Abbie Lundberg: Hello, you're listening to the Verizon Insights podcast. I'm Abbie Lundberg, president of Lundberg Media, former editor in chief of CIO Magazine and contributing editor at Harvard Business Review Analytic Services. Today I'll be talking with Mark Bartolomeo about the Internet of Things and the impact IoT is having on a variety of industries. As vice president of IoT Solutions at Verizon, Mark is especially well-positioned to give us this view. We'll discuss some of the business opportunities IoT represents, and how it just might help to solve some of society's biggest challenges. Mark, welcome.

Mark: Hello, Abbie, it's great to be here and speaking to you about IoT.

Abbie Lundberg: Great. So over the past few years, IoT has gone from an almost science-fiction-like vision to there be a variety of pretty pragmatic and valuable use cases out there. So, just to set the context for our conversation, why don't you tell us what you're seeing in the market? Which industries are leading the way?

Mark: Yeah, you're right, Abbie. The key phrase there that you mentioned was the pragmatic approach. And this has really favored IoT solutions that have three things in common: well-defined business cases, clear ROI's and technical standards that have been agreed to within that industry ecosystem. We are most often observing this primarily in three markets, which have been the leaders and the early adopters. Number one, the energy industry…for things like smart grid and pipeline monitoring. The transportation industry, where they've been working to improve rail safety with positive train control. And telematics for safety, security and diagnostics. I think two specific examples that we're dealing with every day that also don't get a lot of recognition are how demographic trends are really impacting the economy and how smart cities are really also evolving to prioritize solutions where municipalities are ready to invest.

Abbie Lundberg: That's interesting, so from a demographic perspective what's happening, what's changing?

Mark: Well, we've definitely seen this shift to the shared economy. And the millennials primarily have been driving this very aggressively. We've seen the move into the municipalities where people want to live where they work. We're seeing a lot of mixed-use developments and we're seeing a very distinctive shift from things like automobile ownership to automobile user-ship. And of course you've seen many of the other ride sharing applications that are out there and getting a lot of traction.

Abbie Lundberg: Great. I was reading something that you said last year… you sort of defined it as being “the year of emerging opportunity fraught with risk” when it comes to Internet of Things. How do you see 2016 shaping up?

Mark: Yeah, during 2015 I think that's a good observation. We've seen the IoT service providers really de-risking their solutions by creating consortiums. And by creating consortiums, what the IoT service providers have really done that's reducing risk is they're pulling back to their core competencies. And so they're letting each member of that consortium lead with what they're best in class in. For example, it may be analytics; it may be carrier-grade communications. It may be application services. And in addition, we're seeing a leader emerge within this consortium that's helping coordinate that ecosystem of solution providers. So this is delivering a more complete solution to the end user, and it's actually taking some of the risk out of that. The second element that we're seeing also really emerging in 2016 that's been followed closely over the past, really only two years is analytics. And what analytics is doing for a lot of the market is demystifying what analytics can do for your organization. And organizations now are assigning individuals in their company that know their business very, very well to actually get together with data scientists on descriptive, predictive and prescriptive models that can be used to improve planning and reduce risks.

Abbie Lundberg: Yeah, it's fascinating. I've seen such a shift in this past year when it comes to analytics to being something that really only particular kinds of companies and industries are delving into…to really being much more widespread, and companies saying, this is how we're making decisions going forward, and this is how we're running our business. When we talk about Internet of Things, it's still an evolving, still pretty nascent part of the technology space. And adoption has been spotty according to different industries. You mentioned three that are kind of ahead. What do you see it's going to take to really increase that adoption among other kinds of companies and industries?

Mark: Most of the previous efforts have been around the simplification of IoT. And this has increased participation rates, which has resulted in getting more and more devices connected to the network, but also bringing more and more data back to the business owners. And that can be a very positive experience if you're prepared to deal with the data, or it can be somewhat daunting. And we believe that the broader adoption of IoT is really going to require more visibility into the total cost of ownership and ROI and also industry regulations and safety issues that can be addressed, which we see as some of the real compelling use cases. But if I was going to frame up the three big drivers, I think the number one to move it from a nascent space is well-defined ROIs. This is how we see the industry will be positively impacting their business outcomes and using big data—data analytics. And an example of this is how can we directly measure the impact of IoT to improve things like agriculture planning, yield and resource utilization. Particularly when we've been coming off of things like a multi-year drought. You mentioned industry regulations a little bit earlier. We first saw the impact of this actually very positively. With the Energy Act of 2007 where it did establish standards that

facilitated things like smart grid interoperability frameworks. And the result there was really much greater R&D in things like energy management, load balancing and integration of alternative energy sources to the grid. And then the last one that we talk about was really safety. And we saw this with the Rail Safety Act of 2008, which incorporated things like positive train control, collision avoidance, crossing safety, management of speeds on certain types of grades. And if you fast-forward to 2015, we're seeing similar initiatives regarding citizen and public safety in some of this large city deployments.

Abbie Lundberg: That's really interesting…what are some other companies doing in terms of looking for that well-defined ROI?

Mark: So if we look at things like society challenges that are in the news today, we've seen a lot around food safety. And so we're seeing industry by industry pick a very important topic or issue related to delivering a better customer service. But also, ultimately, we're seeing this as what are the issues that potentially could impact my brand negatively? So people who are involved in the data sciences are always concerned around privacy, so they're investing more around privacy. In the food industry, we're seeing a lot of improvements around things like crop yield and sustainability. And we're seeing that as a very big growth area in 2016. And not only for them to get the direct benefit of things like better business outcomes, but also to ensure things like safety across their entire supply chain. So in the food industry it's about food safety. In the municipalities it's about making the cities much more safer. And in the automotive or commercial fleet industry it's about driving a better telematics solution to improve safety and reduce fatalities. So that's how people are sort of making that shift from “I've done a lot in terms of developing and training my people, now how do I go to the next step using IoT” to “Make it part of our everyday implementation of how we're running our business?

Abbie Lundberg: So as those companies are pushing into those areas, what are the milestones that they're looking for and where are we at in terms of realizing those benefits today?

Mark: So I think some of the things that we've seen is that while companies are bullish about how they will use technology, there very often has not been the governance or some of the training and development of people in the organization of how to use this technology. So what we're seeing in a lot of areas is the establishment of governance boards where they're actually setting up committees to review how can we help coordinate a lot of the silos within an organization so that we can really use big data and we can really use technology more effectively. And then also areas of education and changing a lot of the culture in these organizations to embrace technology. We've also seen people really looking at their business and saying how can we use technology to

build new revenue streams? And you've seen people focus more in the area of delivering solutions that will reduce things like unplanned outages or reducing any types of downtime on their equipment in the field. So there's been a number of areas, primarily around governance, bringing people in who are thinking about how we can use IoT to improve the business. And then working across different silos to understand how they can maximize revenues and build new revenue streams.

Abbie Lundberg: Great. One of the things that's really pretty exciting about the Internet of Things is its extensive scope. As more things become connected things that are sensing, being able to sense and transmit information, what are some of the big problems that we might solve?

Mark: So one of the things that we've been looking at and it's been a big challenge for many municipalities is how do you really create a unified approach for a smart city? And so even, where you are today, in Boston you have a number of different departments who are responsible for running the city. So you have the public works; you have the department of transportation; you have public safety organizations. And so people are really looking at how do I take technology and instead of implementing a solution that improves just traffic or implement a solution that just improves things like lighting and sustainability, how do I take a more holistic approach? And I think the full integration of IoT really opens up the possibilities of reducing risk and economic growth. And an example of how municipalities want to work across these silos is…take a scenario like a water main break, which we see from time to time in some of the municipalities. They have to be able to deal with that. They're sending people out; they're closing the streets; they're redirecting traffic. And the longer it takes for them to respond to an address the retailers on Main Street are really being negatively impactedAnd what we're seeing to address that is what are the integrated solutions across all these different silos that we could be using? And so one very interesting thing that we've seen is that we've seen people put out sensors on all of their water pipelines. So in the event of a leak or a pipe being burst, they're getting an alert, and that alert is going directly to the public works department, they're getting videos of that from video cameras that have been installed on the streets. They're remotely shutting off water valves. They're sending information to digital signs to redirect the traffic. They're informing citizens that parking is not available on that particular road. And then they're dispatching repair crews and public safety people to be on the scene and really help get that situation under control. So these well-integrated solutions are really solving problems across different departments using different types of media and addressing different groups of users.

