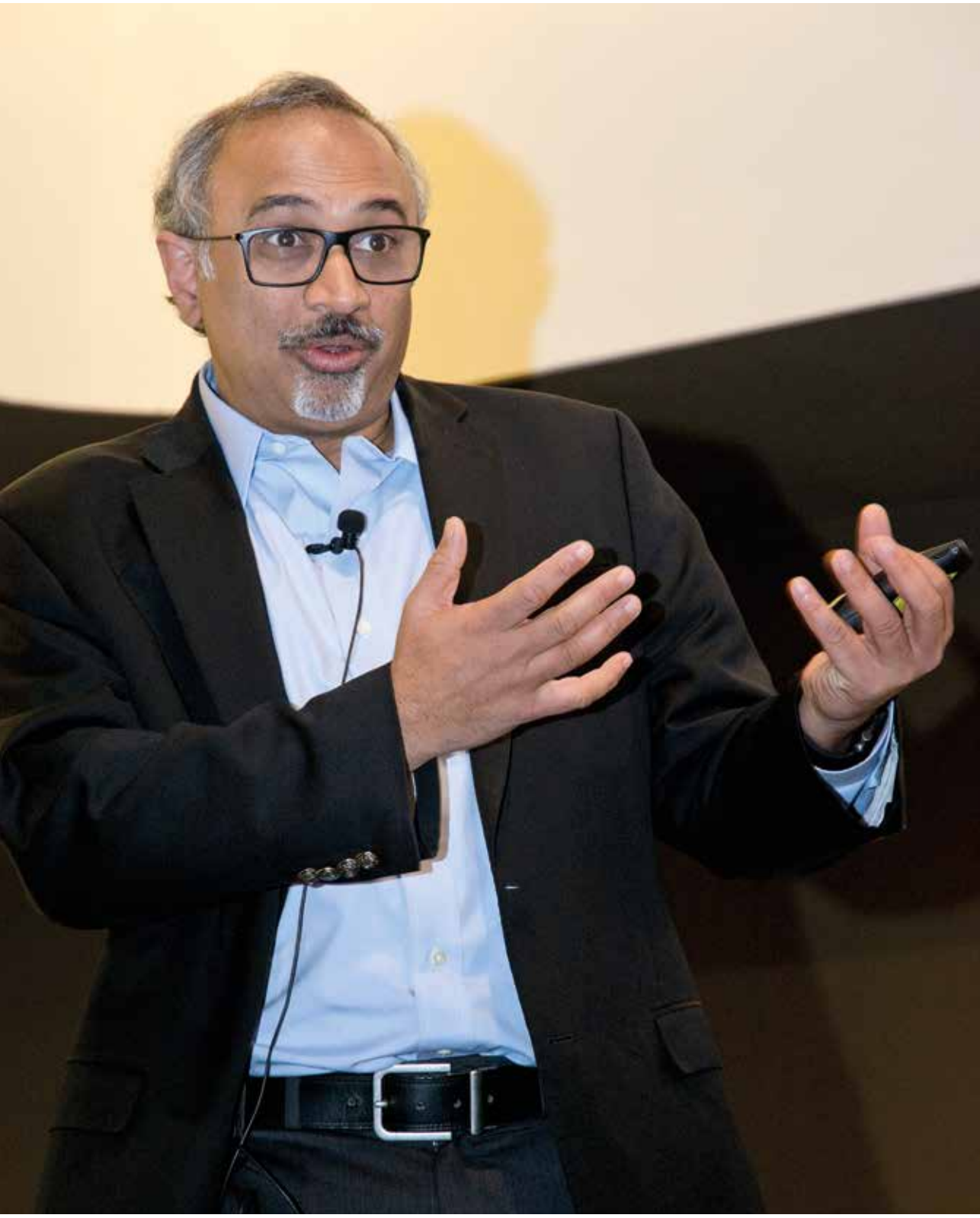

A New Design Language: CREATING SEAMLESS EXPERIENCES WITH IoT

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Los expertos han llegado a la conclusión de que, en los próximos diez años, seremos testigos de un ritmo de cambio tecnológico más dramático que en los últimos cincuenta años. Con la adopción cada vez mayor de machine learning*, inteligencia artificial,* cloud computing*, internet de las cosas y digitalización, la fuerza laboral y sus empleadores se enfrentan a desafíos incomparables, como diferentes conjuntos de habilidades, nuevas formas de trabajar, nuevas industrias creadas mientras que otras están amenazadas, y recursos técnicos y humanos en competencia. La Fundación Ramón Areces y el Instituto de Tecnología de Massachusetts (MIT) reunieron a tres profesores del MIT -Thomas Malone, Jeanne Ross y Sanjay Sarma- en la jornada* "Modelando el futuro del trabajo" *quienes compartieron sus opiniones sobre cómo las personas, las organizaciones y los ordenadores pueden aprender y tomar decisiones juntos, cómo las empresas pueden prepararse para abrazar la era digital, repensando su propuesta de valor y, finalmente, cómo internet de las cosas puede cambiar la forma en que las empresas ofrecen experiencias y valor. Sanjay Sarma habló del Internet de las Cosas.*

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Imagine it's 1990, and you can see into the future. You see two teenagers, and one of them says to the other, "I will WhatsApp my location to you."

In 1990, you are completely perplexed by this statement. Fortunately, a professor from the future is there to explain it to you. Mobile phones were the size of suitcases in 1990, so she has to convince you that they will become a smaller, with a screen and a battery. While you may be aware of the Internet, she has to convince you of something called