

August 2019 @ CTM

THE DIRECTOR SPEAKS - Can't Manage a Modern Communications Infrastructure with Antiquated Ideas



The proposed Sprint-T Mobile merger is continuing to move forward despite concerns expressed by those that worry about increased market consolidation. At the same time, other voices have suggested that different areas of the tech markets are too consolidated and need to be broken up. Underlying both conversations is the unifying fact that the Internet has redefined our understanding of fair-competition and we have yet to come to grips with a regulatory paradigm that adequately addresses the needs of a market that is moving so rapidly.

At a macro level, infrastructure is needed to allow economic growth. There are many types of infrastructure such as roads, airports, and mass transit systems that are funded directly by the citizens through their taxes. There are other types of infrastructure investments that are funded by private investment such as the airlines and the communications network system. Regardless of whether an infrastructure is publicly or privately funded, (a) the existing infrastructure must be maintained if ongoing economic activities are to be sustained and (b) the infrastructure will require investment to sustain a higher level of economic activity. If these infrastructure projects are starved from investment capital, the system will initially stagnate and then begin to fail along with the economic activity it supports.

Before the Internet, geography was a major force that limited access to markets. Consumers could only buy products physically available in their geographic area. Many infrastructure projects that are designed to serve the public good are funded by taxes as community owned monopolies. In other situations, private companies began by building a commercial service that later evolved into an essential component of commerce. The success of these enterprises put them in a position where they 'could' establish monopolistic positions if they use their market position to limit access to competitive products. During this time, free trade legislation often focused on ensuring open and equal access to supply chains and suppliers. These efforts were all positive steps but they assumed a regulatory regime had the ability to oversee (and enforce) market behaviors.

Then came the Internet. The Internet has been an economic equalizer in that a company on the other side of the globe can sell product to a local consumer as easily as a company down the road. The Internet has made the process of discovering products, ordering products, and supporting products practically seamless and advances in supply chain technology have made geographic distances almost meaningless.

In today's world, since the internet has increased global competition, regulators must focus less on whether there are multiple local competitors and worry more about whether their local companies can compete on a global stage. This is not to say competition is not needed but instead is an acknowledgement that market competition can come from areas outside the regulator's span of control.

In the case of Sprint-T Mobile, the merger did not reduce competitive market pressures but it does allow Sprint and T Mobile to reduce their costs. Presumably this cost reduction will allow them to increase their investment in the network infrastructure that will ultimately improve service levels and potentially make them a stronger player on the global stage. This is an example of a situation where reducing the number of competitors can have a very positive outcome for consumers.

Others have suggested that large tech companies have too much market power and should be broken up. There is an underlying assumption that by increasing the number of players in the market, free-market competition will lead to better behavior. However, fragmenting the market only serves to undercut the value these companies already provide to consumers for free. This example, reflects a potential situation where increasing the number of companies in a market space can have negative implications for consumers.

This is not a suggestion that the market is working flawlessly. The point is that attempts to manipulate a market's competitive dynamics as an alternative approach that avoids the need for a more comprehensive regulatory reform can do more harm than good.

UPCOMING EVENTS

- **Aug 17, 2019**, [Data Con LA](#), Los Angeles CA
- **Aug 19, 2019**, [I3 Consortium Conference and Workshop](#), USC Campus, Fertitta Hall, Los Angeles CA
- **Sept 10-13, 2019**, [Global Network for SMART Organization Design](#), USC Campus, Los Angeles CA
- **Sept 16-19, 2019**, [Oracle Open World](#), San Francisco, CA
- **Oct 22-24, 2019**, [Mobile World Congress](#), Los Angeles Convention Center
- **Oct 28-Nov 1, 2019**, [Advanced Management Program](#), Los Angeles CA
- **Nov 18-21, 2019**, [Automobility LA](#), Los Angeles Convention Center
- **Nov 22 -Dec 1, 2019**, [Los Angeles Auto Show](#), Los Angeles Convention Center

If you have an event that you would like us to include in our newsletter, please send an email to ctm@marshall.usc.edu

IN CONVERSATION WITH Manuel Morales, Holland America



A highly motivated and proactive analyst, I possess several years of experience in requirements gathering, team leadership, software implementation, user acceptance testing (UAT), departmental communications, and team collaboration. A team player and quick learner, this has given me the opportunity to work with all levels of an organization from collaborative projects to improve software functionality and process improvement to strategic initiatives addressing shifting market conditions and demographics. Fluent in Spanish.

