ISSUE 1

The Dialog Box

EPAM CONTINUUM

CONVERSATIONS WITH

Megan Burns
Tom Peters
David Rose
John L. Brooks III
Christina Agapakis
Sridhar Iyengar
Alan Rusbridger
Eric Topol
Sunandini Chopra

A *RESONANCE TEST* MAGAZINE

3. Opening Up The Dialog Box

1 Customer Experience Conversations

6. Megan Burns: "Human Beings Are Notorious for Wanting Multiple Conflicting Things"

13. Four Books to Augment Your CX IQ

14. Tom Peters: "The Experience that Is Wonderful Is One that Has Emotional Appeal. You Can't Depend on Metrics. You Can't Engineer It."

22. David Rose: "That Whole Idea of a Virtual Try-on, I think, Is One of the Best Use Cases for Augmented Reality"

2 Speaking of Business Model Innovation...

30. John L. Brooks III: "All the Players Need to Be in the Solution Business. You Can't just Be Thinking about Selling the Product"

36. Christina Agapakis: "So, the Kinds of Plastics and Materials that End Up Throughout *All* of Our Stuff... Could All that Stuff Be Bio-Based? Could It Be Coming from a Renewable Source?"

43. EPAM Continuum's Read on Business Model Innovation

45. Sridhar Iyengar: "We Make Fitness Trackers. I Totally Get That. But You Realize We've Also Kind of Accidentally Created a Globally Distributed Sensor Network."

3 We Need to Talk about Digital Transformation

55. Eric Topol: "If You Combine All These Features that AI Could Bring Us, It Really Gets Us to a New Plane Whereby Doctors Have Time, the Gift of Time, to Spend with Patients"

61. Alan Rusbridger: "The Point About a Revolution Is You Have No Idea Where It's Going to End"

67. Sunandini Chopra: "The Future Is Almost Two Futures: One that's the Future for Cutting-Edge Technology, and One the Future for All the Other People in the World to Get Access to Basic Care."

73. What's in Your Digital Transformation Library, Jeff Wilcox?

75. *The Resonance Test* Is a Networked Team

Table of Contents

Opening Up The Dialog Box

By Ken Gordon and Toby Bottorf

Let's talk. There's no clearer signal of how good your ***teams*** are at innovation than the quality of their conversations. Good conversations help remove the biases and blind spots we're all prone to. They are how teams define, articulate, and challenge ideas.

We know how important real conversations are, and we know what good sounds like. When someone speaks with us, we listen like shrinks, investigate like detectives, analyze like scientists, and imagine like ***novelists***.

Is the conversation representing ***diverse perspectives***, and building a complete picture of the opportunity or solution space? Is disagreement helping us reveal and resolve some complexity, or is it expressing zero-sum competitiveness? Is our focus on what's true and meaningful? Does the conversation have momentum and a sense that it's headed toward a clear conclusion?

Talking things through is at the heart of any innovation process. Because all innovation is the work done with ***incomplete information***, we need to talk through inferences, patterns, and conclusions.

Two questions thread through all this work: What's going on? and What should we build?

Opening Up The Dialog Box (con't.)

Finding the right idea requires an ability to read subtext, gesture, a shifting tone. It requires an ability to get people: Quickly, well, and often. Real conversations are the essence of our ***ethnographic research***, but also equally crucial to all our interactions in teams and with clients. It's hard, so we take it seriously, and work hard to orchestrate it.

Fact is, much of the poetry of innovation gets trapped in project rooms and corporate conference spaces. And one of the reasons we started ***The Resonance Test*** **podcast** was to capture and share the sound of these conversations. An interesting conversation is a delight to overhear: intimate, surprising even to the participants. Alive. That's why we've compiled this collection of first-class exchanges in *The Dialog Box: A* Resonance Test *Magazine*. We're delighted to share how we engage with smart friends to get smarter.

There are nine conversations in *The Dialog Box.* Each one reveals a considerable amount about the interlocutors, and even more about the process of innovation. The experience of reading them is different than listening to them because the text versions make visible the conversational twists and turns. Reading them, we observed that certain conversations shared a particular set of themes, and we've grouped them accordingly: Customer experience, business model innovation, and digital transformation. Of course, the exchanges sometimes touch on more than one theme, but what else would you expect? Truly innovative thinking resists containment. All conversations have been edited for clarity and concision.

CUSTOMER EXPERIENCE CONVERSATIONS

1

In which we focus on what it means to understand customers deeply, design peerless experiences, and create value for business.

Few people get customer experience the way Megan Burns does. For years, she was a leading CX analyst at Forrester Research, producing many of the firm's most thoughtful reports. Today, she helms her own company, ***Experience Enterprises.*** If you seek to understand the vital importance of CX to contemporary business (and it's extremely important), as well as its relationship to employee experience (and it's absolutely relevant), you'll want to read the great back-and-forth between Burns and our Toby Bottorf, Senior Director and Head of Client Engagement at EPAM Continuum. Burns understands that respect for humanity must be knit into the experience, if companies are designing for growth. It's a necessary response to the increasing digitization of our lives. "The experiences that companies are going to have to facilitate will be increasingly human experiences, because we have all of this digital technology and people are more connected and yet feel more alone than they ever have." The opportunity, for companies, resides in a human-centered approach: "I think that humanity piece is going to become a bigger piece of the emotion that people are looking for from an experience."

"Human Beings Are Notorious for Wanting Multiple Conflicting Things"

—Megan Burns

Mentioned in this Conversation

Better CX Is Like Eating Healthy and Exercising. It's Not Enough to Want It. Part of the challenge in delivering on expectations is that people are creatures of habit who often want multiple, conflicting things. In this blog post, Megan Burns shares how to achieve balance and incite change by making people aware of their own actions.

Is the World Getting Better or Worse? A Look at the Numbers "There's no limit to the betterments we can attain if we continue to apply knowledge to enhance human flourishing," says Steven Pinker, Harvard professor and author, as he uses data to explain why the world is getting better in his 2018 TED Talk.

The Sleep Revolution Sleep: We all need it to survive and thrive, but what happens when this basic human need is culturally dismissed and viewed as time wasted? Co-founder and Editor-in-Chief of *The Huffington Post* Arianna Huffington explores how lack of sleep compromises pretty much every facet of our lives.

Deep Work As the world becomes more connected and, therefore, more permeated by distractions, people must figure out how to do more, better, with less time. In *Deep Work*, author and professor Cal Newport presents a training regimen to focus, without distraction, on cognitively demanding tasks.

2019 Edelman Trust Barometer Each year, Edelman releases its *Trust Barometer* to outline trends in consumer behavior. The 2019 report titled "In Brands We Trust?" details how, now more than ever, consumers have more reasons to question how much they trust a brand.

Megan Burns

TOBY BOTTORF: Every time we talk, I feel like I learn something more about the space we're in: CX, customer experience, service design. Our perspective here at EPAM Continuum is often kind of a deep dive into narrow, very specific projects. And when we've talked in the past, I've always benefited from your broader perspective. You get to see a lot more cases and different kinds of pattern recognition at play. I'm curious if we could just jump into what we're talking about when we talk about good customer experience. You've written about effectiveness, ease, and—my favorite, we're going to talk about our feelings—emotion. Let's start with effectiveness. What's going on there?

MEGAN BURNS: Effectiveness is basically the idea that, [in] most business interactions, there's some customer trying to accomplish some goal. It might be looking up information. It might be entertaining themselves, if they're listening to music on Spotify—

TOBY BOTTORF: —or really good podcasts.

MEGAN BURNS: Or really good podcasts, true. But whatever need you [have, the question is]: "Did you get that need met?" So very functionally, if you were trying to buy something, [effectiveness is about asking]: "Did you buy something?" going on through, "If you had an information need or to resolve an issue, was the issue resolved?"

TOBY BOTTORF: So is [effectiveness] closer to "basic quality" or even "product quality"?

MEGAN BURNS: The word "quality" has so many dimensions. I think [the right word] really is "effectiveness" because experiences are inherently subjective. And so, quality to me is actually more around the emotional piece. "Was it a good experience?" This really has to do with the very task-oriented, functionally-oriented dimension of quality.

TOBY BOTTORF: Sometimes we get the problem of low engagement, and [clients] think that may be a problem of the customer experience. And often, we diagnose that it's really a problem of effectiveness or, really, usefulness or relevance. Does that resonate?

MEGAN BURNS: It does. And it's interesting because the effectiveness, ease, and emotion framework actually came from a usability framework many, many years ago before I even started working with it. "Desirability and usefulness," that was actually what that dimension was called. So there's absolutely a piece of that.

TOBY BOTTORF: The next one is ease, which may be the same thing as convenience. Check me if I'm wrong on that.

MEGAN BURNS: The word nerd in me could probably spend a couple minutes talking about the difference between ease and convenience. Convenience, to me, is ease of access. There are other forms of ease, but I think of it as: "How much unnecessary effort do I have to put in?" There's inherently some amount of work involved in every task. And when I think of things being not easy, it implies that there is some level of effort that I have to put in beyond what I "should have to put in."

TOBY BOTTORF: In work that we've seen, especially around employee experience more than customer experience, sometimes work is really crucial to leave in. People take pride in certain aspects of their work, and the things that you want to get rid of are menial, busywork. People have their craft that they want to be good at.

MEGAN BURNS: Interestingly, I heard, I believe it was the CEO of Betterment, talk at a conference not long ago, and he was saying that if [employees] don't show their work in the math, the customers aren't as trusting of the numbers. So they actually expose some of the work instead of simplifying, which is counterintuitive, but it speaks to that emotional dimension of experience. And also, sometimes slowing down and going through the steps [is necessary]. We were just talking about writing earlier, and writing is not easy. There is no shortcut to writing, and sometimes the work of doing that is difficult but necessary.

TOBY BOTTORF: That Betterment example sounds a bit like they've put some friction in it, which is great because we keep on hearing—I think too much—about "removing friction" and "frictionless" and "more convenience." Sometimes things are better if you have to slow down. If you notice more, you get more out of it.

MEGAN BURNS: I wrote a blog post, probably about a year and a half ago now, on what is really the definition of meeting customers' needs, because human beings are notorious for wanting multiple conflicting things, right? So is making it easy for someone who's trying to curb their spending habits to buy $400 worth of shoes at three o'clock in the morning from their bed, from their phone... Is that really meeting the customers' "needs"? Probably not. And so, in customer experience, I think we need to start factoring that into: "Where do we put some friction in place to help customers save themselves from some natural human tendencies that we [all] have?"

TOBY BOTTORF: Now, let's get to emotion. You've said that's the one that drives loyalty the most. Loyalty. Something I'm a little bit

Megan Burns

obsessed [with] on our projects, because the experiences are so ephemeral. What makes them stick? My hunch is that has a lot to do with memory, and emotion and memory are super connected.

MEGAN BURNS: They are, and if you look at the research, emotion plays a role in three different places in the experience. It determines what we even notice, right? Our conscious brains only notice about 40 pieces of the 11 million pieces of information we take in at any moment. What we even notice depends on how our brain unconsciously processes it. Then how we attach meaning to it is also shaped by emotion. It's pretty well-proven that if you're in a bad mood, you're going to interpret things as more negative than you would [otherwise]. Some days, your friends and family are just more annoying than they normally are because you're in a bad mood. And then [there's] the emotional intensity of that experience, which is based on that sort of level set that you come in with. The more emotionally strong an experience is, [the more] our brains are programmed to keep [it] first in the queue. Memories are kind of like a hierarchy, and the ones that are really emotionally intense—which tend to be negative—those are the ones that we can very often recall fastest.

TOBY BOTTORF: So are we hardwired to remember negative things more easily than positive things?

MEGAN BURNS: Yes. For a couple of reasons.

TOBY BOTTORF: That sounds like a glitch.

MEGAN BURNS: Well, no, it's not a glitch. It's a survival mechanism.

TOBY BOTTORF: "That pan is still hot that you just pulled out of the stove." I can never remember that. Yeah, I know how to stay away from a lion, I guess.

MEGAN BURNS: "Oh, hey: Last time I saw that I was in a world of hurt—perhaps I should steer away from that!" versus, you know, forgetting. So, it is absolutely a survival mechanism, but it does have implications now, where we can hear about and have an emotional response to far more stories and experiences than we ever used to. So it biases us towards a more negative view of everything. In 2018, Steven Pinker gave a TED Talk that I absolutely loved about why the world is actually better than it's ever been—counter to the feeling a lot of people express having that, you know, we're about to fall off a cliff. That's that negative bias in action.

TOBY BOTTORF: The world is so complex right now. We're going to hell in a hand basket and things have never been better. Things that are contradictory can both be true at the same time, I think.

MEGAN BURNS: Yes. And I actually use that phrase "hell in a hand basket." I just wasn't sure if anyone else still did. So, thank you.

TOBY BOTTORF: That connects to the second point that you mentioned, which is: We go through the day, especially in unfamiliar situations, making meaning. A line is made up of just two points, and you can extrapolate from that, and then all new evidence gets mapped to this template. You've built a provisional version of, "Oh, I see how this is going to go."

> **"Our conscious brains only notice about 40 pieces of the 11 million pieces of information we take in at any moment. What we even notice depends on how our brain unconsciously processes it."**

MEGAN BURNS: Yeah.

TOBY BOTTORF: And it cues you to expect good things or more trouble ahead. I'm starting to feel a little overwhelmed. What's an experience designer to do? Do we even have the tools to set people up to be more optimistic, to have positive expectations and intent?

MEGAN BURNS: We do. And I think it's really easy to get this sky-is-falling perspective. I did an analysis very similar to what Steven Pinker did, but with customer experience data instead of with life-and-happiness data, and the vast majority of customer experiences are not only okay, they're positive. More than 75%. And if you think about your life, you don't go through life having massive crises every day. But we take for granted that so much works. So just building in moments where we can pause and recognize that, especially as experience designers, recognize all the things that we get right before we worry about how to improve the things that we get wrong. Because we get a lot of it right, and we don't give ourselves credit for that.

Megan Burns

TOBY BOTTORF: There's been a first wave of customer experience improvement that's been about fixing the most broken things—[making] sure people don't have something terrible to remember—and now we're moving into a new wave. We're thinking more about, "Where are the heightened emotional moments and what can we do there?" So we're not trying to just bombard people with delight every step of the way, which sounds a bit wearisome to me.

MEGAN BURNS: It is. When people say, "Surprise and delight customers," what they're really getting at is the fact that humans are wired for novelty. One of the things that makes something get our attention is that it's new. And so, surprise is usually new or unexpected. And [achieving] that does become harder because people acclimate to things very quickly. When I think about the fact that there was no iPhone when I started in customer experience in 2006, and I think about what we defined as "easy" or "effective" back then relative to now... [it's] only been 13 years. So, what counts as "new" or "standing out"? Things just blend into people's expectations so much more quickly now. I think the challenge is really: "How do we do something new, even if it's not necessarily delightful for any reason other than that it's new?"

> **"When people say, 'Surprise and delight customers,' what they're really getting at is the fact that humans are wired for novelty. One of the things that makes something get our attention is that it's new."**

TOBY BOTTORF: One of the things that's tricky about novelty is it doesn't work repeatedly. So, one of the things that I think we've seen in our work is [that employers need] to try to give [employees] flexibility. Something that is scripted is inherently not novel, but [when] you give frontline employees the leeway to respond to people's needs—do the right thing in context—that fits better. It's more memorable. It's more in line maybe with effectiveness, and it's got a nice emotional component to it as well.

MEGAN BURNS: Part of what we need, the needs that we need met in an experience, is to be seen and recognized as ... human being[s]. And people actually dislike, at least in the research I've read, humans who are acting like robots more than they dislike actual robots because there's something just inherently worse about that. Every experience you have is novel. Even if you and I sat down later this afternoon and did this again, it wouldn't be quite the same. So part of what we have to do is just... recognize human interactions to be the sort of ad hoc things that they are. And that's where a lot of that employee empowerment and just conversational-ism, I think, is going in customer experience. We also have a pendulum effect. I was thinking about this the other day. It used to be that you would go to your mailbox, your snail-mailbox, and pull out a giant stack of direct-mail postcards. Now I get maybe three or four a week. So, if someone sends me a letter, not a postcard but an actual handwritten letter, that stands out tremendously. Whereas 20, 30 years ago, that was not that unusual of a thing to do. [It] used to be that people were like: "Oh, I got an email! Ooh, I got an email!" Now we get thousands of emails. So, we sometimes have this pendulum of behavior that says what wasn't new or different a while ago, after some time becomes new and different again.

TOBY BOTTORF: Some things come back. Old things come back in new ways. We're having an event here, just an internal beer and jam session—with typewriters.

MEGAN BURNS: Oh, I love it.

TOBY BOTTORF: [The event was thrown by] some of our younger designers... I remember typewriters as being tiring for your hands. But they're now a different kind of thing. They're fun. They're special. They're analog.

MEGAN BURNS: I probably have an old record player somewhere in my basement that I could lend to some of them. Yes. They're becoming very cool again.

TOBY BOTTORF: The relationship between customer experience and employee experience. We find repeatedly that, when you start out trying to develop a better customer experience, you're inevitably gonna have to start working on a better employee experience. Is that true to your experience, too?

