

IES
2015 SPRING
SEMINARS

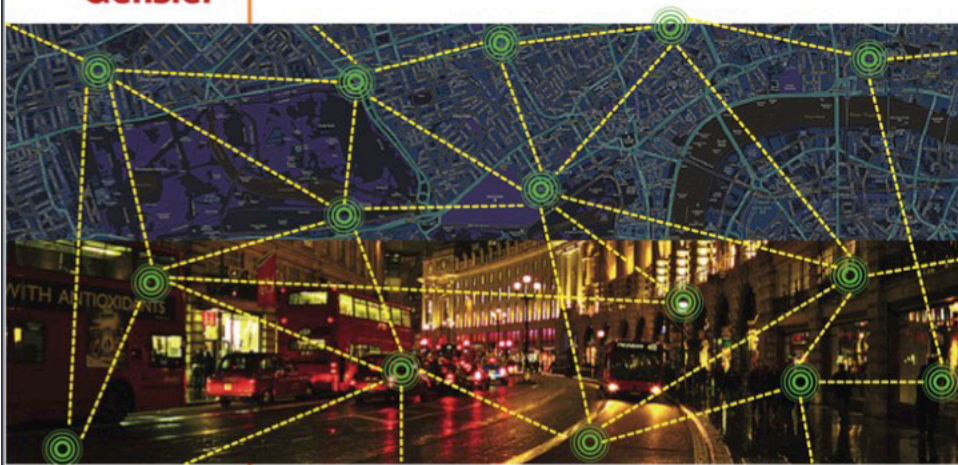


Gensler

IES SF Education

Lighting & Placemaking

Part 3- Smart City



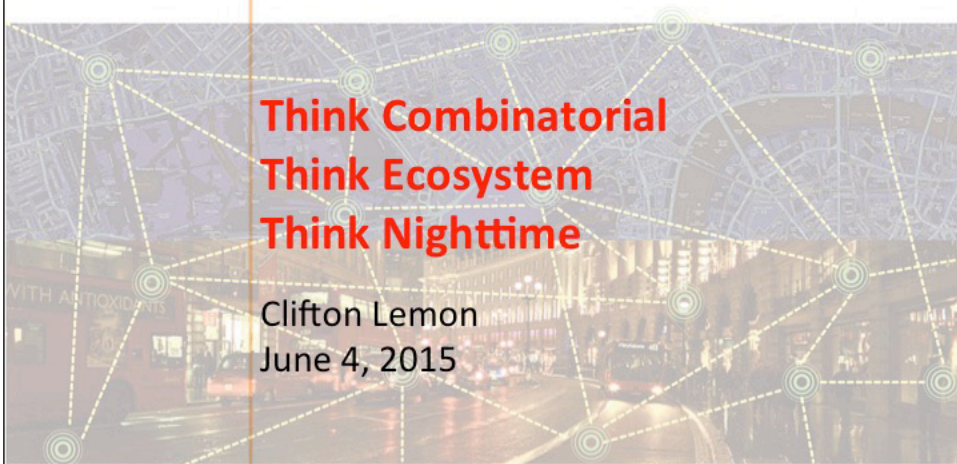
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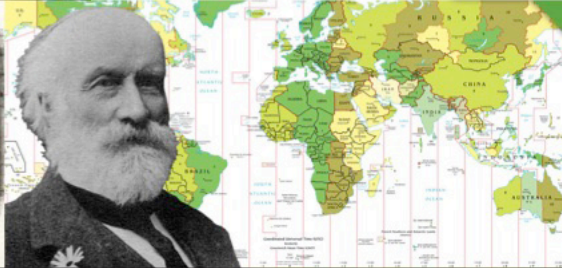
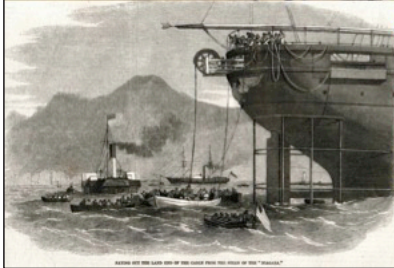
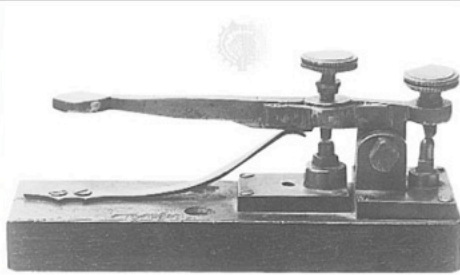
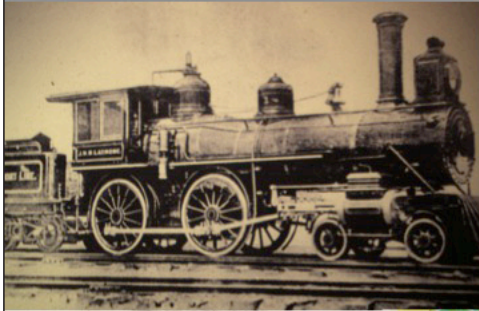
Part 3- Smart City

