

December 2018 @ CTM

**THE DIRECTOR SPEAKS - Anticipating Tech Driven Efficiencies**



Much has been written about the potential impact of Artificial Intelligence (AI) and robotics on employment. It is clear that as these technologies continue to advance, adoption will increase driven by their ability to increase corporate efficiencies. These efficiency dividends can be used to increase profitability, reduce product costs, or to fund pursuit of new revenue opportunities. While there are those that have expressed concern about the impact on workers who are displaced by these advanced technologies, there are also those that argue that such tech driven advances have always created more net jobs than they have eliminated. Both points may ultimately prove to be valid, but only if any displaced workers can be redirected toward new endeavors that can be justified by incremental economic growth. More specifically, these technologies allow fewer people to satisfy the needs of the *existing* market, therefore, new markets must be conquered through the use of the displaced workforce to maintain employment parity.

It seems clear that as use of these new, highly efficient, technologies are deployed, there will drive an increased need for additional training in order to redeploy displaced workers to meet the needs of new markets. Economically displaced workers cannot be simply revector to similar positions at alternate companies or placed in alternate industries undergoing their own technology driven transformation. Workers will need to undergo extensive training so that they can be equipped with the skills need for next generation positions that, in many cases, do not exist today. While it is unclear whether the cost of such training programs should be a private or public matter, it is certain that access to sufficiently capable employees will separate the commercial winners and losers. By increasing the emphasis on analytics and communications skills, premier academic institutions, like USC, are taking steps to make sure they go beyond teaching their students about current business practices to ensure graduates are equipped with agile problem solving skills that will equip students to adapt as the workforce continues to evolve. However, employers and the employees themselves must take on a much more proactive role in their efforts to ready themselves for the future workplace. Rather than waiting for a transformational event that necessitates the need to change employee skill sets, anticipatory programs should be established to encourage increased employee adaptability. Workplace changes are coming and rather than waiting to teach employees specific new skills, employers should be preparing employees to contribute in a dynamic environment where job requirements are constantly changing as technology empowers companies and markets to evolve.

**UPCOMING EVENTS**

- Nov 30-Dec 9, 2018. [Los Angeles Car Show](#), Los Angeles CA
- Dec 4-5, 2018. [Impact > Cities Conference/Workshop](#), Las Vegas NV.
- Dec 4-6, 2018. [DataWest 2018 Conference](#), UCSD San Diego, CA
- December 12, 2018. [I3 Consortium Meeting](#), Los Angeles CA
- Dec 13-15. [MedTech Impact](#), Las Vegas, NV
- January 4, 2019. [I3 User Group/Conference](#), USC Campus, Los Angeles CA
- Jan 8-11, 2019. [Consumer Electronic Show](#), Las Vegas NV
- Jan 29-Feb 1, 2019. [IOT Evolution](#), Caesars Palace, Las Vegas NV
- Feb 20-22, 2019. [NIST Smart and Secure Cities Expo](#), Washington DC
- May 13-16, 2019. [IOT World](#), Santa Clara Convention Center, Santa Clara CA
- Sept 10-13, 2019, [Global Network for SMART Organization Design](#), USC Campus, Los Angeles CA

*If you have an event that you would like us to include in our newsletter, please send an email to [ctm@marshall.usc.edu](mailto:ctm@marshall.usc.edu)*

**IN CONVERSATION WITH Jagjit Dhaliwal, Deputy CIO at the County of Los Angeles**



Jagjit comes to the County of Los Angeles with 17+ years of diversified IT consulting experience across multiple industry domains including Media & Entertainment (Studio, Education & Gaming), Telecom, Banking, Insurance and Manufacturing domains across different geographical locations globally. His main focus has been on IT transformation, operations efficiencies, enterprise initiatives, application modernization, and the adaption of emerging technologies. He has a wealth of experience in supporting complex systems delivery in a global onsite/offshore operating environment and managing large diverse teams.

**1. What is the difference between a Smart-City and a Smart-County?**

There are many differences between Cities and Counties, especially in terms of the services offered apart from just geography and population. The County holds expanded responsibilities and provide 'safety net' to the encompassing cities & incorporated areas in case they cannot cover required services themselves.