wireless Internet — and that it will be available on every phone. She has to convince you that every phone can give you access to maps of the world. She has to convince you of something called social networking, of a company called Facebook and a company called WhatsApp. And she has to convince you that every teenager in the world will soon have a phone that can do all of these things.

If she convinces you of all that, you may understand what these teenagers meant when they said, "I will WhatsApp my location to you."

In 2017, I co-wrote a book on the Internet of Things, a term developed at MIT by a colleague, Kevin Ashton. When I began writing the book, I wondered what the Internet of Things, or "IoT" for short, really was. Is it something that you can buy from a store? Is it a platform or a system?

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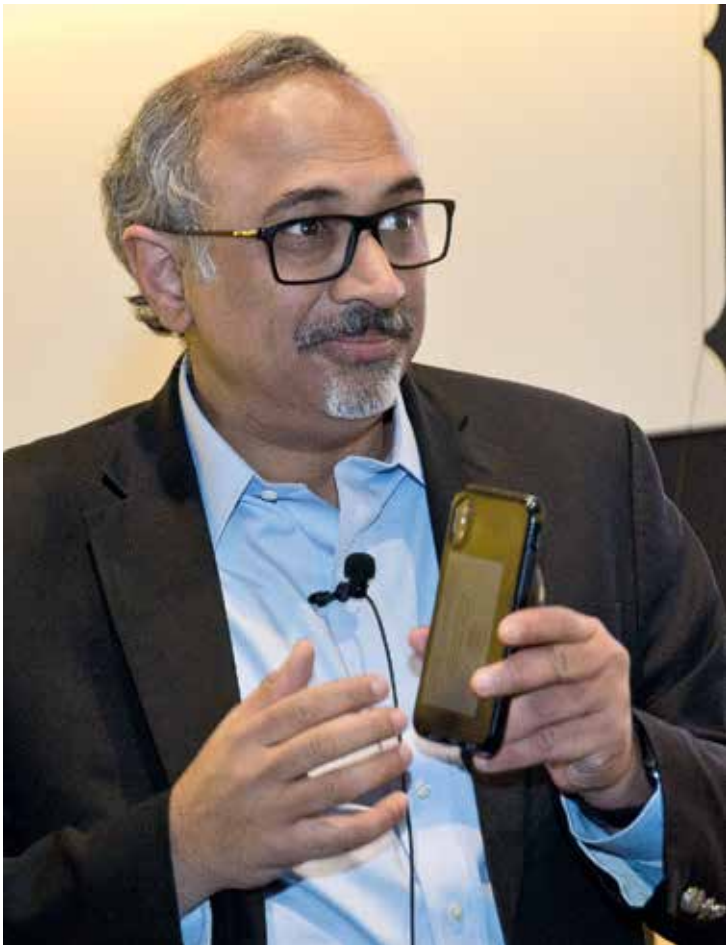
This is not the first time we have invented a new design language. Think, for example, of electricity and what buildings were before it had been propagated. Before electricity, it was very hard to light a building. That's why we used stained glass, big windows, and clever architecture to maximize natural light. But electricity did something very special. Lighting became accessible. So, the language of the architect changed the moment we had electricity. Before electricity, buildings couldn't be very tall. Then, using electricity Mr. Otis invented the elevator, allowing easier escalation and taller buildings. So, electricity changed our design language. Electricity enabled indoor heating and cooling, without which it had been necessary to build fireplaces to heat buildings with big windows. Electricity enabled indoor plumbing, which in turn enabled bathrooms upstairs, adjacent to bedrooms. So, the architect's language has changed fundamentally because of electricity.