Abbie Lundberg: And that sounds like a really challenging problem to solve. I mean getting all of those different entities from an organizational standpoint, but also from a technology standpoint to be communicating and acting in concert seems like a pretty big challenge. So what needs to happen to actually bring this vision of IoT to reality?

Mark: It's a combination of how do we simplify IoT so it can be implemented across these different silos and be adopted rapidly. It's part of reducing the cost and de-risking these solutions. It's part of the regulatory environment that's out there also. And when we look at things like safety issues and safety concerns, they do tend to be very good drivers of getting these solutions on board. And there's been a number of initiatives put in place where funding is being made available to different municipalities from the federal government to help them fund some of these safety issues. I think one that comes to mind is the Vision Zero initiative. And it really starts with the proposition that traffic deaths are preventable. So none are acceptable. And Vision Zero really looks at things like ethics, that human life and health take priority over road traffic systems and safety. That road traffic systems should really take into account things like human fallibility. And so if we start to look at how we're designing roads and how we're designing intersections, we should be accounting that we do make mistakes, and could we build more around the infrastructure that would be helping people have fewer accidents and fewer fatalities. This actually started in Chicago first. They had set a goal in 2012 to bring traffic fatalities to zero in ten years. So in 2022 they've set that goal and then most recently Boston launched the same program in December of 2015. And they're now even offering scholarships for students that would take into account things like research around safe driving and building safer intersections and safer roads. But it's also focused on not just the automobile, but bicycles and pedestrians. It's a very data-driven approach. They're reviewing all the data now. They've identified specific corridors in these municipalities where fatalities have occurred. They're trying to understand what really caused it. And what should they redesign or what systems should they put in place to really achieve the objective of zero fatalities in ten years.

Abbie Lundberg: One thing that strikes me is that this is so dependent on innovation. Companies are having to really think about things in a very different way. And so I'm just curious…Verizon has lots of customers who are working in this space. Do you see these innovation practices accelerating, and what do those look like?

Mark: So, we are seeing the acceleration. We are seeing people coming into organizations who are bringing new vision on how they want the business to be run. We're seeing companies take more into account that in order for them to grow, they need to bring the rest of the ecosystem along with them. So if I could just point to the agriculture solution again, we've seen this phenomenon of consecutive years of drought. We know that we have a very big issue to deal with here in terms of AgTech where the population will double by 2050, but the amount of arable land is continuing to decrease. And agriculture is working with the suppliers of seeds…chemicals. They're sending field agents in to help work with the farmers on best practices for sustainability and how they're using water. There's all different types of educational programs that are being pushed down to the field level on things like food safety. So, it's about bringing

together that entire ecosystem that the company or the farmer is dependent on to deliver the final end product. Now with the whole idea of being able to use IoT to connect that ecosystem end to end, we can all share information. We can improve the quality of product. And we can improve the safety of that product as it moves through the supply chain.

Abbie Lundberg: You've mentioned the need for simplification to have this become more widespread and more reliable. And ecosystems are sort of by their nature somewhat complicated. So tell us a little bit what you mean by simplification?

Mark: So a lot of the focus has been on the technology itself. So building some of the biggest analytics engines or different types of devices that are out in the field. And one of the things that people are realizing now is…what about the user experience? If we're going to see the type of growth in IoT, and we're going to get to this elusive 20 billion devices deployed by '22, we really need to be looking at a low-touch automated approach to how people are going to deploy and provision these types of devices. And the early adopters of machine-to-machine have a clear advantage in this because they already are comfortable with many of the activities of setting up devices, provisioning and managing these devices. And the early adopters also know the limitations that have been imposed on them by things like network speeds, different types of network topologies, the cost of device modules, systems integration efforts, and so now big moves are really being made to directly address those barriers to drive adoption …and some of the big items I see that are really going to be helpful for the deployments and the rise that we're seeing right now of low-cost, low-power modules. So these are actually 4G modules that at launch years ago were over $100 per module. We're seeing these now down to $15. And we'll quickly get those to less than $5 with scale. Now these modules are going to be able to take advantage of the exact same 4G network that's out there today, but they're not broadband devices because they're not working with devices that actually have high broadband output. They have very small data usage. They may only be monitoring devices and only sending out a communication if there's an exception or some type of an alert. These low-cost chips with low-power consumption are really going to allow the market to connect many, many more devices. And then of course we also mentioned the analytics processing. We're going to see more of that at the end of the network. Imagine if all 20 million of these devices, in order to have their intelligence and in order to work, have to come across the network. It just wouldn't be a very good experience and obviously we don't want to bring data from 20 million devices across a network. So we're seeing more of the data analytics being pushed out to the edge to manage those devices. And we're seeing use cases around things like security, where they're not streaming video across a network but using analytics to identify specific types of activities that may be of concern. And then they're only using network assets when they want to bring that information back to the center.

Abbie Lundberg: That's fascinating. What kinds of technologies are involved in making that possible?

Mark: Well, we're seeing that the cost of data storage has dropped tremendously. And so we're actually seeing now municipalities deploy small servers that can store up to four terabytes of data out into the municipality. And these are basically hardened storage devices that they're hooking video cameras to. And within that storage system are analytics where they can define specific types of events that they want to be able to monitor. So, those cameras are monitoring all different types of activities at the edge of the network, but they're only sending information back to the public safety department or creating alerts if an activity occurs that was previously defined by the analytics engine. And we're seeing great results with that. It's making it a lot more affordable for the municipalities. It's caring for a lot of the privacy issues so there's not something that's completely being monitored every minute. It's just looking for specific types of incidents.

Abbie Lundberg: The other thing that you had mentioned is companies are now getting more data back. And operating based on analyzed data is new for a lot of organizations. What are you seeing in that regard?

Mark: They're much more concerned about the interface of that data and making access to information much more accessible to the business owner. So in the past, we've seen much of the data coming back into the data sciences department for interpretation and for reporting to the marketing department or who was ever going to use that particular data. Now we're seeing these systems being set up as self-service types of systems. So that you, as one of the business users, are actually able to go into the data analytics engine and define your own types of scenarios or be able to do direct English queries into those databases to get specific results back. A lot of these today are focused on consumer and the propensity of consumer for specific behaviors. But we're seeing it now starting to be deployed in some of the industrial Internet areas and agriculture.

Abbie Lundberg: And as we look at the potential, what are the things that are primarily holding things back? What are the biggest hurdles?

Mark: So, our industry is constantly making investments in more spectrum and more network connectivity. And those investments will continue. But we always are underestimating how fast the data and the amount of traffic on our networks is going grow. And no matter how much you look at the market, it's just incredible how people who are great innovators in their industry can find ways to use those network assets. And so one of the things that we're working on today is how can IoT leverage all network connectivity? And you've seen a lot of the work that's going on now with things like LTEU, which is unlicensed spectrum. And the advantage to some of these

unlicensed spectrum integrations and the ability for 4G LTE to coexist with these is that depending on the use case, you're able to move data to things like Wi-Fi. But you're also able to continue to apply the same type of security protocols and device management protocols when we're looking at things like LTEU over Wi-Fi.

Abbie Lundberg: Yeah, I know security comes up a lot of in these conversations. How secure is this data? And what are the risks of exposure?

Mark: Yeah, so the industry has always looked for how do we improve security on existing systems? And that in itself, I believe, is a big task. So today what you're seeing is things like security and privacy are thought about first. So as organizations are going through their product ideation and their product development, security is being built in. An example of that would be looking at devices where they're now being shipped with managed certificate services. So we're looking at number one, how do you address the device security? And then the next step is how do we manage the network security? And we've seen a big shift over the past several years and it's almost now a requirement where we're seeing almost 100 percent is that the enterprise participants in IoT are deploying many of their devices on private networks. So mobile private networks…that whole area has become a requirement. And then back at the cloud or within the datacenter, they continue to use the best practices that they've developed over the years for security, starting first with some of their remediation capabilities, continued forensic and research in those areas to ensure that they're maintaining the right security protocols.