MEGAN BURNS: Absolutely. And I think it's most acute for the employees who interact directly with customers. Because that's the same experience. You can't redesign one half without

Megan Burns

redesigning the other half. But I think that's also true further down in the organization because everything is so interconnected. Even if people hadn't slept well or they're stressed out—they don't make as good decisions [as they otherwise would]. There's a great quote from Arianna Huffington in her book on sleep that said a board that gives kudos to a CEO who says they only sleep four hours a night is basically saying: "Okay, good, we're happy that you're running this company drunk, because the cognitive impairment of living on four hours of sleep at night is the same thing." Our empathy goes down when we're frustrated and we don't have the right tools and we have barriers. So, all of these things that we're asking people to do—and put themselves in customer's shoes—if we don't make sure that they're having an experience that makes them feel like they're achieving something in making a difference—in doing work with purpose—they are physically, physiologically less able to do the things that we're asking them to do.

"When you start out trying to develop a better customer experience, you're inevitably gonna have to start working on a better employee experience."

TOBY BOTTORF: That comment you made a minute ago about customers wanting to be recognized as people, as individuals—the same thing is true of employees. And, the employee [who's] being forced to behave like a robot, they're not having a good time, either.

MEGAN BURNS: No, it's funny that, totally separately, [in] the research that I did and then [in] some research I've seen from the HR space, the number-one thing that drives loyalty for customers and employees is feeling valued.

TOBY BOTTORF: So have you seen examples of where you might not perceive there to be a lot of value creation in the process, but actually there's room for things to be pretty special? I think one of the things to look for in good customer experience, good employee experience, is that you're not just transferring value in one direction or the other, but you're actually creating it through that interaction.

MEGAN BURNS: There's a lot of talk about empowerment and the need to include empowerment in employee experience. But what a lot of people don't realize is that the act of being given the option to fail or to make a bad decision and develop your judgment over time—that's an incredibly valuable skill. [For example,] if you think about an entry-level employee: No, maybe they can't make as good judgment calls as their manager right now, but how will they ever be able to until—and unless—they've been given the opportunity to hone that judgment? Learning how to read people, learning how to think on your feet, all of the things that we have to do to manage the uncertainty of customer interactions, those are incredibly valuable skills for employees in the coming decades that we're helping them build.

TOBY BOTTORF: Everybody who works at [a] corporate job that used to wait tables retained some lessons from their time waiting tables.

MEGAN BURNS: Yes.

TOBY BOTTORF: I can speak for myself having been fired from waiting tables. I learned some hard lessons.

MEGAN BURNS: And there [are] some companies [in which] I believe this is still the case. [At] Enterprise Rent-A-Car, you cannot be promoted into management unless you have come up from the ranks of working in one of their rental facilities, because they don't want anyone who doesn't have that visceral experience of staring at a customer who is upset because their car's not ready. They are just very … "strict" isn't the right word, but they are very consistent about that.

TOBY BOTTORF: The gap between frontline interactions, between customers and employees and the C-suite, can be so high. It's a reason why I love *Undercover Boss*. Because it's such a shock oftentimes for executives to know what their employees are going through on a daily basis.

MEGAN BURNS: And I'm sure you see this in research. I've seen it. I do an executive journey mapping workshop where it's not [the point] to come up with a full journey map, but it's to expose executives to the process. And, more than a few times, I've had a head of a call center who has never actually called into his or her call center that they run. And they do this as part of the workshop. And [I've seen] the change in their facial expressions from sort of frustration to horror to being ready to throw the phone at the wall—a feeling we all know quite well, but they never realized just how bad it was.

TOBY BOTTORF: We've worked with some clients where the CEO spends time every month answering the phone and we know that's a sign of a good company. Absolutely. I try to oftentimes tell clients there's only two rules of customer experience. One is: "You can't make me," and two is: "I'm not doing it wrong."

Megan Burns

MEGAN BURNS: I've heard you say that before and I think you're absolutely spot on. So I do a lot of working with companies [that] are interested in customer experience, [and that are] not quite sure what that means, not quite sure what a transformation involves. And empathy in particular is a tough concept to introduce because you're sort of backhandedly saying that these people are not already empathetic. So, one of the things I remind people, and a lot of them don't even know this, is that it is difficult for human beings to put ourselves in the shoes of another person. That task of perspective taking, some of us are better at it than others, but it takes practice. And so, the idea that you need to do customer visits and spend time on the phones and spend time with people is not a sign of your competence as an executive. It's a sign of the fact that you are a human being who is different from the people you are trying to serve. And taking that stigma away from it helps some people feel more comfortable about doing this, without seeming like they're admitting what they didn't know.

TOBY BOTTORF: To that point about empathy: It's extremely hard to persuade somebody, rationally, about the value of it. When they get it, they get it in a visceral way. It's kind of like a closed loop. We try super hard to get executives [to join us] when we're doing customer interviews, going out to meet customers in their homes or shopping with them or whatever the right domain is. Because there's just no substitute for that firsthand experience, for the overburdened messiness of somebody's life. And that you're trying to earn permission to have a place of prominence in their life and be a choice for them? It's harder than you think.

MEGAN BURNS: And I heard a great example of this. So we were talking about employee and customer experience coming together. I was at a conference, and I heard the chief diversity and inclusion officer of a tech company talking about her work. And one of her big challenges was getting people to think of D&I as more than just representation, right? [More than:] "Do we have the right number of people?" And she said what she does when she works with a new executive is, she says: "Can you tell me about a time when you felt left out of something?" And it doesn't matter how much of the mainstream majority class you are in; we have all felt left out of something at some point. And she uses that as a foray into, "Diversity and inclusion programs are about minimizing the times when employees feel left out or excluded or not part of something." And she connects it to an emotional experience that everyone has had to get them to think differently.

"Empathy in particular is a tough concept to introduce because you're sort of backhandedly saying that these people are not already empathetic."

TOBY BOTTORF: So, I have some questions about where you think things may be headed. We talked earlier about a good first wave of fixing things that are the most broken and now getting to a more targeted understanding of where to prioritize—maybe that's in line with brand—and maybe it's in service of a better, bigger-picture vision. I think a lot of customer experience work has been incremental in nature, focused on measuring and fixing and measuring and fixing. What do you see about the prospects for a kind of a bigger-picture perspective taking form? Because I think the reputation of customer experience is increasing in the C-suite.

MEGAN BURNS: It is, and I think there are two paths that are going to happen in parallel. One is, the general population is getting to a point where they're saying: "Just because I can doesn't mean I need to or want to." I read ***Deep Work*** by Cal Newport, and one of the things he talks about is that our strategy for social media has been an "any benefit" strategy. "If there's any benefit to using a social media platform, let's just add it on," as opposed to saying, "No, you know, this had some benefit, but it doesn't add as [many] benefit as others, so I'm going to pick one or two." So, I think there's going to be a thinning out and a calling out of things that [will encourage people to say:] "Just because it's a cool experience doesn't necessarily mean that it earns a place in my life." And then, in parallel with that for companies, I think the experiences that companies are going to have to facilitate will be increasingly human experiences because we have all of this digital technology and people are more connected, and yet feel more alone than they ever have. And there [are] a lot of sociologists looking at that. So, we're seeing more live events. We're seeing more people coming together in very human ways. I think that humanity piece is going to become a bigger piece of the emotion that people are looking for from an experience.

TOBY BOTTORF: It's that pendulum swinging back again. I've noticed that so many [companies that] started out as purely digital direct-to-consumer businesses, [ones] that sell mattresses or shoes or makeup and skin-care stuff, they're all opening shops. It may not be the place where they're going to make a lot of money, but a place that somebody can visit once makes all of the other, more ephemeral touch points a little bit more human, a little bit more concrete in their lives.

Megan Burns

MEGAN BURNS: Yeah. Humans are physical beings.

TOBY BOTTORF: I feel like this conversation has kind of moved from the customer to the employee experience. Let's take one more step backward and move behind what, in the trade, we call the line of visibility. What about things, systems, or ways of working that can be set up—invisible to customers—that you may have seen this as helpful to a great customer experience?

> **"The truth is that scale creates some problems that empathy will just never be able to solve."**

MEGAN BURNS: I think one of the most useful things, one of the most useful systems, is having a way to show people where they fit in the bigger picture. The truth is that scale creates some problems that empathy will just never be able to solve. More empathy is not the answer. And so, the question becomes: "How do we deal with those problems?" And [part of this is] understanding where [employees] fit in a larger process. [An employee might say:] "Maybe I can't understand all the details, but it gives me a connection, it gives me some context for making decisions, that makes me better at my job—in addition to making me feel like I'm part of something and understand how my work impacts people." There was a company that found that when they had good collaboration, it was because there was someone on the project who had been there 25 years or more. And they said, "What is it about that person?" And they said, "That person knows people everywhere in the company." They said, "How can we build that for new employees?" So, the first three months of an employee's tenure was about building relationships with people in other parts of the company. Because, even if you're not the person to solve the problem, [you might say:] "I feel much more comfortable picking up the phone and calling and saying, 'I know this is somewhere in your division. Will you help me solve this problem [and/or] find the person to solve this problem?'" And so, that social connectedness inside the company has a very functional usefulness, in addition to making people feel like they're part of a team.

TOBY BOTTORF: And that keeps people from having to solve the same problem again and again. If somebody solved it already, we have already discovered fire—don't go do it again. One of the things that gets me excited about the pendulum swinging back to more humanity is what it asks of brands. Customers more and more want to understand what a company stands for, as a place to shop, and employees want the same thing from a place to work. That's where I see things headed. That's where I hope customer experience is taking us.

MEGAN BURNS: How a company treats its employees is increasingly important to customers. And I was flabbergasted when I saw this year's Edelman Trust Barometer data that said that the most trusting relationship people have is with their employer. So, people don't trust companies, but they trust the company they work for to do the right thing. And so, it's increasingly important for people to believe that the company they work for is gonna take a stand on bigger social issues as well.

TOBY BOTTORF: You heard it here first, guys—get after it.

> **"It's increasingly important for people to believe that the company they work for is gonna take a stand on bigger social issues as well."**

Four Books to Augment Your CX IQ

Dr. Gary David, a sociologist at Bentley University and a **Resonance Test** *guest, has some strong opinions about which books on customer experience are worth reading. "My reading list is diverse in how the authors approach customer experience, which is fitting, as customer experiences vary across situations," says the good professor. We suspect that reading any, or all, of these volumes will give you plenty of ideas on improving your CX and growing your business.*

THE EFFORTLESS EXPERIENCE by Matthew Dixon, Nick Toman, and Rick Delisi questions whether customers really want a "wow" experience, or if they just want to have their expectations met. Rather than "surprising and delighting," companies should be thinking about meeting and succeeding on those basic promises. Essentially, people want their lives to be made easier. The point is to focus on what matters to the people who you're trying to serve. In a way, it also gets us back to human-ness. Do what you do well, adding a touch of connection, a sprinkle of caring, and a dash of commitment—more often than not, this yields a better recipe than going heavy on spice and zest.

Born out of Dr. Katherine Frank's work as a stripper in a southeastern city while completing a PhD in anthropology, **G STRINGS AND SYMPATHY: STRIP CLUB REGULARS AND MALE DESIRE** is more than an ethnographic explanation of what it is like to work in strip clubs. Rather, Frank interviews customers who frequent clubs to understand what it is that they are looking for and getting out of the experience. In this way, the book is a fascinating examination of customer experience, while also exploring aspects of the employee experience. One important takeaway from the book is what customer experience would look like if your employees interviewed your customers directly, speaking to them about what they look for in their experiences.

A reflection and guide to treating your employees as your internal customers, **THE CUSTOMER COMES SECOND** by Hal Rosenbluth and Diane McFerrin emphasizes that by focusing on employee experience first, you are able to increase the customer experience second. Other interesting elements include how Rosenbluth's company integrated across hierarchical levels to increase transparency, awareness, and buy-in across the organization. While somewhat dated, it still holds some important lessons for anyone who wants to improve customer experience by connecting it with the employee experience.

In **VERBAL JUDO: THE GENTLE ART OF PERSUASION**, Dr. George Thompson, an English-professor-turned-cop, blended these two worlds together to create a rhetorical approach to diffusing encounters in which members of the public, and suspects, escalated tensions. If you want to learn how to manage conflict with customers, go to those occupations that do it routinely. I used this book as an essential component to designing a call center training program, which empowers workers to use their own interactional aptitudes to practice "verbal judo" with their customers.

When it comes to CX, Tom Peters was there long before many of us stepped onto the scene. His famed shelf of books, stretching from ***In Search of Excellence*** (1982) to 2018's ***The Excellence Dividend***, has had a profound effect on the way businesses think about designing for both customers and employees. Jon Campbell, Head of Experience and Service Design at EPAM Continuum and a long-time Peters fan, was jazzed to put some thoughtful questions to his literary hero. In the course of their rollicking conversation, they cover many diverse topics: design, W. Edwards Deming, the dangers of ritual in business, thinking skunkily, hiring for poetry, Montgomery and Eisenhower on D-Day, Jimi Hendrix, and so much more. Peters quotes Twain's "Never miss a good chance to shut up," but, fortunately for us, neither he nor Campbell took this injunction too seriously.

"The Experience that Is Wonderful Is One That Has Emotional Appeal. You Can't Depend on Metrics. You Can't Engineer It."

—Tom Peters

Listen to the ***audio version*** of this conversation.

Mentioned in this Conversation

Re-Imagine! Business Excellence in a Disruptive Age [Hardcover] The world of business is ever-changing. To keep pace with the rate of change and emerge as an innovative company, Peters shares strategies for implementing values and processes that empower a talented workforce.

In Search of Excellence: Lessons from America's Best Run Companies Tom Peters and Robert Waterman based *In Search of Excellence* on a study of 43 American companies across various sectors. They identify eight principles of management that are attributed to the success of these companies.

The Design Dimension Christopher Lorenz provides a fresh look at revolutionary product design and its impact on corporate strategies.

The Experience Economy *The Experience Economy* dives into how companies thrive by offering captivating experiences to their customers.

The Excellence Dividend: Meeting the Tech Tide with Work that Wows and Jobs That Last A lifetime of passion around the idea of excellence is gathered to give readers inspiration for the realities of 21st-century business.

Emotional Design: Why We Love (or Hate) Everyday Things People think, decide, and act on their emotions every day. Don Norman takes his thinking around human-centered design to a whole new level in *Emotional Design*, where he asserts that good design melds well with our emotions.

A Passion for Excellence Peters and Nancy Austin delve into what sets some of the most efficacious businesses apart.

Thriving on Chaos Peters offers guidance to managers at any level in his "handbook for a management revolution." In *Thriving on Chaos*, Peters outlines 45 recommendations on how to survive in a world where things are always changing and certainly uncertain.

Tom Peters

JON CAMPBELL: I came across [a hardcover copy of] your book, ***Re-Imagine!***, in late 2005, and it ended up scratching an itch I had because I'd been working in marketing and brand strategy [at Harley-Davidson]. I started to rethink the types of products and services I was helping brand and market and the way that organizations were working, and how they deliver value and the like. And in there, you talked a good bit about design and the power of design. I guess within two years of reading *Re-Imagine!*, I actually quit Harley and went to grad school at the Institute of Design in Chicago.

TOM PETERS: Oh, cool!

JON CAMPBELL: My mom might have been a little unhappy with you at the time when I quit a good job at Harley-Davidson to move and go to school again, but I want to thank you for that.

> **"As a civil engineer, the people on our campus who we despised the most were the architects, because they would design some gorgeous, fabulous-looking incredible thing that was totally unbelievable."**

TOM PETERS: I worked with a guy who went to work for IBM based on all the wonderful things we said in ***In Search of Excellence***. And the day he walked in, all the shit hit the fan and he never forgave me. Now I'm batting .500, one out of two. That's not bad.

JON CAMPBELL: No, that's pretty good. I'm sure there's dozens and dozens more out there [who] probably quit something or another to go try something else because of those [books]. But that was 2005, so that's like 14 years ago. I started design school in 2007 and joined EPAM Continuum in 2008. So, yeah, it worked out well.

TOM PETERS: That's really cool for me, for a different reason. Number one, obviously, I'm delighted it worked for you. But number two, we really started getting serious about design in that book. I had written about it before—a fair amount—but we really put it front and center, and [it's] unavoidable in that one. So it's delightful to see that it had some hooks.

JON CAMPBELL: I agree with you, because I had been following you and your blog for a number of years at the time. I'd been following it more from, kind of I guess, a management [perspective] and [a] doing-business-in-a-different-way [perspective], but I hadn't really thought about the power of design on business in such a considered way prior to that. That was a real eye-opener for me. That was 2005. And since then, the iPhone's come out, and guys like the founders of Airbnb went to Rhode Island School of Design and the like, and you start seeing how commonplace really good user-centered experiences are now. I guess I'm kind of curious: Reflecting on what you thought of design back then and then looking at it today, what you've seen happen…

TOM PETERS: Well, way back when… there was a management column [that published a] couple of times a week in the *Financial Times*, and the guy who wrote it years ago was called Chris Lorenz. And he wrote a book called ***The Design Dimension***. I'm trained as a civil engineer, so to me: (a) design is a foreign language; and (b) I don't trust designers. As a civil engineer, the people on our campus who we despised the most were the architects, because they would design some gorgeous, fabulous-looking incredible thing that was totally unbelievable. So, my first exposure to design was very negative [laughs]. Anyway, Chris wrote this book, and it had lots of case studies, and I thought the case studies were really cool. And—my son went to RISD, but I have zero artistic talent—the way that I work in general is, frankly, more intellectual [than artistic]. And so, I started reading up like crazy and got really fascinated by it. Then Chris Lorenz asked me to write the foreword to his book, which was very cool. And one of the funny things that happened was, I developed a reputation as a design guru in the UK, and even won awards, and had never opened my mouth about the topic in the US. I just sort of grew into it.