When someone talks about 'Smart', we generally think about an infrastructure and mobility, be it smart lighting, parking, buildings etc. which is typically managed by Cities. This could be a reason of more hype around a term 'Smart City' than 'Smart County'. We always relate 'Smart' notion with technology but instead it's about the people; technology is an enabler to make people's life better. When we look at social issues, natural disasters, civic engagements impacting people, County plays a significant role. A 'Smart County' brings all agencies together and provides a platform for better communication, connectivity and enablement of variety of services which may not be covered under City's umbrella. It's an area where our technology partners certainly have not made significant progress yet. There is a huge opportunity to focus on public safety, social services, health services models too apart from urban mobility & infrastructure and provide a unified view for better services to our residents. I think the right term to use is "Smart Communities" which is an innovation driven ecosystem where technology is leveraged to improve the quality of life as well as the relationship between citizens and their government. It's all about making our community 'Livable', 'Efficient' and 'Resilient' irrespective of the geographical and political boundaries.

## 2. How do the needs of LA County differ from other counties in California?

Los Angeles County is the most populous county in the United States, with more than 10 million residents. It is the largest non-state level government entity in the United States, with 88 incorporated cities and many unincorporated areas, covering an approx. area of 4,083 square miles. This itself distinguishes LA county needs and solution approaches from other Counties. Technology initiatives for Los Angeles County are completely different in-terms of scale and timelines. The business processes can be quite complex with many variances as compared to smaller County's. This requires a greater focus on disciplined processes, detailed planning and business process reviews. The organizational change management is the most important and challenging aspect of any program in Los Angeles County. Moreover, Los Angeles County has a federated IT organization in which all 38 departments have their own IT leadership and staff, and maintain their own IT systems. Enterprise initiatives are complex to implement due to departments focused on their own IT priorities. The Los Angeles County Office of the CIO was established to focus on enterprise IT strategic needs aligned with the County business priorities, accelerating innovation and enablement of synergies between large distinct departments.

## 3. How much technology interworking is there between the cities and the counties? Between the county and the state?

There are 50 states, more than 3,000 counties and close to 20,000 cities in the United States. There are a lot of forums, associations, advisory boards and consortiums in existence to connect these jurisdictions to share their best practices, lessons learned, and innovative solutions. But like any other large ecosystem, "silos" exist in state and local governments that result in inefficiencies and duplication. The same business functions can be approached and implemented in multiple ways which results in significant challenges whenever there are any changes due to new legislative policy. The question has two keywords – technology and interworking. I strongly believe that technology is actually enabling and improving interworking between agencies. With abundance of next-gen cloud enabled platform solutions and less custom development approaches, more and more synergy is coming between the groups. We are heading towards a service enabled technology environment which will provide unified self-service solutions to our residents diminishing any geographical boundaries.

## 4. You are new to public service after a distinguished career in the private sector. What would you describe as the biggest differences between the two?

Throughout my IT consulting service experience, I was able to explore multiple industry domains across different geographical locations. After working in private sector for many years, I got an opportunity to explore public sector recently. Accepting the challenge of a public sector job was a big paradigm shift that introduced me to different but exciting challenges. I have completed six months at the Los Angeles County Office of the CIO and am now that I am able to better understand the culture, processes and people of the County, I can share my perspective on differences between 2 distinct worlds:

- **Purpose of existence:** The business goals of both organizations are quite different. It's "Service to People" vs "Revenue Generation". The public-sector organizations are often pressed by legislative mandates with a single target of service to public. But the metrics to measure success in public service organization are difficult to quantify (e.g. how successful are programs and services to prevent recidivism) versus the private sector (e.g. revenue, profits, margin, consumer registrations, attrition etc.).
- **High Stakes:** The public sector is securitized for every cost due to being funded by tax payers. This creates a risk adverse environment where failure is not an option which causes projects to take a long time to implement and late technology adaption. The private sectors has the pressure of faster 'go-to-market' needs that facilitates a more innovative culture where staff are encouraged to try new ideas and failure is viewed as a positive step forward. It's the difference of "Can't Afford to Fail" vs "Fail Fast" mindset.
- **Change Outlook:** Due to large scale and significant risks associated with new implementations in public sector, there is generally "resistance to change" unless it is driven by a legislative/regulatory compliance situation. In private sector, the business always looks for innovative ways to retain customers and grow revenue/margins, invoking "Change is the only constant". If private firms do not acknowledge changing needs quickly, they will soon be replaced by the competition as we see from examples like Sears, Blockbusters, Kodak etc. Unfortunately, it's not the case in public sector.
- **Process:** As public sector is serving large community with permutations of end client behavior and expectations, the processes evolve over a long period of time and become very complex. Be it a business process or operational processes related to hiring, budgeting, procurement, it can become a "constraint more than enabler". It's comparatively easy to change processes in private sector as driven by market conditions.