An avid learner, I continually seek channels of further education. This has led me to return to graduate school to complete an MBA degree and a Health Informatics certificate. Additionally, I enjoy learning from my colleagues through networking events from various organizations including the ACHE, HIMSS, and PMA.LA. This has enabled me to expound my knowledge of the industry as well as gain a deeper understanding of the subtleties of my craft. My education has paid dividends as I stay apprised of the latest trends in management, strategy, and technology which I share amongst my team members and personal life.

A cruise ship might be described as a small city and a large resort combined. Can you elaborate on this analogy?

What many people do not realize is the amount of crew on board that live in the ships of this size. When put in aggregate to the guest compliment this equates to a small city, of the larger Princess Cruises ships we are talking about around 5,000 souls onboard. This is a daunting task to support and maintain suitable living conditions on board for all. In order to do this a hierarchy similar to a city is needed and is divided into the ship and hotel operations. There are various managers administrating the many different teams on the ship so that it all hums together to create a coalescence of a smooth experience for the guests. At the top of the hierarchy is of course the captain who is responsible for the safety of this "city" and along with his officers oversees the ship's overall operations that spans the spectrum of operations you will see in your respective living center including, security,

sewage management, mail delivery, food management, and even recycling centers. On the other side there is the resort/hotel operations division handling the guest's experience directly. Through these teams the moving resort can accommodate just about any demand our guests may have. These dedicated crews are able to handle thousands of requests for such popular/common requests on a land based hotel as food and beverage, spa, casino, theatre shows, and live musical entertainment to name a few. There are a few differences that make the ship experience different from the onshore hospitality environment. A big one is handling immigration operations as potentially a ship can visit a new country on a daily basis. There is also a heightened awareness towards health especially in washing hands and making contact, on a closed environment a sickness can quickly spread. Our dedicated teams handle these areas with great care and because of that, major issues have not arisen. Lastly there is the need to stay concentrated on your duty as you pass from one memorable sunrise/sunset on a port to the next.

Trying to provide support services to passengers on a ship when their expectations are determined by their landside experiences seems to be a very challenging task. Would you agree?

Yes I definitely agree. Today in general the adoption rate of cellular usage and Internet availability have caused an expected minimum standard of service that should be available essentially everywhere. This expectation includes the cruising industry and we must try and find ways to meet that expectation or come as close to it as possible. I am still amazed at the fact that Satellite Communications allows us to connect with moving targets on a consistent basis to the point I still say to our guest and crew it is a feat of engineering. There is not just the satellite touchpoints to consider but also the ship infrastructure as well. A big challenge is having transmission carry across the whole of the ship which is made out of metal, a large number of wireless access points (WAP's) must be installed in order for the signal to cover all areas of the ship including down with the crew. It is not the same as the office or your home where you stay relatively in the same spot, our guests can traverse the entire length of the ship within a matter of minutes as they go from the cabin to the Lido deck for their lunch. These WAP's must be able to hand-off effectively and efficiently to create seamless experience. Another challenge is the amount of bandwidth available for a cruise ship, only recently have there been significant strides in technology that would allow for an increased amount. This is especially crucial in today's world where streaming YouTube and Netflix in HD is customary, where websites like news carry much more graphic intensive content, and even emails can be data heavy (especially for work). The balance of course is being able to justify having the bandwidth with the operational cost which is still significant versus a land side setup. While we work hard to keep the connectivity up at all times there are still situations where it will go down. There are known parts of the world where connectivity is spotty at best including the Norwegian Fjords, certain Alaska ports, and in the Baltic Sea. This can be due to weather but often times it is because the signal is blocked by a mountain or other land structure (large building). It is interesting that a few feet can make the difference between having Internet and being in the dark. Here too we have done research and are excited to pilot existing/new technology that should eliminate these challenges.

A vacation is a time to get away from the hustle and bustle. For some that means reducing their use of technology and for others it means an increased usage pattern. Can you compare and talk about how changing passenger needs are driving Holland America/Princess Cruises to think differently.