One of the things I use to this day is what I call TGRs and TGWs. Thirty or 40 years ago, the quality of a car was measured by TGWs: Things Gone Wrong. And you would buy a car and 90 days later, you would go to your service station, and you would have a list of the 27 things that hadn't worked. Then the quality movement came along and the Deming stuff came along and the continuous improvement came along. And then, eventually, Six Sigma came

Tom Peters

along and stuff worked. And so if stuff works, then what the hell are you gonna do to differentiate? That pushed things in that direction.

I got [in] an incredible amount of trouble, which was purposeful, two or three years ago in Frankfurt—note the word "Frankfurt"—talking about this topic. I said, "Well, I got a Subaru, and my Subaru has 156,000 miles on it, and it's working great." And I said, "With all due respect to you Mercedes people: In terms of quality, my Subaru and the Kia I rented last year are as good as anything Mercedes makes." I said, "I totally acknowledge all the sexy stuff you've got on top." So the point of your question was: Stuff works, how are you going to differentiate?

JON CAMPBELL: Right.

TOM PETERS: And I think in 1990, Pine and Gilmore came along with the ***Experience Economy*** book.

JON CAMPBELL: That's right.

TOM PETERS: And that sort of changed everything. The word "experience" got into the language. Obviously, we were always doing it to some extent, but it [suddenly] became hot as a pistol. And it became hot for, in my opinion, very good reasons. Though, to skip way ahead—and we should come back to what you're saying—but to skip way ahead, in my current book, I wrote a cautionary piece on experience. And I said a lot of people think they can engineer an experience. And the experience that is wonderful is one that has emotional appeal. You can't depend on metrics. You can't engineer it. Don Norman, who's to me the guru of gurus in this stuff, wrote a book called ***Emotional Design***. And the one-liner that I remember [from it] was, he said—and don't ask me to get this exactly right—[in] a review in a big auto magazine of the Mini Cooper S: "No car in recent memory has brought more smiles to people's faces." And he said, "That's the kind of differentiation [you want]." He said, "The thing has gotta work. That's the functional part of it. You've gotta have the right kinds of features to make it appropriately sexy." But the question is: "Where's the stuff that hooks people?" One of the one-liners I use in my books, in my presentation[s], [is] a quote by Laurene Powell Jobs, Steve's wife, and the one-liner [is]: "Steve and Jony," as in Jony Ive, the head Apple designer, "Steve and Jony would spend hours talking about corners." Then there's the great Jobs-ism that says, "You know a design is good when you want to lick it." And yes, somewhat unattractive as that is, I really get it. I think we've turned the experience economy in a bad [direction]—but it's the same damn thing that happens to everything. Six Sigma was fantastic. And then Six Sigma became a religion, and it induced rigidity into systems. I think experience is doing the same thing. I am an archenemy of agile, if you capitalize the A, because then it becomes a religion. When that happens, you end up introducing bureaucracy, and to some extent, you may often be worse off than you thought. When some GE guy came to 3M, he installed, down to the last nut in the last bolt, Six Sigma into 3M's innovative culture. 3M incidentally was my favorite company in ***In Search of Excellence*** in '82, and the research I've read says that, basically, Six Sigma came within a half an inch of killing 3M. The systems can get way out of hand.

"A lot of people think they can engineer an experience. And the experience that is wonderful is one that has emotional appeal. You can't depend on metrics. You can't engineer it."

JON CAMPBELL: I really appreciate that point, both on quality and also agile with a big "A," because, as we've seen more and more organizations embrace design, or what is commonly referred to as design thinking, you do get this danger of the-process-can-replace-the-people-and-the-experience, right? Where it starts to become this paint-by-numbers approach, as opposed to good judgment, experience, nuance, and not just "following the rules," so to speak.

TOM PETERS: I would only change one word in what you said. You said, I believe, if my memory is worth a damn, [that] the process can eclipse the goal or something like that. And the word I would change is "could" or "can" to "will." Way, way, way back, IBM was known as the service company. That's how they broke out of the mold. Their computers didn't work. Other people's computers worked. But IBM had all this great market share and they were doing the service thing right. Then the service thing turned into rituals. I spoke at an IBM sales conference. It's funny the things that stick in your mind. I can still see the conference table. And I was sitting across from a, I don't know, VP or EVP or [some] big deal [function]. He was dressed perfectly, like IBM guys were, and he pulled a cigarette out of his pocket. And, just like the king or the queen of England, the assistant, who was standing there three feet away, bent over immediately and lit the cigarette. Well, great service, with [the] hands-on, be-there-on-time [ethos]

Tom Peters

had deteriorated into rituals piled upon rituals, piled upon rituals, piled upon rituals, and nearly killed IBM. Yep.

JON CAMPBELL: Yeah, I totally agree. And I like the change to "will," because I do think there is an inevitability that as you start to take anything with its original intent, as you start to pull it apart and look at it as repeatable and then try to scale it, there is a danger that you lose the original intent of whatever that is, right?

TOM PETERS: There is a certainty—there's not a danger, dammit!

JON CAMPBELL: [Laughter] I gotta be more specific.

TOM PETERS: You gotta be more brutal. You gotta be closer to my age to have the little cynicism button.

JON CAMPBELL: [Laughs] One of my old mentors here at EPAM Continuum used to quote a Jimi Hendrix line. Sometimes you'll talk to an organization that's interested in, "Okay, what are the six steps that gets us to this design?" And it's like: "It doesn't quite work that way..." And so, he had a Jimi Hendrix quote I always use: "The blues is easy to play, but hard to feel." I love that quote, and I think it's probably the same [thing] you experienced with quality and with agile, right? You can play the notes, but it doesn't mean that it's doing it.

TOM PETERS: Absolutely. 100%. Almost the other end of the spectrum: There was a system which may well have died, started a jillion years ago by Peter Drucker, and it was called "MBO," which was "management by objectives." You're the manager of a group of nine people, and I'm your boss. Drucker introduced MBO, and he never capitalized the letters. And, in fact, he never said the term "MBO." What he said was "management by objectives and self-control." The whole point was: You sat down with me, your manager, and we chatted for, over a period of time, a couple of weeks or a couple of hours or what have you. And we came up with your goals for the next three months, and then you went away, and I never saw you again. The whole point was to give you a framework where you could behave autonomously. And 10 years later, the "and self-control" had disappeared. Lowercase "m" and "b" and "o" had become capital "M," capital "B," capital "O." And the thing that was supposed to give you freedom was one more effing layer of control and bureaucracy.

JON CAMPBELL: Right.

TOM PETERS: And that was just the sweetest example you could imagine.

JON CAMPBELL: That's a fantastic example. And it reminds me: I used to download all your PowerPoint presentations after you would post them after you gave [a] talk. One slide that, I think, was one that you came up with ... and I think it was in response to MBO ... was MBWA, Management By Walking Around—

TOM PETERS: Do. Not. Give. Me. Credit. [MBWA are] the most important four letters in my life. We found them at a youthful, non-bureaucratic Hewlett Packard. I. Fell. In. Love. You'll see me now, at the age of 200, get as emotional as I did when we started talking about it in 1978. It was always about being in touch, hanging out with the folks who do the work at HP. In the days that that we did our stuff, Bill Hewlett was still around and you would watch Bill, whose name was on the door, sit down at a computer screen or

> **"[MBWA are] the most important four letters in my life. We found them at a youthful, non-bureaucratic Hewlett Packard. I. Fell. In. Love. You'll see me now, at the age of 200, get as emotional as I did when we started talking about it in 1978."**

whatever kind of screen they had then [laughs]—he would sit down next to a 23-year-old engineer, and they would talk like peers for 30 minutes. The MBWA thing was absolutely, positively beautiful, and it still is today.

I'll add one small thing to it. I'm over here in gorgeous New Zealand and I'm actually on the seaside. And I always say this shamefacedly in my talks. Here I am, 76 years old, been writing about this stuff for 40 years and, God help me, I find myself out on the beach thinking about MBWA. This is related, and off on another tangent: I really had this, to me, a real breakthrough—and in an odd way, it has to do with all the stuff that you and I have just been talking about. So I'm walking on the beach and thinking about MBWA. "Why do you

Tom Peters

do MBWA?" Well, you do MBWA to be in touch with the work where the work is being done. They used to say, "at the coalface." You do MBWA so you can meet some of the people and understand who they are and so on. And that's MBWA. And I was on the beach and I said to myself—and you know, there was no tape recorder, my iPhone was turned off—I said to myself, "Tom, that is bullshit. The reason you do MBWA is because it's fun. And if it's not fun, go back to your office, write your letter of resignation [Campbell laughs] and get the hell out of management for the rest of your life. If it's not a kick to be out with your team in the distribution center at 1:00 a.m. You. Are. In. The. Wrong. Job."

And yeah [in MBWA], you learn all those things [such as,] "I learned about the people and I learned about what's really going on and I learned about some of the roadblocks, which are holding them up and all that good stuff." But, mainly, if it's not a hoot, a kick, a pleasure to be doing it, you really are in the wrong job. And by the way, the team at the front will be able to read your attitude a hell of a lot better than you can, and they know when you're going through the ritual. "Guys: Boss said do the MBWA. Oh, shit, it's 11:00 at night, I should be watching whatever is on at 11 and here I am." So you can do it wrong.

I came across this tape—tape, tape, tape—one of the old tape tapes made out [laughter] of plastic tape, and [it was] written by a general by the name of Melvin Zais, and it was called You Must Care. And he said: "Leaders must care." And the one little story I remember, which is so indicative, he says: "You're a lieutenant and your guys are in the barracks and they're getting ready for an inspection tomorrow morning. If you're the right kind of lieutenant, while they're doing that work, you walk down to the barracks. You do not have to open your mouth. You just walk down to the barracks and you sit down for a little while and walk out." And I can still remember his words: "They know that you know that they are working their asses off to make you look good." That nearly brings tears to your eyes.

JON CAMPBELL: It reminds me, I keep a running list of quotes and there's a quote I had—I can't remember off the top of my head who said it—but there's one around: "You can't lead a cavalry charge if you think you look funny on a horse." [Peters laughs] I really like that, because it's kind of that point. You have to be present and you have to be doing the work. You can't just be quote unquote, "managing things."

TOM PETERS: Ulysses S. Grant was unbelievable in that regard. He always used to go riding with the troops, and typically when a general would go riding with the troops, he would bring seven colonels, nine majors et cetera, et cetera. And Grant went out early in the morning, and he always went out alone. And the way [Grant's biographer]… described it—from the notes and the diaries and so on—he said: "You know, when the other generals would show up, people would kind of run away or stand at attention. When Grant showed up, they treated him like the neighbor next door, and he used some of the language. They said: "Mornin' General, how [are] things going?" and so on and so forth. What a beautiful one!

With any luck—we will not have that many Brits who are listening to us. [Campbell laughs] No, with great luck for your show, we'll have millions of them. And I hope you do. But D-Day! Bernard Montgomery was the head of the English troops. And they were talking about either the night before or the morning of [D-Day]. And by the way, I'm going to cry on the microphone before this is over. The night before [or] the morning of, the two generals [Montgomery and Eisenhower] did their last thing. Montgomery gave a speech to his troops. And it is said that it was absolutely one of the most perfect speeches imaginable. Eisenhower, who never wore medals on his jacket, went down to the beach, and just hung out with the guys, one at a time, walking up and down the line chatting. And one author who wrote about it—I'm getting spine tingles even though I've told this a hundred times and it's so unbelievable—said Eisenhower was so in touch with his troops, that moms and dads were willing to send their sons to die for him. I mean, if that's not a line for history, I don't know what the heck is.

That's MBWA. Honest to God, I wish I could take a selfie for you because I really teared—I've said it 200 times, and I can't say it without tearing up. But you know, that's the essence of leadership. That's when you do agile with a lowercase a, and that's when you do Six Sigma with a lowercase s, and so on. I'm not a very religious person, but there is a spiritual dimension to it.

You have to worry about that in your hiring, for God's sakes. I mean, that's where we screw up. We, as they say, promote the best salesman to sales manager and the two jobs actually have nothing whatsoever to do with each other.

JON CAMPBELL: Well, how do you balance the spiritual moving into the ritual? Or is that, like you said, it's inevitable [that things get ritualized]: Whether it's design or its quality or its agile? Is there anything that you can do to protect that?

TOM PETERS: Part of my answer, which is not very attractive relative to the goals of this show [laughter], is to say it's a losing

Tom Peters

battle. One of my old McKinsey colleagues, Dick Foster, who was a researcher's researcher, did a study of the 1,000 largest publicly-traded American companies over a period of 40 years. Over that period of 40 years, not a single one outperformed the market. As I said to somebody: "For God's sakes, if you've got an N of 1,000, you would think that maybe one or two could have made it past the hurdle." But it really is a downhill slide. When I'm in my smartass mode when I'm giving a speech, I say: "Hey, have fun, go for it, do anything crazy. You're gonna lose but you might as well enjoy the trip—"

JON CAMPBELL: "—as you do it—"

TOM PETERS: "—as you do it."

I think bureaucratic deterioration only goes in one direction. To go back to my own experience, the gorgeous, vital, lovely Hewlett Packard that Bob Waterman and I wrote about in ***In Search of Excellence*** in '82 and researched in '78, is long gone. And, in its place, there are rigidities piled upon rigidities and we could have a long discussion that's way beyond my skills about monopolies and concentrations—and I get that—but I do not believe that the most modern of the modern of the modern tools that we have now will, in the long term, keep a Facebook or a Google or an Apple from not calcifying as well.

JON CAMPBELL: It's hard because you end up fighting all the detritus that you've built up over the years as you look to scale. The challenge is how you identify a second way of working when you're looking to innovate, as opposed to whatever first way of working that the optimized engine kind of [requires].

TOM PETERS: One of the things, again, and this takes us back but it now has become common is—I don't think this is [in] ***In Search of Excellence***, I think this is my second or third book, either ***Passion*** or ***Thriving on Chaos***—I started studying the Lockheed Skunk Works. And Lockheed built its first Skunk Works in Burbank, California, to handle precisely what you have just talked about. The first thing that Kelly Johnson and his gang created was a famous spy plane called the SR-71, and the SR-71—and this is probably inaccurate but it is within real close spitting distance—the SR-71 was developed by a team of 175 people. And it took them six or nine months. The same thing [using the conventional development process] at Lockheed would have taken 3-4,000 people six to seven years. They started this Skunk Works and they put it out in the boondocks, and they didn't micro-control it. Obviously, it had a finance guy who was doing the numbers, but for a while that was the secret. There's no way in hell you are going to de-bureaucratize the product development process in a big company. And so the answer is, or an answer is: Create something really totally wacky. Don't put it within 75 miles of the corporate headquarters, et cetera. I really fell in love with the Skunk Works thing.

And we used to do this thing. It was just incredible fun, and I wish you had been around for it, you would have loved it. We got so turned on by this idea that—my office was in Palo Alto, and down south of Monterey, about 90 miles away—we started holding these things called Skunk Camps. They were basically aimed at answering the question, which you asked a couple minutes ago, and that is: "How do you get vitality back into a big corporation?" And the whole idea was to try to think skunkily, if you will. And so, we spent five days talking about Kelly Johnson's Skunk Works and a Skunk Works that I had run into [at] the Xerox corporation, and so on and so forth. (A) it was great fun, and [(b)] we really got some characters to attend.

> **"I do not believe that the most modern of the modern of the modern tools that we have now will, in the long term, keep a Facebook or a Google or an Apple from not calcifying as well."**

JON CAMPBELL: I feel like that could be something you still run today, because more and more of these large established companies are looking at how they build up new business units or spin up new startups or partner with accelerators, all in that same service of getting away from the mothership.

TOM PETERS: Absolutely.

JON CAMPBELL: You talk a lot about hiring for empathy, the notion of empowering your employees. We frequently see companies trying to build their internal human-centered design and innovation capability, trying to stay nimble and adaptable. A lot of what we talk about is that need to hire empathetic employees and then empower them so that they can have the decision-making rights to move faster, to be [nimbler]. You've been talking about that for decades. And I'm curious: When

Tom Peters

you look at today versus the last few years and even back into the prior decades, has that gotten better? Because it seems to me like a lot of companies are still very nervous about their employees' empowerment.

TOM PETERS: Oh, I think they are.

God descended on my shoulder and gave me two of the greatest slides I have ever had. I'm not 100% happy with God because He gave them to me just too late [Campbell laughs] to put in my latest book. They are literally two paragraphs and if I had them at hand, I would read them to you. But they are about Google. They talk about two very serious, big data research projects that Google did. Number one… was to figure out what the characteristics were of the best Google employees. And so they came up with eight characteristics and number eight on the list was STEM skills. All of the other seven were soft skills. You know: Listens well, pays attention to other people's ideas, and so on. So, that was top employees. The second one they did was an analog and it was most creative teams. And Google apparently breaks teams down into A teams and B teams. And the B teams routinely beat the crap out of the A teams.

JON CAMPBELL: Really?