## STEVE SHEPARD: Non-Linear Technologies



IoT as a technology family has been much in the news of late, with lots of talk about exciting, sexy, beyond cool applications that will change the world in all kinds of amazing ways. I agree with that assessment—some of the applications really are way beyond amazing—but there is another side to IoT that I want our readers thinking about. It's not a dark, conspiracy theory-laden side; it's just an angle of view that isn't often talked about.

One of the preeminent applications of IoT is autonomous vehicles—self-driving cars. I've been in them in California, and frankly, I found the experience to be a bit underwhelming, which is what it should be. After all, it's just a car. The fact that it drives itself is interesting, but that's what most trains at airports do, and I don't stand agog, peering out the window, when I read in one of them.

So instead of talking about the in-your-face part of self-driving cars, let's talk about some of their other implications. For example, in spite of all the hype about deaths due to autonomous vehicles, their safety record, even adjusted for the fact that there aren't many of them out there, is off-the-charts better than traditional vehicles, because there is no potentially distracted, tired, or drunk driver at the wheel. So, with

that in mind, what happens to driver insurance rates? Will they go down? Do we even need insurance anymore? If so, what are we insuring against?

And what about parking places? Will we still need them? It's a well-known statistic that the average car spends 95% of its time parked in the driveway. So, I have to say, maybe all those Millennials who aren't buying cars have the right idea. It's like paying for the mortgage on a new house but only sleeping there 18 days out of the year. Will this then lead to radically declining car sales?

Here's another thought. If you own a self-driving car, imagine the following scenario. It takes you to work in the morning, drops you off, then heads over to the nearest UPS or FedEx depot, or to the airport, or to the local pizza place, where it spends its day picking up and delivering parcels—for which you get paid, as the car's owner. News flash—your car just became a profit center.

My point here is that the typical linear excitement that we feel when a new technology arrives on the scene is well-deserved. But don't forget

to take that less linear path, to think about the technology from different perspectives. You might just discover something even more exciting to ponder.

## THE I<sup>3</sup> CORNER (I3.usc.edu)

The Consortium has established a set of Use Case Teams and Technology Teams. The Use Case teams are working to define a series of situations where we can demonstrate that either the data from one device can be used by multiple applications or where an applications value is increased by providing it access to a variety of data sources. Either option demonstrates how the composite value of an IOT network is greater than the sum of its parts (the magic of leveraging technology). The technology team has posted I3 R0.1 to github for I3 consortium member access. They have also established 6 technology teams that are looking at the requirements to lay out a targeted progression from R0.1, to R0.2, and so on until we get to our first general distribution. Additional Technology and Use Case specialists are still needed; if you are not already involved and what to create a better world, [by all means check out the I3 website and join the movement.](#) Our next I3 meeting is scheduled for Dec 12 on the USC campus.

In addition, the I3 Consortium is hosting the first annual **Intelligent-Integrated IOT Conference and Workshop** at the USC campus on Jan 4, 2019. To register for the conference [click here.](#) If you are interested in speaking or sponsoring a portion of the event, please send an email to [manager@i3-iot.net](mailto:manager@i3-iot.net).