Abbie Lundberg: Now Mark, as we've talked about this requiring a lot of innovation, talk a little bit about what are those skills that companies need. You know, think about a company that is moving into this space whether it's in agro business or an automotive company, whatever, in health care, they're trying to leverage these capabilities themselves but maybe don't have the kinds of analytic skills in-house that they might need. How are they developing them? Where are they getting those skills?

Mark: I've gone back to the example with agriculture a couple of times. I think everyone has probably played around with developing a green thumb at home. Everyone spends time in the grocery stores, and they have an appreciation for what farmers, many of them small farmers, are having to go through to deliver things like fresh fruit and vegetables. So I think it's a really good example. But in that case, even in the face of positive ROI and a compelling total cost of ownership model, you still see reluctance to invest. And a lot of times this is generational, particularly in the agriculture industry. But if you look at what's happening today, you have Silicon Valley, which is the largest innovation center in the world, located just an hour north of Salinas Valley where 65 percent of all the fresh vegetables in the United States are grown that we consume. And we're seeing them come together to directly address how do we fill that skills gap? And

it starts with education. There's some really tremendous educational programs that are underway where they're teaching the children of migrant workers how to code software. And these children are attending things like coder dojos where they're seeing their future change dramatically and they're seeing opportunity to work in technology departments of big Ag-companies and solve some of the local problems in the Salinas and Monterey areas. And then we're seeing accelerators—one is the Thrive accelerator, which is located in Los Gatos in California, not very far away from Salinas. And it's part of a joint venture between different companies in the valley— the Western Growers Association—where they're really focused on innovation start-ups to provide funding and mentoring to help them bring technology that was specifically built for the agriculture industry. I think that's a really great example because they're saying this is an industry that could maybe be one of the oldest industries who may have been the slowest to adopt a technology. So we're not going to solve it, overnight.

Abbie Lundberg: I think that's a great example. I was speaking this morning with a CIO at Monsanto and he was talking about…this is an industry that has done things the same way pretty much for thousands of years until the last five or ten and there's been more change in the past five or ten years than there's been in thousands.

Mark: Yeah, and I'll just point on that is as companies like Monsanto have really innovated. So for example, in 1975 the average yield of corn was 75 bushels per acre. Today it's 200 bushels of corn per acre, which is using half as much water. Now, where someone like Monsanto is really interested in IoT is that if farmers continue to water the same way they've always watered, they would not only be wasting water, but they would be overwatering the crops. So there's lot of challenges that companies like Monsanto and others have on educating the farmers that don't necessarily do everything the way you used to do because the crops and the way they propagate are changing over time.

Abbie Lundberg: Absolutely. You know, Mark, we've indirectly touched on a number of things that Verizon is doing in this space. But I was wondering if you could tell us a little bit more directly…what are some of the things that you're doing around the Internet of Things?

Mark: So we're focused right now on five industries, which we believe are the leaders in deploying technology. And they're big markets. They tend to be very global in nature. You know, the first one is health care where we're working closely with a lot of the pharmaceutical companies to help them comply with a lot of the new drug security regulations where they have to track other drug shipments from the point of origin to the wholesalers to distributors and to the retailers.And so we're working quite a bit in the health care industry in that area. We're working closely with agriculture companies, deploying things like soil monitors for soil temperature, soil moisture, integrating

weather stations, integrating irrigation pumps and weather stations. The same thing in transportation. We're very focused on working closely with the large global automotive OEMs in the areas that you've mentioned. But also trying to understand the demographic trend that's really driving some of the changes in how millennials want to consume products and services. And then, of course, we're very involved in smart cities. We have a long history in that area. And we have an enormous investment in things like security and infrastructure, and we're really now working to extend that infrastructure to other parts of the municipalities. So some of the more—say untraditional devices…things like lighting and video. So those are the markets we're working in. But we're trying to bring a different view to it. So even in smart cities, when you start looking at connecting things like intelligent lighting or adaptive signaling for traffic management or looking at things like smart video for public safety, it's really not enough. And where we're investing heavily is bringing together these solutions on a common platform. And that platform is called "Thing Space." And what Thing Space does is allows you to bring all of these different solutions together in a common platform and apply our analytics engine and look at the data in a very different way. So I'll give you an example of that. If you look at managing smart lighting, it's had a very big ROI on how municipalities are looking at using energy. But what they really want to understand, in addition to reducing cost, is what's the relationship between pedestrian lighting and public safety? What's the relationship between traffic congestion and air quality? So they really want to look at what are the different relationships throughout my municipality? And how is that coming together to make my city more desirable than the city in the Pacific Northwest or in the Southwest? They want to be desirable so they attract the right individuals to those locations who will come there and maintain it as a very vibrant economy. So at the behavior level and at the sort of the larger market level, that's a lot of our focus in IoT. But we also mentioned the technology. And of course we're doing a lot of investments in our network and in low-power modules and in analytics and leveraging things like unlicensed spectrum, and then also addressing some of the usability issues around low-touch. So, when we designed our IoT platform, we designed it specifically so that it was self-service and low-touch. So that organizations can go in there and provision network assets, access the API's to integrate different types of devices or create applications in a developer environment for their specific use. There's a broad-based investment taking place in IoT.

Abbie Lundberg: Great. Now 2015 was the year for a lot of organizations; it was really about sort of proving IoT's validity. So what do you see in the year or two or three years ahead? What is your forecast for what the future will bring?

Mark: It’s about extending capabilities across the silos that we have been talking about…and really demonstrating that we can identify opportunities that improve safety, sustainability and economic development. And I think the example of that is the one that we talked about with the smart cities. Municipalities have deployed intelligent lighting.

They have deployed adaptive signaling. The focus in 2016 and beyond is bringing that together and really creating more and more value looking at lighting, parking, intersection, management and public safety more holistically to really improve the experience of the people in that municipal are experiencing. And I think it's about delivering more value when we're integrating those silos. The, the other area that we're seeing is more and more crowd sourcing types of solutions. So you know, when we talk about the consumer and the incredibly high penetration rates of things like smart phones, there's some innovation occurring there where people are saying, "How can I work with these consumers with all these smart phones and develop crowd sourcing applications?" One that we recently saw was based out of California and they've actually developed an early warning system that alerts people to any type of seismic activity in the event of an earthquake to give early warning to not just consumers, but to power companies and other organizations, so they can get maybe 10, 15, 20 minutes early warning of seismic activity that may be occurring several hundred miles away. Another area we've seen in terms of crowd sourcing for consumers has been ad hoc carpools and ride sharing programs from trusted sources in your social network. So in the case where as a parent, we're unable to potentially meet our children at the required time, how do I use my social network to actually set up carpooling in advance? So it's really about making technology work for me and making it easy to consume and creating more value.

Abbie Lundberg: Well clearly this is a very exciting area in many, many fronts. I mean it seems like there's not an industry or part of our lives that this is not going to effect. So, Mark, thank you so much for speaking with us today. It's really interesting. And for our listeners, you've been listening to the Verizon Insights podcast. Thanks for joining us today. To learn more, please visit verizonenterprise.com or find us on Twitter @VZEnterprise and on LinkedIn.

[END FILE]

Abbie Lundberg: Hello, you're listening to the Verizon Insights Podcast. The thoughts and opinions expressed in this podcast are those of the individual speaker and do not necessarily reflect the views of Verizon or any other entity mentioned in the podcast. I'm Abbie Lundberg, president of Lundberg Media and former editor in chief of CIO magazine.Today I'll be talking about the role of data and analytics in the Internet of Things, with two experts on these topics. First we've got Verizon's Chief Data Scientist, Ashok Srivastava. And joining Ashok is Evangelos Simoudis, founder and managing director of Corporate Innovation Ventures. We'll also talk about automation, how humans and machines will work together in the future, and how we might overcome some of the barriers to getting the most out of the Internet of Things. Gentlemen, welcome.

Ashok Srivastava: Thank you, it's a pleasure to be here.

Evangelos Simoudis: Thank you, Abbie, for having us.

Abbie Lundberg: Ashok, let's start with you. You lead a research and development center in Palo Alto where your team is focused on building products and services powered by big data and analytics. Could you tell us a little bit about the work that you're doing there?