TOM PETERS: And they did the analysis and it was the same thing, the soft stuff. I take your ideas into consideration. I listen when you talk. Et cetera. And one of them that was really cool, I thought was fantastic and, unsurprising to me at least, in places like Google or Facebook, is the number-one item that the B teams exhibited, that the A teams didn't, was no bullying. In that software world where everybody has an IQ of 372 and all 300 of them graduated first in their class at MIT or Stanford, they are bullies. They behave that way a lot of the time. As I said to somebody: "My life is over. All I have to do is show these two slides, hand them out to people in paper copies [Campbell laughs] or electronic copies, and then leave and say: 'There it is, guys; take your truth, guys and women.'" There's the proof. And yes, as I said, I love it because it was Google. Because if it was Joe and Harry's Bar and Grill, it would be anecdotal. But Google has never done anything anecdotally in their whole bloody life.

JON CAMPBELL: Right. It's also such a good example, too, where your point around STEM coming in at number eight [is concerned]. It's like: "That's great that you have these incredible engineering skills or your 375-point IQ, but there is no substitute for being able to work and build off the ideas of others and communicate clearly." And that goes for the leading tech companies as much as it does anything else.

TOM PETERS: Those skills are far more important, I would hypothesize, on remote teams than they are on teams that are together. When 40 of us from 30 locations in nine countries on three continents are trying to get something done, and I know it's being done electronically, blah, blah, blah, but to really get something good done, you know, really requires a depth and a human touch to pull it off. You could argue that that's actually more important [for remote teams] than it is in the big open office at Google or Facebook.

JON CAMPBELL: And that trend's only going to continue to increase.

TOM PETERS: Incidentally—on one of my favorite topics—it's also one of the reasons that particularly in these distributed environments, that the research shows pretty clearly that women on average are better managers than men. They listen better. They can handle ambiguity better. And that's, if you will, the perfect design for the kinds of teams we're using today. Guys are good if there's a hierarchy. Women are better when there's ambiguity and no rules.

JON CAMPBELL: Which is what innovation is—so that makes total sense, right? How do you navigate ambiguity and figure out what comes next, what to do next?

TOM PETERS: Incidentally, and it's something that I'm paying a little bit more attention to [nowadays]: Those kinds of skills ought to be, and you can't get them entirely out of a classroom, ought to be far more intensely taught in professional schools than they are today. And I'm not talking [just] about computer science. I'm talking about computer science, engineering, law, medicine, et cetera. I remember the guy who invented the checklists—who was not Gawande, who wrote ***[The Checklist Manifesto]***—but a Hopkins doc by the name of Peter Pronovost. And I remember ***Peter saying in his book***, he said, "When I was in medical school, I probably looked through a microscope for 300 hours, something that I have never done for one microsecond since I got out." And he said, "I did not have one minute of team leadership training. And here I am now running the ICU at Johns Hopkins Hospital." And (a) it's a disgrace; but (b) all the professional schools need [to hear] this. Lawyers don't know how to talk in front of a judge. The Stanford and MIT computer science people don't know how to deal with their next-door neighbor[s]. And [in] all the professional schools, that's arguably the case.

Tom Peters

JON CAMPBELL: Yeah, this idea of training for collaboration and how you actually work in teams, as opposed to whatever discrete craft or skill that you're building up.

TOM PETERS: I think the evidence is pretty clear, and I do not pretend to be an expert, that that stuff is teachable. I can't teach it to you the same way that your second-grade teacher taught you the multiplication tables, but I can give you a lot more sensitivity and thoughtfulness toward these topics.

JON CAMPBELL: You talk a lot about hiring for empathy. And we hire here for four, I guess, attributes. We're always looking for: Empathy, curiosity, poetry, and logic. And I think all four of those are—

TOM PETERS: Oh my God: I love it. I love it. I love it. I love it. Especially number three.

When your son or grandson attends my MBA school 25 years from now, I will be long dead. He is going to take, or she is going to take, an art appreciation course. And on top of that, the school will be still called an MBA, but it will be called the Master of Business Arts. I love it that you guys do that.

JON CAMPBELL: That's cool.

TOM PETERS: No, it is not cool, it is seriously hot shit. There are some things that deserve words like "cool" and "hot shit" may or may not be appropriate in this context, but that's what it is.

JON CAMPBELL: It's critical to be able to tell stories and connect, and not just have that part where you're spouting the facts or you're just trying to lead people through. You have to be able to make things sing, so to speak, right?

TOM PETERS: It's a long way from you guys, in a way but it's the basic point: There's a one-liner that I found. Our Secretary of State was a guy by the name of Dean Rusk. And the wonderful line from Secretary Rusk is "The best…" and this is precise: "The best way to persuade someone is with your ears." And that's a beauty.

JON CAMPBELL: That's really good. Because then you understand what they're looking for, what their needs are, and can respond accordingly.

TOM PETERS: Absolutely. Absolutely. The Mark Twain version of Dean Rusk was, "Never miss a good chance to shut up."

JON CAMPBELL: [Laughs] I'm a big Twain fan. And another one of his quotes that I use is: "It's better to keep your mouth shut and appear stupid than open it and remove all doubt."

TOM PETERS: [Laughs] I love it.

JON CAMPBELL: Yeah, that's his sense of humor.

TOM PETERS: I love it. I love it. I love it. I love it.

Our reality, you may have noticed, has become augmented. Virtually everything we do is surrounded by a digital layer of communication, images, and business. Futurist David Rose, author of ***Enchanted Objects: Design, Human Desire, and the Internet of Things***, has certainly noticed—and he's given a tremendous amount of thought about how augmented reality, or AR, might fit best into human lives. Fresh from a stint at Warby Parker, Rose brings his forward-thinking ideals to EPAM Continuum—he's now a colleague—and this conversation with Toby Bottorf. Rose has a rosy view of technology and innovation ("I'd like to focus on the positive valence stuff"), but it doesn't mean that he's not acutely aware of the business value it creates. "That whole idea of a virtual try-on, I think, is one of the best use cases for augmented reality," says Rose, because "for many businesses, where the rubber hits the road is being able to be in the e-com funnel."

"That Whole Idea of a Virtual Try-on, I Think, Is One of the Best Use Cases for Augmented Reality [because] for Many Businesses, Where the Rubber Hits the Road is Being Able to Be in the E-Com Funnel."

—David Rose

Listen to the ***audio version*** of this conversation.

Mentioned in this Conversation

The Glass Cage: How Our Computers are Changing Us In *The Glass Cage*, Nicholas Carr simultaneously celebrates new technologies and cautions their misuse. He discusses the perils of granting seemingly unlimited access into our lives through data generated from wearables, digitized medicine, and more in this gripping account of how technology is used in human experiences.

We'll Soon Be Able to Experience Reality as We Want It. But Is that a Good Thing? This *Quartz* post of Rose's considers six "clusters of concern" around our mixed reality futures and speculates how we might innovate our way around them.

David Rose

TOBY BOTTORF: We are talking today with David Rose, one of our newest colleagues at EPAM Continuum, a guy who spends a lot of time thinking about the future—but he's [also] got a pretty interesting past. So, David, you're new to EPAM Continuum. You've come to us from Warby Parker, the MIT Media Lab. Tell us a little bit about what you just finished doing.

DAVID ROSE: Well, at Warby Parker, as you know, the company is known for their home try-on service. So, if you're inspired to buy a pair of affordable glasses, they will ship five to your home, without prescription lenses in them. You can try them on for your friends and family, and [you might] decide that you fall in love with lens number two or frame number two—and from there, you can finish the order online without ever having to go into a store. And that presented a big problem for the company, because many people, once they've made a frame choice, are asked: "So what's your prescription?" It's not like we keep our prescriptions in the bottom file drawer. I mean, does anybody keep file drawers anymore? Not only was it hard to lay your hands on a prescription because it was at the nearby optometrist, who was not eager to give [the] Warby Parker call center operators that prescription because they would lose the sale and they knew it… but also, there's a regulation in this country that, in many states, you have to get a new script, despite the fact that your eyes don't actually change very quickly—every couple of years. Every two years.

TOBY BOTTORF: My prescription, like a prescription for a drug, expired—

DAVID ROSE: —Right, right.

TOBY BOTTORF: —after two years.

DAVID ROSE: Well, by design.

TOBY BOTTORF: Uh-huh.

DAVID ROSE: There's a lobby for that.

TOBY BOTTORF: OK.

DAVID ROSE: So, we tried to solve that problem by building a new business that needed to be built, which is to verify and correct your prescription from the comfort of your own home. And if you think about an eye test, it's not that complicated. There has to be a stimulus, also called an optotype, which are those tumbling Es or Landolt Cs or sometimes they're even pictograms that are designed for kids [who] are pre-literate. You have to be a certain distance away from the unknown stimulus and optotype. And you have to test people to the point of failure, so that they can't see the 2015 line, the 2010 line.

We built a system that used a computer or your laptop, for example, to put up the optotypes. Your phone [will] detect, very precisely, how far away you were from said eye charts, and then your phone [will] indicate what you see. So, you swipe with the phone, as if you're a remote control, in the direction of the opening of a Landolt C, which can be one of eight different orientations. And then with that information, we ask you a set of questions about the history of eye disease in your family and other conditions. We can send that data to an ophthalmologist in your state by law, and then they can issue a new prescription. It was my job to put together a team to prototype this, to iterate on the user experience, and ultimately to roll it out in 20 states, which make up about 80% of their customers. And it's perceived as a real success because it removes a really important point of friction in that user journey.

TOBY BOTTORF: You're wearing glasses. I wear glasses. Certainly the eye test is one of two pain points for me. The other is, if I take off my glasses, I can't see very well. To try on a new pair is kind of like, "I don't know what I look like in these." Because I can stand in front of a mirror but I can't see clearly. There may be some remedies for that with interesting technology, too, right?

DAVID ROSE: When I was at Warby, the iPhone X came out, which has a front-facing camera [that] can unlock your phone. So that technology, which I think Apple acquired, turned out to be perfect for the second use case which is: "Show me glasses on my face in a really convincing way—we call it 'virtual try-on'—that will inspire so much confidence in what I will look like with these new glasses that I will be compelled to buy them." And luckily, because Apple in that system has a[n] infrared projector and an infrared camera that's dedicated just to reading the topology of your face as being unique to you, we could use that point cloud, that 40,000-point cloud, in order to understand your pupillary distance, your nose-bridge height, the width of your face, and then really convincingly put a 3D model with textures and shading and transparency of glasses on your face.

That's been a huge boon to the business because a lot of that population, as you might guess, does have iPhone X[s] or now iPhone 11s, and they're trying on glasses rabidly and buying through that experience. That whole idea of a virtual try-on, I think, is one of the best use cases for augmented reality. There are many, many use cases, some people say maybe 15 or 18 things you could use

David Rose

this mixing virtual with real [for], but for many businesses, where the rubber hits the road is being able to be in the e-com funnel. "Let me see what those glasses look like on my face. Let me see what the shoes look like on my feet. Let me see what the haircut looks like on my head. Let me see what the makeup looks like [on my face] or even something like [trying] jewelry [on my body]." My friend works at Cartier in New York, and they have all these shop window displays on Fifth Avenue that millions of people walk by. After 5:00 p.m., when Cartier, for safety reasons, takes all the jewelry out of the window … we spoke about, "Well, that would be a great opportunity for virtual try-on: You're walking by the window; the window sees your face; it reflects your face; and now [it reflects your face] with a new amazing Louie XV Gold Sapphire brooch."

TOBY BOTTORF: For folks [who] haven't applied social media filters to their pictures (they might not know what we're talking about): "Augmented reality" is a couple of big words. What are we talking about? Also: What aren't we talking about?

DAVID ROSE: With augmented reality—the new term is actually "spatial computing" and I kind of like spatial computing more—it's taking the base plane of the real world and superimposing a digital layer on top of that base plane. So, if the base plane is what is revealed to you in your front-facing selfie camera, it's putting other ornaments or decorations or costumes or vomiting rainbows or whatever on the plane of your face, and allowing you to see that, oftentimes in real time. If you take the other camera on the phone, it's pointing that camera at the world and being able to recognize where you are. For example, Google Nav now has an application where if you walk out of the subway in New York and you're lost—like most of us are in that moment—rather than looking down at a plan-view map, now a fox pops up. And it's a red fox, kind of from the Pokémon vocabulary, and you just follow the fox. That is kind of a use of having the front-facing camera recognize where you are in Manhattan, based on not putting QR codes on any buildings but just recognizing the skyline, because all of those buildings are now trained on so they can determine that you're at 42nd and 8th. And then they superimpose, on the view through the camera, the red fox, which is now walking down off to the right—so now you follow that fox.

TOBY BOTTORF: Sounds both charming and easier to follow.

DAVID ROSE: [Laughs] Well, I think a lot of people are debating: What is the killer app for this new mixed-reality world? Is it navigation (the following-the-fox example)? Early signs of what AR will become are now found in lots of high-end cars, right? You throw the car into reverse; not only do you see, through the rear-facing camera of the car, what you shouldn't hit or what you might hit, but also there's a superimposition of, "If you turn the wheel to the left, here's an arc of how the car will move out of the parking spot," for example. Or, in your front-facing heads-up display, you can see a path that superimposed on the road in front of you in order to figure out where to turn next. This, generalized, will become what is baked into glasses.

TOBY BOTTORF: Google Glass. I remember trying those on when they were brand new and I felt: "Man, this is like a Segway for your face." Not something I wanted.

DAVID ROSE: There's a very bright line in between glasses that show disembodied information that is floating in front of your head, and when you turn your head, it turns with your head—that was Google Glass—and the new technology that is part of HoloLens, it's part of Magic Leap, and it's part of 50 other glasses companies that are coming out soon to eCommerce sites near you, which is a technology called "specialized location and mapping," otherwise known as SLAM. This SLAM technology uses front-facing cameras that are embedded in the frames of glasses in order to image the world in front of you, which then gives you the ability to actually superimpose information on the physical world, in places where it's appropriate to put information in the physical world. So if there's an open space on a wall, or an open space on a table, you might superimpose information [on] those places. And when you turn your head, the information stays right there.

TOBY BOTTORF: That sounds really promising to me, in terms of lightening the cognitive load, because if the information has object permanence, I can go back to it. The other thing that's lightened your load is if the information is not connected to the world, it has to have some other information architecture to be accessed and re-found—and then you gotta learn that, you know, cyber-information architecture, as opposed to [it] just being in the world.

DAVID ROSE: That's right. I founded a company 19 years ago now called Ambient Devices, where the big idea was: Could you take this insight that cognitive psychologists have had for a long time, which is called pre-attentive processing—this is the ability for your brain to process things in peripheral vision, in parallel, in less than a quarter of a second, without any cognitive load—could we design more information that can exist in your visual periphery that you love having around? Because, just like you like having a window around, because without even glancing, you can tell: It's raining outside or it's getting dark or lots of other information that

David Rose

our reptilian brains can perceive in the periphery. We were making dedicated objects to render information as light or as a pattern or as an angle or other pre-attentive phenomena. But now, with AR, you can imagine painted pixels or a digital dashboard that tells you about the things that you most care about in your periphery. Right? Everyone has the set of things that they care about. For some of us, these things are jumping on to wearables. Like all of the things that are on your watch—"Are you late for your next meeting? Is there an important notification from someone that you care about? Are your servers down? How's the mood of a loved one?"—all of these status indicators. But now they don't have to be on your phone. Now they can be kind of spread thinly in the world around you. And that will happen through augmented reality.

TOBY BOTTORF: So they're a little bit less needy of attention.

DAVID ROSE: Well, that's where design comes in. A lot of what has been prototyped or speculated about the coming AR future is a world of immense clutter. Where you can imagine [the] superimposition of reputation systems, or navigation, or advertising, that's just going to be totally polluting our visual field. But that's kind of this dystopian view of it. I think, with design and with understanding people's needs and understanding people's psychological states and really deeply understanding people, we can start to provide services that can exist in your visual field that are things that you want.

TOBY BOTTORF: I'm glad you brought that up. If we're talking about what the killer app for spatial computing or augmented reality might be, I want to also make sure we spend a minute thinking about our current understanding of the worst-case scenario[s], because a lot of new technology has unintended consequences. I think there's general consensus that the dystopian view of this is that it's just billboards everywhere; that again, your attention has been monetized.

DAVID ROSE: The popular fear is that this coming world of kind of augmented vision is going to be mostly undesirable and that the big players that are monetizing attention today, through advertising, will have a brand-new rich field to clutter with promotions of all sorts. And they'll be able to do it in a much more insidious way because, not only will they know where you are, but they will also know what catches your eye and what the gaze vector specifically is looking at. As you walk by a sign or a store display and you dwell for 400 milliseconds on something, well, then that's going to be retargeted at you.

TOBY BOTTORF: Gonna follow you home.

DAVID ROSE: Yeah, we've been working here on a set of hazards. I'm calling this whole field the intersection between computer vision and wearables as SuperSight because that is the promise. That is the fantasy. That is the superpower. [We're talking about] X-ray vision and being able to see in time-lapse, being able to see in slow-mo, being able to see through things, being able to see the meta cloud of information that now surrounds everything.

TOBY BOTTORF: The glasses that are sitting on my face were invented close to 700 years ago. There haven't been a whole lot of upgrades. They're super-hip. They're called "progressives," which is a much nicer word than "bifocals," but there hasn't been a lot of technological advancement.