	General Track	Technical Track	Use Case Workshops
8:00-9:00	Registration and Coffee		
9:00-9:30	Keynote 1: Data Driven Communities		
9:30-10:00	Keynote 2: Government Panel session		
10:00-10:15	Break 1		
10:15-10:45	Session A1: I3 Consortium Overview	Session B1: 5G Technology	Session C1: Smart Citizen Information
10:45-11:15	Session A2: IOT for Community Good & Quality of Life	Session B2: Cloud, and Edge Technology	Session C2: Smart Buildings
11:15-11:45	Session A3: IOT Systems and Ecosystems	Session B3: Big Data and AI Technologies	Session C3: Smart Wellness/Healthcare
11:45-12:15	Session A4: Networking, Platforms, and Infrastructure	Session B4: IOT Devices	Session C4: Smart Mobility (Xportation)
12:15-1:00	Keynote and Lunch: Data Management and Data-Centric Infrastructure		
1:00-1:30	Session A5: The Nature of Real time Companies	Session B5: Introduction to I3 and Community IOT systems	Session C5: Smart Airports/Ports/Depots
1:30-2:00	Session A6: Impact of Mobile Networks (5G, wifi, ...)	Session B6: I3 Systems Architecture	Session C6: Smart Citizen Involvement
2:00-2:30	Session A7: Big Data, AI, and Data Analytics Impact on Business	Session B7: Device/Application Development Options and Processes	Session C7: Smart Video Analytics
2:30-2:45	Break 2		
2:45-3:15	Session A8: IOT Driven Marketing	Session B8: Participating in the I3 Development Community	Session C8: Smart Social Services
3:15-3:45	Session A9: Customer Experience	Session B9: IOT Trust, Privacy, and Incentives	Session C9: IOT Entertainment
3:45-4:15	Session A10: Data-Driven Public Policy	Session B10: I3 Networked Systems	Session C10: IOT Emergency Services
4:15-5:00	Networking and Closing Reception		

We have created an I3 mailing list for people who are interested in the I3 Project. To join the I3 mailing list, simply send an email to [i3-join@i3-iot.net](mailto:i3-join@i3-iot.net). The system will send you a confirmation email. Once you are confirmed, to send a message to the entire I3 community by simply sending an email to [i3@i3-iot.net](mailto:i3@i3-iot.net). If you are interested in participating in the I3 project, as a volunteer developer or to participate in the development of one of the above use cases, please send an email to [manager@i3-iot.net](mailto:manager@i3-iot.net).

## READER CONTRIBUTIONS - 5G in the San Joaquin Valley by Roxanna Barboza



The “Race to 5G” is a race that everyone wants to win. It will create new opportunities for all communities when given the broadband they need. Ultimately, it will revolutionize the ability to compete, operate and contribute in today’s evolving digital economy.

For rural agriculture communities, this will become a game changer. It will enable farmworkers to use advanced sensor and drone technologies to track and manage the irrigation components on a farm in real time. The ability to increase yield and productivity will reduce waste, ensure efficiency, and streamline delivery of products to the market.

Today, a [quarter of Americans](#) are still without the general broadband services they want to meet their needs. Unfortunately many of those in broadband-need are in rural areas – areas where these services will make a significant difference to the local economy.

### 5G IN THE STATE OF CALIFORNIA

In the state of California, different cities are in the process of deploying 5G technology. The cities of Los Angeles and Sacramento are partnering with Verizon Communications in launching a fixed wireless 5G. In the San Joaquin Valley, the City of Fresno and [XG Communities LLC](#) have partnered to announce the first of their 5G small cell sites utilizing city-owned infrastructure

When considering the specific benefits of faster and more reliable telecommunications, Deloitte LLP found that 20% of surveyed businesses reported the number one reason for their interest in 5G was the increased work flexibility, [12%](#) ranked better customer engagement as their top perceived benefit, and [6%](#) [thought that decrease costs](#) would be the greatest benefit. The survey results shown in Chart 1 illustrate that there are many 5G interest drivers that are expected to create value when this technology is deployed in rural areas.