Ashok Srivastava: Sure Abbie. One of the key issues that I think lot of companies are seeing in the '90s and 2000s and in this decade is that there's a preponderance of data that's coming to them from a variety of sources. In the old days it was CRM data and data from call centers and so forth. And now with sensors becoming more ubiquitous, some companies are starting to see even more data sources flowing and more massive throughput. And one of the things that Verizon is trying to do is to develop new techniques and new products and services to monetize these types of data sets. As we move forward into the coming years, we're going to see major corporations make investments in the development of new products and services that are based on data for revenue generation purposes. I'll contrast that with what we have seen in the past where people say that we'll take these data sources and use them for improving the operational significance and the operational efficiency of the corporation itself. It's something that I think is quite different from the challenge of creating new products and services that are based on data. We have satellite offices in Waltham, Massachusetts, as well as in Bangalore, India. And the whole purpose of the team is to create new products and services for revenue generation based on data.

Abbie Lundberg: You know a lot of the research I've done in this past year has looked at this question of how do we get more value from data, information…insight. Tell us a

little bit, you know, bring this to life for us. What does that look like? What might it be to actually monetize data?

Ashok Srivastava: Here's one way to think about it. A company might be gathering tremendous data sources from its own operations as well as from sensors that are out there from the CRM systems that they have and so forth. And the question is what type of product or service can be built on top of that data? Frankly, some companies say that we're going to take that data and package it and then sell it. Instead, what Verizon is doing is saying that we're going to take that data and build new products that can give people insights into the data source itself, as well as create new products that can be used by others for revenue generation purpose, not only for Verizon, but for the customer in the end. Those services then can enable another enterprise or a small business or even in some cases a consumer to gain more insight about the underlying data sources and use them for their purposes.

Abbie Lundberg: People have concerns around and are they being tracked and this whole question of what is data, who owns it. How do we protect its security and our privacy?

Ashok Srivastava: I think as people start to see the benefit of the applications that can be derived from IoT, for instance, they will be quite happy to have some portion of their data used for these purposes. I think people will always want the ability to opt-out and to say I don't want my data to be used for advertising purposes, for marketing purposes, for IoT purposes, etc. I want to keep it to myself. And I think that companies need to provide that capability to people as we have done at Verizon. Some people are just not going to say how they want their data to be used. And I think that in the best case, that data could be used from an aggregate anonymous point of view. So for an IoT application, we don't need to know that Mary Smith is walking across Main Street right now. But, it might be useful to know that 2,352 people walked across Main Street in the last hour, right? And so that's aggregate, anonymous information. But as long as we give people informed choice, give people the opportunity to opt-out, give people the opportunity to understand how the data is being used, and to really, most importantly, see the benefit of it, I think that many of these issues can be addressed.

Evangelos Simoudis: I think the automotive industry and the transportation industry more broadly provides a very good case in point. The automotive and the transportation industries are finally starting to realize that because of the complexity, volume, velocity of this data and the impact that it can have on autonomous driving, and on the overall user experience while driving, while being transported from point A to point B, it requires that it is treated strategically. And that we start thinking about collections of applications that will need to be developed to take full advantage of it. And in the process of doing

this—developing these applications we will need to be taking into account—obviously—privacy and security.

Abbie Lundberg: That seems like a really big challenge then, if you're talking about that whole, you know, complicated, complex network of ownership scenarios. How do you govern that kind of environment?

Evangelos Simoudis: It requires thinking beyond the boundaries of a single company. A very good example is the purchase of the HERE, Nokia's mapping company called HERE. It was purchased by Mercedes, Audi and BMW. They're coming together, and they're starting to utilize the data that is generated from that. Because they realize that they need that type of data in order to make autonomous cars a reality. You see cities like Helsinki creating next-generation—I will call them—transportation plans for the downtown areas. In order for such plans to scale and become real in larger metropolitan areas, they will require the collaboration of many different entities, including the auto makers and the part suppliers.

Abbie Lundberg: Evangelos, I wanted to ask you as a venture capitalist … you invest in early-stage companies working in this area of big data. You also advise large companies who are trying to understand how to get value in contexts… about innovation and what their big data strategies might be…

Evangelos Simoudis: Over the past couple of years I have been trying to develop a playbook for corporations to use to achieve their innovation goals. This playbook takes advantage of innovations generated by start-ups and approaches used by start-ups and their investors. I have been advising a number of large corporations that are coming to the realization that start-ups have a lot to offer to them, and Verizon is one of these. I've actually been very fortunate to be able to work with Ashok since the inception of Verizon's center that he leads. And with a number of other of Verizon's leadership on this topic of innovation and how data can be used to drive innovation and drive monetization. We're in the midst of a major technology revolution. As Carlota Perez points out, there have only been five other technology revolutions of this magnitude and impact. Many industries such as retail, telco, media, automotive, are being disrupted. And the disruption in many instances is led by start-ups. Corporations in these industries are starting to feel existential threats. As a result, companies have to adjust their corporate strategies to deal with these technology shifts that are happening and Perez talks about. So for decades, corporations have set up R&D labs outside of corporate headquarters and again, Verizon is one such example. There are many others—IBM, Xerox. Today though, large companies are putting innovation outposts into innovation clusters such as Silicone Valley, in order to tap into the cluster's innovation ecosystems. So the first objective of an innovation outpost is to sense. This means to look for or monitor the development of potential innovations that can become

threats to the corporation, or enable the corporation to disrupt itself through the use of technology. The second objective of a corporate innovation outpost is to respond—to respond, to identify threats and potential opportunities.

Abbie Lundberg: I just wanted to let listeners know that there is a series of four blog posts that Evangelos has written on this topic. And for more detail you can check it out at Corporate-Innovation.co. So let's shift a little bit to talking about the Internet of Things. This is a topic that's been very hot this past year. There's a lot of talk about it, and I don't know if the, you know, adoption and what's happening has kept up with some of that excitement. So, Ashok, what kinds of breakthroughs do you see your research fueling in the IoT or Internet of Things space?

Ashok Srivastava: The IoT space is really ripe for new developments and new product lines. One of the areas that I think our research is going to enable is the automatic understanding of massive data streams.. These data streams might have millions or even billions of connections associated with them. As that data streams, we're creating capabilities for the future. Those capabilities include the ability to detect anomalies automatically, to diagnose the source of those anomalies, to make predictions about the nature of those anomalies, if those are in fact operationally significant or not. And then finally, even the ability to take automatic mitigative action against potential issues that might be coming up on the network. Before coming to Verizon I was at NASA. And at NASA, we used this cascade of technologies for anomaly detection, diagnostics, prognostics and mitigation to monitor the health and the system health of very complex systems like commercial aircraft, like spacecraft, like the space shuttle and so forth. We're taking those concepts and translating them into the IoT space and now starting to look and develop new products and technologies that can ingest data, and then give users, number one, an understanding and insight into what is happening on the sensed systems. But I think even more interestingly than that, we're giving machines the opportunity to take that data and make decisions within the confines of the human envelopes that are set up.

Abbie Lundberg: First of all, describe for us what large-scale distributed machine learning is. How does that actually work? And when we talk about machine learning, what specifically do you mean?

Ashok Srivastava: So machine learning is a fascinating subject which really deals with the issue of creating computer algorithms or computer programs that can learn from data. To get a machine to take data and understand the data automatically and take action on that data automatically is quite difficult. Machine learning is the field of computer science that really focuses on giving machines the ability to learn and adapt from data sources as they come in. So now let's imagine that you've got a data source, a really simple one, let's say that you're measuring the temperature and pressure in a

room. As that data comes onto the machine learning system, it might start to build an internal model of what's typically observed as far as the temperature and pressure in the room. You might say that the temperature is usually between 60 and 80 degrees. Now that internal model is something that it can understand and utilize so that if a new data stream comes in and that's one let's say at 90 or 95 degrees, it would be easy for it to see that that's an anomaly or something different than it has seen before. This is a very simple example of machine learning.