DAVID ROSE: And those convex lenses were hip, even then. Actually, glasses have been fashionable since the invention of glasses. Part of my job at Warby Parker was to think about what new sensors and display technologies might be embedded in this base of the temples and the frame—literally, the frames of glasses. And some of the things we were looking at, which I think are still intriguing use cases for many types of companies, [were the following:] One is to just make them AirPods. This open-ear audio is something that Bose has recently commercialized in their Bose AR frames. It's just another form factor for headphones—and a microphone—and I think those get more and more interesting as you find specific service design scenarios that take advantage of the open air-ness of the fact that you could be biking as well as listening and still hear the traffic. You could be doing an outdoor yoga session and these frames, because they have an accelerometer and a compass in them, will know that you're doing downward dog and not just faking it. If they're doing a coaching app, like Aptive, they will know what your pace is. They recently just enabled a new gesture, which I think is actually brilliant because it's a familiar gesture, where if you look skyward, they tell you what the AccuWeather forecast is. Isn't that nice? That's not a new, novel gesture that you have to learn. That's just learning from how people move their head around and try and doing something sympathetic to an existing gesture.

TOBY BOTTORF: It means for me that when I'm trying to remember something, I'm going to be told the weather. [Rose laughs] Because that's my habit.

DAVID ROSE: Well, maybe for you, they need to be personalized to actually tell you the thing you're trying to remember.

TOBY BOTTORF: We went off on a nice interesting tangent. I want to loop back to what you were describing as a part of SuperSight and these hazards.

David Rose

DAVID ROSE: We've described ***six buckets or clusters of concern.*** For each of them, it's my intention to not just raise them as issues or to be catastrophizing about what the problem is, but also to propose a remedy, to propose a way out—either a design way out or [legislative] way out—of the woods. The first one is social insulation. In the same way that we have bubble filters today and different people are experiencing different realities, in terms of the news. I think that's going to be one of the most profound effects. You could be walking hand-in-hand with someone through the city, and he could be interested in another set of things [from you], perhaps superheroes jumping around, like Spider-Man weaving around buildings. I could be interested in architectural history. I could be getting my glasses for free, subsidized by ads. We would [each] be experiencing a totally different stroll. What does that do to social interaction between two people? So, I think there needs to be new synching gestures that allow people to see the same thing. That's another opportunity for design.

TOBY BOTTORF: The same thing was true of cell phones, when people started talking to themselves in public. The first impression was: "Uh-oh, keep a wide berth." Now it's become a little bit more normal. I do think that there's going to be a problem if you can't tell what somebody else is seeing. Are hey looking at you or looking through you at something else?

> **"In the same way that GPS and calculators, a long time ago, gave us these cognitive crutches, I think that [these crutches are] going to be another thing to deal with"**

DAVID ROSE: Thad Starner, who was a proponent of wearables when I was at the Media Lab in the 90s: It was very hard to talk to him because he was always staring past you and doing something else, using a chording keyboard in his pocket. Something was always going on. In addition to talking to you, he's also coding. I have a pair of the North glasses, which have a little pico projector in the temple of one of the eyes, and they just launched this week a Twitter feed, much to my chagrin. [Laughs] So, in addition to getting a heads-up display for your talk, so you can see what to say for each slide, or notifications, or when your Uber is coming, or what Spotify song is playing, now you can see your Twitter stream right there in your glasses. That's going to be good for human interaction [laughs].

Let's talk about another issue. In the same way that GPS and calculators, a long time ago, gave us these cognitive crutches, I think that [these crutches are] going to be another thing to deal with, in terms of having everything in front of you labeled. So, even after having been at EPAM Continuum for about four weeks, I still struggle with: "Who's who? What are their roles? What projects are they working on? What superpowers do they have? Who's an expert at what? Who aspires to what?" Remembering [all] that times 130 people or so is—I'm going to be at that for months.

TOBY BOTTORF: Can I tell you what my killer app for augmented reality is?

DAVID ROSE: Sure.

TOBY BOTTORF: Name tags.

DAVID ROSE: Do you worry that if everyone has a name tag that's superimposed, either where you put a name tag or maybe larger on top, floating over their head: Will it make you dependent upon that technology?

TOBY BOTTORF: So, if GPS is a precedent, then yes, most people's sense of direction has really atrophied. Personally, I would imagine it would be a learning tool, and that it would be the kind of thing that I would like to modulate a little bit or it's on a gradual fade that I can say, "Whoa—bring it back."

DAVID ROSE: I think that's the way out of these cognitive crutches. In the same way that pilots are, because of autopilot, probably are becoming worse and worse, the less that they have their hands on the yoke of the plane. Maybe instead of just hanging out and drinking coffee, they should instead use the context of the cockpit to do simulations as they fly.

TOBY BOTTORF: There's a great book, ***The Glass Cage***, that talks about the perils of automation. Pilots are the best example because we're dividing up the labor where we're taking away the repetitive stuff that keeps [pilots'] skills sharp and asking [them] to only intervene very rarely and in an emergency. It's the worst possible combination.

David Rose

DAVID ROSE: Do you remember what other professions [*Glass Cage* author Nicholas Carr] spoke about? I think one was architecture, and he said the lack of having the hand sketching is homogenizing the buildings that we design in AutoCAD.

TOBY BOTTORF: That's super resonant because here at EPAM Continuum, everybody, regardless of whether sketching is their medium or something else, we think and sharpen our thinking by sketching. You can sketch in an Excel spreadsheet. You can sketch in 3D foam. But make a thing. Figure out what you're really talking about by making.

DAVID ROSE: That's kind of a perfect segue to what I'm doing here—

TOBY BOTTORF: —Yeah.

DAVID ROSE: —which is making things. I know that we have an amazing tradition of deep customer research and being reserved and appropriately slow at inventing solutions before we understand context and people deeply. I think that the culture of the Media Lab is different, and maybe interestingly different. To me, the tradition there is more about quickly prototyping, almost blindly, quickly prototyping as a way of learning and understanding what a new material might be. If you liken electronics or sensing or augmented reality as to a new material, there's this [sense of]: Jump right in, try it; you will be wrong in lots of ways about what the abilities are of this new material! And if you've ever thrown a pot—have you ever thrown a pot on a wheel?

TOBY BOTTORF: I taught ceramics at summer camp one year when I was in college, having never thrown a pot before that. That was an interesting week before the kids showed up.

DAVID ROSE: So, the materiality of clay is such that it behaves very differently than what you might imagine. You can't just do a sketch and then produce that thing because you don't have the ability to pull up the edge of a pot in the way that you would imagine. So, it's like getting in there, experiencing the material, experiencing the plasticity of it, and the limitations of it. I think we can apply that same metaphor to this material of AI. You know: What will it be good at? How will it fail, interestingly? And where will it be brittle? And I firmly believe that the best way to understand that is to have an idea for something, start building it, start failing, and then you'll discover. I think this kind of notion of prototyping a concept quickly is maybe best true for new materials, where you really don't have a sense of the capabilities and the limitations. Once you become an expert, then you know how to apply those materials to specific client situations. And you become a master craftsperson in that respect.

> **"I think our designers and strategists are super careful not to predetermine a technology or solution, which I think is right. But maybe we sometimes over-index on that, and I can totally see what you're describing."**

TOBY BOTTORF: I think there's an ideal middle ground. I think our designers and strategists are super careful not to predetermine a technology or solution, which I think is right. But maybe we sometimes over-index on that, and I can totally see what you're describing. See. Interestingly, we talked about things, even when we're not talking about vision. I see what you're talking about, in terms of the difference between having a technology as a solution in search of a problem and just trying to solve the wrong thing with it again and again and again, which is a stupid way of failing fast. And investigating it, a little bit more open[ly] and curious[ly], so you can understand: What is its essential quality? What is it good at? What does it want to be? And you're still going to go back to people and understand their needs, but with a greater fluency about potential solutions.

DAVID ROSE: Right: What is buildable? Just in terms of the categories of the benefits of what augmented reality might be able to do for us. I've been trying to catalog some of these wishes that people have and some of the types of benefits that [they] might deliver. In addition to the labeling of the world, either [with] big nametags [for people] or [a taxonomy of] plants and animals or whatever that you need—architecture—labeled, the ability for this technology to look back at us and help us understand how we perform and what our state is, to me is fascinating because we're now used to this idea of personal digital assistants. We're used to those [digital assistants] answering Wikipedia [queries], gathering shopping lists, playing music for us. The proliferation of [places] where these digital assistants will be is kind of answered, right? Amazon just launched rings and glasses and other things that will have this technology embedded. But if we can actually use this technology to look at ourselves, and kind of be the perfect coaches that help us play sports later in life, with more confidence and less injury; that can notice how we react in different situations;

David Rose

that can stimulate us when we're about to fall asleep and driving; that can soothe us when we're [stressed]; that can introduce us when we're lost; that can seek help before we make mistakes. I think that's really powerful: To think about how these things will be our companions, desirable companions—probably shut-off-able companions—as we go through all these tasks throughout our day.

TOBY BOTTORF: I like that you call them "companions," because there's a certain amount of life and relational stuff going on there. This conversation has been really cool for me, to get a sense of how you think about the future.

We've talked about dystopian scenarios and the list you just gave of, I thought, really optimistic scenarios. How do you balance optimism about the future—and where's that come from—with some guardedness around unintended consequences and potential negative use cases, dark patterns?

DAVID ROSE: My philosophy is that most new technologies can be used in positive or negative ways. Most of the things that we love about our spouse are also the things that drive us crazy. They're always two Janus sides of any new tool. The way that I want to be in the world is to optimize for and look for and design and build the things that help us understand each other more deeply, that connect [us] to each other more deeply, that help us understand more about the environment, that function in the world in a way that's desirable. I think at the same time, we do need to paint the provocative dark scenarios that will help us do things like privacy-by-design architectures as we build these things.

But I tend to think that there are more journalists, whistleblowers, and kind of people who are willing to be alarmist in the world rather than people who are trying to kind of create the desirable future states. I'd like to focus on the positive valence stuff.

SPEAKING OF BUSINESS MODEL INNOVATION

Designing new offerings is no easy task. Fortunately, we have three people who have considerable success in this area, and they're not shy about revealing (some of) their secrets. It's a master class in the art of spinning up new offerings and even businesses.

2

John L. Brooks III is a weighty name for a man with a weighty reputation and a deeply impressive track record in the world of diabetes. Brooks, who is the managing director of Healthcare Capital, LLC and former president and CEO of the Joslin Diabetes Center, has played a wide variety of dramatic roles: Innovator, investor, executive, mentor. In this conversation with EPAM Continuum alum Mike Dunkley (recorded in 2017), he takes the role of an analyst, chiefly providing essential perspectives on what it takes to build viable businesses in the diabetes space. Deeply motivated to help people with diabetes—a group that includes his own son—Brooks understands that this requires strategic business thinking, planning, and execution. Throughout the conversation, Brooks has his mind on turning opportunities into working business models. "If the AI enables better understanding of what's going on with people with diabetes, the key is: How do the healthcare providers, nurse educators, clinicians, partner care doctors, endocrinologists, how do they adopt? Because, at the end of the day, their economics are important."

"All the Players Need to Be in the Solution Business. You Can't just Be Thinking about Selling the Product"

—John L. Brooks III

Listen to the ***audio version*** of this conversation.

Mentioned in this Conversation

Insulet: Omnipod Insulin Management System Insulet Corporation envisioned an insulin patch that could adhere directly to the skin's surface. This patch would automatically inject metered amounts of insulin according to the specific needs of the user and be managed wirelessly via an integrated handheld device. The catch: The technology behind the patch didn't exist yet, and the company had an aggressive timeline for development. EPAM Continuum was honored to help figure this out.

John L. Brooks III

MIKE DUNKLEY: John, it's a real pleasure to sit down and chat with you. You come to this [conversation] with a long career in innovation, healthcare, executive leadership, and [investing]. There's this overarching theme and strong interest in diabetes. I wonder if you could just add some color [here].

JOHN L BROOKS III: As it turns out, 25 years ago, our then-three-year-old son was diagnosed with type 1 diabetes. And, to be honest with you, there was no family history [of diabetes, and I] really didn't have any appreciation of why that happened. And, maybe like a lot of other parents with kids with a particular disease, you decide, "Hey, I need to do something about this; I need to learn about this disease." For the last 25 years—our son just had his 28th birthday last week—I said, "What can I do to get myself up to speed on understanding diabetes—not just type 1, but all aspects of diabetes?" And I just made a conscious effort to be a continuous learner [and] make sure I could read as much as possible. And I tell people, in the early days, whatever I read, I was lucky to absorb about 5% of it. But, over time, you start getting fairly knowledgeable.

I had the opportunity when I was in the venture [capital] industry to look at lots of companies in diabetes, which was great. Obviously, lots of companies that were working on, at the time, noninvasive glucose sensors, [which were] next-generation ways to help people with diabetes. And that was really the opportunity with one of my partners and I at ***Prism [Venture Partners]***. He was a medical device guy as well. We ended up creating the idea for the ***Omnipod***, the insulin Omnipod. That was born out of a flight that he and I took in 2000 back from the West Coast. I was describing all the challenges of insulin initiation and administration for our son, and we came up with this idea of a disposable insulin delivery system based on another opportunity that we were working on in the disposable hearing aid area. So, we thought the idea [of] disposability would be disruptive.

MIKE DUNKLEY: And this is the infamous napkin sketch?

JOHN L BROOKS III: Exactly, which unfortunately, we weren't smart enough to keep. But that led to [the Omnipod] and then I had the opportunity—as I joined the board at the Joslin Diabetes Center—to work my way up the food chain as chairman and then, about seven years ago, I became the CEO, and did that for the last five years up until two years ago. And it's really been an opportunity for me to even further appreciate the research side, the clinical delivery side, and, on a global scale, the magnitude of the diabetes pandemic. So, for the last two years, I'm still driving all that through my board work and advisory work, consulting work, and I just have a strong passion to see what I can do to try to help the now 461 million people around the world that have diabetes… principally, type 2 diabetes. But, as we all look at the numbers, it's only escalating. We need to think differently.

MIKE DUNKLEY: So, thinking differently is kind of a theme, I think, for the conversation. It feels like we're maybe [at] an inflection point where, you know, we're not quite 100 years since insulin was first identified and developed, and there's been a lot of really tremendous development when you look at the insulin itself—the delivery systems, the measurement systems—but we're starting to move towards this kind of solution space. And maybe Omnipod was one of the first inventions that started to look at [diabetes treatment] more holistically. Do you want to just give your perspective on where we are in that trajectory?

JOHN L BROOKS III: I think you've hit it on the head. I mean, we're transitioning away from the device world or the pharmaceutical world where the focus was on, you know, "Here's a device—let me get through the FDA. Let me find some key opinion leaders and try to convince them to adopt the product in the pharmaceutical industry, the insulin producers." I mean, the focus [here was] on: "How many more vials of insulin can I sell?" And now, I think, there's an appreciation to your point. All the players need to be in the solution business. You can't just be thinking about selling the product; you need to think about, "How do you participate in helping, whether it's a payer, whether it's [a] provider, whether it's a patient, their family?" How do you basically come up with a way to say, "Hey, I need to be recognizing that I need to be part of that. I need to help drive adherence. I need to help patients make better decisions. I need to take the burden of diabetes off of them. I need to give them an opportunity to have their diabetes management undertaken in a way that works for them"? You know, we don't have a one-size-fits-all mentality.

But I think the next big leap that we're just starting to emerge in is the ability, and not that we want to use AI and machine learning as buzzword[s], but we have now an opportunity through the power of sensors, whether they're CGMs [continuous glucose monitoring devices]—[there are] a lot of new CGMs coming on the market, obviously, [and] some of [them are] related to driving the artificial pancreas—but now we have an opportunity to take a sea of data that's coming off of devices, that's coming off of the sensors, physiologic devices, Fitbits, all these different data points are in the cloud. In the early days, people thought, "Well, this is great. I'll push it back to the doctor, push it back to the patient." Clearly, that was never going to take hold. It's really

John L. Brooks III

the idea of, "How do I take that data and turn it into actionable intelligence? How do I actually use it to look at patterns?" And then I could use that to inform doctors to think about different care plans. Patients [could] understand what they could do to try to optimize their care. And that really sets the stage then for better decision support—automated decision support—decision support taking place behind the scenes, if you will, and ultimately helping to drive changes in the economic environment, where we expect that we're going to see more and more payments for innovation—for solutions—being driven off of outcomes, being driven off of taking costs out of the system.

We're starting to understand that diabetes is a 24/7 disease and [asking:] "How do we help patients manage the disease, again, on their terms, at home, and recognize that they're trending in the wrong direction and intercede… [How do we] keep them from getting into trouble, which is going to lead to potentially a hospitalization or ED visit?" I think we're just starting to scratch the surface where we can really provide this oversight in the background, engage with the patient in a way that they want to be engaged, and understand the challenges of behavior, lifestyle, family situation, economics, the home, and all of that. So, I think the next evolution is going to be really this idea of having the ability to basically help people manage diabetes, and they don't have to be the ones doing it. It's really being done on their behalf.

MIKE DUNKLEY: I want to talk more about outcomes, which you mentioned briefly there. But maybe [we should] distinguish a little bit between systems designed for people with type 1 diabetes and systems designed for people with type 2, because [it] seems like there [are] two fairly distinct opportunities. You mentioned [the] artificial pancreas, which is about tying the measurement to the delivery and having some kind of algorithm—AI-driven, potentially—in the middle of that, automating that and taking that burden away; whereas type 2 is more of a behavior change challenge. Do you think of them separately like that?

