

Smart Communities

Hi I'm ben

I'm a planner at a consulting firm called GRAEF, which is mainly engineers, but includes planners and architects

I'm happy to be here today with David Neumann, our Director of IT at GRAEF

Today we will be giving an overview of smart communities, the technologies that are involved, and some thoughts about how we should proceed in building them.

I recently attend the Smart Cities Summit in Atlanta, which featured a variety of utilities, municipalities, and vendors – and there are many areas in the country that are starting to embark on becoming smart places, but there is no place that has fully integrated the full portfolio of smart city technologies to achieve the full-potential of their application

Without a full model and thus a full road map

What is a Smart Community?



Without a complete model, it is hard to answer this, but I think we can say that a smart community is one that uses next-generation technologies to perform better services with fewer resources

Why fewer resources? Because smart city technologies both enable operational efficiencies which save resources, and benefit from using distributed energy networks like microgrids with renewable energy like solar power to ensure their operational
Why better services? New technology is really good at providing customer tailored services, maybe too good.

What are Smart Technologies?



What are smart technologies? Internet of things

Put generally, the technologies that make our communities smart involve A system of sensors embedded in our infrastructure, buildings, and vehicles, connected through a network of 5g and fiber optics, to computers that process this wealth of data with artificial intelligence to observe, learn, and predict patterns of behavior in our communities

These technologies have a variety of applications that we already know about, and who knows how many more

Smart Applications

For example

Intelligent Transportation Systems



Image: About Civil

Intelligent transportation systems that predict and avoid collisions, alter lights to avoid split-second decisions (i.e. the “danger zone”), and coordinate traffic behavior in a way that distributes the load with respect for the behavior of the whole – that means if there’s an accident on a main thoroughfare, the system won’t send everybody on the same backup local road, creating new congestion

Here is a short video that gives a nice picture of what an ITS is

E-Government



Image: REVE Systems

Another application that is already being applied, yet has the potential to dramatically be expanded, is e-government services. The basic premise behind this service is that every record or piece of information can be tied to a comprehensive GIS-based system which is totally connected, such that one change in department A is immediately visible elsewhere within the other departments,

Wealth of regulatory information
Permitting and processing transparent

Apps for reporting potholes
Chain of custody for reports
Everything digitized and secured
Endless possibilities

Smart Buildings



Image: Flow Communications

Smart Buildings : energy management, service, and safety

These new sensors can detect and predict how buildings will be used, saving huge amounts in operational expenses. Also, many smart communities are embracing an attitude of preparing for the future and relying on renewable energy sources to meet their energy needs.

Mobility as a Service



Image: Medium

The last category I will address here is mobility as a service, which was a prevalent topic at the conference in Atlanta. The general idea is that for many of us, our cars sit idle most of the day – what a waste. Instead of owning a car, why not use an automated vehicle service, or until then, an easy to track and purchase Micro-transit solution. They say Aves are within the next decade

Smart Components

Alright, also at this conference was a bunch of vendors who were selling the ingredients of smart communities, I want to introduce a few of these because I think it is helpful in understanding what it means to become equipped with these technologies

This isn't an advertising pitch, as we don't presently work with any of these companies

Cimcon Lighting, Inc.



Product: Nearksy™ 360

First lesson I learned is that it's all in the light-poles

Well not really, but much of the sensors that are involved in creating a robust ITS involve putting sensors in the light poles and connecting these light-poles 5g and fiber optic network to a main computer, or to an "edge computer" located in a nearby digital kiosk. To be discussed in a moment

Additionally, these poles will be equipped with small cells and serve as a system of distributed mini cell towers, providing broader and quicker connections for our 5g future

This company X, makes light pole adaptors that connect to the Nemba7 which I'm told is the general connect for the light dimmers that many of our light poles currently use, and their piece is able to be equipped with whatever sensor you like

NOV Pole Products



Standard Model



Custom Molds

What if you can't retrofit your existing lightpoles, because they are too historic, etc. Alternatively, this company NOV sells modular light-poles that are designed to be equipped with whatever smart city solution fits your fancy

They specialize in making custom molds for poles to fit various sign codes of historic districts, or any other design guideline, as they have found that their major hurdle is meeting local regulations, both in terms of design, as well as in terms of what they are - are they cell phone towers, or are they light poles? This latter issue is a point that I think we need to address preemptively

BoldVu Outdoor Displays



Product of LG-MRI

Another component of our web of smart technologies are these digital kiosks, which can provide a variety of services, as well as provide a place to locate an edge computing processor.