Abbie Lundberg: And when we talk about the Internet of Things, oftentimes we're talking about many things, not just one. How does that machine learning happen in that much more distributed environment?

shok Srivastava: We find that a lot of times people want to bring the data and centralize it into a single system and analyze that data. And what happens in IoT applications in particular, is that the amount of data that's coming in, the sheer throughput is such, that by the time it arrives on your system it might be too late to actually analyze and take action. And so we're creating the ability to push those analytics and push the machine learning to the edge of the network. And what that means is that we're creating distributed computing capabilities so that the data can reside, let's say on the sensor or on the sensed platform. Analysis is done locally. And then some messages are transmitted to a central server or between different elements of the sensed network. What this allows for is a significant reduction in communication costs. But then on top of that, a significant enhancement in the overall ability of the system to perform, let's say, diagnostics or anomaly detection or prognostics.

Abbie Lundberg: I see a lot of executives really struggling with the fact that you know, they have all this data, they have all this information, and they still struggle with being able to make practical use of it. How do you see this combination of the Internet of Things and big data analytics helping in this regard?

Evangelos Simoudis: So Abbie, I've been in business intelligence pretty much since the inception of the field. And I would say after all these years around business intelligence, data warehousing, analytics, extracting actionable insights from big data remains difficult. Some of the reasons for this difficulty are technological. But as you heard from Ashok, we are generally able to address them, and address them very successfully. However, many of the issues are organizational, and they result from data remaining hostage because of organizational boundaries and not being integrated into collections that can lead to insights. I think one way out of this problem is to provide what I've been calling "insight as a service." So you have corporations like Verizon that have the ability through their reach and their technological prowess to integrate data from a variety of sources, analyze it and provide these insights. Now, we have made

great strides at creating data scientists. However, the demand still outstrips supply. In addition, while in some degrees like high-tech and financial services, and telco, we are in better shape.

Ashok Srivastava: I also think that because there's such a tremendous shift occurring in the technological landscape, people are not used to thinking about the new applications and the new business problems that can be solved by these types of technologies. It takes time to conceive of and to understand how data, machine learning, analytics and insights can be brought together to solve new and challenging problems. So let's say that you have a city that has been outfitted with sensors. So you have parking meters that are sensed. You have lights that are sensed, so you know when the lights are on or off. You know the traffic flow through the city. You also know the time of when the stores open and close. Normally what people would do is say, "Okay, I'm going to now build an application to monitor the lights and make sure that they're on." And somebody else will say, "I'm going to build a traffic-oriented application so that I understand how the traffic is flowing." But the real benefit of an IoT solution comes when you integrate the information from disparate sources. So usually people don't think about how traffic and lights and temperature and these other areas can be brought together in order to develop a more holistic picture of what's really happening in the city. For instance, you might find that when the weather is in a certain condition, that the traffic flow is actually hindered in certain places. And because of that, it's leading to issues as far as store hours and store availability in other parts of the city. But to derive that insight from the data and to use that insight to make sure that that's a true insight and not just a spurious anomaly, that takes a bit of expertise. But we now have the opportunity to get a much better insight into what's happening on complex systems than we've ever had before.

Abbie Lundberg: You know, how can people overcome that limitation? What's it going to take to get to that more holistic view?

Ashok Srivastava: I think that as a society, we're now being given the opportunity to think about the things and understand things at a level that we've not seen before. So this is going to be an evolutionary process where people start to think. They try new ideas. And as a society we're going to move forward and start to see new and more complex applications coming out. This is really the notion of agile development, instead of being applied to computer programming, being applied to a much larger context where we're trying to understand very large, very complex systems and gain insight about those systems and make actionable decisions based on the data that we're getting.

Abbie Lundberg: I was thinking that it really requires having a lot of different stakeholders across a large complex space. Is that something that you see happening

yet or are companies and organizations and entities aware that this is something that needs to change?

Ashok Srivastava: I think it's happening. What we see is that start-ups come. They try things. They fail. Larger companies might acquire them and they might try some things. They might fail, and so forth. And so as this ecosystem starts to develop and evolve, I think we're going to see really tremendous new applications in the IoT that come out that will have tremendous societal benefit. So, it's agile in the sense that we don't have a plan today. We don't have a five-year plan saying five years from now we will accomplish A, B and C. Instead, we're developing new technologies. We're going to try things, see how they work. And as we put them together, we're going to create a new ecosystem of companies, of technology and of people that can think and act in a way that's consistent with the purpose of the IoT space.

Abbie Lundberg: Where are big companies today in terms of understanding this is what it's going to take and starting to develop those new frameworks?

Evangelos Simoudis: I would say the automotive industry, an industry where I've been doing quite a bit of work during the last year…we have come to appreciate that, or starting to appreciate is a better way of saying it, that things need to change and you see that particularly in areas such as autonomous cars. Navigation, decision making while, you know, the car is on the road has to happen on the edge. And it's very complex because of all the streams of data that need to be collected, integrated and analyzed in order to make very simple decisions such as turning left or avoiding a pedestrian. Ashok has also mentioned agriculture. We're seeing particularly in certain geographies where we have large farms and you're trying to increase yield in the presence of significant climate change, whether it is Asia, whether it is Latin America—here in the U.S. and North America in general. Again, there is a forcing function that is causing corporations to think about how to utilize this type of technology. And also, I think in the urban sector—mega cities like New York, London, Shanghai—will have to realize that they have to become smart through IoT very, very quickly.

Abbie Lundberg: So I'm wondering, do you have any specific examples of companies that are taking a more strategic approach to rolling out the Internet of Things versus just looking at these as, you know, one-off projects?

Ashok Srivastava: So Verizon is working with a winery in the Salinas Valley of California. They have many thousands of acres of grapes that are grown for different wines. And they're very interested in understanding how to improve the performance of their crops. We went down there a couple of weeks ago to look at the IoT sensors that

they've deployed. Those, including sensors for weather measurements, soil moisture sensors and other types of sensors. We even flew a UAV over the crops, in order to get additional information, additional data. We have the opportunity to bring in satellite data that has radiants, optical radiants, and spectral radiants from the vineyard itself so that we can understand the solar radiation and other things. Bringing all of this data together is a daunting task because it's measured in different ways. Some of it is at a very high scale, some of it is at a very low scale from a physical measurement standpoint. Bringing all of this together, though, we have the opportunity to create a new product and a new service in which they can get better understanding of how their crops are performing, what they can do, what specific actions they can do—let's say in terms of watering or in terms of fertilization or in terms of cover—that they can take in order to improve their crops. This is starting right now and we anticipate over the next couple of months to be taking more data and to help them make better decisions on their winery.

Abbie Lundberg: And what strikes me about that particular example is that the benefits are so multifaceted, that it's improving the quality of their crops; it's decreasing costs because maybe they don't have to use as much fertilizer as they might have in the past. And it's making better use of scarce resources, particularly with the drought going on now.

Ashok Srivastava: Every time we've done this, if you look over history, every time we get a better understanding of a system, we tend to have better insights and those insights lead to better results. Better results for the environment, better results for the communities that operate in those areas, and also better results from an economic perspective.

Abbie Lundberg: One of the things that we touched on earlier was the fact that being able to take advantage of the Internet of Things really requires a lot of automation and that's been a topic that's brought some concerns for people recently. This idea that you know, machines are going to be able to do things that perhaps people did in the past.

Ashok Srivastava: I think that humans for the foreseeable future are going to be a key component of a system in which humans and machines are interacting. It's been happening for many, many years in the cockpits of commercial aircraft. So the fact is that there are two pilots in the front of the commercial aircraft. And those people are in command and control of that aircraft. But also, there's a tremendous amount of automation up there that helps that airplane stay in stable flight over long distances. It can help them land the aircraft, help them take off and help them navigate difficult storms. We know that it's safe. We know that it can be done. The idea of taking that capability and translating it into new areas is very exciting. And if you think about the problem of flying an airplane across the Atlantic Ocean, if you have a pilot in constant command of that aircraft, and he or she also has the assistance of automation, it makes

the overall system safer, more reliable and more affordable, right? And in the same way, if we take an IoT application, let's take one for instance, in the agriculture sector. If we have an IoT application there, people will be there, they will be in charge of that system, but they might get more insight and more information that can help them make better decisions on how to raise that crop so that it has the best performance, the least environmental impact and the most economic value.

Abbie Lundberg: What advice do you have for businesses that are looking at this as an opportunity? How can they best capitalize on this? What advice would you give?