JOHN L BROOKS III: I think that's a good way to think about it. As you indicated, [with] type 1, the objective at the end of the day is: "Can we emulate the way a normal pancreas works?" The opportunity—now that we're able to move away from episodic finger sticks [and] we're getting different blood glucose readings—now we have an opportunity, almost on a continuous basis, to really look at glycemic variability [and] really understand what's driving it, whether it's… the foods [one eats], whether it's stress, whether it's hormones, whether there's sleep or lack thereof. So, the idea is… how to then use the power of that information to drive

"We're just starting to scratch the surface where we can really provide this oversight in the background, engage with the patient in a way that they want to be engaged, and understand the challenges of behavior, lifestyle, family situation, economics, the home, and all of that."

much more precise insulin doses that keep those folks in a very good range.

Over time, I think there's an opportunity where the algorithms will become adaptive. They'll understand that individual. They'll understand what their habits are. They'll understand what they do Monday through Friday… the weekends are different. And all of a sudden, it'll really help that person optimize the care in a way that is [tailored to] exactly who that person is. So, that's exciting. Where[as], in the type 2 area, obviously, at the end of the day, people's pancreases are functioning. The problem is, they probably can't produce enough insulin because of insulin resistance [and/or] obesity. A lot of people with type 2 tend to be somewhat reticent to go on insulin. They've been convinced that that's really the drug of last resort—which isn't true. Historically, primary care doctors, who are very concerned about the risks, didn't have the resources to really support insulin initiation for type 2s. And now, I think there's a [recognition] that a lot of that heavy lifting burden can be taken off of people with type 2 [and] that, at the end of the day, insulin is actually [about] trying to augment what your body produces, and it's not a drug of last resort. It could be a drug [of] first resort.

The other part of it, I think, which is the heart of type 2 is, as you alluded to, helping people with a behavior change. It's really a family situation because people want to think differently about the foods they eat, their lifestyle, their habits, their level of activity,

John L. Brooks III

you know, all the other things that are going on. And, historically, I think a lot of people with type 2 didn't even fully understand what it meant to have diabetes. [There are] some opportunities now, with some of these sensors—if you put them on a type 2 [monitor] just for a week, all of a sudden, people get a real sense that: "This is what's going on!" Because a lot of people think, "Well, I can somehow sense what my blood sugars are," and most type 2s check their blood sugars fairly infrequently. And, here's an opportunity to basically show them, "Here's what's going on; here's what's spiking your blood sugars," and getting an opportunity [for them] to understand what's happening while they're sleeping. And I think there's been some evidence that tends to really give people [a] sense [of]: "That's me. I'm just not a statistic..."

And I think the other issue is [that] a lot of people understand the downstream complications of diabetes, but a lot of times, unfortunately, we wait until they're symptomatic. And, obviously, that's not a good solution because all [of] the sudden, maybe they're starting to have vision problems, cardiovascular problems, neuropathy problems. I think the healthcare system's understanding that we need to be far more proactive [since we're faced] with just an explosion of diabetes in this country [is essential]... Right now, we have about 30 million people, but it's projected [that] by 2050, if we don't aggressively do something, [we] could have close to one in three Americans with diabetes and, globally, 461 million people or so. And those numbers could be tripling in the next 20 years. So, I think the real answer is we need to think as we're talking... very differently. Not that we're going to throw technology [at the problem] and think it's gonna solve it, but we can use technology and analytics and machine learning [and] big data and understanding behavior change to help really wrestle this disease and give people an opportunity to live their lives and not have diabetes be this worrisome, burdensome thing that a lot of people aren't sure they want to invest in.

MIKE DUNKLEY: So there [are] some very sobering statistics in what you just said, in terms of the numbers of people affected, but, obviously, an opportunity is huge to help them improve their lives, right? And when I think of the various solutions for type 1, type 2, I think it's relatively straightforward to sketch them out on a whiteboard and say, "These are the key pieces and this is how it's going to work." But then you try [to] implement and scale these, and you run up against a whole host of different complexities and regulatory concerns, business models... Can you talk a little bit about that? As healthcare goes through the transformation, what are the key things that people are going to have to work through?

JOHN L BROOKS III: I think it's a great question. And if I just step back a little bit, and then I'll get right to that... We've been talking a little bit about mechanical or biomechanical and analytic approaches to addressing diabetes. But, certainly, there's a lot of work being done in regeneration, regenerative medicine. Some of the work that's being done to really see if there's a way to basically induce, or use different cells in the body, or to find a way to basically regenerate beta cells. And, obviously, the key in type 1 is, "How do you thwart the immune system for initiating the attack on the pancreas?" But companies are looking to do that within capsulization. There [are] companies that are looking for ways to basically inhibit the ability of the regulatory T cells for going after that. There's a lot of interesting activity going on in the biologic side, if you will. There [are] other people looking at even this area of the microbiome. You know, there [are] certainly some implications that, changes in the gut bacteria [are relevant]: Is it possible that [they] trigger an autoimmune response in type 1s? In the case of type 2[s], is it correlated—which it seems to be—to insulin resistance? But you know, I just wanted to put that out there...

MIKE DUNKLEY: And you're absolutely right to because it's easy to think that this is a chronic disease and we have to manage it as a chronic disease, but if there are some more fundamental interventions, you can make this an acute disease that is treatable.

JOHN L BROOKS III: Exactly. A lot of our healthcare system historically has been targeting acute diseases. And here we have a situation where diabetes [is] clearly a chronic disease. And, in some ways, healthcare for the most part is still kind of bricks-and-mortar-driven. And, if you think about it, that's how providers get paid, fee-for-service. But we're seeing opportunities, as we said earlier, with outcomes-driven measurements, value-based healthcare, where we want to put more of the incentives on keeping people literally out of a hospital. We want to make sure that we're basically helping people stay in a good range so that we can hopefully defer, if not diminish, their likelihood of developing diabetic complications. But then, as you said, it's complicated in this country because [of] how doctors get paid, reimbursement... You know, [we have] 50 states [and] we have 50 different flavors of how healthcare economics are driven. We have lots of issues where we're still biased towards treating the consequences of diabetes.

Then this idea of looking at prevention. Historically, there hasn't been a lot of money to look at [family histories]. We generally know, through family history, [about the likeliness of a person getting diabetes]. There's even some work being done in the genomics

John L. Brooks III

area. We can pretty much predict who's likely to become a person with diabetes. And obviously, we know today there's 90 million people in the US that are "pre-diabetic." But, generally speaking, we don't do a lot with that. Obviously, the CDC has made some progress with diabetes prevention programs, but it hasn't been fully baked into our healthcare system. And again, part of the problem is, there hasn't been a lot of economics to reward helping people not develop a chronic condition—so that's a barrier.

And in other parts of the world—whether it's the Middle East, China, or elsewhere—there's still a focus on building new hospitals, bricks-and-mortar facilities, and the idea that the patient with diabetes goes to a facility and, in some cases, they're just getting supplies, and [in] other cases, they're getting some of what they need to live with their diabetes for the next month. But the nature of diabetes is: How do we really help those people in their homes? How do we educate people, literally, on how our bodies work? The thing that I always find fascinating is the fact that a lot of people with diabetes don't really know what it means. A lot of people, for instance, well, they believe, "Okay, I got to avoid sugar," but that big bowl of pasta, rice: That's great, that's healthy, with no real appreciation of, "Well, how does it break down? It becomes glucose." And then the other part of it, I think a lot of people just feel: "Well, I feel okay. All these statistics that you're giving me... they don't apply to me." There's just a lot of that denial. There's also a sense of, in some populations, fatalism. They just think, "Well, it's been in the family, and [there's] nothing I can do about it." To come back to your main question there, as we have heard, healthcare is complicated. A chronic condition's complicated because we're trying to treat it in many cases in an acute-care world.

"We're seeing opportunities with outcomes-driven measurements, value-based healthcare, where we want to put more of the incentives on keeping people literally out of a hospital. We want to make sure that we're basically helping people stay in a good range so that we can hopefully defer, if not diminish, their likelihood of developing diabetic complications."

The other opportunity is, essentially... just knowing in this country and globally that... the obesity epidemic, if you will, [is] driving diabetes. Frankly, other than some efforts to try to help people lose weight—and, again, if the prescription that's been generally given, "Hey, you want to lose weight and exercise"—for most people, that just doesn't translate. I think we need to think differently about the reimbursement. We need to think differently about being proactive and prevention. We need to think differently about recognizing that diabetes is really an at-home disease... How do we help people? Maybe it's through telemedicine. Maybe it's through remote diagnostics. Maybe it's through coaching. The idea is that we need different approaches. And then I think the point is different reimbursement and business models, where we're getting away from the idea of episodic payments.

MIKE DUNKLEY: So, there's a key part in all of this, right, which we mentioned a couple of times—outcomes—which feels critically important. But I guess that, in its own right, is very difficult to align around. What is the right outcome for a patient with diabetes? Maybe it's different for everybody. This kind of traditional key clinical outcomes—people focus on like A1C—but that doesn't tell the whole story by any means, even clinically. Let alone in terms of what benefits the patient in a nonclinical way. Are you optimistic that we can align on a set of outcomes for the industry that could then be the standards against which value-based payments are made or risk-based payments are made?

JOHN L BROOKS III: I think you're spot on. I guess the answer is we have to, because otherwise, we just have this runaway freight train, if you will, that's not going to be stopped. But the real answer is, if the only outcome measurement is A1C, that doesn't correlate to—I think we appreciate that glycemic variability is an issue. And then the element that relates to diabetes... [for] most people, we need to understand: "What's their lipid status, cholesterol?" Certainly, there's a correlation with hypertension that could lead to kidney disease. I think we're appreciating the fact that even depression affects people with diabetes. Or, if people aren't feeling good about themselves, are they likely to be proactive in their care?

The real key is, we ought to have some standardized mechanisms so we can really drive the appropriate clinical outcomes, which will then support the right economic outcomes. The key is, again, to think

John L. Brooks III

about looking at how people are doing over a longer period of time because, "[For] A1C, I'm [potentially] measuring control for 90 days." But, at the end of the day, are we really helping people? If they're early diagnosed with diabetes, we can reverse it. What are the incentives to do that? And then, I think the other part of it is really understanding that diabetes is kind of this driver of all these comorbid conditions. The key is, we need to look at people holistically… and again, that just makes it harder, but that's the way we have to look at it.

MIKE DUNKLEY: Absolutely, we have to take this incredibly complex disease [with its comorbidities] and reduce it down, ultimately, to a set of measurable outcomes that can be used to drive the new business models. That seems like a really important but tough challenge.

JOHN L BROOKS III: Yeah, exactly. Right.

MIKE DUNKLEY: You mentioned AI and this need for intelligence to make sense. And that's almost certainly going to have a role in behavior change and coaching and helping people with their lifestyles and decision-making. But there's got to be an ongoing role for the humans in the loop here, the providers that can help interpret this and give support and appropriate coaching to people. I wonder if you have any thoughts on the providers in the future and how they're going to live with this technology, and how are they going to work together so we get the best of AI and the best of what providers [can contribute].

JOHN L BROOKS III: I think it's a great question in the sense that, if the AI enables better understanding of what's going on with people with diabetes, then the key is: How do the healthcare providers, nurse educators, clinicians, primary care doctors, endocrinologists—how do they adopt? Because at the end of the day, their economics are important.

In the early days, people thought, "Well, all this information is going to be available to the providers and they can monitor and see which patients are problematic." But the greatest fear was: Did [providers] think they were going to bear liability if someone reported a hypoglycemic event and they didn't act on it? The other part of it is, in a lot of cases: [Providers are] being tied to, really looking at [the idea that]: "I get paid for time with the patient, the physical." And we're just starting to see some glimmers [of change] in a number of states, and a number of payers are now starting to say that a diabetes connection with the patient can be done electronically—[via] telemedicine—and then that the reimbursement ought to be the same. Why are we penalizing a situation where, in fact, for a lot of patients, driving to the hospital, paying for parking, waiting in the waiting room, isn't what they want?

Many other industries have figured out, "Hey, let's engage with people where they are." And frankly—with wearables, with sensors, all the information that's needed to understand the physiologic condition—is available. We need to come up with a way that… allows… physicians to be effective and understand how to reduce the burden of spending a lot of time documenting in an EHR system what they're doing. Then really trying to provide insights to the patient, and, I think, with clinical decision support capabilities, we should be able to help doctors [and] nurses zero in on all the things that are going on with [their] patient[s]. Here are the two things that, for this particular intervention encounter, you want to have them hone in on. So, the idea is we can also help doctors understand what's going on, and move well beyond the days where they're just looking at a big printout from their blood glucose or CGM, and we're really trying to make sure we're giving them the opportunity to do what they do best in getting away from, whether it's the bureaucracy or documentation or the fact that they've got 15 minutes to try to come up with something intelligible (and if they're spending 10 minutes to try to get to the bottom of it, that's not a good use of their time).

MIKE DUNKLEY: Absolutely. So, John… in closing: Do you want to quickly say what you're going to do next? What you're interested in now?

JOHN L BROOKS III: Yeah, [I'd] love to. Hopefully, you get a sense that I'm pretty passionate about what I do. The journey that I started 25 years ago hasn't abated at all. I'm currently involved with a number of diabetes companies as either chairman of the board, or on the board or [as] an advisor, a consultant, and it really is from an international standpoint. I think, at this point in time, my hope is that I can help bring some insights, bring some encouragement. [I provide] help—especially for early stage companies—[regarding] how to really understand, as they develop a next-generation solution… where they're going to need to be a few years down the road, as we anticipate what the regulatory requirements… [and] the reimbursement requirements [will be]. [I guide them on] how they're going to participate in this "outcomes" ecosystem and [on] understand[ing] what the value proposition is. And that's kind of fun, because you've got a lot of people excited about solving some element of diabetes and, a little bit that we know about healthcare is, it's evolutionary, not revolutionary. So, if I can give them some advice or coaching or different points of view, my hope is that it keeps moving us in the right direction.

Synthetic biology is an idea that's new to the world and new to the business world. Because of this excessive novelty, it can be a difficult concept to grasp. To communicate its value, and help build a flourishing business upon it, it requires someone as thoughtful and articulate as Christina Agapakis. She is the Creative Director of ***Ginkgo Bioworks***, which is, she says in a dialog with Mike Dunkley, an "organism design company." (Ginkgo, we should add, is a neighbor of ours in Boston's Innovation and Design Building.) How does Ginkgo's business actually work? "We believe that organism is the product," says Agapakis. "That's one of our tag lines, and that means we've licensed that organism to our customers, and then we get royalties back on what benefit they see, on top of their traditional ways of doing things. That's, I think, where the main business lies, in those royalties that are coming in the future." An essential part of Ginkgo's business model is invested in their clients' success: "We will we succeed when they succeed."

"So, the Kinds of Plastics and Materials that End Up Throughout All of Our Stuff... Could All that Stuff Be Bio-based? Could It Be Coming from a Renewable Resource?"

—Christina Agapakis

Listen to the ***audio version*** of this conversation.

Mentioned in this Conversation

Scientists' fear of the public's phobias and catastrophic imagination around synthetic biology Scientific institutions and innovation-focused entities are fearful that the public is fearful of synthetic biology—and views this perceived attitude as an obstacle to the field's growth and development. This article analyzes this fear of fear and its impact on progress.

Christina Agapakis

MIKE DUNKLEY: Super excited to be chatting [with] you today. So, maybe a great place to start is [with] Ginkgo Bioworks. What do you guys do?

CHRISTINA AGAPAKIS: Ginkgo Bioworks is an organism design company. We work with a lot of different companies across a lot of different industries [that] are maybe having some issues with their supply chains or looking for different ways of manufacturing their products and finding ways [that] biology, and specifically microorganisms, might be able to help them. So, a lot of the work that we do is engineering microbes, so that they can produce a new kind of compound during the process of fermentation. So, we brew these microbes, and out of that "beer," effectively, we get ingredients that might end up in perfume, in food, in cosmetics, [in] all sorts of different products.

MIKE DUNKLEY: And, so people talk about this particular industry as being the next kind of really exciting thing.

CHRISTINA AGAPAKIS: It is to me [laughs].

MIKE DUNKLEY: Can you add some color to that? Is that a fair assessment? And if so, why should we be so excited?

CHRISTINA AGAPAKIS: This idea of the next big thing, the revolution… I think that that can be a little overblown and can lead us into sort of silly [laughs] kinds of statements. The field that I did my PhD in, and that the company really grew out of this analogy between biology and computer science and software engineering—the idea that you could engineer [a] DNA sequence the way that you might be able to engineer software code. And so, I think that metaphor, that analogy, is a little too simplistic. But, I think it leads us into some really interesting kinds of thought experiments.

So, one of our founders, Tom Knight, is a computer scientist, and he always likes to say: "Would the person [who] invented the transistor, back when he did that, would he have been able to possibly imagine the iPhone?" I think that in some ways, we're in the same place today with biology, you know, [with] the people who are building those tools for us to be able to work with biology, to design biology. We can't possibly imagine what is going to be happening 50, 100 years from now. When you rework the analogy again and think about how the information industry [and] information technology has changed so much about how we do things in the past 50 years, I think we might see a similar transition in how we do things when we have more access to biological technologies. Our computers might not be using DNA [laughs], but anything that is made of physical stuff is something that's going to be potentially impacted by the field of biology.

MIKE DUNKLEY: Cool. Cool. It's clear that it's exciting. You have a technology with huge potential, but you haven't mapped out the future entirely at this point. We're in the very early stages.

CHRISTINA AGAPAKIS: I think it's still early. Yeah.

MIKE DUNKLEY: And how did you end up in the role that you have?