Think Combinatorial
Think Ecosystem
Think Nighttime

Clifton Lemon
June 4, 2015

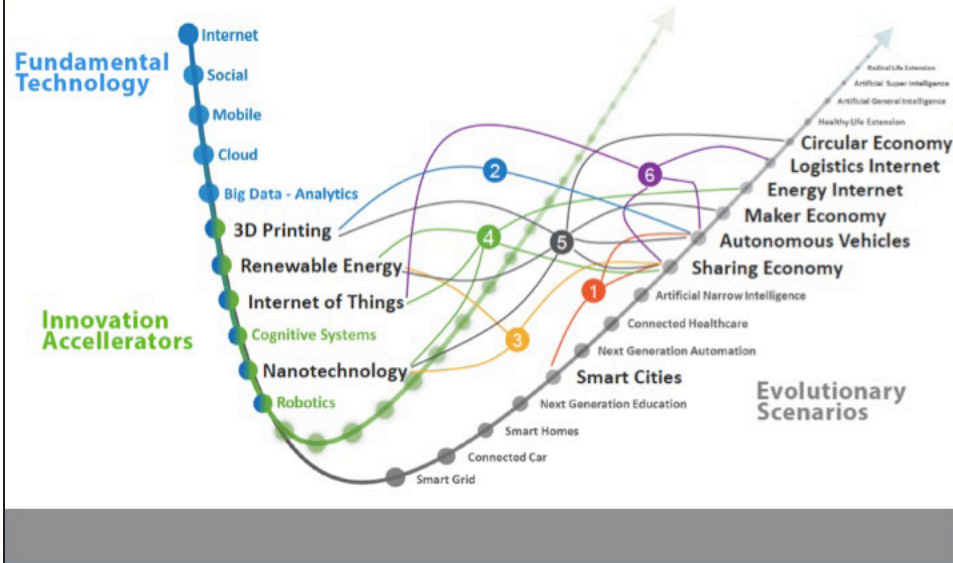


Combinatorial Innovation- Past



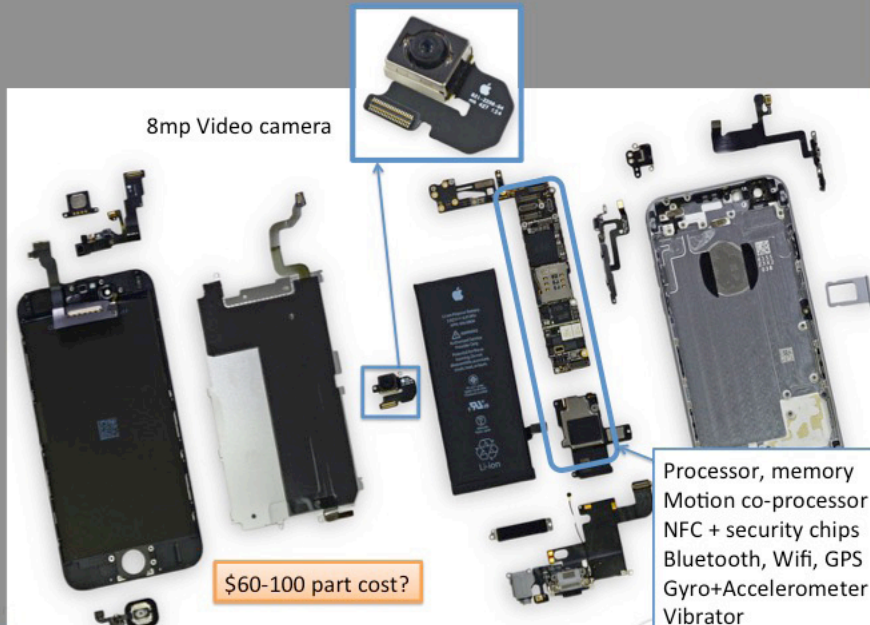
The biggest advances and changes during explosive periods of growth are not single innovations, but combinations of innovations, as new technologies emerge, collide and multiply their effects and impacts. Steam engines and railroads combined with the telegraph to propel transcontinental trade in the U.S. and intercontinental trade abroad. And one often overlooked advance in was the creation of the international time standard in use today, pioneered by the Canadian engineer and inventor Sanford Fleming. This story is told in the book *Time Lord* by Canadian author Clark Blaise.