With the advent of IoT, businesses must adapt and figure out how to speak an entirely new design language. If they do not try — even if it means that they fail in some small instances — the future will leave them behind.

Inversion: From Products to Experiences

Before beginning design, companies must think about what it is they are designing. It used to be that we were designing products, but we're now entering a new realm. Instead of designing things we are designing experiences. We can now design full, rich experiences —all due to this amazing new language that IoT technology has given us to work with.



Once the experience is identified, companies must ask themselves, “what business are we really in?” Theodore Levitt, a professor at Harvard Business School, put this into perspective by describing a company that sells drills: "When customers buy a quarter inch drill, are they buying a quarter inch drill, or are they buying a quarter inch hole?" In fact, what the customer wants is the hole. They don't want the drill, the wire, to spend money, or the maintenance. But can you think of a company that sells holes? Ikea furniture comes with the holes pre-drilled. So, in some ways, Ikea competes with a drill company, because the holes come for free. The fundamental question here is, are you in the business of selling drills or holes? This question, what experience or need you are fulfilling, is a question we can ask much more liberally today than we could five years ago, and certainly more than we could 50 years ago.

Technology enables us to figure out what people really want and to give it to them. There's no better example of this than Uber. Uber figured out that people don't want to drive cars; they want to buy transportation. Most of us don't want to drive in snow, to pay for car insurance, or to risk parking tickets and car accidents. We just want transportation.

Uber was founded when the company’s two co-founders were stuck in the rain in Paris one day. One of them said, "I wish I could move a finger and a car showed up." The other one knew how to do it, and that's how Uber was born. Before Uber, in 2012, the revenues of taxis in San Francisco were $200 million. When Uber came to San Francisco, their first market, they were very successful —and taxi revenues quickly dropped from $200m to $120m. Taxis were not wiped out, but Uber’s model hurt them quite badly. That year, Uber revenues were $500 million. So, if you think of Uber as a taxi company, the combined revenues tripled, $620 million. So,

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who lost in this equation? People thought it was only taxi companies. Of course, taxi companies suffered, and then insurance companies, parking companies, and public transportation. But the car manufacturers also suffered. It's reaching a point now where many university students in cities such as Cambridge, Madrid, San Francisco, and New York don't even know how to drive a car when they graduate, because they just move a finger and transportation shows up. This is possible because of GPS, connectivity and maps, the new design language that we are inventing with technology.

If we don't think through what people really want and instead give them what was available to them 10 years ago, someone's going to swing by and solve their problem with newer technology. Then it will be too late.

With technologies like IoT, we open up opportunities to design new businesses. The smartphone is amazing technology. With the sensors, the magnetometer, the GPS, the camera, the microphone, the computing, the connectivity, it's essentially a magic wand. It turns a dumb car into a connected car through the driver. And that's what Uber is. By the way, Uber's trying to get rid of the driver too and, eventually, they will.

This act of inversion allows us to get away from products and to focus on the experience.