These kiosks can be equipped with the same sensors on our light poles, but can also provide a wealth of information for citizens that may not otherwise have access to the internet or a smart device. They can be the digital libraries of our streets. They are typically financed by advertising companies, which make back their money on the ad space then share some of the profits with the municipality. One problem they have is with municipal regulations, are they are signs, or are they billboards? How bright can they be? As with the light poles, our zoning codes are not always equipped to handle the new types and forms of technology and civic infrastructure that is involved in building a smart place.

If we don't, it will be hard to implement them in a robust and effective manner to achieve these benefits.

Smart Benefits

Why Become Smart?

Improve **safety** of communities

Improve **services** of communities

Improve **efficiency** of communities

Improve **environment** of communities

Improve **attraction** of communities



Improve **safety** of communities (gunshot detection, lighting, pedestrians)

Improve **services** of communities (micro-transit, information access)

Improve **efficiency** of communities (ITS, e-services)

Improve **environment** of communities (smog detection, electric vehicles)

Improve **attraction** of communities (Smart Communities are more fun)

The Fourth Industrial Revolution

Smart technologies will be as **transformative as the internet**

Smart technologies will be the **infrastructure for economic development**

Smart technologies will be an **essential component of communities**

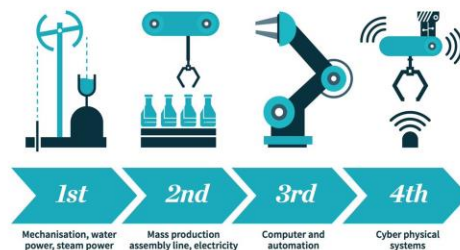


Image: Farahhanis

According to klaus of WEF, yadda

A developer wants to build smart home, will need a supporting network of fiber and 5G cell towers for appliances cars etc,

If industries want to locate, they will also need that same supporting network, the large ones may be able to build their own, but the smaller ones likely will not

The Fourth Industrial Revolution

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"There has never been a time of greater promise, or one of greater potential peril... the Fourth Industrial Revolution may indeed have the potential to "robotize" humanity and thus to deprive us of our heart and soul...it can also lift humanity into a new collective and moral consciousness based on a shared sense of destiny."

Klaus Schwab, Founder and Executive Chairman of the World Economic Forum

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Smart Opportunities

A bridge to **transpartisan action**

Rich, local data to **inform policy decisions**

New financing tools to **encourage sustainable development**



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Smart IT

Technology Services Alignment

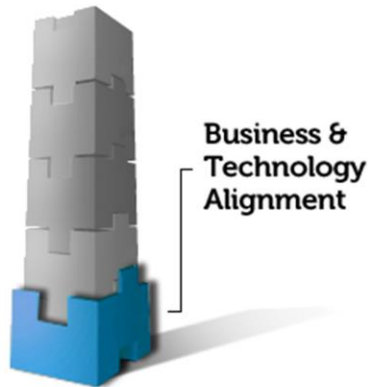


Image: Iteres Group

- As consumers we can't seem to get enough technology. Our phones, watches, and tablets keep us connected and organized. We have integrated it into our cars, our homes and made it part of our lives.
- Why? Because it helps make the everyday task of trying to manage our life and schedules easier. Imagine getting through the day or week without it.
- So why haven't organizations adopted this efficiency based use of technology? The vast majority of organizations are simply consuming technology because they feel they have to. It's just part of doing business.
- However we seem to have experienced a moment of clarity. Organizations are starting to see the untapped potential of the investment they are making in technology. Just like I have initiated at GRAEF other organizations are starting to bring IT to the table as a business partner.
- I read an article recently that said Smart Cities are just as much about people as they are about leveraging technology. Well for us to effectively and efficiently implement and support Smart City Technology, we are going to need the people, the people behind the technology in your organization.

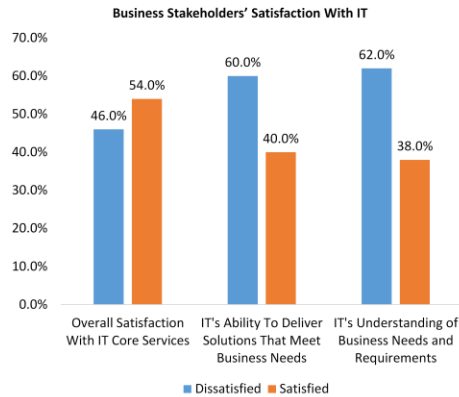
Be More Than Just IT



Image: Taylor Made Computers

- Information Technology by definition is the use of computers to store, retrieve, transmit and manipulate data. Technology today so much more than that. If it wasn't I don't believe we would be having this conversation today.
- You need your talent and resources to be more than just IT. For GRAEF I have rebranded my department and we operate as the Technology Services team. I could spend the rest of the day engaged in talking about this alone. But in short as a service provider my team helps to strategize in order to come up with ways to help the business achieve their goals and objectives. We then help plan for that implementation and then support and manage it going forward.
- You need to engage and encourage this transformation in your organizations as well.