Combinatorial Innovation- Today



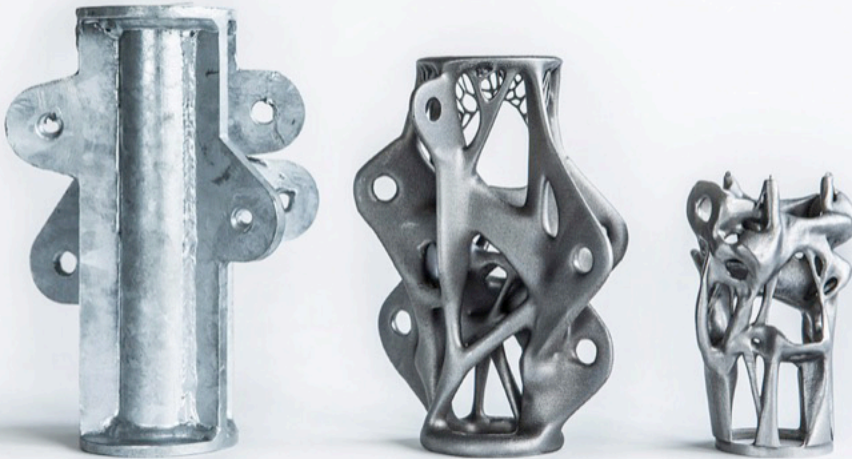
The theory of Combinatorial Innovation has been articulated most recently by Frank Diana & Gerd Leonhard. Today we're experiencing a particularly rich explosion and combination of innovations and technologies. The number and sheer diversity of new technologies and their infinite possible combinations is utterly overwhelming, exponential & unpredictable. I often wonder how much new technology we can actually tolerate, what it will take to slow it down, or if it ever will.

Trends: Miniaturization



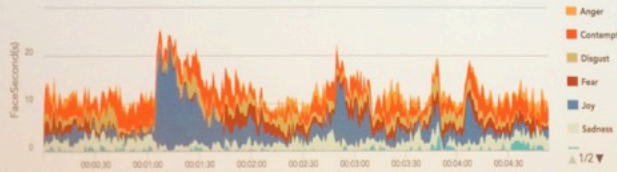
The prime example on the trend in miniaturization is the iPhone. According to my friend Jay Shuler, a founder of Sensity Systems, to build a smart city network, we could worse than simply putting an iPhone on every light pole.

Trends: Biomimicry



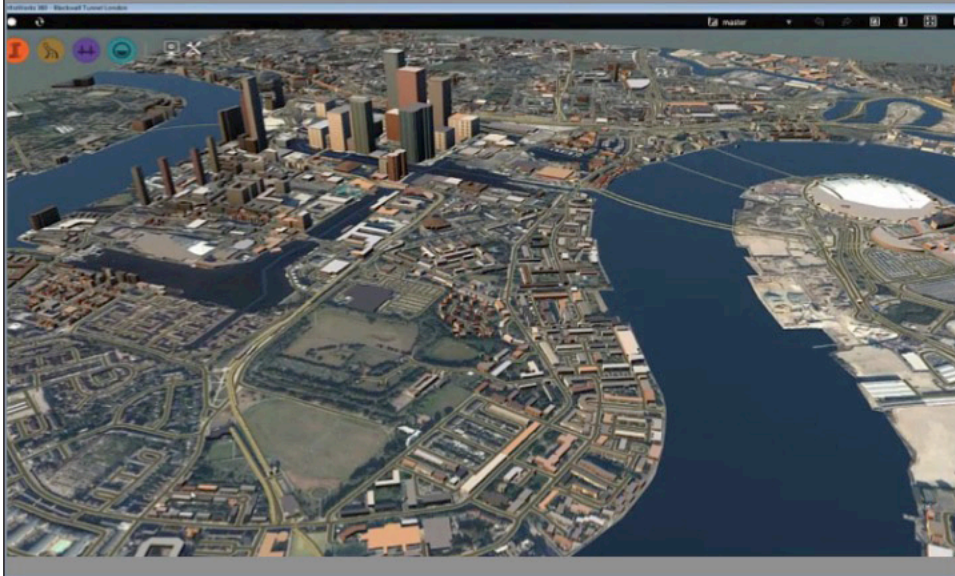
This image illustrates three trends actually: 3D printing, miniaturization, and biomimicry. Devices and machines of all classes are shrinking and have been steadily for decades. (Also, pretty much everything is getting “smart”, which can mean at the very least that objects have some form of sensor. Miniaturization is evident in lighting more than other building systems. This is having a positive effect on the required physical infrastructure for lighting, which will no longer require lots of metal and glass. This image is a highly engineered and 3D printed biomimetic joint for a structural assembly.