CHRISTINA AGAPAKIS: My title is creative director, which sounds a little strange, I think, for a biotech company. The reason why I think creativity and design are at the center of what I do, and what I think biotech can do, is because of work that I've done, starting in my PhD, working and collaborating with artists and designers, thinking about the way that cultural issues and social issues and the stuff at the human scale impacts how we think about and how we might design things at the molecular scale.

MIKE DUNKLEY: I want to dig into that a little bit more. One of the questions I have coming into this conversation is, at one end, you've got this really advanced science and at the other end, you've got unmet needs or some creativity and [they're] essentially very, very different worlds. So, how do those worlds intersect and collide? [I would] love to dig into that. The first point to start is just the technology itself. And, maybe not in layman's terms, but in terms that hopefully most people would understand—what's going on, what are we doing?

CHRISTINA AGAPAKIS: Biology is awesome [laughs]. I hope everyone can understand that. I think what microbes can do, what cells can do, what biology can do is really powerful. That's where we start. We look at [things like]: What is it that cells can do? What is the chemistry that cells can do? What are the kinds of things that those cells are making? So, when we're talking about making a fragrance, for example, you can say, "Well, there's a plant that smells beautiful [laughs]… We want to be able to access some of that fragrance and understand how it does it." So, we look to the biochemistry of those cells. What are the enzymes living inside of the plant that are actively making those compounds that make the fragrance? And then we can take the genes that encode that enzyme, and we can put it into a yeast. And that's thanks to now 50 years of research in molecular biology and an understanding of DNA.

MIKE DUNKLEY: So, you're taking yeast and you still want yeast to be yeast, right? You want it to be able to replicate, grow, and thrive, right? But you're inserting some new genetic code, which allows that to do things of direct interest. So, that produces this

Christina Agapakis

new product—intracellularly, extracellularly—and then, hopefully, that's [moving] in the direction of what you're trying to achieve.

CHRISTINA AGAPAKIS: Exactly.

MIKE DUNKLEY: I noticed the way Ginkgo talks about this idea of "rational design." You could imagine this being pure trial and error, right? Just a numbers game. And maybe when it first started out, there was a large element of that. But this idea to be able to predictably insert new genetic code and know that you're going to get the right product and the right productivity: How rational is that at this point? And, on a scale of naught to 10, where naught is purely hit and miss and 10 is: "You just dial into the software and there it is," where are we at this point?

CHRISTINA AGAPAKIS: Okay, let me zoom out a little bit. So, you can do biochemistry and know the functions of certain enzymes in that, I know that this enzyme will be able to convert sugar to this other compound that's downstream from sugar, or if I add these three enzymes together in a row, what we see is the sugar gets converted into the smell of flowers. Right? And so, that kind of research in biochemistry and an understanding of the function—the chemical function—of enzymes, that's known. What we can't predict very well is that productivity side that you mentioned. We can guess pretty well what those enzymes will be making, if they're inside of a cell within a certain boundary. But we won't know that it's going to be doing it really well, in a way that's going to be relevant commercially when you are starting to grow them in a tank. And so, what our strategy is, is to actually say, "Well, evolution has probably already solved this problem. There's probably an enzyme out there that is better, that is going to have a higher productivity. So, let's synthesize all of them—as many enzymes as we can find that have a similar sequence, a similar function—put them in the cells and then test and see which one is best." So, that's the combination of the rational design of knowing which enzymes you want to put in, plus this kind of more, not quite trial and error, but experimental, empirical approach of having many that you're testing.

MIKE DUNKLEY: Got it. So, you're making deliberate modifications within what you know to be today's science, but you're still applying that over a wide number of variants so that you increase the likelihood of success.

CHRISTINA AGAPAKIS: Exactly. And that's really central to the philosophy of Ginkgo, in that, if you want to be able to synthesize and test and build all of these different prototypes effectively, you have to build not just the understanding of the biochemistry and the understanding with cells, but you have to also build automated tools to help you access those kinds of prototyping—that rapid prototyping.

MIKE DUNKLEY: So, when we talk about prototyping, we're generally talking about building something and testing something and learning, right? So, what does that cycle look like? I get [that] the end product is this new perfume ingredient. But what are the kind of critical points along that process of which [you say:] "Yeah, I've got something, and I know I've got something because I've tested it this way…" What does that look like?

CHRISTINA AGAPAKIS: In fact, we split our team into design, build, and test. And so, we were [operating] very much on this engineering-prototyping kind of system. Speaking with designers, I think what's different in our rapid prototyping is that we have to do it in parallel, just to be able to access as much of the prototype space as possible. If you're going to make 10,000 versions of something, doing them one after the other is harder than doing them all at once. Our design team is designing [these] sequences, and those sequences then are sent to a DNA synthesis provider. Those synthesized sequences come back, and our build team will assemble them and put them into cells.

So, our build team builds the engineered cell—the prototype. And then our test team does the experimental work to see: "Well, what's happened? What is this? What is different about this prototype from all the other ones? Which one is producing the most of this compound? Which one seems the healthiest throughout the cell?" Because, that's also important; you don't want your product to be hurting the cell. And then from that, we can learn a lot about which enzymes are working well. We can start [narrowing] down the focus of the prototype space, and our design team can then go back again and iterate and refine the design from there.

MIKE DUNKLEY: With perfume in particular, my mental model coming to this is almost certainly wrong, right? I'm imagining there's somebody [who] has this olfactory specialism [asking,] "Am I getting enough of this [odor] of interest?" That's not happening, right? Are you chemically analyzing what's coming out and saying, "Yeah, this is exactly the kind of thing we want to make," or at what point do you say, "Yeah, this is what we have…"?

CHRISTINA AGAPAKIS: So, yeah, we're using analytical techniques that the fragrance industry uses, but [we] are a little bit downstream from the person actually sniffing the bottle. We do

Christina Agapakis

eventually—when we do produce enough that people can smell and we think we've hit on a good prototype—start bringing in those human smellers [to] just try and make sure, "Does this smell right to you? Is this what you what you're looking for?" Before we get there, the first level is definitely an analytic approach, where we're using machines, basically, to smell and see what's there.

MIKE DUNKLEY: How far do you think we're away from being able [to] imagine a product that you want to create, [being] able to codify the properties (maybe it's a new material), the strength, the weight, whatever, and predictably push that through?

CHRISTINA AGAPAKIS: Without any prototyping?

MIKE DUNKLEY: No, just in terms of some maturity scale thing: Is there going to be a point where you're so confident [and] deterministic that it's going to take X amount of experiments to get there? Is that the future? Or is it always going to involve this tradeoff between what you actually get [in] the scale [and] the number of prototypes?

CHRISTINA AGAPAKIS: I think it's a good question. I think [the answer] will be somewhere in between. I think we have seen that our process gets better [than] it was as we do more of it. And each cycle can get shorter. We have better algorithms and better tools for being able to narrow the design space in advance. But there's a lot that is unpredictable still, and I think that will remain unpredictable in interesting ways. Predictability in biology is something that can be misinterpreted. It's not like my yeast is going to become a lizard [laughs]. So unpredictable, right?

There are questions like, "Oh, you know, what if your yeast becomes pathogenic?" or "Haven't you seen Jurassic Park?" It's almost as ridiculous to a biologist to say your yeast will become a pathogen, if you add genes that produce fragrance compounds, as it is to say [that] your yeast will become a lizard. Because the path it would take to get from one to the other is impossible.

MIKE DUNKLEY: So, we could talk all day about the technology. But one of the things that intrigues me around this is: How do you connect these potential end users—whether it's a new rose perfume or a new material for furniture—with the starting point? I think I read somewhere—I don't know whether it was on your website or another one—around mycelium and mushroom fungus and that being actually really interesting in terms of furniture material or the potential to create clothing fabrics. These, to me, feel like such different worlds that previously haven't been connected. I'm imagining this kind of hipster fashion designer in Brooklyn. And then there's Craig Venter, right? They don't get together—or do they? How are we connecting user needs [and] opportunities with the science?

CHRISTINA AGAPAKIS: That's really interesting, and a really good question. Because it, in fact, is hipster designers in Brooklyn who are messing around with the biology, and they're starting to ask different kinds of questions. They start to see the potential and they make these kinds of connections. So, when you're talking about mycelium-like mushroom as a material to make objects and art out of, there's an artist named Phil Ross, and he was interested in mushrooms now maybe 20 years ago. He was using mushrooms and all that they could do and the kinds of medicinal compounds they might be producing, and he started just experimenting with them as an artist. What he ended up finding was that you could produce these bricks of mushroom, and he started experimenting with those as materials in his artwork. And so he made these big arches and spaces and chairs and furniture, and from his work that's inspired now a large field of people and many different kinds of designers and several companies—including his own company called ***MycoWorks*** that's trying to make new kinds of materials and new kinds of objects out of this material. This biomaterial. So, yeah, [he's] someone who came from the arts but used a biological material in a new way.

> **"There's a lot that is unpredictable still, and I think that will remain unpredictable in interesting ways. Predictability in biology is something that can be misinterpreted. It's not like my yeast is going to become a lizard"**

Similarly, there's a woman named Suzanne Lee, who's the Chief Creative Officer at a biotech company called ***Modern Meadow***.

Christina Agapakis

She's a fashion designer, and her question in her early work as a fashion designer was, "What's going to be the textile of 100 years from now?" And she tells the story better than I do, obviously. But, somebody said, "What about biology? What about biological materials? Could you grow a garment?" And that got her now 10, 15 years later, to be working at a company that's trying to grow leather. And so, connecting those dots and having people coming from a creative industry, from a creative point of view, from a creative background and training, and learning about something, being able to access the biology and those materials and start playing around with them—that brings those new opportunities, which brings together the scientists and brings them in.

MIKE DUNKLEY: In terms of the venues out there now, where these traditionally separate worlds that are colliding deliberately—you've got the creative people with their ideas and then the scientists, and then mixing it and kind of riffing together. Is that what's happening?

CHRISTINA AGAPAKIS: Yes and no. What I see is much more coming from the world of design. So, I think you have master's programs popping up in deliberately intersecting fields for designers in design schools, where designers are going to be engaging with new kinds of technologies and new kinds of materials. You have design studios and research groups and design researchers who are independently working on and approaching this and reaching out to scientists. I think it's much [rarer], in my experience, to see the scientists going the other way and walking towards the designers without having to be pulled a little bit. I'd love to see more of that, and I think that's where there's going to be so much creativity and so much new potential for ideas of, "What is it going to be for the transistor to the iPhone? From where we are now [to] what we can do with DNA [in] the future?" I think we do need that energy and that vision and the kinds of questions that you ask when you do come together.

MIKE DUNKLEY: So, when you look at some of the applications that are publicly disclosed, like you have, I think, a relationship with Noma, a world-famous restaurant in Copenhagen, around the potential to engineer a novel yeast and get some really exciting new flavors in wines and vinegars. I get that that is kind of exciting. It has great PR potential. It gives you a goal to end points into developing your science. But I don't connect that to a company that's raised a 100 million dollars or more. So, how are you thinking about future markets? What are the big global drivers of the value here? I'm thinking there's obviously [a] way to make completely new products, so that's one. But what are the major trends here that give you reason to be?

CHRISTINA AGAPAKIS: I think the smaller projects, like our project with Arielle Johnson from Noma—she's now at the ***Media Lab*** here in Cambridge—we were interested in asking this question: "Okay, this technology exists, what's going to be interesting about doing it in fine dining?" Being able to make those connections, I agree… I think those [connections] kind of push us in different directions, but they're not the main driver of the technology or the business. I think where we are seeing a lot of drivers is in industries that are making stuff, whether that stuff is flavors or fragrance and those kinds of biological-type compounds, things that interact with us. Our noses and mouths led to those tastes and smells. That's a large industry that is looking for better ways of producing a lot of their ingredients, understanding the kinds of limitations that exist around their own supply chains, and looking for new opportunities and ways to make new things.

That's an industry that, until very recently, was not really accessible to biotechnology—biotechnology was just pharma and maybe agriculture. And I think that that perception was largely driven by the cost of doing genetic engineering, of doing biotechnology. And now, as those costs come down, as the technology gets better, new kinds of markets open up things that may have not been possible before. Maybe it was too small for [the] market 20 years ago to make sense, but now it's starting to make sense. So, flavors or fragrance is a big one, and that's where we've seen a lot driving of this industry and a lot of interest in what is possible to be able to do and how we can support their supply chains. Similarly, I think the food industry, food and nutrition: That's a biological industry, and a place where there's a lot of opportunities where biology can make a really big impact. And then, I think, there's another space in actual stuff. So, we have a partnership with a company called ***Genomatica***. They are using biology and fermentation to produce the chemical compounds that end up in everything. So, the kinds of plastics and materials that end up throughout all of our stuff, for lack of a better word. Could all that stuff be bio-based? Could it be coming from a renewable source? So, that question, I think, is animating a lot of drive.

MIKE DUNKLEY: So, is [sustainability] a key driver?

CHRISTINA AGAPAKIS: I think so. It's definitely a huge motivator for many of the people in the field—the scientists and engineers working in the field—and definitely a pull for a lot of different industries looking for those bio-based solutions for a number of different issues that they have.

MIKE DUNKLEY: And what about other kinds of things? Let's talk about food—you can think about food as the potential to build

Christina Agapakis

novel nutritional elements, right? Or you can think about food in the case of national security. Are you thinking about these things differently? Trying to get a sense of the big picture question here: What's the roadmap? The opportunity space seems huge, but how [deliberately] are you, as a company, thinking about these different opportunities and which to tackle first?

CHRISTINA AGAPAKIS: Very deliberately [laughs]. The question of how to build a sustainable business is something that is on our minds, and it's something that we're very actively working on. My bias, personally, is towards those smaller projects and those projects that give us a different feel for things or a new taste or a new experience. But, I think that there's so much power and potential in biology to impact all of these different spaces and fields. And so, it's a matter of prioritizing, finding the right partners, and finding the right kinds of projects that are going to be able to show the potential for different industries.

MIKE DUNKLEY: So, it may be interesting to think about how you get into business relationships with your clients, right? Because I can imagine that proof of concept is not necessarily a cheap thing to achieve here—there's a lot of understanding that's got to be codified and you [have] to do these vast number of experiments… So, how does that work? How do you engage with somebody? I may have an idea, but how do you build that confidence to a point where both parties are like, "Yep, there's something in this," and you have a viable business model at the end of the day?

CHRISTINA AGAPAKIS: Yeah. That relationship is really interesting and it's iterative, and it goes through so many different kinds of levels as we build our relationships with our partners. I'm actually curious to hear from you guys, too—how similar it is to the kinds of processes you build with your projects and your partners. For us, we can show people what we've done before; we can show people the technology; we can show people the potential. You have to convince them that that's something they need, something that is worth investing in. And you have to then work together to find a project that makes sense for both sides. You know, what's going to be a great target for their business? What has a good market that this makes sense for? What makes sense technically and biologically? Is this a compound that biology can make? Is this a process that's going to be scalable? All of those questions are things that we're asking and going back and forth with our partners as we build these projects together.

MIKE DUNKLEY: Interesting that you asked about our company. I suspect there is a high degree of similarity. At the end of the day, we're selling trust. We are able to point to the great successes we've had with previous customers. We lean on our process and our belief in our methodology. At the end of the day, it comes back to [the fact that] we know what [we're] doing [and] we've done this before, but [we must] also… make sure that investment on our client side is needed, [and] that we can show progress throughout the process. This idea of building something—it's the value in the idea that we've co-created. [It's] a critical piece. We only take it so far and then support our clients as they deploy it in their organization. And I guess there's a point at which you would stop as well, right? You don't want to become like the owner [of] large capital biofermentation plants, I imagine…

CHRISTINA AGAPAKIS: Our approach has been to do that manufacturing through partnerships, whether it's [with] a sort of contract manufacturer, whether it's [with] our partner customer that already is working with large-scale fermentation, or whether it's with our partner, ***Amyris***, which is another company in this space that's done fantastic work in scaling and manufacturing.

MIKE DUNKLEY: The business model: Are you basically charging your clients along that process through proof of concept, or is it more of [the idea that]: You're making the investment; you'll get a proof of concept or some kind of royalty? I imagine IP is everything in your industry, right? So, you want to retain the learning, and you have to build that into your future value. Can you say anything about that?

CHRISTINA AGAPAKIS: We believe that [the] organism is the product. That's one of our taglines, and that means we've licensed that organism to our customers, and then we get royalties back on what benefit they see, on top of their traditional ways of doing things. That's, I think, where the main business lies, in those royalties that are coming in the future. We do have fees and milestones and all that stuff. But that's just part of the process and not the whole story. I think we see the value of these kinds of organisms and products long-term.

MIKE DUNKLEY: So, you're vested in your customers' success?

CHRISTINA AGAPAKIS: Exactly. Yeah. We will we succeed when they succeed.

MIKE DUNKLEY: So, [we] left one of the more intriguing questions [for] the end. You talked about the benefits of technology sustainability, but this is GMO. This scares the shit out of people. So, how do you bridge that gap between the reality—it's not entirely benign, but it's like you say: You're not going to suddenly end up

Christina Agapakis

with a lizard when you're trying to iterate a new vinegar flavor—between what it really is and what it can do, and the inevitable fear of the new, the unknown, and the public perception? How much of your time is spent on that kind of challenge?