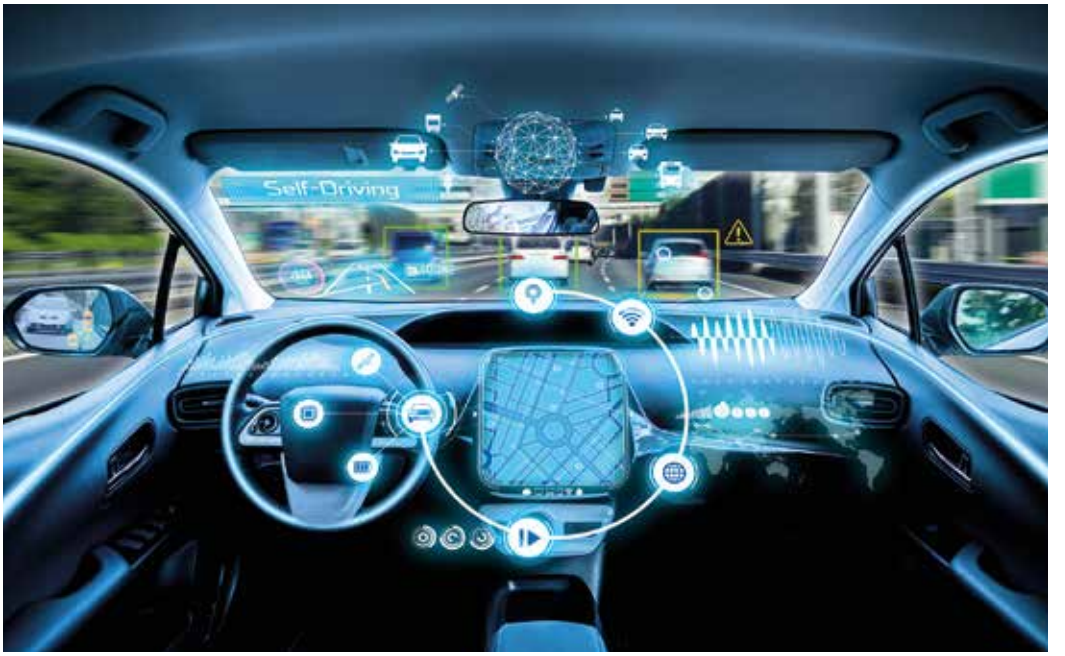
But it's not just Uber. Remember the guy who created Amazon in the late nineties to sell you books? His partner is now the richest man in the world and wants to own your experience.

The Amazon journey began by selling books, but then broadened. Do you buy a book because you want a book, or because you want to read? I would argue that most people want to read. In the 2000s, when the iPhone and tablets were rumored, Amazon figured out that they may sell books —but that they really needed to be in the reading business. So, they created the Kindle.

The Kindle was an amazing product, even if many studies show that Amazon sold it at a loss. Eventually, Apple came out with the iPad, but Amazon retained the market.

With the Kindle, Amazon was not in the product mindset, they were in the experience mindset, the inverted mindset, which is, "I want to own reading." When the iPhone and the tablet came out, the Kindle remained. But what did Amazon do? It immediately introduced apps for the iPhone and the Android phone. Imagine how demoralizing that would have been for the Kindle team, –the app undermined the product. But Amazon's goal is owning reading. So they launched the ap, and now you can read a books from Amazon on your iPhone, your android phone, or your tablet. Amazon is loyal to the experience, not to the product —that's inversion.

But Amazon wasn't done yet. Perhaps its leaders asked themselves, did they really



want to own reading, or is there something even deeper that they wanted to own?

Today, Amazon brings knowledge and information to its customers. Reading is only one way. Sound is also a way. Amazon produces audible books. Now, you can read a book on your Kindle or on your iPhone, and Amazon Echo will read it aloud to you.

And the beauty of this is that it's seamless. You put your Kindle down, and it'll start reading the book to you aloud on your Echo. You say, "Stop." You pick up your iPhone, and the page you just heard appears. Amazon owns not just reading, but also the experience of obtaining information. This is only possible because of this new wonderful design language that technology has given us. Book manufacturers are not thinking that way, because they're still in the product mindset. They sell books, while Amazon is getting closer and closer to the experience that we ultimately seek. Amazon has gone from selling books to owning reading and, eventually, to owning the experience of knowledge acquisition.