Trends: Emotion Analytics



Machine intelligence can now recognize unconsciously expressed emotions almost more accurately than we can, at large scales in real time. Voice, gait, facial expressions and gestures can all be monitored and analyzed with a high degree of accuracy. These technologies have tremendous potential in a very broad range of applications, including research and continuous feedback systems for smart cities.

Trends: Rapid Prototyping



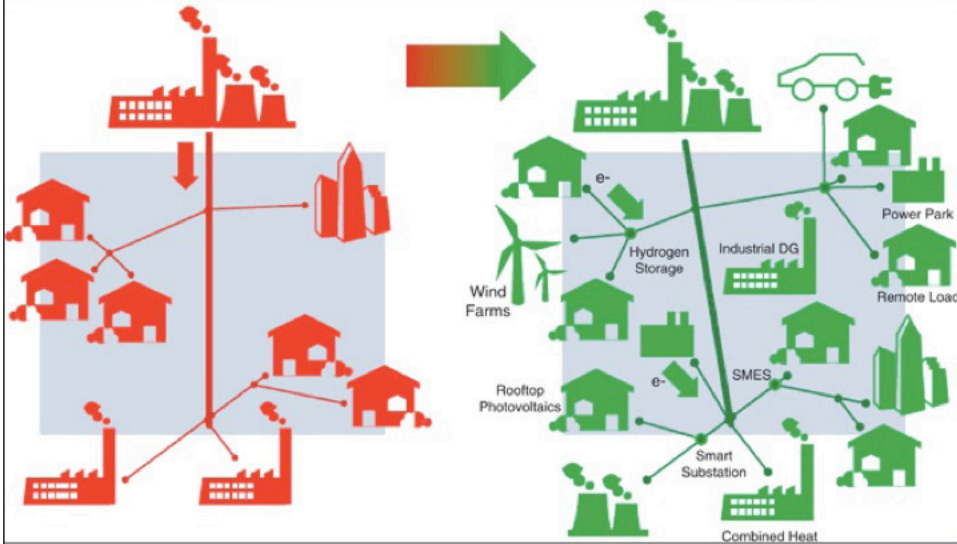
Rapid modeling of buildings, cities, and infrastructure is having a dramatic effect on the urban design process. We can now visualize things never before possible on previously unimaginable scales, in real time, over shared networks that allow all stakeholders to provide input.

Trends: Additive Manufacturing



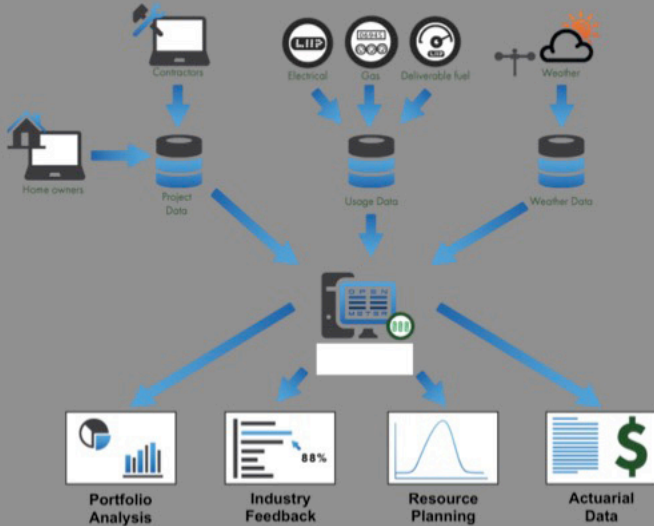
3D printing is only one of the rapid prototyping technologies that is revolutionizing manufacturing and other industries. Shrinking product cycles can be used as a competitive advantage, but is also creating difficult disruptions. Now many buildings are 3D printed. This image is a 3D printed house manufactured in China. This has huge potential scale effects & impacts on the construction industry.

Trends: Decentralization



One of the most profound and largest scale trends is decentralization of power generation and distribution. This is coming from a number of different technologies, but the main ones are solar and improved batteries. One potential impact of this trend will be a dramatic change how we view energy efficiency strategies. Changes in our electrical infrastructure will result from a host of combinatorial factors- batteries plus solar plus smart controls plus big data plus cloud computing plus GPS, etc.