Evangelos Simoudis: IoT is here to stay. I mean…we've been working at the edges of it for several years, but now between the advances in sensors and the advances in big data infrastructures, it is more real than ever before. So corporations need to start. Realize that in many of the problems that they're trying to address are very industry-specific. They need to identify and rank these problems by their strategic importance. And my advice would be to also start addressing problems that have not been addressed before, and can be addressed now through modern infrastructure as opposed to trying to retrofit certain, you know, machinery or other infrastructure before you can start gathering data.

Abbie Lundberg: What predictions can you confidently make about the future of data, analytics, automation—the Internet of Things? Where do you see things going?

Ashok Srivastava: I foresee a future in which the IoT, just like the internet, and just like big data, is going to allow people to express their creativity at scale. And what I mean by that is that we will see businesses such as the agriculture business or medicine or the transportation sector…I envision that these are going to be transformed in ways that today we can't even foresee because of the combination of new data sources, massive computing, machine learning and also ingenuity on the part of human beings. I think that humans will always be at the forefront because they are the ones who are going to come up with the creative solutions and will be deploying those at scale through the IoT and through big data and other technologies.

Abbie Lundberg: And with that prediction, I want to just recap on one of the things that you both talked about during this conversation which was that need for agility. You know, the ability to adjust as we go along because it is so emergent, and it is so, you know, there's so much innovation happening that ability to stay agile and to adapt and sense and respond is really, really vital. I want to thank you both so much for this conversation. It's been fascinating for me and I hope you enjoyed it as well.

Ashok Srivastava: Thank you.

Evangelos Simoudis: Thank you, Abbie.

Abbie Lundberg: And to our listeners, thanks for joining us today. To learn more visit us at VerizonEnterprise.com or find us on twitter @VZEnterprise or on Linkedin.

[END FILE]

Abbie Lundberg: Hello. You're listening to the Verizon Insights Podcast. I'm Abbie Lundberg, president of Lundberg Media and former editor in chief of CIO Magazine. Today, I'll be talking with Ohad Zeira, director of consumer IoT solutions at Verizon about the impact of the Internet of Things on consumers today and in the future. We'll discuss some of the business opportunities for the Internet of Things along with what will accelerate adoption and what might slow it down. Welcome, Ohad.

Ohad Zeira: Hello, Abbie. It's great to be here.

Abbie Lundberg: So, 2015 was in some ways the year of legitimizing the IoT concept. So, business leaders began to understand its potential and started really building it into their future strategies and business models. What do you see ahead for 2016, especially in the consumer space?

Ohad Zeira: When I look back at 2015, I think some of that legitimacy comes from a broadening of IoT strategies and of the awareness of IoT from what was originally gadget and technology companies to the broader economy. I think one major trend of 2016 is ongoing experimentation at retail. We see retailers investing in how to tell these new experiential stories.

Abbie Lundberg: So give us an example of that. What would that story tell us?

Ohad Zeira: So these are partners coming together to tell a service story that's bigger than the sum of the technology. I think some great examples out of last year were a company called Canary, which makes an all-in-one do-it-yourself monitoring solution partnering up with State Farms, the insurer, in order to make the technology more affordable and reduce risk for the insurer. In the energy sector, we see companies, brands such as Nest partnering up with utilities. Notable one is So Cal Edison. And again, this is the ability to reduce some of those cost barriers, but also tell new stories about this is how technology allows you to be both more comfortable and more cost and energy efficient. We saw recently in automotive, just last week at CES, Ford Motor Company announcing integration—future integration—with Amazon Echo, which is Amazon voice controlled technology. And so these are broadening stories that allow the technologies to expand beyond the immediate gadget and use case in the home into the services that we use in an everyday basis.

Abbie Lundberg: That's really interesting. So coming at it really from a consumer experience perspective versus what the product or particular capability is from any one provider.

Ohad Zeira: I think it's a smart strategy. It allows us to tie to existing cost that consumers have, which of course is compelling. Now, on the experiential side, and within retail, there's also innovation storytelling. And I think what it took the market a little bit to understand is that these technologies are very personal. They're very personal because they come often into our home or are worn on our bodies. And that's a very different level of interaction. And so, users really need to experience what the control mechanism is. And that's really part of the education that we need in order to get to broader adoption.

Abbie Lundberg: Before we talk more about that particular issue, which I find just fascinating, are there particular verticals within the consumer space that you see as being particularly poised to take off in the next year or two ahead?

Ohad Zeira: You know, that's the amazing part about this sector is that we see dramatic amounts of activity, innovation and energy going into all sectors at this point. Wearables, which was ahead of the curve with fitness trackers, got an absolutely amazing boost in awareness and adoption as the more traditional players came out with connected watch solutions over the last year. And we'll continue to see a tremendous amount of innovation there, especially as the watch becomes more and more untethered from the phone itself. There's lots of activity in connected cars. Verizon's very involved in this market. But when we look at major trends influencing the connected cars, from usage base to insurance, that's kind of a service tie-in, the sharing economy and moving from ownership into a much more on-demand model. And more recently, the tremendous amount of attention on autonomous or semi-autonomous vehicles. And those are all going to drive really meaningful change and innovation in the connected car category. And then in the connected home, which is probably my biggest area of focus today, it's interesting. It's probably the most fragmented and difficult to describe. We talk about adoption potentially being low. We also must remember that twenty percent of American households have a security system. And that is a form of a connected home—just one that we're more comfortable with and may use more traditional technologies. And when we look far enough out, if we push that five-plus years, to me, it's very difficult to imagine modern households that won't have these kinds of affordances and conveniences. Then you look across all of these, and you have major points of interaction that are really gaining momentum. I think voice is probably one of the major 2016 themes. The Amazon Echo has really captured people's imaginations, but there's lots of companies and services that are really innovating in this space allowing us as users to engage with our technology on our terms as opposed to . . . through a syntax or a type of input that was dictated by that technology.

Abbie Lundberg: So do you think that's something that's been really holding the technology back?

Ohad Zeira: Let's take the context of a home. When I think about the user experience within my home, I often think about a kitchen scene. I'm there. My wife is there. My daughter is there. And it's often a fun, hectic, sometimes messy environment. And there's very little cases in which taking out my phone and engaging three or four menus deep inside an application fits within that user experience. And so in that specific use case, doing something in a hand's free manner, doing something in a way that fits with whatever it is that I'm doing inside that room, removes a lot of barriers. And at the end of the day, this technology needs to enable new experiences, delight and do all these things without taxing us on a day-to-day or even moment-by-moment basis.

Abbie Lundberg: That sounds to me, from a technology perspective, like a pretty big challenge. So, I wanted to loop back on something that you mentioned. You talked about the link between the sharing economy and the Internet of Things. What is that link?

Ohad Zeira: Yeah, the sharing economy is one in which we see assets really not being fixed, right? They're moving around. They're on demand. The companies that are creating sharing businesses need a way to understand where their assets are, where their customers are. Where is the best way to link those assets to those customers? As well as all the other operational details of how are my assets doing? What do I need to do to them? And that's a really big network problem, where we're connecting people. We're connecting devices. And those could be cars. But, you know, those could be apartments, toaster ovens. Those are all things. I think it's really a nice analogy for the Internet of Things and the kind of use cases that are really enabled.

Abbie Lundberg: Right. So, it's not just the Internet of Things. It's the Internet of Things and people. When we think about this from a supplier perspective, not necessarily the technology companies, but from companies in those industries we've talked about: automotive, retail, insurance. These are different business models and different strategies. And clearly some companies get it more than others.

Ohad Zeira: The companies that are doing it right really understand the formula of benefits versus cost. And then, really break down that cost into not just the hard dollars that consumers have to part with, but the soft cost. The soft cost being anything from the ability to set up, the ability to live with it and how it fits into their day-to-day lives.

And so, when companies are able to go out together and describe the benefits in their own unique way. I think a really good example here is what a start-up from Silicon Valley called August Locks did within Airbnb. And so now, Airbnb hosts are able to introduce this smart lock technology into their homes. And there's a very specific use case and benefit that's financially meaningful to an Airbnb host. But also, really nice for the person that's renting that.

It's a real multifaceted, multiparty story that reaches a much broader audience. And then there's also a lot of innovation when we talk about the soft cost and what does that mean. So, if we talk about these devices, solutions . . . experiences. And we're talking in the context of the Internet of Things, it means that how a device or a service gets used, the way in which people engage with it, the path that they take from their first moment of interest through a purchase consideration. Through closing of that. Bringing it home. Beginning to use it. Which use cases they go they enable. Am I taking full advantage of the capabilities of this new service?