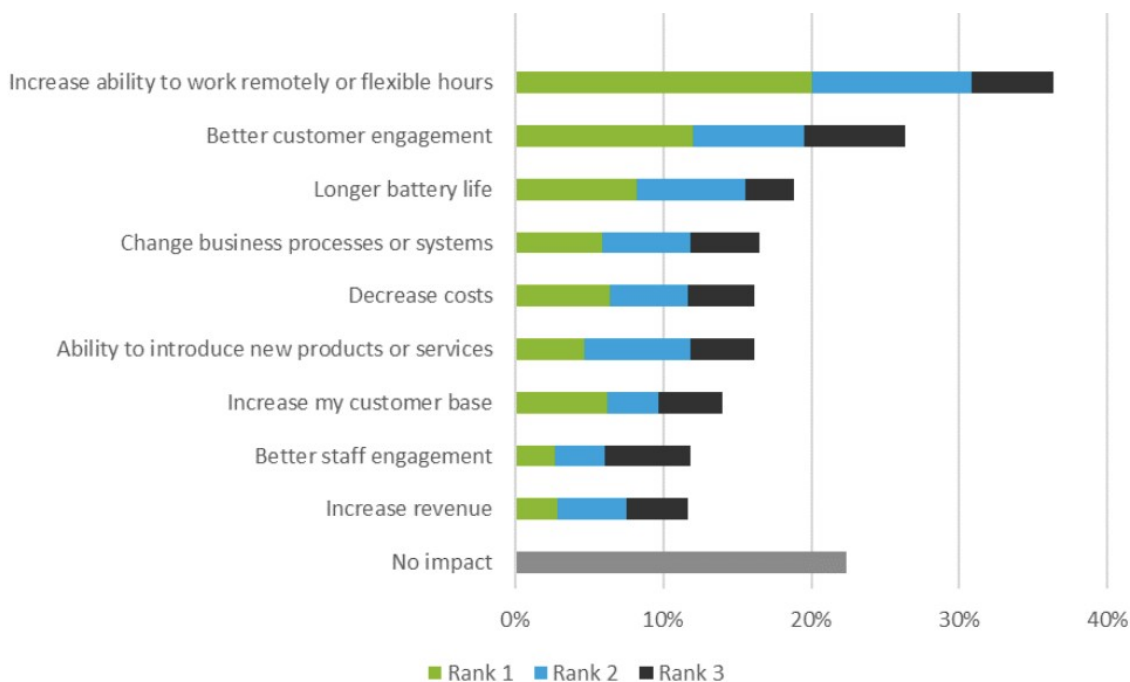


Chart 1: Benefits of 5G enabled technology

Deloitte believes that 5G's new mobile network will contribute broader economic benefits to regions where it is deployed and for companies that are able to take advantage. The three main mechanisms through which 5G technology will contribute to economic growth include:

- increased productivity;
- increased workforce participation; and
- new business opportunities.

History shows that rural areas are not targeted areas for new technology rollouts. In a Los Angeles Times article [5G service rolls out- but not without controversy](#), Scott Mairr, AT&T's president of operations describes how small cell technology will start initially for mobile networks in dense urban areas and suburban areas. Jonathan LeCompte, president of Verizon's Pacific market, has also remarked on how rural markets are not a part of the company's initial rollout plan, but added that "obviously, we need to care for those." Technology, is almost always first deployed where there is a defined market and rural areas do not have the population needed to make it to the first tier.

#### 5G IN RURAL AMERICA

In the heart of California, there lays hundreds of orchard acres where farmers dedicate their time and energy. It dominates the geographical center of California which stretches 450 miles from north-northwest to south-southeast. It is California's single most productive agricultural region and one of the most productive in the world. It provides more than half of the fruits, vegetables and nuts grown in the United States.

According to a [2016 report by the California Public Utilities Commission](#), of the 6.5 million people living in the San Joaquin Valley, only 43% of the rural population, most of which resides in the San Joaquin Valley have access to internet. This leaves 3,705,000 people without access.

"I do believe that there will be a change when 5G technology comes into play. Vehicles and handheld devices will be able to collect and transfer large amounts of data that will allow developers to create applications that are not possible now, like autonomous cars," explained Ed Varner, Chief Information Officer at [Wonderful Orchards](#). "Unfortunately I believe that remote areas that we work in will be the last to receive 5G cell sites, and we will likely still struggle with areas of no connectivity."

When interviewing farm workers, there was no excitement of this new 5G technology.

"Working in the fields for 22 years, there has been new technology appliances we use but that's only if we are connected to the internet," explains a migrant farmworker. "Why can't we focus on the bigger problem which is being connect?"

Jeff Dahlberg, Director of the UC Kearney Agricultural Research and Extension Center (KARE) in Parlier, California, understands where these farmworkers are coming from. KARE is a world-class research operation in the heart of California's San Joaquin Valley from which flows a steady stream of practical ideas and solutions ready for implementation by the region's farmers. Dahlberg is a former Peace Corps volunteer in Africa and life-long California farmer and agricultural scientist. KARE has over 100 research projects and grows over 50 crops. As the director of the center, he recently oversaw the installation of a wireless connectivity on 10 poles bringing Wi-Fi throughout the fields.

"Recently, I have visited Africa and the mobile coverage there was better," said Dahlberg. "It surprises me that given the amount of wealth there is here in the United States, rural communities cannot be connected. So it does not make sense if we were to talk about 5G technology right now."