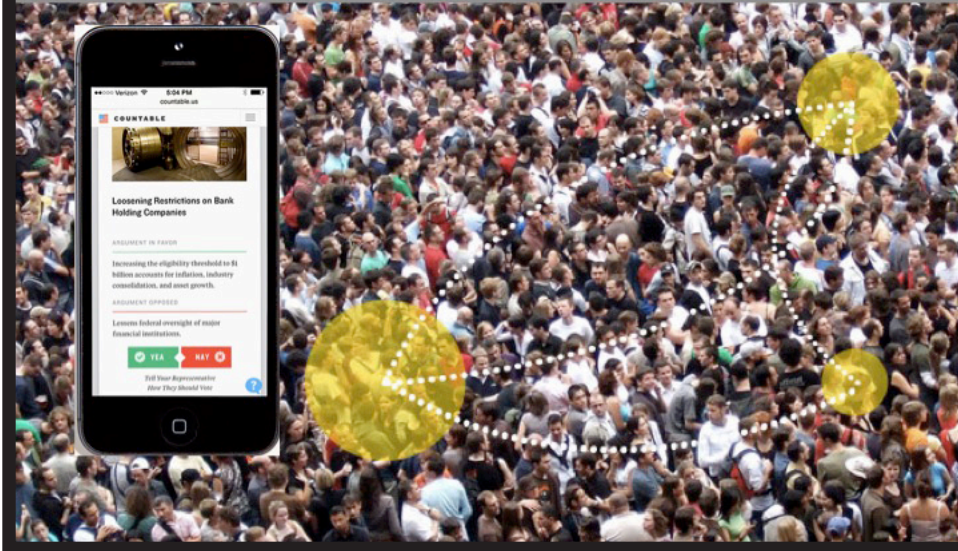
Trends: Energy Efficiency



It's time to reassess energy efficiency as a driver for technology and design. In certain conditions we can't squeeze much more efficiency out of systems that are already optimized to the point of diminishing returns. We also can't afford to pursue efficiency at the cost of quality- we never really had to, but given historical tradeoffs, it's counter-intuitive that we can have both. Lighting is the perfect example of this- with LEDs we can now have much better quality light at 20% of the energy use of incandescent.

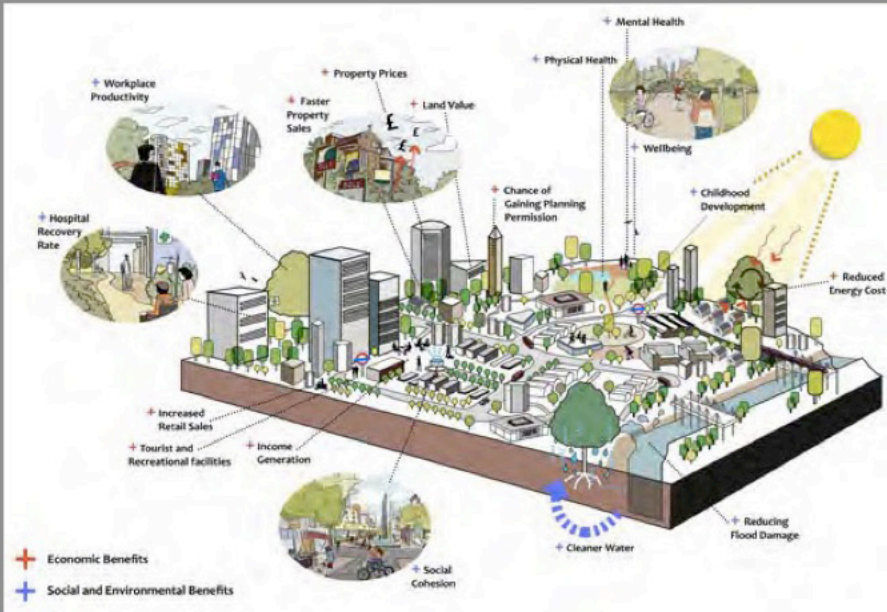
Another dirty secret about efficiency in the built environment is that we're not yet measuring it very well because of problems with metering, metrics & data analytics.

Trends: Crowdsourcing & Civictech



Crowdsourcing applied to government is somewhat of an organic development resulting from social media. There is an emerging backlash to over hype by tech promoters. Star Trek's George Takei contest on Facebook, asking entrants to describe the hardest thing to explain about life today to a time traveler from the 1950s. The winner: "I possess a device in my pocket that is capable of accessing the entirety of information known to man. I use it to look at pictures of cats and get in arguments with strangers." On the other hand, crowdsourced technology can lead to a renewed faith in participatory government.

Trends: City as Ecosystem



What is a Smart City? One way to view it is biophilic. Much is made recently of seeing the economy as a dynamic, interdependent “ecosystem”, which is in fact exactly what it is, as much part of nature as a forest or an alpine meadow. The ecosystem includes deeply interconnected networks of technology, built environment and human communication and transportation systems.