While there is still a large segment of our guests that wish to get away completely, we have been seeing this trend reverse. Our guest demographics have been running the gamut, especially in Princess Cruises, that we are seeing more families, business owners, and even our core demographic (retirees) wanting to be connected more often. At the minimum the current trends in Social Media have our guests wishing to communicate and broadcast their experience to their family and friends so they know where they are and how much fun they are having. In conjunction with Apps such as WhatsApp and Facebook Messenger, this is an easy way to remain connected but not fully engulfed in the online experience. This is now more of what being disconnected means. Compare this with being connected during their entire voyage these passengers will often want to keep aware of their affairs including running their business, keeping up with the news (local and world), and socializing with their social groups through the various social applications. These guests can be more immersed and at times more demanding of our

services since they are not plugged into their familiar setting at home or in an office. It is these guests that we at times have to contend with as they expect the land-like connection and realize it is not the case.

Can you give some examples of how has the advent of new technology changed the way Holland America/Princess Cruises operates in support of its on-board crews and the way it works to meet customer expectations?

A great example is the OCEAN program being implemented by Princess Cruises, it is a combination of on board wireless technology in combination with a different satellite solution. The use of Medium Earth Orbit (MEO) satellites which hover around 10K-15K miles below current Geosynchronous Orbit (GEO) satellites allow for increased bandwidth and speeds overall as the major touchpoints are closer to each other. Through this system we are able to deliver an enhanced experience using the digital mediums including Apps that allow guests to make purchases on board in advance, location technology so that family/friends can find each other easier, and crew can quickly and more efficiently cater to guests needs. The term IoT is really fitting. Another example is what we call "Apple Caching" which assists in downloading important updates and instead of individual users having to consume the ship's bandwidth it will download off a device located on board. This assists in relieving the traffic to the network and allows other transmissions to pass.

STEVE SHEPARD: Looking Back - and Forward



When I first became an instructor for CTM's AMP curriculum, my job was to deliver a single half-day program on wireless technologies. Let me be clear: This was a technical presentation, and included such things as how Code-Division Multiple Access worked, how Direct Sequence Spread Spectrum differed from Frequency-Hopping Spread Spectrum, what frequencies CDMA operated in vs. those that GSM occupied, and what the technical differences were among GEO, MEO, and LEO satellite arrays. And the best part? *The audience, made up largely of telecom executives, actually cared.*

Over the years, the presentation content has shifted. I delivered a half-day program about multimedia, before anyone really knew what that was. I gave programs on the industry phenomenon known as convergence. In the great days leading up to the collapse of the mighty (yet ephemeral) telecom bubble, the focus was on need driven demand. We also taught one of the first programs on the Internet—an introduction that that mysterious world that no one had yet come to understand (at the time there were precisely four commercial Web sites in existence on the planet). I still remember how the executives would gather around me and my little Mac PowerBook and watch in awe as I dialed into the Internet using my mighty 56 Kbps modem and filled my screen with a Web site - it was magic.

It's easy to laugh at ourselves when we think about those simpler times, but in reality, how are they any different than the times we find ourselves in today? We are no more insightful about the future impact of quantum computing, natural language processing, robotics, artificial intelligence, various alternative realities, analytics, and Internet of Things than we were in the 90s about the World Wide Web. So, my challenge to everyone in or around the technology domain is to take a step back, think about those heady days of yore, and now think forward. It has never been a question about a specific technology - technology has always appeared to meet emerging demands. It's a leadership thing - Leaders have to know 1) where they are at, 2) where they *could* be, and 3) knowing that things are going to change, leaders have to envision and drive a plan that shapes that future reality in a way that maximizes their future potential. In short, how can we drive the new status quo? As Alan Kay of Apple once observed, 'The best way to predict the future is to invent it.' I think we owe it to future generations to start inventing. Now.

The next Advanced Management Program is scheduled for October 28 - November 1, 2019 in Los Angeles. Hope to see you there. (<https://www.eventbrite.com/e/marshalls-advanced-management-program-amp-fall-2019-registration-67346442021>).

THE I³ CORNER (i3.usc.edu)

What a month it has been! As you know, The Viterbi engineers completed work on V0 of the I3 software in May and we have been working with a number of companies to integrate I3 into their product offerings. We will have a working demonstration of I3 based on the V0 software at the Aug 19 Conference/Workshop. V0 is not production release software but it is integration ready. Once the Conference is behind us, the engineers will focus on things like performance characterization, documentation, and the usability improvements that must be accomplished before a public release (scheduled for late 2019).