#### RECOMMENDATION

Yes, 5G technology will bring advances in rural America by supporting new irrigation technology, providing more accurate predictions of weather conditions, and allowing increased utilization of drones to help better identify changing crop conditions. California is based on agriculture that already accounts for [\\$47 billion in exports in 2015](#) and it is reasonable to expect that providing general broadband to the San Joaquin Valley could increase the figure substantially. 5G will not only provide the public service to the communities but it will also be in the state's best economic interests.

The San Joaquin Valley understands that widespread deployment of wireless broadband services is a critical economic need for the region. Local government agencies are interested in finding ways to accelerate the deployment process. Three ways in which rural communities such

as the San Joaquin Valley could be provided with broadband are, 1) Citizens Broadband Radio Service (CBRS) spectrum, 2) White Space Technology, and 3) increased government subsidization of services in economically important areas that do not have the end-user numbers needed to justify accelerated technology deployment plans.

CBRS is an innovative arrangement that allows for exclusive rights (Priority Access) as well as spectrum sharing (General Access) when spectrum is unused. Small and medium sized providers are using the General Access CRBS feature now to provide service but could provide better service if can gain priority access to the band. The second way is to use the unused broadcasting frequencies in the wireless spectrum known as White Space. This wireless spectrum is similar to what is used for 4G and therefore, can be used to deliver broadband internet services over large geographies where there is underutilized broadcast spectrum. For example, Microsoft has invested in [White Space technology](#) in developing countries such as Africa. The Federal Communications Commission has a Connect America Fund that subsidizes telecommunication services in rural and remote areas. Unfortunately, there are still many Americans that do not have access because this fund has not been able to reach them.

Have in mind: while big mobile wireless companies are focusing the national conversation on 5G technology, the next generation of service, residents and businesses living in parts of the San Joaquin Valley struggle to get basic broadband services. The criticality of the problem is causing many rural agencies to consider new, potentially lower cost alternative broadband technologies. While this might be a step in the right direction, there remains a continued concern that unless government agencies are funded to take a more active role, the rural regions of America will always be playing catch-up.

## READINGS FROM THE EDITOR'S DESK

- [Let's Celebrate the Hidden Heart of 21<sup>st</sup> Century Management](#). Forbes article challenging the notion that companies exist to maximize shareholder value. Companies should be primarily driven to serve their customers while fairly reward investors and employees in the process. Anything other is short sighted.
- [Five Tips to Becoming a More Agile Business](#). Customer-centric business is not new nor are dynamic markets. Agile development processes create a methodology by which market shifts can be incorporated in ongoing programs. These same concepts can be extended beyond the development sphere as well.
- [Sundar Pichai of Google: Technology Doesn't Solve Humanity's Problems](#). Technology doesn't solve humanity's problems. Technology is an enabler, but humanity has to deal with humanity's problems. We're over-reliant on technology as a way to solve things and over-indexing on technology as a source of all problems, too.
- [Marc Benioff Says these 4 Principals are Key to Salesforces's Success. Here's How to Use Them](#). Salesforce uses V2MOM (Vision, Value, Methods, Obstacles, Measures) to coordinate forces. Employees & groups have a vision. They move forward knowing how their vision fits into the larger objectives as they overcoming obstacles, etc.
- [How to Manage IOT Data Streams to Improve Customer Experience](#). Customer Experience determines whether a customer a) makes an initial purchase, and b) whether the relationship becomes a recurring revenue stream. IOT will provide more customer data expanding the need for analytics that drive actionable insights.
- [Why IT Infrastructure Approach Needs Modernizing](#). As technology advances, the IT job will change from supporting a diverse set of applications to be more focused on creating and supporting a common infrastructure that allows technology investments to be leveraged for improved financial performance.
- [IoT Technology is Now Proven- But Where is the Money? Tech can do amazing things; the true question is whether the solution is economically viable. Platform and Ecosystem thinking can address these issues but it take a different mindset. Article describes IoT perspective but learnings are valuable elsewhere.](#)
- [Robots in the Field: Farms Embracing Autonomous Technology](#). Agri-tech strives to increase farming efficiency, increase yields, produce healthier food (less fertilizer), and be more eco-friendly. Robotics, AI, data analytics, IOT being worked together to allow these advances.
- [The Internet of Things is Changing How Commercial Buildings Operate - Here's where the Technology is Going](#). Smart-Buildings use sensors to monitor/manage occupancy, temperature, lighting, and energy use. This technology can reduce energy consumption by as much as 50%. The fact that it can increase building and personal security is a bonus benefit.