What services am I linking it to? All of those are really interesting metrics and behaviors that imply what kind of relationship I'll have with this customer in the long run. If I say that another way, the Internet of Things allows what previously were ad hoc usages, purchases, experiences and make it into an ongoing relationship, it really has the potential to make any device a service.

Abbie Lundberg: There's sort of a user anthropology kind of feature to this here in terms of being able to place the right bets. And be able to go forward with innovations that matter.

Ohad Zeira: I like the user anthropology example because it fits into another one that I neglected to mention, which is some companies are just much better at making it fun. And I know that sounds maybe a bit trite, but a lot of the use cases that we describe when we get into IoT are very functional. And, yeah, it's nice to have fun. It's nice to get a little joy out of it. I mean, I think a great example of this was the work that Phillip Hue has done with the SyFy Channel. It's another example of partnership, but it's one where the Phillips Hue, which is a connected color light bulb, light board—lighting system, I should say is synced up to the content delivered by the SyFy Channel. And I think the infamous Sharknado series was the first one that they went off on this.

But what they did was artistically create a lighting script that matched what was going on in the movie, creating a much more immersive experience. Now, sure, those Phillips' users are still getting the functional benefits of that lighting, the energy saving, the ability to control, and all that. But it's those little moments of joy that I think are going to be important as this industry matures.

Abbie Lundberg: That's very cool. As this gets developed, are companies having to organize in new ways for IoT?

Ohad Zeira: I think it depends on the type of organization. I have heard analogies that compare how companies are organizing today to how companies organized at the beginning of the original internet boom. If you recall then, you know, late '90s, you did have a lead for ecommerce or internet and internet services. That was sitting often at a C-level or directly below. And that was seeding the organization with thoughts, thought leadership, best practices about how to implement these kinds of new-to-the-world and certainly new-to-the-organization type of functions. And I think we see that happening today. There's often somebody who could be the IoT czar or expert within an organization. But just like in the original internet case, that quickly diffused into every part of doing business. And now, when we look at a modern organization, there really aren't very many functions that don't have an intimate relationship with the internet. I think the same will be true for the Internet of Things.

Abbie Lundberg: You talked about wearables and what's changing in that space. And, I loved your point about, you know, *make it fun*. So are consumers kind of coming at this more from a what can entertain me perspective versus a more practical, how can I do things more efficiently perspective?

Ohad Zeira: It's a great question, right? It's one that a lot of us are battling with. What really gets attention? Versus things that you discover later. I think the fun is maybe the thing that you discover later, but that might be the biggest driver of adoption in the end as people tell everybody else, "Look what I can do," right? In the onset—or I'd say maybe the reinvention of this category—five, six years ago, the ability to take a phone and turn on a lamp without physically touching it was a wow moment and was a lot of fun. Now, that wore off, right?

What we see over this last year . . . we talked a little about voice and how that's coming in. And there's some amazingly functional and great use cases around hands-free control, getting weather, traffic, that kind of data information. But when I ask people about, you know, why they really like the device or the experience, a lot of them talk about, "Well, it's great when my kids ask for jokes. And, you know, they're corny, but we all laugh."

And that's fun. And certainly nobody's going to buy it for that, but it makes it sticky. And I think that’s the kind of feature that really drives net promoter score—really drives word of mouth. And at the end of the day is going to do a lot more for adoption.

Abbie Lundberg: And so are there particular applications that are really starting to take off? Is it in the wearable space? Is it in the connected home space?

Ohad Zeira: So, certainly the smart watches are doing extremely well. Interesting: I saw some stats that showed the number-one use of a smart watch is telling the time, which makes sense, and yet, is surprising at the same time. Within the connected home, I really see a lot of attention right now. And I think this is interesting, because it's a combo of products that really started breaking through. The door lock itself has been one of the hero categories for the connected home. But there's been concerns about really giving that control over—moving away from that really analog safety of the key into something else. And I really see the combination of that smart lock with an emerging category, which is your connected video doorbell that allows you to see who's coming and going. And the combination of those two together, the awareness of who's coming and going as well as the control of the lock . . . that seems to be a pretty powerful story that's resonating with consumers.

Abbie Lundberg: So, again, it's sort of the value of one becomes much greater when it's combined with something else.

Ohad Zeira: Yeah, that's exactly right. And there's actually a really interesting study that talked about this. And it's a real chicken-and-egg problem for the industry, because we talked previously about needing to be very specific in that benefit use case in order to understand and communicate what these new technologies can do for users. At the same time, what the study showed is a more-than linear increase in net promoter score or really a great measure of satisfaction of the users of a suite of products and services—so a more-than linear increase in satisfaction based on the number of unique experiences in the home. So that means there's really only so much happiness you can get out of having only one experience. And a bit more out of that second experience. And really the ceiling rises very high once you get into that fifth, sixth, seventh experience. But that's a lot of new devices, new services, new behaviors to ask a consumer to do at one time. And that's the real chicken/egg of this market and adoption.

Abbie Lundberg: Right. So, it's really those early adopter super users who are helping to create those stories. So describe one of those people for us. You know, what are they doing in their home? What does their day look like in their home?

Ohad Zeira: Well, if we talk about an early adopter, they're certainly experimenting. I think the major area where this technology hits their life the first is the thermostat. That's a really nice, easy, central point, and it's a nice trade off of comfort versus dollars. So, that's a really meaningful tradeoff that technology can help solve by making a less of a zero-sum game with use cases such as, well, really, “Don't heat it when I'm not there.”

But make it very comfortable for me when I am in the home. Lighting is a second major category. That's driven by light bulb, light switches and plug-in modules, in terms of hardware delivery. And lighting, I think, is unique because it is functional and emotional. Certainly, we need lighting in order to see . . . in order to do things. But when you start talking about color and color temperature, that really has a big impact on mood and our perception in the environment. So, that has a really nice emotional, rich vein to it that I think some companies are exploiting very well. Security is the reason we moved into caves in the first place. So, it becomes a very fundamental part of who we are as humans in our home. I would include the traditional security as just earlier iterations on some of these IoT systems. And we've seen a lot of innovation. I think a lot of these early adopters would have do-it-yourself type security sensors, whether that's a connected smoke detector that lets you know something going on when you're out of the home. A camera that can be used both for peace of mind . . . of what is going on, but also of checking in of, "Is my dog doing okay?" . . . "Can I look in on the family when I'm away from home?"

Abbie Lundberg: As you go through that list of all the different possible things that can be more intelligent and connected in our homes, what started coming across for me was a picture of the house—the home—taking care of us.

Ohad Zeira: Yeah, I think that's a really nice way to say it. And, the only way for the home to really take care of you is for it to act as a home—more as a system. And that's the interaction that has to exist between these services to make it fluid and seamless.

Abbie Lundberg: What are consumers most concerned about when they think about the Internet of Things?

Ohad Zeira: The Internet of Things Consortium did a study with IDC last year. And it showed that the top concern related to the smart home was data privacy. And frankly that's not what I would've guessed would've been at the top, but that's what it was. And when you drill down on that data privacy, even more interestingly, not knowing who has access to the data was a much bigger concern than hacking or some of the mainstay security concerns. We know there's been tradeoffs of data privacy and functionality in the internet for years. But I think this really points to a different feeling that we have about our home. Again, the home is our cave. It's the place where we can really be ourselves. And so the perceived threat of that sanctity being broadcast out elsewhere is meaningful. I'd say the same thing applies to maybe a different degree in wearables as to what I'm doing physically . . . to the connected car. Where I'm going. Where I'm visiting. I mean . . . these are all very personal data points.

Abbie Lundberg: That's interesting, because consumers have been, to date, pretty liberal with not being too concerned about their data privacy when it comes to internet-based services. It sounds like that consumers are perceiving wearables and their home as being a much more personal things than things they may reveal about their shopping behavior or preferences that they're putting out there through social media.