Another metaphor that aligns with “business ecosystem” thinking is the City as Platform: an environment in which innovation can build upon itself.

Smart City: Smart Home



1915-1920



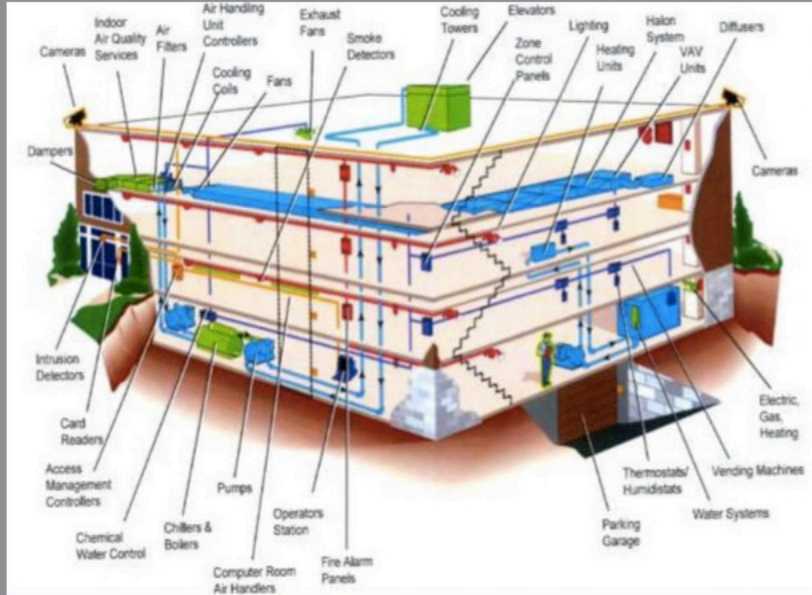
1939



1966

Let's look at a foundation of the city- the home. The trope of "smartness" started in the home environment, directly after electrification, which was led by lighting. Labor saving devices that freed women contributed to the most extensive social and economic shift of the 20th century- to eventually enter to enter the workforce. Planned obsolescence as an economic theory got its start in this environment, and the Echo IV was the first home computer. It could manage shopping lists, turn on and off appliances, and make life wonderful. Although it was too big and expensive for practical use, its intended utility in 1966 was exactly that of today's crop of smart home devices.

Smart City: Smart Buildings



A Smart City is, in one real sense, also a collection of “smart” buildings. Although a “meme” for decades, the promise of “smart” buildings has never quite materialized as envisioned. This illustration shows some of the typical building functions controlled by control systems, greatly simplified. But building controls are basically still kind of a mess, difficult to integrate, hard to use, problematic to commission, and often simply disabled and ignored. It’s difficult to imagine building yet more complexity or “smartness” into what is a disparate and fragmented layer of the built environment.