More Than Connectivity —Creating Seamless Experiences

Nestlé makes many things, but, traditionally, it is a coffee machine business. But what business is Nestlé really in? It's the morning experience business.

I have a routine every morning. I wake up, stagger downstairs, and turn on the Nestlé coffee machine. It takes about a minute to warm up and to prepare the coffee. I ask Alexa to read me the news. Then I pick up my phone and read my email. If it's really cold outside, I heat the seats in my car.

If Nestlé wanted to own my morning experience, if it wanted to make me really loyal, that's the workflow it needs to own. Maybe when I turn the machine on, it could say, "Sanjay, your blood pressure is a little high today. Maybe you should have a lower caffeine coffee. Would you like me to play BBC News on your smart speaker? Yesterday, you turned the heater on. Do you want me to do that?" It should slowly work itself into that experience.

Beyond connectivity, IoT has enabled competition. It is the intelligence at the device or the intelligence of the device with the help of the Cloud. The third piece is recruitment. The fourth and last thing is immersion

A few years ago, Nestlé took a coffee machine and connected it to a smartphone. But the whole point of connecting something to a smartphone is to enable you to operate the machine at a distance. Why would I turn on a coffee machine if I'm not in front of it? I'm not going to operate a coffee machine from my office if the machine is at home. Nestlé failed to understand the experience that I really want.

If anything, my coffee machine should be verbal. In fact, and even better, it should recruit my Smartwatch like my Apple MacBook Pro does. When I come close to the machine, it could unlock automatically. Businesses like Nestlé should strive for that seamless experience.

Imagine that you are a mattress company. Good sleep is the business that you really are in. If you're still selling mattresses, you're missing the point. What will give you better sleep? If I wake up to go to the bathroom in the middle of the night, I turn the lights on so that I don't trip over something. Heating and cooling turn out to be very important, because our body temperature changes a lot. Some mattress companies allow you to change the mattress from soft to firm, and vice versa. This is what you should be in the business of. Perhaps when the alarm goes off early in the morning, if you're in REM sleep, maybe the mattress knows it and can talk to the alarm, and say, "The poor guy didn't sleep very well, but he's sleeping well now. His appointments don't start for another 90 minutes. Please let him sleep another five minutes." This may seem like just a dream, but we have the technology to do it. We have the verbs and the nouns. We have the language. We can make this future.

When I wrote my book on IoT, I thought the mattress was a corny example, but then I received a call from a company in New York, Eight Sleep. This company designs mattresses that do all the things I described. If it can be said, it can be done. If you're not saying it, someone else is. That is the power of a new design language.

In the case of rice cookers, what business are companies that make them really in? Saving time or food preparation? I don't want a rice cooker and a microwave. I'm a working professional, and I am busy. I want to spend time with my kids, but I want my food to be tasty and healthy. This means that rice cooker companies are in the food preparation business.

As Nestlé showed us, it's not the IoT that matters, it's the narrative and the experience you create with it. There's a company called Instant Pot, and it's doing very well in America. Instant Pot is one machine that does it all in food preparation: slow cook, electric pressure cooker, rice cooker, steamer, yogurt maker, browning pan, warming pot, and it has Bluetooth. Instant Pot has designed their machine so that you can download recipes with an app on your phone, and the machine will talk you through the recipe. "Now put the onions in, now fry it inside, now put the rice

in, press this button, and step aside." With IoT, Instant Pot has managed to reinvent the food experience.

We are living in a magical era, with all of the technologies being developed today — AI, machine learning, CRISPR, Blokchaing, quantum computing. It used to be very difficult to do things, but now there is magic.

Think Outside the Pallet

Kiva Robotics was established about 10 years ago. They were acquired 4 years ago by Amazon for $700+ million.