Ohad Zeira: Yeah . . . one could argue that we made some of those tradeoffs. We really didn't understand the concept of what that really means to share those pieces of data. I think that world is slowly changing. When we look to Europe, we see some signals of users, companies and regulatory starting to look in that light in a different way. And yeah, now we're in the cusp of a new set of services, new things that need to be adopted. I think users are much more aware of that tradeoff today. And so, we really need to be transparent. We really need to be clear about what is the value that we're providing? How are we using that data? And, really, not overreaching.

Abbie Lundberg: It sounds like there's sort of two sets of concerns. The main one being about data privacy. But also, when you talked about the connected locks on homes, there's also some concern about giving up control. And, I would imagine that sort of blends down into also concerns about hacking for things like the home or connected cars. Are there other things that companies are doing to reassure consumers or to put in those safeguards? What are companies working on today, both in terms of the safeguards they're putting in place, but also how they're communicating that to their consumers?

Ohad Zeira: Yeah. So I see companies in the space putting a tremendous amount of energy and effort into securing their devices and services. I don't know that that was always true in some of the Gen One offerings—and some of those Gen One offerings, ones that got exploited and made the news in a significant way. And so consumers react to that. And it's a great story. And it's really, really scary to, you know, I think the famous one is the camera, the baby monitor camera that was accessed from the outside. And so, companies are really aware that this is fundamental to the survival and the ability for their brand to thrive. They're taking it really, really seriously. So, what companies are doing are building security into the process from step one. They're using external services and submitting their code to penetration testing.

Abbie Lundberg: You mentioned before about the importance of voice. And you put that in the context of life at home, which is a great place to talk about this, I think. You know, because our lives are very multidimensional, you know? We're shopping. We're cooking. We're driving. We're working out. We don't want to have to have separate devices or interfaces and have to learn how to operate different services to engage in all

those different activities. Because we do them . . . they all overlap. So, what do you see as the model going forward?

Ohad Zeira: It will continue to have to be multifaceted and dynamic. There really isn't a one size fits all that's going to satisfy us. Starting even just the app. If we forget some of the other types of interfaces, within the app, there's pros and cons for consolidation versus distribution. If you think about a consolidated app, it has a lot of things on it. And, that was what some of the Gen One systems did in the space. So, yeah, I can do absolutely everything from one interface. But that implies either a significant amount of drill-down hunting and pecking through menus to figure out what it is I want to do or an overwhelming choice of buttons and levers and dials and dashboards that I have to work through in order to figure out what it is that I want to do. And I think there's a good analogy in here when you look at the Smartphone OSs. I mean, pretty easy to have built a macro app that would've included mail and calendar and calculator, and all of those things that live separately on that phone today. And yet, knowing exactly where to go and being able to engage in the activity you want to engage in is really significant. And makes the user a lot more effective and productive. Now, it's very different to talk about the interface and the fact that it's all in one place or it's in different places and the logic, right? The logic, the interop, that's really where the interaction needs to happen. So, even if I have one, three or seven ways to interact with these experiences, I want the rules that I set, the things that they know about me and about my home to be shared back and forth so that one experience doesn't conflict with the other ones. Then you can go above it and say, "Okay. Voice control." And we talked about voice control being an exciting new, natural interface for the connected home and connected devices in general. And it's great. Although it doesn't eliminate this, because there are times where engaging with my phone is the best thing for me. There are times where talking to a device may be the best interface. There are other times when it's loud. When there's folks around. When I don't want anybody to hear what I'm saying. That it's not. And there's times when gesture and gesture control may be the most logical. So, all of those will live side by side for some time. Again every piece of the system or every single device and service understands what's going on around it the better. And I think that starts painting the path forward into the future where a lot of us are aiming, which is actually getting to much more of a zero UI world . . . which is where the systems, the services, really anticipate our needs and really start taking the user out of the direct equation telling devices what to do.

Abbie Lundberg: I like the analogy of the mobile phone just because we all want to choose the particular service that appeals most to us. How do we provide choice in terms of the way we engage and the services that we use, but keep them simple so that there's not a big learning curve for every single thing?

Ohad Zeira: New experiences are often not simple. We often design them for ourselves—engineers designing for engineers. And we really need to move away from that.

Abbie Lundberg: Are there other challenges that you see going forward from the provider side? What has to change for us to get to that place where that's all working well together?

Ohad Zeira: In order for the industry to make this happen, we have to really lower our drawbridges. That's a terrible analogy, but a lot of providers, a lot of vendors in this space have have built moats, I would say, around their users and their experiences. I think what we saw over the first few years of this market developing is a massive land grab,driven by the user experience to try to claim as much of an emerging space as possible. If we go back to thinking about trends, what we'll see in 2016 is a very healthy understanding from companies about what is their right to play in this world. What is the unique value that they can bring to a connected world? And once a company starts operating in that kind of capacity with understanding, where are their strengths, where are their weaknesses, what they can offer is, collaboration can be a lot deeper because the bridges that we create can be a lot more meaningful.

Abbie Lundberg: That's also a kind of a cultural challenge for a lot of companies as well, because that land grab thing is sort of a first impulse from a traditional point of view. So this is a very new world that we're in.

Ohad Zeira: Yeah, and it's very natural to make that land grab. And some islands end up bigger than others. But at the end of the day, as long as they remain islands, it's difficult to see this kind of interconnected world really succeeding. And we're not just talking about what happens inside the home. We're really talking about all of the sectors of IoT.

Now, that also brings up another interesting topic . . . what is the conversation with the consumer? What does engagement mean? The concept of an automated world really changes how you measure that level of engagement. I'll give you an example. I'd previously designed and launched a connected light switch. And at some point in time, we honed on the top use case for that light switch. And that use case was for the front porch. And it's an interesting use case, because the front porch, front porch light and the switch that controls it is one that, at least in my household, you often forget to turn on at night when somebody might be visiting and when you want that light on the front door. And then, the contrary, you often forget to turn it back off. And so, it's running through the day. And so, that's really inefficient and doesn't really give you the benefits that you want from it. And so, we created a rule set that allowed users to automatically turn on

that light at sunset. And then turn it off either at sunrise or some pre-programmed time that was preferable to them. And a really interesting thing happens when you do that. One is we stopped selling light switches. I mean, fundamentally, we were still moving boxes of connected light switches, but really what we were selling was the perfect front porch light experience. Another thing that happened is engagement really dramatically dropped, because there was no real reason to ever touch physically the light switch or even engage with the software that allowed you to program or control it once that experience was set up. And yet, that light turned on every night exactly at sunset and turned off exactly when the user programmed it to. And so, there's a real fundamental benefit that the consumer's getting. They were taking full advantage—I guess I would say—of the functionality that was provided, which made us think there really has to be a different way to start measuring engagement. It's not about the number of times I look at something or touch something. It really is about how much of the capabilities am I getting out of that system?

Abbie Lundberg: That's fascinating. I would guess that's going to differ from thing to thing—what meaningful engagement is will vary.

Ohad Zeira: It goes back to what we were discussing, which is . . . it really depends on what the company's really good at and how they understand that consumer. It's one of the reasons I'm so excited about what innovation is yet to come in this space. And it's not technology innovation. It's really service delivery innovation.

Abbie Lundberg: So, Ohad, if 2015 was the year of proving IoT's validity and proving out some of these concepts and letting companies sort of understand that this was in their future, what do you see 2016 being the year of?

Ohad Zeira: Yeah, so 2016 will be the year of partner-driven ecosystems. Let me break that down. I think we're starting to see as companies realize their place in the world, and what they can meaningfully offer and start to find like-minded companies that don't directly overlap with that vision, we're going to see stronger and stronger relationships. And we talked about a few of the partnerships that have kind of signaled the world to come in 2015. I see that trend continuing in 2016 to the point where we start having a mass of companies that have come together, which is going to allow them to tell much more meaningful stories in a multifaceted way and really drive consumer adoption. I think we'll see the continued evolution of voice, gesture, and other natural user interfaces become much more pervasive to a mainstream market. And that'll reduce some of the usage frictions . . . add some delight. I think the combination of both of those trends will be very meaningful.

Abbie Lundberg: Ohad, thank you so much for sharing your insights with us. This is a really exciting time. And, and I really look forward to seeing how things evolve in the years ahead. To our listeners, thanks for joining us today. To learn more, visit us at verizonenterprise.com or find us on Twitter at VZEnterprise and on LinkedIn.

[END FILE]