At the conference, there will be many presentations from companies that describe what the company has been able to do with V0 of the I3 software. Many other presentations will focus on the direction they would like to see I3 go as we begin to consider future releases.

Metcalf's law states that the value of a network is proportional to the square of the number of connected users. That is, the greater the degree of interconnectedness, the more value. The telephone network became valuable as more people had access to the telephone. The broadband network became increasingly valuable as more people had access to broadband services. That same idea is driving the momentum behind I3 in that the easier it is to connect IOT generated data to intelligent data consuming applications, the greater the value of IOT overall. And, just like we are all connected to different work, social and other communities, the IOT connectedness will reflect our personal and community views on trust and privacy.



The I³ Consortium (i3.usc.edu)
The Internet of Things (IOT)

Please join us for

The Intelligent-Integrated IOT Conference and Workshop

Join us on Aug 19, 2019 at Fertitta Hall at the beautiful USC campus in Los Angeles where you will hear from industry luminaries on smart-government, smart-systems, and other topics that will shape the way we live in work for the next decade.

<https://www.eventbrite.com/e/aug-2019-intelligent-integrated-iot-conference-and-workshop-registration-60988753002>

READER CONTRIBUTION: I3: Working Together by Bhaskar Krishnamachari



Bhaskar Krishnamachari is Ming Hsieh Faculty Fellow and Professor of Electrical and Computer Engineering at the USC Viterbi School of Engineering, Director of the Center for Cyber-Physical Systems and the Internet of Things, and a Co-founder of I3. Bhaskar Krishnamachari's research interests are focused on the design and analysis of algorithms, protocols, and applications for next generation wireless networks. These include low power wireless sensor networks and the Internet of Things, connected vehicles, robotic networks, cognitive radio networks, underwater networks, and green cellular networks. On these topics, his research spans the entire spectrum from theoretical analysis of algorithms to prototype software implementations of network protocols and applications.

About three years ago, when Jerry Power from CTM and I started having conversations initially with each other and others at USC about the Internet of Things (IoT) and what has inhibited its wide-spread adoption despite its clear promise to seamlessly bridge the physical and virtual worlds and add value to our lives, we quickly identified that the underlying problems were inherently multi-dimensional, and required crossing traditional disciplinary and organizational boundaries cutting across government, industry and academia. As we expanded our conversations and proceeded down the path of building the Intelligent IoT Integrator (I3) project with the help of many partners and members, we have continued to grow our understanding of challenges and questions arising from multiple perspectives.

From a purely technology perspective, IoT applications are still being developed largely under an assumption that was characterized by Peter Deutsch and others at Sun Microsystems as one of the [eight classic fallacies of distributed systems](#): "there is a single administrator." Scaling IoT systems beyond siloed applications that can be handled by a single administrator requires revising the fundamental architecture of IoT systems, identifying the ways in which applications and devices/device networks tend to be tightly coupled together and working to decouple them so that different data sources can be fed to different applications in a more flexible manner. It also requires incorporating into the very foundations of the architecture economic, game-theoretic, thinking -- a scalable IoT system must allow the different participants to have an incentive to interact with each other, to buy and sell "goods" and "services" pertaining to real-time data.

From a business perspective, what is the value to companies to collaborate with each other in the IoT space and how should they do so? While there has been no shortage of new networking and technical interoperability standards in the IoT space over the past decade (BLE, LoRAWAN, NB-IoT, Iotivity, Alljoin, to name a few), they have not addressed the underlying challenges of how companies can help develop, operate and participate in a shared B2X (spanning business to business, business to citizen, business to government) real-time data ecosystem in a way that benefits all parties. What are the frictions and pain-points in enabling such collaboration? How could the necessary business agreements and transactions needed for such participation be simplified to reduce such frictions? What does the new "data value chain" (analogous to the traditional supply chain for physical goods) look like?