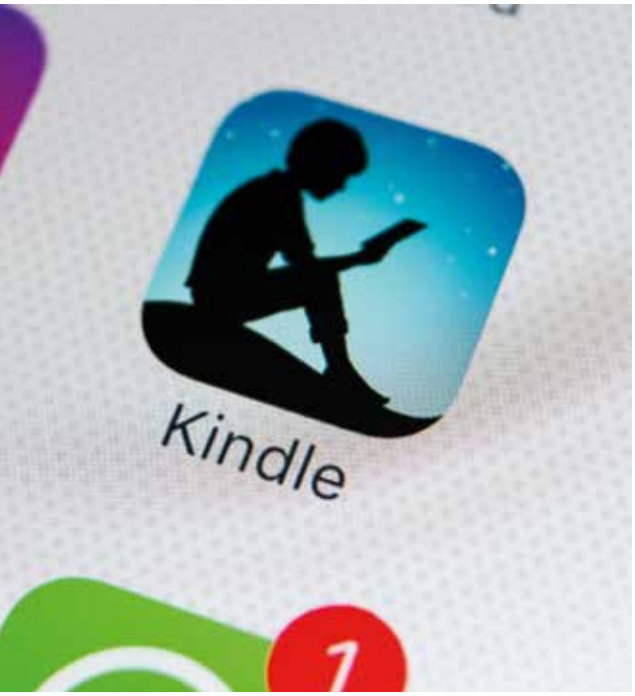
The founder of Kiva used to be at Webvan, a home delivery company that failed. But Kiva's founder realized that the reason home delivery wasn't working well was because warehouses were not designed for shipping small items.

To ship a single book, as opposed to a pallet of books, was inefficient with the way that warehouses are designed.

Mitchell Handling was set up to pump pallets and cases to retail stores. Of course, Webvan went out of business, and about a year and a half later, I was still noodling on this problem. It was still nagging at me, and I started thinking about it again. Then, I thought I should just focus briefly on what I wanted as a pick worker, what my vision for a pallet should work. So, I focused on the problem. If I have an order, what I need is a system where I put out my hand, the product shows up and I pack it into the order. This would be a very operator-centric approach to solving the problem. I just need to find out what technology is available to solve this problem. In this way orders can come and go, products can come and go. It allows us to focus on making the pick worker the center of the problem and providing them the tools to make them as productive as possible.

I want to make two points. The first is that Kiva's founder took that moment seriously. He believed in the magic. The second is that he focused on the experience of the pick worker. It's not just about B to C. It's also about B to B. The old warehouse methodology that was used in 99.9% of warehouses around the world is: you go to the shelf, you pick up the item, you put it in the trolley and you bring it back. But he started dreaming and thought it would be great if you could just do this and the product showed up.

There is a power of emergence in systems when you let things start to talk with each other. That was a little bit of the journey. But what became the practical reality of this idea? At the warehouse, now we send little orange robots out to pick up the little shelving pods and we deliver them to the side of the building so all the pick workers now get to sit on the perimeter. The game here is to pick up the shelves, take them down the highway and deliver them straight to the pick worker. This pick worker's life is completely different. Rather than wandering around the warehouse, she gets to stay still in a pick station and every product in the building can now come to her. So, the process is very productive. Reach in, pick an item, scan the barcode, and pack it out. By the time you turn around, there's another product there ready to be picked and packed. So, what we've done is to take out all of the non-value walking, searching, wasting, and waited time. We've developed a very high-fidelity way to pick these orders where you point at it with a laser, scan the UPC barcode, and then indicate with a light which box it needs to go into. So more productive, more accurate, and it turns out it's a more interesting office environment for these pick workers.



He used technology and something that we did not have fifteen years ago — mobile floor robots. He knew the word. He knew the noun and the verb. He also knew the experience because of his previous experience. He had that idea and made it happen. It's quite an amazing story in and of itself.

The Language of IoT

What are the verbs and the nouns that IoT has enabled? Many people think of connectivity. And that's important. I do use connectivity. I use the camera in my house. I can unlock the door of my house when a maintenance person shows up. So, connectivity's very important.

But connectivity is not the whole story. That's the mistake that Nestle made. They took a coffee machine, connected it, and thought that was all. They were in the world of IoT, but they failed to think through the experience.