Solutions That Meet Your Needs



"It's ALL about relationships...." Len Anhalt

Image: Info-Tech

- I am sure that all sounds wonderful in theory but for those that may be asking themselves why this is important or what it has to do with smart cities.
- This is why.
- Based on a recent study done by Info-Tech Research they found that over 60% of organization stakeholders didn't feel their technology departments had an understanding of the business needs. And subsequently 60% felt they failed to deliver solutions that met business needs.
- Over the last 20 + years my teams have been left to make technology based decisions based on very little C-Level management or organizational input. So this is not a surprise to me.
- But this begs the question. How are your technology departments going to deliver Smart Cities technology if they are not part of the strategy to begin with?
- The time to engage is now! Establish that relationship and start receiving value added services.

Once Aligned....



Image: Stepping Forward

- What you get from this alignment will be a business partner. One with clear expectations to help you strategize and help you meet your Smart Cities goals. This alignment will support stronger decision making, allow you to keep up with the emerging disruptive technologies and be agile enough to adapt to the ever-changing end-customer needs. As a business partner you can rely on them to provide solutions through innovative and effective technology solutions.

An Innovative Culture



Image: CivicMinds

- So let's talk a little bit about how we leverage that business partnership.
- After you have made the effort to align and engage your technology services department you need to make sure you have the right resources in play to innovate. What skill sets are you going to need to support your initiatives? Is your technology services culture one that promotes a strong organizational interest in innovation and creates opportunities for them to shine? Building a culture of innovation is hard but we are here to do just that.
- By engaging your technology services team from the beginning they become part of the creative strategy and effort to innovate.

Sustainable Technology

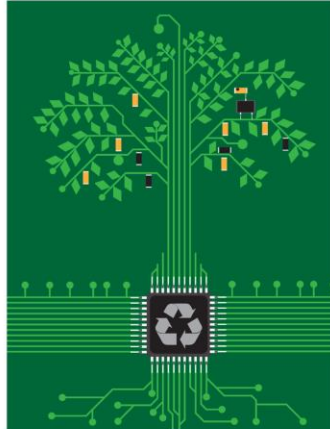


Image: STHAL

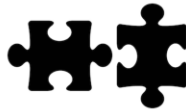
- When we talk about sustainable technology we can look at it as the building blocks of a foundation. We want a solid foundation to support our structure regardless of whether or not that structure stays the same in the future. We want to grow, adopt and evolve.
- Through sustainable practices we can start investing in smart city initiatives to make lives easier. It will also help to ensure we can support and maintain the up-keep of those resources going forward?
- How do we do that?

Think Compatible versus Incongruent

Next-generation technologies must be developed to work together synergistically

Compatible technologies enable multi-system analytics

Compatibility allows us to leverage existing technologies



The first principle is that our smart city technologies must be compatible. Smart city technologies must be developed to work together synergistically. The sensors and devices that monitor our traffic systems, air quality, pedestrian activity, water usage, etc., all must be able to communicate with each other.

Compatibility between different technological systems will enable multi-system analytics that can provide some exciting insights. For example, how do various traffic prioritization patterns relate to the creation of smog? Or, how do various parking management strategies relate to the generation of pedestrian activity? We have studies today that shed light on these questions, but smart city technologies will allow for a much greater potential in acquiring rich, local data to inform our decision making processes. Even more so in that these new technologies will allow for analysis of real-time situations and conditions.

Additionally, compatible technologies allow us to leverage existing resources without reinventing the wheel. We do this now, instead of employing hard-drives and massive databases, we share the cloud infrastructure. Additionally, our GIS servers point to shared municipal databases, rather than duplicating the information and storing data locally.

Not only will compatible technologies save resources, but it will allow us to evaluate the wide-realm of smart city data with one lens, offering the potential for some very exciting research.