From a government perspective, what is the right approach to building smart cities enabled by IoT data that balances a number of concerns, including a) how to build an open multi-vendor ecosystem that avoids concerns about single-vendor lock-in, b) how to create a self-sustainable market economy to drive innovation and meaningful deployment of technology rather than depending on pure government funding alone, and c) how to empower citizens with useful data-driven services to enhance the quality of their lives in their communities, while also providing them meaningful data privacy guarantees and user-friendly data ownership and management tools?

From an operational perspective, what are the real problems in managing a community like a campus or city or an airport that the technology can help to address?

These diverse questions pointed us in the I3 project towards building a multi-stakeholder market-based data-management ecosystem for IoT that is open and allows the scalable integration of new data sources, applications, and services over time. And we believe that the very process of building such an ecosystem itself requires a thriving ecosystem of diverse partners representing the various perspectives, having a voice and engaged actively in every stage of design, development and testing. We feel truly fortunate to be supported by a number of enthusiastic, passionate individuals from a wide range of organizations - faculty and researchers from research institutes and university centers to officials from city and county governments to entrepreneurs from private companies both big and small, from across the world. These stakeholders have contributed very substantially to the I3 project in many forms including ideas, feedback, time, software and other resources.

I welcome you to attend our upcoming second I3 conference and workshop this month and see hands-on demos of applications put together by our various members and partners working with the v0 version of the I3 software platform we have been developing. We see the I3 conference as a forum where diverse interests are presented, not with a naive intent to align everyone to the exact same goal but rather to create a common framework that can

support a diversity of needs. We believe it will help us continue to grow our community so we can continue to make progress towards addressing the multi-dimensional questions and challenges facing us.

READINGS FROM THE EDITOR'S DESK -- UPDATE

- [Foot Locker's Jed Berger: 'The marketing industry is in for a revolution'.](#) The CMO of Foot Locker points out that there is an ongoing revolution happening in marketing. The profession is shifting from being brand-focused to becoming a business partner with the company's other divisions. This shift enables them to influence the entire customer journey as the voice of marketing serves to represent the end-to-end customer experience.
- [New Research Uncovers The Biggest Differentiator of Effective Marketing: Bravery.](#) Ad Age makes the point that successful (effective) ad campaigns require bravery. The point is clear but this same observation resonates in many other business areas as well. The act of being brave is not the same as being outlandish. Being brave requires objectives but not so many as to dilute the issue where you are trying to stand out. Do research but don't overdo it so as to get lost in the detail. Don't bail too soon as brave actions take time before results appear.
- [Customer Journey Map: Why The CIO And CMO Must Collaborate.](#) Customer Journey Maps demonstrates how a customer discovers, acquires, uses, and becomes a loyal customer. Some customer evolve to become advocates based on their customer experience and their desire to share their experiences with others so they help others. These customer journey maps should be based upon data throughout the customer journey and the data collection/analytic process must transcend a company's organizational boundaries.
- [Innovation Vs. Data Privacy Or Innovation And Data Privacy?.](#) Consumers will give their data to brands they trust and support. They expect these companies to use this data to better serve the needs of the customer. If a company undermines that trust by not using the data for the customer's benefit, the customers will begin to resist such data collection efforts. Earning and maintaining a customer's trust is critical to the realization of a data driven strategy.
- [FCC gives ISPs another \\$563 million to build rural-broadband networks.](#) It has been well established that by improving communications, economic activity is spurred. This means that increasing access to broadband services is an economic impairment, but 'access' to broadband in and of itself, does little if people do not know how to use it or cannot afford it. When there is no broadband option a digital divide is inevitable that stifles economic growth and reduces long term opportunities. The efforts of the FCC to increase broadband access AND use is to be applauded.
- [What this global B2B marketing chief has to say about transformation.](#) Arthur Filip, EVP at HCL, points out that the marketing profession circa 2009 is nothing like the marketing profession circa 2019. In 2009, marketing focused on awareness and the product and sales to convert awareness into revenue. In 2019, marketing is much more about building sustainable customer relationships that grow revenue and this change has driven marketing to adopt many new tools and to broaden their understanding to envelop and end-to-end understanding of the business process.
- [Project Management Isn't Just For Project Managers: 4 Skills You Need To Know.](#) While there are professional project managers, everyone must develop their own project management skill set. Project management breaks complex tasks down into a series of interlaced smaller projects that can be pursued individually so that when the component projects are reassembled, the complex objective is met. At a systems level an independent project manager is often needed but given that we expect individuals to be able to multitask as they work on multiple projects at the same time, we have each had to become personal project managers as well.
- [A Handy Guide to The Differences Between Edge, Fog And Cloud Computing.](#) Edge, Fog, or Cloud are places where IOT processing (or any kind of data processing) can occur. Edge means the processing is done close to the IOT device and sometimes even inside the device. By doing the processing near the point of demand, performance can be optimized. Cloud means the data processing is provided at a central server, distant from the point of demand but by providing this functionality as a shared resource, costs can be reduced. Fog