Beyond connectivity, IoT has enabled competition. It is the intelligence at the device or the intelligence of the device with the help of the Cloud. So, the intelligence doesn't have to be just at the device. It can be the device and the Cloud. This little thing, competition, is actually very powerful, and we don't think about it enough.

In my lab, we took a simple outlet. When the current exceeds a certain threshold, the fuse trips. The problem with that is that most fuses don't detect arching when there's a short and there's an arch. The current doesn't become high, so the fuse will miss it. And the sparks are what create the fire. But with artificial intelligence, you can sense the spark. You can do competition locally and with the Cloud and look for signatures of dangerous events. The moment you start putting competition on devices, everything changes. The thermostat can now figure out that Sanjay and his family are usually out of town at this time. I will turn the heating off 45 minutes earlier, because the house takes about 45 minutes to lose two degrees. It's amazing what competition does and we forget about it.

The third piece is recruitment. Recruitment is another paradigm that is very hard for product manufacturers to think about. Recruitment is not getting all the functionality from yourself as a device, but also using other devices. If my coffee machine can talk to my Apple Watch or to my Fitbit and turn on in the morning when I come down, that's recruitment. The old product mentality might be to force me to wear a Nestlé band, which I'm not going to wear. The new product mentality, or the inverted mentality, is to own the experience and to recruit my Fitbit, the smart light, the Google Home, the Amazon Echo, or the Apple HomePod. That recruitment is a different mentality.

The fourth and last thing is immersion.

Steve Jobs once said that, when technology really works, it should be like magic. An immersive experience is when you come home in your car and you're listening to news, you walk into your home, and the speaker starts playing the same news to you. You go up to your bedroom to change, and it follows you and plays the same music. By the way, Amazon's already doing this with the Kindle. Immersion is when, magically, your experience is uplifted.

This is the full story of IoT that is often missed. IoT is so much more than simply connecting things. We're already beginning to see more smart homes, cities, public transport, hospitals, schools, and universities. We anticipate that the impact on retail will be enormous. Amazon has introduced the Amazon Go store. While not a scalable technology, everything happens magically. You pick up cheese and you get a suggestion for the wine that'll go with the cheese.

Now there are drones, home delivery, smart speakers, and more. It's very exciting. It's only a matter of time before people are not the only buyers when things can buy things. There's a Whirlpool washing machine that buys cleaning pods.

The Path to Success is Through Experimentation —and Graceful Failure

When we look at companies and think they were very innovative, we often forget the failures along the road to innovation. Remember the Amazon phone, the Fire, which was a complete failure?

We need to recognize that the path to success is through experimentation and graceful failure. We have to learn to fail gracefully. A blind person needs a walking stick, and every time the walking stick touches something, it's a signal and they're learning from it. It's not a failure. And innovation is similar as well. And with IoT, failure will belong to the complacent. Those with the creativity to think through the experience anew, the imagination to envision creative solutions, and the resilience to learn from failed efforts will benefit most from the possibilities that IoT unlocks.

Bio

SANJAY SARMA

Profesor de Ingeniería Mecánica en el MIT. Es el primer Decano de Aprendizaje Digital en MIT. Fue cofundador del Auto-ID Center en MIT y desarrolló muchas de las tecnologías clave detrás de la serie EPC de estándares RFID que ahora se utilizan en todo el mundo. También fue el fundador y director de tecnología de OATSystems, que fue adquirido por Checkpoint Systems (NYSE: CKP) en 2008. Es miembro de los directorios de GS1, EPCglobal y varias empresas emergentes, como Senaya y ESSESS. Sarma también trabajó en Schlumberger Oilfield Services en Aberdeen, Reino Unido, y en los Laboratorios Lawrence Berkeley en Berkeley, California. Es autor de más de 75 trabajos académicos en geometría computacional, detección, RFID, automatización y CAD, y ha recibido numerosos premios por docencia e investigación, incluyendo el MacVicar Fellowship, el Business Week eBiz Award y el Informationweek's Innovators and Influencers Award. Asesora a varios gobiernos nacionales y empresas globales.