Smart City: Inside Meets (vs) Outside

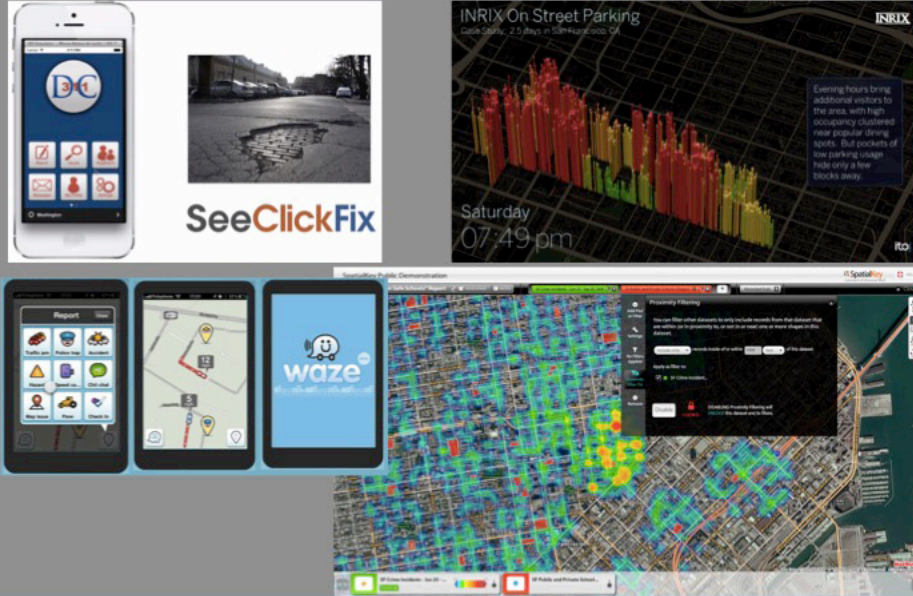


- 1 Buildings:**
The state of Massachusetts owns 72 million square feet of property. Software helps improve maintenance, space and management across public sector buildings.
- 2 Traffic:**
Approximately 1.9 million commuters travel by car a day in Boston. Officials examine how Big Data technology makes transportation more efficient and reduce pollution.
- 3 Airport:**
Tens of millions of travelers pass through Logan Airport every year. Software helps the Port Authority better manage maintenance operations for equipment such as air conditioning, doors and escalators at Terminal A.
- 4 Physical Assets:**
Boston has more than 60,000 streetlights and 13,000 fire hydrants. Software helps city officials better manage and maintain physical assets.
- 5 Special Events:**
More than half a million people attend events such as the Boston Marathon and July 4th fireworks every year. Software can integrate and visualize critical information across city departments, including fire, police and emergency responders to help coordinate and plan special events.
- 6 Water:**
Massachusetts Water Resource Authority (MWRA) serves 2.5 million people in 61 communities. Using software, MWRA decreased corrective maintenance and project work orders by 38 percent.

One of the pervasive issues in implementing “smartness” in to the built environment of cities is that there is a wide gulf in professional practice between those who design, construct, and maintain exterior projects, which are largely public, and interior spaces, which are largely private. Despite this gulf, there is still a big opportunity to learn from each.

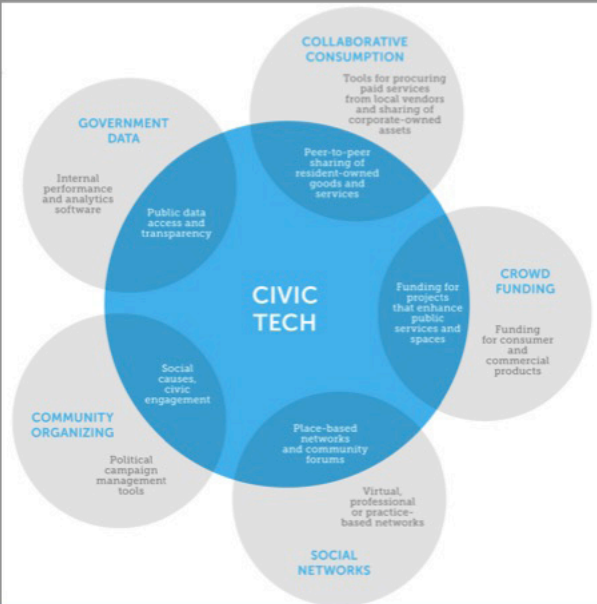
Another thing that characterizes visualizations of “smart cities” is the style of graphic representation often employed to illustrate the future- reminiscent of Lego or Sim City, where humans, if they appear at all, tend to be globe-headed little objects sprinkled sparingly around a highly engineered landscape.

Smart City: Rapid Feedback



One of the great potentials for smart city technology is the ability to provide real time feedback. This can completely redefine or even eliminate research as we know it. Instead of squads of guys in white lab coats with clipboards, we have sensors delivering fire-hoses of actionable data, the raw material for Civic tech apps for parking, traffic flow, navigation, and communication with City Hall. Predictive policing is another area of considerable potential: geo-based data has been successfully used for decades by urban police departments.

Smart City: Better Decisions



blockchalk.com

TurboVote

PHONE 2 ACTION

Neighborland

OpenCounter

Nextdoor

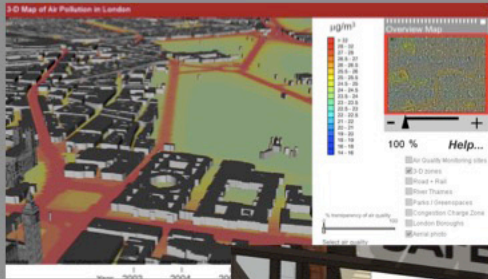
civilmakers

SF MAYOR'S OFFICE OF CIVIC INNOVATION
OFFICE OF MAYOR EDWIN M. LEE

In recent years a whole new ecosystem of civic tech has emerged, where bottom-up thinking uses Big Data for better local decision making. Open government, community action, and increased transparency are all facilitated by new applications and innovations. The Knight Foundation, for example is funding dozens of new players in this space.

Luis Bettencourt of Santa Fe Institute says “We build cities because they are ‘social reactors’—they provide the dense structured spaces for our social evolution. Cities are the niches we construct to magnify our prolific sociality. Cities are the essential means by which human development happens.”