computing is a more nebulous term with means the data processing is provided between the edge and the cloud with the intent of locating these services at a point where cost and performance can be balanced.

- [Where's The Trust Gone?](#) The Internet has given consumers more choices than ever. The internet provides a wide range of product options that can be provided from vendors across the globe. This increased level of competition is working to driven price based competition toward relative parity making it even more critical that suppliers are able to compete on something other than price. The result being that customers are increasingly making their purchasing decisions based on their trust of the company behind the product.

The Real-Time Revolution – Transforming Your Organization to Value Customer Time

by

Jerry Power and Tom Ferratt

Coming September 3, 2019 from [Berrett-Koehler Publishing](#)

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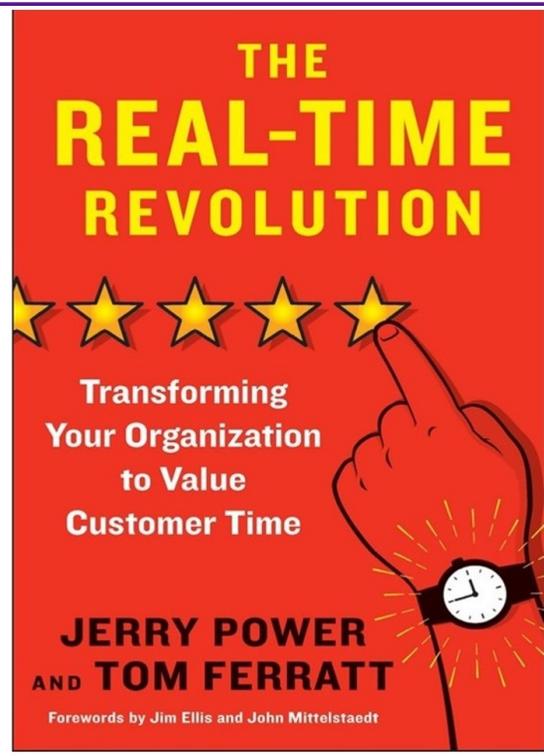
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Time is becoming the dominant customer currency. Customers want to spend their scarce time well. Organizations striving to provide ideal customer experiences are real-time organizations. They are the core of the Real-Time Revolution. These organizations are demonstrating that they value all aspects of the customer journey in an effort to better serve the customer's end-to-end experience.



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 for a complete list of resources.

- [The Need for a Fourth Industrial Revolution Operating System \(free\)](#). The application of Fourth Industrial Revolution thinking to our data-centric world requires that we rethink the macro systems that govern the way that humans relate to the data that surrounds them.
- [How AI Could Tackle City Problems Like Graffiti, Trash, and Fires \(free\)](#). Cities operate fleets of diverse vehicles to serve their citizens. By equipping these vehicles with video cameras and using video analytics to self-identify issues requiring attention, cities can be made more efficient.
- [I3: An IoT Marketplace for Smart Communities \(free\)](#). I3 (The Intelligent IOT Integrator) is a data governance system that manages IOT data flows for independent device owners. It allows users to self-manage their data streams and allows them to determine when/how their data streams are used by applications.
- [The Evolving Internet of Healthcare Things \(free\)](#). IOT infrastructures will reshape IOT application paradigms as healthcare networks emerge to support a fluid and gracefully evolving healthcare data environment.
- [The Fan Multiplier Effect \(free\)](#). Marketing programs should be driven by behavioral objectives and measured by metrics that are focus on driving increased fan engagement
- [Internet of Things \(IOT\) Model](#). CTM has developed an Internet of Things (IOT) model that allows users characterize IOT market behaviors and test what-if paradigm shifts in demand.

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. 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 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.