## CTM RESOURCES

CTM has a history of making topical and thoughtful information available to the CTM community. In support of our community, the following may be of interest to our readers. See [marshall.usc.edu/ctm](http://marshall.usc.edu/ctm) for a complete list of resources.

- [The Need for a Fourth Industrial Revolution Operating System \(free\)](#). The adoption of Fourth Industrial Revolution thinking to our data-centric world may require that we rethink the macro systems that govern the way that humans relate to the data that surrounds them. In the 4th Industrial Age it is interesting to think of the technology around us as resources which could be managed by a societal operating system.
- [How AI Could Tackle City Problems Like Graffiti, Trash, and Fires \(free\)](#). Cities operate fleets of diverse vehicles to serve their citizens. If these vehicles were equipped with video cameras, the captured images could be used by video analytic programs to self-detect many city operational issues in need of attention so appropriate crews could be dispatched without waiting for citizen complaints to be registered.
- [I3: An IoT Marketplace for Smart Communities \(free\)](#). I3 (The Intelligent IOT Integrator) is a data governance vehicle that manages IOT data flows for many independent device owners. It supports the user's need to self-manage their own data streams, manages participation incentives, privacy, and monitors device security. This curated environment creates the free and open IOT data marketplace needed to accelerate IOT adoption.
- [The Evolving Internet of Healthcare Things \(free\)](#). Healthcare IOT applications can be divided into hospital, doctor, and consumer applications. Over time these isolated worlds will blur and there will no longer be a single administrator that oversees the network infrastructure; healthcare data networks will be an open and fluid environment. New systems will be needed to manage vendor neutral data repositories and to govern data flows.
- [The Fan Multiplier Effect \(free\)](#). Marketing Programs should be driven by behavioral objectives and measured by metrics. Instead, many marketing campaigns focus revenue driven objectives even though campaigns designed to increase fan engagement can often drive greater strategic value. This paper focuses on efforts to drive fans to advocate for a product or service so that they become your revenue drivers.
- [Internet of Things \(IOT\) Model](#). CTM has developed an Internet of Things (IOT) model that allows users to identify profit pools within the larger IOT market, test how changes in pricing will affect demand, and see how different functional characterizations impact the model. The modeling tool is sufficiently flexible that the users can adjust the parameters in order to develop a personal view of market evolution.

## SUPPORT CTM

Please feel free to forward this email to your friends and colleagues who you believe would benefit from participation in the CTM community. For those of you who wish to be included in the CTM family of people who believe that technology is a tool and that business success is achieved by skilled wielding of the tools available to us, you can join the CTM family by registering [on our home page](#). A voluntary subscription would be appreciated for those that want to give back and help grow the CTM community ([click here to contribute](#)). If you have suggestions, topics you want to see included in future newsletter updates, or other general inquiries, feel free to email us at [ctm@marshall.usc.edu](mailto:ctm@marshall.usc.edu). For physical mail correspondence: USC-Marshall-CTM, 1149 S Hill Street, 9th floor, Los Angeles CA 90015.

The idea expressed in this newsletter are intended to stimulate conversation and dialog that will lead to a better understanding of our collective future. The opinions may not necessarily reflect the opinions of USC, Marshall, CTM or the wider CTM community.

## GOT A BUSINESS, TECHNOLOGY, STRATEGY ISSUE?

The CTM team is dedicated to working with its member companies to better understand the increasingly dynamic business world in which we live. We believe that companies must lead in order to prosper in a world where the threats and opportunities facing us are constantly evolving. Feel free to reach out to the CTM team via email at [ctm@marshall.usc.edu](mailto:ctm@marshall.usc.edu) if you would like to start a conversation.

## ABOUT CTM

*Founded in 1985, the Institute for Communication Technology Management (CTM) is the world's foremost institute at the intersection of technology and content and represents a powerful network of industry leaders involved in every facet of the digital media value chain. For more about CTM go to [marshall.usc.edu/ctm](http://marshall.usc.edu/ctm).*