Smart City: Better Decisions



The level of detailed design visualization technology widely available to design practitioners today is highly advanced. This enables more different prototypes, a closer link between models and built projects, and a high degree of public involvement in decision making.

Smart City: A Living Model



The tagline for Autodesk's InfraWorks product is "What Can Be in the Context of What Is."

The truly smart city is a predictive model that can dynamically alter its predictions and strategies, and form, as new data becomes available. In short, it can learn.

Smart City: “Stubbing Out”



An important first layer of smart city technology is the public streetlight, which can support multiple functions on a single piece of equipment. Products like these are fully available today, even if the network and data infrastructure behind them isn't yet fully deployed in most cities.

The average city can't possibly predict all future uses of new technology, so a prudent practice is to “stub out” streetlights in the process of LED retrofits that are widely underway now.

Streetlight networks represent an excellent ownership & revenue opportunity for smaller municipalities- lighting is a powerful platform for IOT.

Placemaking: Lighter Quicker Cheaper



The Project for Public Spaces has articulated the Lighter Quicker Cheaper approach to placemaking, which is in one sense the opposite of an engineered approach to public infrastructure. It emphasizes Experimentation Zones, "popups," and other models and techniques that can give a city a strong sense of identity, draw people into previously neglected city centers with festivals and spectacles with a big lighting component, and when applied correctly, ultimately create often surprising increases in value in real estate and tax revenue. Lighting plays a key role in LQC placemaking.

Placemaking: Think about Night



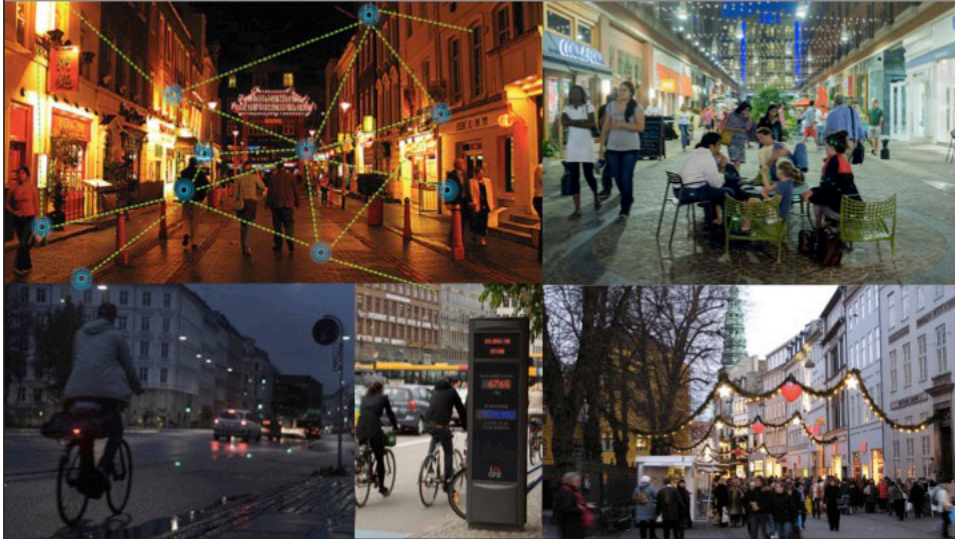
Unfortunately almost all planning efforts for public spaces focus entirely on day time use, while some of the most intensive (and revenue-generating) periods of use are after dark. Good lighting is crucial to the identity, perceived safety, navigability, and economic success of public space at night, and smart city applications built on the lighting network can add great value to what are the most important parts of cities.

The Future City: Really?



Our images of the future are seriously broken- this is from the film "Tomorrowland" currently in release. This basically utterly outmoded view of the future is by now patently ridiculous. An insipid tangle of glass and metal structures with gratuitous "greenery" festooned about the hardscape to suggest "nature" has moved us no further than the 1960s cartoon "The Jetsons," which was cooked up in a half ironic climate of Cold War imperialistic technical hysteria. Cities will never look like this. Yet architects keep trying to build to this aesthetic because they evidently simply don't know any better. We need better images of the future of cities.

The Future City: Reboot



One vision of the Smart City of the future might be one that is like the best places we love, just more interactive, more resilient, and more adaptive. Technology can help quality of life rather than driving it- tech works for us, not the other way around. But most cities today, small to mid-sized ones where the most dramatic change is possible, can't yet implement a lot of new tech, because of budget, political and implementation issues, so we need to deal w political realities and tech fatigue. Adding sensors everywhere is not the answer- there is a great need for new data architecture. IoT is here, and we can't ignore it: we need cities to be smart to meet the challenges of increasing global urban density in the 21st century.

Thank YOU

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