warehousing and agriculture (which still makes up 30% of the economy). The political culture was low-tax and low-services.

This culture began to change a decade ago when a dynamic new Mayor and Council won office. The change accelerated when, in response to recession, the city proposed and funded a Build Surrey program to substantially upgrade its infrastructure. These commitments from government attracted billions in private investment, because Surrey is one of the fastest-growing population centers in Canada, which adds 1,000 newcomers plus 500 newborns per month, a 4% annual growth rate. Surrey Economic Development Corporation was re-energized and began examining the city's economic assets to find ways to leverage them in new areas like clean tech.

Innovation Boulevard

The centerpiece of this strategy is a one-square-mile district now in development called Innovation Boulevard. It encompasses City Hall, Simon Fraser University and Fraser Health, a formerly small hospital now handling 100,000 emergency room admissions per year. Simon Fraser University is a four-year research institution focusing on science and technology, from physics to mechatronics. It has students working on autonomous vehicles, 3D printing (including the creation of new kinds of printers), and robotics. It runs an incubator to commercialize faculty and student research, and their intellectual property policy allows the inventor to retain all rights.

The university finds itself in high demand. It built an iconic building in the downtown core with a tower for commercial tenants and multi-story "vertical campus" on top of an existing shopping mall. It was designed for 2,500 full-time-

equivalent students and now serves 3,000. It has won funding to double the size of the university, which plays a pivotal role in the innovation economy of Surrey.

The plan calls for filling in the district with incubators, accelerators and buildings for growing companies. One example is HealthTech, a newly formed incubator that will focus specifically on reducing the explosive growth in demand for emergency room services by finding effective ways to treat chronic conditions more cost-effectively, then commercializing them for global markets.

Fiber Future

Surrey sees the future as fiber and is pursuing multiple routes to install it where it will have the greatest economic impact. The Innovation Boulevard project will be served by a dark fiber network installed in a joint venture by Surrey, BC Hydro and a network development company. To encourage private-sector involvement, the city is incorporating fiber route data into all its publicly-accessible GIS maps. They believe that, by being transparent and leveraging the city's property and control of rights of way, they can encourage the partnerships needed to deliver high-quality service at competitive prices.

Today, Surrey is partway through a revolutionary transition from a suburban past to an urban renaissance that draws energy from Vancouver but has an economic momentum all its own.

[i] "Changing Office Trends Hold Major Implications for Future Office Demand," by Mark Heschmeyer, CoStar.com, March 13, 2013.
[ii] "Crop Values Drop 9.8% in 2013 as Prices Fall," by David Pitt, Associated Press, *USA Today*, February 17, 2014.