Rise of Modern Programming



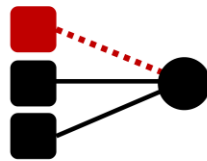
Image: Medium

Think Dependable versus Vulnerable

Dependable infrastructure maintains efficiency in the long-term

There must always be a backup plan

Utilize both the digital and the physical



The next principle is that our smart city technologies must be dependable

Though we want to save municipal resources in building our next-generation technologies, we must ensure that they can be used dependably and reliably. It is likely that our civic technologies will soon become exponentially more complex, and thus vulnerable; and so as the world becomes increasingly less stable and predictable, we must prioritize building systems that are durable and recoverable, and not so narrowly streamlined that they are vulnerable. In this sense, dependable infrastructure maintains efficiency in the long-term.

For our systems to be reliable, there must always be a backup plan. Worst-case scenarios must be planned for so that municipal capacities are not threatened when something goes awry. This past year, the company Mead and Hunt had to abandon their offices during the hurricane. Yet because of the application WorkSpot, their employees were able to remote back into their company network and maintain operations. At GRAEF, though we use cloud infrastructure for our daily operations if something were to fail in that service we could revert back to our land-based connections.

In turn, municipals records must be stored in multiple ways to avoid disasters. We must utilize both the digital and the physical.

Think Flexible versus Singular

Technologies must be flexible, customizable, and adaptable in order to prepare for an unknown future

Must adopt an attitude of open anticipation in preparing for Smart Cities

Must invest in multi-purpose opportunities (not singular solutions)



As new transformative technologies continue to be developed, our communities will become increasingly dynamic. Planners and municipal leaders cannot predict what will be invented tomorrow – and so technologies must be flexible, customizable, and adaptable in order to prepare for an unknown future. They must be flexible in terms of how they can be applied within their own right, but also flexible in how they can apply to existing and future technologies in novel ways.

How do we do this?

For starters, we cannot rely on traditional assumptions for how infrastructure will be used, or how cities will be organized. We must adopt an attitude of open anticipation in preparing for Smart Cities. For example, as I-94 is being reconstructed they are making space for the future use of autonomous vehicles. Likewise, we must not make investments that will lock us into particular modes of operating and restrict the abilities of our communities to flexibly adapt. We must invest in multipurpose opportunities rather than singular solutions. A multipurpose opportunity is something that accomplishes more than one mission. For example, instead of investing in a private communications system for emergency vehicles or the police department, one could invest in blanket wifi that could cover the entire municipality, and offer additional opportunities for other civic benefits.

Think Public versus Proprietary

To the extent possible, make municipal records and procedures transparent and accessible

Utilize an E-Governance platform

Encourage shared access – avoid restrictive services



Lastly, to the extent possible, municipal records and procedures should be transparent and accessible. There are certainly aspects of information that cities need to protect, but there is a wealth of other information that can be transparent and broadly accessible. For example, instead of having to call the Village to check the location of laterals, this information could be digitally available to anyone who wants it. Much of this can be accomplished through existing GIS services that Scott will talk about shortly.

Many municipalities are beginning to use E-Governance platforms to allow civic functions to be performed online, such as permitting, licensing, or submitting applications. Establishing digital access to these civic functions will improve efficiencies as well as broaden the transparency of civic processes. For those of us who review plan commission applications, receiving incomplete applications is a common occurrence. Instead of having an applicant wonder about the requirements for a conditional use permit, for example, there can be a digital checklist that requires a complete submission before receiving Village review. That same application could be tracked as it is reviewed by the various village departments, so that the chain of custody is clear.

Lastly, we must encourage municipalities to share services with their region. Municipalities should provide open access to data and coordinate their efforts in providing new municipal services. I will soon turn it over to Scott who will cover examples of how InfiniteGIS accomplishes this.

Rise of Modern Programming



Image: Medium

Smart Planning

Learn from Others

Aurora, IL: “crawl, walk, run”



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If industries want to locate, they will also need that same supporting network, the large ones may be able to build their own, but the smaller ones likely will not

Learn from Others

Austin, TX: “create new swim lanes for procurement”



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Learn from Others

Hollandale Beach, FL: “match Smart Technologies with goals”



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Embrace Flexibility

For the **physical component**

For the **operational capacity**

For the **financial infrastructure**

For the **regulatory process**



Next Steps

Plan Smart Communities

Prepare Smart Regulations

Build Smart Infrastructure

Other Ideas?



Smart Community Planning

Technology strategic plan, digital transformation plan, smart mobility plan

Preparing for regulatory hurdles (sign codes, cell tower codes, etc.)

Certainly would need a lawyer, but planners could do the brunt of the research and drafting of language

Creating a smart city infrastructure (electric grid, charging stations)

Other ideas?

It just so happens that our firm, GRAEF, can perform all three of these functions