CHRISTINA AGAPAKIS: I think a lot about it, and I work really hard to understand where fear comes from and what people's objections and opinions are and where they come from. I found there's some really interesting work, actually, in the sociology of science. There's a sociologist named Claire Marris, who wrote a ***fantastic piece*** about something we should call "synthetic biology phobia phobia." So, I did my PhD in synthetic biology, and, constantly within the field, people are talking about, "Wow, everyone is so afraid of GMOs. What are we going to do about it?" And that fear of fear shapes the way that we think about and talk about the work that we do.

For me and the work that I do—and thinking about how we're going to build new kinds of products and design new things and communicate about them—I work to battle that fear from the scientist side. And then within that fear [are] assumptions about people and their beliefs and their perceptions and their understandings of the science that are not always borne out in reality. So, I think there [are] a lot of assumptions that people are stupid [laughs], and that's why they don't like GMOs. And, if we just told them how great GMOs are then they would love GMOs—and that's clearly not it, either.

For me, what I see and what I have tried to understand from reading this sociology and talking to people is that a lot of tensions around technologies really come down to values. And so, being able to show our values and build that kind of trust, whether it's with our customer or our customer's customer, I think, is really, really important. So, we focused on transparency. We want to talk about how we make these GMOs and how they're great and that not everyone's going to like it because they're fundamentally opposed to changing DNA. That's fine. You can make that choice, I think, and we want to leave that choice up to people. We want to trust people to make that choice. And then, I think other people are going to find like, "Oh, well, I see where our values do align on sustainability... This is kind of just cool and interesting, and I want to try this." I hope that there will be a large group of people who fall more in that camp.

"A lot of tensions around technologies really come down to values. And so, being able to show our values and build that kind of trust, whether it's with our customer or our customer's customer, I think, is really, really important. So, we focused on transparency."

EPAM Continuum's Read on Business Model Innovation

"The power of business model innovation is clear to most senior executives I meet," writes Harvard Business School professor Gary Pisano in his new book ***Creative Construction: The DNA of Sustained Innovation.*** "What's less clear is how you can design and implement effective and potentially transformative business models. A big part of the haziness lies with ambiguity about the concept itself. Most of the talk about 'business model innovation' takes place without a precise understanding of what exactly it is... The literature on the subject is equally frustrating. A quick perusal of definitions reveals a plethora of abstract descriptors such as 'a framework,' 'a structure,' 'a mission,' 'a rationale,' and so forth. It is hard to imagine becoming excellent at business model innovation if we cannot even agree on what a business model is!" In an attempt to clear up the haze, and to provide you with some useful information about business model innovation, we asked a number of our EPAM Continuum colleagues about their favorite volumes about business model innovation.

JONATHON SWERSEY, PRINCIPAL, EPAM CONTINUUM

Business Model Generation by Alex Osterwalder and Yves Pigneur is one of those foundational books that should live on folks' desks instead of on their bookshelves. Written by nearly 500 collaborators, the book is delightful in style and graphically engaging; it touches on all of the major pain points of business models, from customer empathy and value propositions to resources and partnerships in a clear way, not just as a framework, but as a tool to help you refine existing business models, identify new (to you) business models all while connecting innovation to design and strategy.

Rita Gunther McGrath and Ian C. MacMillan's ***Discovery-Driven Growth*** was published in 2009, yet remains one of my go-to sources when I work on translating the great ideas my colleagues generate into business models that my clients can understand. When it comes to valuing innovation, good teams look to the traditional forecasting tools they know best. While those tools work if you are valuing an operational innovation within an existing business, they tend to choke when a business model is materially different from the core. McGrath turns this approach on its head. She starts from the end result—What would an innovation have to deliver to be meaningful to the company?—and works backwards toward revenue and cost drivers in a way that enables senior leaders to engage de-risking the assumptions in the new business.

PHILIP SOFFER, HEAD OF TEST IO AND VP AT EPAM

New business models can emerge from anywhere—even the most unexpected places—and turn in to something that they were never intended to be. What happens when you dive in to and embrace novel business models without thinking about how it will scale or even the potential negative consequences? Nick Bilton's ***American Kingpin: The Epic Hunt for the Criminal Mastermind Behind the Silk Road*** explores how Ross Ulbricht, a.k.a. Dread Pirate Roberts, launched the Silk Road—a site hosted on the Dark Web where anyone could trade anything. Bilton's epic account details how Ulbricht's ambitions in creating the "ultimate free market" turned criminal and can serve as a cautionary tale of where innovative business models can go wrong... horribly wrong. The Silk Road is part of a larger story about how globalization has fostered new business models, many of which have been pioneered and most effectively exploited by criminals. Nils Gilman has termed this process "deviant globalization." In this collection of essays around that theme, ***Deviant Globalization: Black Market Economy in the 21st Century,*** Gilman and his co-

EPAM Continuum's Read on Business Model Innovation

authors explain how deviant globalizers have exploited holes in international trade and regulatory frameworks to unlock vast opportunities—in a manner that parallels, or even prefigures, the behavior of legitimate multinational corporations. Taken together, these two works—one a thrilling narrative, the other a set of academic essays—suggest that some of the most innovative business models lie on the margins of what we consider legal, and may best be considered a form of regulatory arbitrage.

CASSIDY REID, INTELLIGENT AUTOMATION CONSULTANT, EPAM

In ***Digitize or Die***, Nicolas Windpassinger, a Global Vice President at Schneider Electric, discusses how critical it is for companies to digitize their business models. Not only does he provide expert insight into the Internet of Things and the digital revolution that derives from it, he also discusses the opportunities for new offerings and revenue streams that stem from IoT. Best part: Windpassinger gives readers four straightforward steps to follow in order to excel in digital business.

Back in 2007, Alexis Maybank, Alexandra Wilkis Wilson, and three colleagues launched a startup that would transform the retail industry: Gilt. In ***By Invitation Only: How We Built Gilt and Changed the Way Millions Shop***, Maybank and Wilkis Wilson explain how this group identified a business model that they couldn't pass up: Selling discounted fashion merchandise online, in a flash-sale model, to a membership community. It's a compelling story about how Gilt influenced the way retailers works online.

CLARE BOND, SENIOR DIRECTOR, EXPERIENCE DESIGN, EPAM

One of the most successful examples of business model innovation in recent years is Netflix—a company that found opportunity in revolutionizing movie rental and transformed into a completely digital service. Without high performing teams, Netflix's constant innovation wouldn't be possible. Patti McCord was central to developing the culture that facilitated the meteoric growth of Netflix. Her book, ***Powerful: Building a Culture of Freedom and Responsibility***, while not directly about business models, is relevant here because it focuses on the strategies that lead to Netflix's culture of flexibility and agility. She argues that traditional top-down forms of managing people within organizations stifle innovation. Instead, management should be about creating and empowering great teams to solve business challenges at every level of the organization. Powerful details practices that instill the core behavior that drives flexibility, problem solving, and growth within organizational teams. McCord's point is that you cannot have the kind of transformation and growth that Netflix had without a culture to support it, and that innovation needs to come from every part of the organization.

Entrepreneur Sridhar Iyengar learns the way other people breathe—naturally. Automatically. Efficiently. He co-founded one company, ***AgaMatrix***, that turned an iPhone into a blood glucometer. Then came a second company, ***Misfit***, which became a hit wearable business. Now, he's on his third company, ***Elemental Machines***, which Iyengar tells Kevin Young, Senior Director of Client Engagement at EPAM Continuum, is an "an IoT for science company," one that uses sensors and cloud computing to create dashboards for biological and chemical labs. "The idea behind this is, quite simply, everything I learned at Misfit applied to the problems I had at AgaMatrix." Iyengar, you'll soon learn, knows a considerable amount regarding the creation and implementation of new offerings. Aspiring innovators, even regularly practicing ones, would do well to attend to what he has to say.

"We Make Fitness Trackers. I Totally Get That. But You Realize We've Also Kind of Accidentally Created a Globally Distributed Sensor Network.'"

—Sridhar Iyengar

Listen to the ***audio version*** of this conversation.

Sridhar Iyengar

KEVIN YOUNG: The first company that you founded was *AgaMatrix*.

SRIDHAR IYENGAR: Yep.

KEVIN YOUNG: And that created the *iBGstar*, which [according to] my understanding… it's the first FDA-approved glucose monitor [that] connects to an iPhone.

SRIDHAR IYENGAR: Yep.

KEVIN YOUNG: [I] would love to hear more about how that idea was formed and how you made that happen.

SRIDHAR IYENGAR: Sure, sure. We started the company, myself and my business partner, Sonny [Vu], who was actually my old roommate in college. So, we've known each other for a number of years. AgaMatrix was started in 2001, and it was really a continuation of my PhD work in electrochemistry and glucose sensing.

The original idea for the company was to develop a signal-processing, noise-cancellation technology that could make glucose meters more accurate without really having to invest a lot of capital in new materials, new enzymes, new chemistries, or new manufacturing processes. It was basically noise-cancellation for this type of sensor.

So, we got the company off the ground. We started making a lot of OEM [original equipment manufacturer] white-label products. In fact, we [made] the Kroger brand of glucose meter, the CVS brand, the Target pharmacy brand. And after a few years, we started seeing several patterns emerge. [One of which was] that, no matter how well-designed the product was, people weren't actually testing themselves and they weren't as compliant as the American Diabetes Association recommended that they [should be]. We assumed it was because of the pain of pricking your finger to get a drop of blood.

What we realized was the number-one reason why people don't test themselves as often [as they should] is because they forget. And this is really for folks with type 2 diabetes. If you're a type 1, obviously you're insulin-dependent, and you're testing yourself and dosing yourself multiple times a day. But for type 2, the number-one reason was [that] people just kind of forgot, because it's not something that's an acute issue with them on a day-to-day basis. The number-two reason was, even if they remembered, they would forget their testing supplies—because, again, it's not part of their lifestyle. And the number-three reason [was], if they remembered to test and they had their stuff with them, that they wouldn't know what to do with the number [that the glucometer produced]. "Okay, so I tested, I got a number, what do I do? I don't take insulin, so what action do I take?" And it turns out, the number-[four] reason was the pain. When we looked at all that, the top-three reasons were all behavioral, nothing to do with technology.

When the iPhone came out, we looked at each other and we said, "Wow, this could actually [solve] all three of those problems because, if you were to make a device that physically plugged into the bottom of the phone, the phone's always going to be with you." So: (a) you always have your supplies; and (b) you can have an app that gives you alerts and reminders so you remember to test yourself; and [(c)] you can collect all the data, you can find the trends, you can share [it all] with your loved ones and your caregivers, and the data becomes more relevant. The iPhone helped bring all those three factors to bear, and that was the impetus for designing this product.

> **"The major reasons why people were not compliant with their medical therapies [were] all behavioral. We had to plug into people's existing behaviors."**

KEVIN YOUNG: It's super interesting to me because it started as a technology solution, right? Because of your background, and your partner's background, on the project.

SRIDHAR IYENGAR: Yep.

KEVIN YOUNG: That's where it began. But then you discovered where the real opportunity [was located]…

SRIDHAR IYENGAR: Right, right. And it's such a cliché to quote Steve Jobs, to say that technology has to be hidden, but that's what we found. The major reasons why people were not compliant with their medical therapies [were] all behavioral. We had to plug into people's existing behaviors. It's something that BJ Fogg advocates tremendously, which is: "Don't try to change people's behaviors; fit into what they're currently doing." We came up with this thing called "the turnaround test." And the idea was: If you left home and you forgot something, would you turn around and go get it? For

Sridhar Iyengar

many things in life, you wouldn't. You forget your sunglasses? Meh, you wouldn't really go turn around. If you forget your eyeglasses, then yeah, you probably would. We went through this whole list of things and [concluded that], if you forgot your glucose meter, people generally didn't [turn around]. They're like: "Ahhh—I'll test when I get home." And so, it failed the turnaround test. Yet, if you forgot your phone, people would turn around and go get it. So, we just said, "Look, let's just piggyback on top of that." It was [as] simple as that.

KEVIN YOUNG: Simple, I'm sure [both laugh]. So from there, some might expect you would stay in the healthcare space, in developing products in that area, but you took a little bit more of a consumer turn, or quite a bit more of a consumer turn, with ***Misfit wearables***. I'm a big fan. I've followed the company from the beginning. Can you talk similarly about how that [company was founded]? I'm really interested in the people [who] came together to form that, and [in] the origin of the company.

SRIDHAR IYENGAR: Misfit actually had three founders: Myself, my business partner, Sonny, and then Mr. John Sculley, who is well-known from his tenure at Pepsi and Apple. Now, John, we had actually met semi-socially, because when we developed the ***iBGStar*** (it was actually codenamed "The Nugget" before we had a name for it), we were looking for an OEM commercial partner, a white-label partner. We met John because he was the chairman of a medical-device company that was operating in the sleep apnea space, and there's a huge overlap between folks with type 2 diabetes and [those with] sleep apnea. And so, long story short, we were in talks for him to be a commercial partner to us and take it to market, [at] least for that vertical.

Now at the 11th hour, Sanofi came in and made us an offer we couldn't refuse, and so of course, we wound up doing the deal with Sanofi—and that's how the name iBGStar came about. It was amazing getting to know [John] and his wife, and we were just getting to know them over the course of a couple of months. We explained: "Sorry, Sanofi came in and made us a huge offer [laughs]. We have to take it." John was very gracious. He's like: "First of all, guys, that is the absolute right thing to do." So, he gave us some reassurance. And then he turned around and he said: "Well, listen, let me get this straight. You guys started this company. You've been there for 10 years. And you guys really want to move in[to] the digital health space? Why don't you guys transition out, and the three of us will do something. The company is going to be on a good trajectory with the Sanofi deal and all that. If you stay in one industry for too long, you're never going to escape." And then he gave us the story about Pepsi and Apple and all that. He [was] kind of joking: "Guys, 10 years is, you know, you're almost beyond help" [laughs].

We looked at each other and we said: "You know, he's kind of right." So we transitioned out. The three of us put in some initial capital and we said, "Look, we want to do something in digital health because we had a taste for that when we did the iBGStar." We understood this world of apps and sharing data and ecosystems that you can build. We launched that product in… 2010? So, this was the very early days of digital health, and we just wanted to do more in that space.

Now, the reason we went consumer was because when we were developing the iBGStar—because it was an FDA-regulated product—iterating on a UI or a design was not very fast. We had to go through [a] very slow process [for] documentation and dealing with the FDA. So, what we thought with Misfit is: "Let's do something in health-and-wellness where we can iterate really quickly, without having the regulatory burden. And once we understand the UI and the user experience, we can then put a quality system together, and then move that into medical." So the whole idea was: "Let's bifurcate the work and say, 'Let's do good UI and UX but not make any medical claims,' and then once we understand what's going to catch on behaviorally, then [we would] move that back into medical." That was the idea.

KEVIN YOUNG: I didn't know that was the origin of the company: A plan to eventually move into more regulated space.

SRIDHAR IYENGAR: Yeah. We really wanted to do more in the biometric space. There's a lot you could do that was unregulated—there's a lot in the health-and-wellness space [and we thought:] "So, hey, let's go do that first." That was the idea. And then, as you know, we never actually moved back into that exact space. Turns out that the consumer aspect and design aspects of what we were doing ended up getting a lot of traction. So, we just kept investing in that direction.

KEVIN YOUNG: I've always wanted to ask—I've heard a little bit about the origin of the name…

SRIDHAR IYENGAR: First of all, we had these weird links into Apple. And that was not only with John, but also with the iBGStar. And we're just big Apple fanboys. [The name] Misfit really comes from Steve Jobs talking: "Here's to the crazy ones. Here's to the misfits." And we said, "Okay, we'll start with that, and it's memorable, and it has the word 'fit' in it. It was kind of cool, [but

Sridhar Iyengar

we thought:] "If people don't like it, we'll change it later." But, turns out, it stuck and created its own little brand.

KEVIN YOUNG: I've heard rumors of that, but it's good to hear from the source that that's where it came from. Some of the main characteristics of the quality of the product [are] that it had a longer battery life [than other wearables] and it was one of the first products in the space that really focused on fashion, which is close to my heart. As I think about that convergence of medical and consumer, there's still a lot of opportunity there, right in that space.

SRIDHAR IYENGAR: This is something we directly learned from building the iBGStar. Now, before I jump into this design aspect of Misfit, I gotta go back a year or two. When we were designing the iBGStar, we knew we had two big hurdles. We knew we had the FDA hurdle. And we also know we had the Apple hurdle, because Apple has to approve anything that plugs in [to its devices] and they have to approve the app. In fact, it was the very first medical device—not just the first glucose meter, the first medical device—that Apple allowed to physically plug into the iPhone. We were a little concerned. We had to design the product in such a way that the Apple decision-maker would fall in love with it. So, of course, we mimicked the Apple design language. We actually got a very nice compliment [from] one of the folks there saying, "Wow, this looks like something we would have designed."

KEVIN YOUNG: That's huge.

SRIDHAR IYENGAR: That was huge, yes.

KEVIN YOUNG: [Laughs] That's enormous.

SRIDHAR IYENGAR: So, we were very happy about that. But what happened once we launched that product [was], we started getting letters from parents with kids who are you know, 10 years old, 12 years old, eight years old. There's a bunch of letters and emails that were saying, "Yes, this is great, thank you very much, et cetera." We expected that. Then we started getting a second type of letter, which we didn't get expect, which was: "My son or daughter is no longer embarrassed to have diabetes." Because when you're like eight years old, you don't want to be different, right? All of a sudden, they were the only kid[s] in class with an iPhone.

KEVIN YOUNG: [Laughs] That is cool.

SRIDHAR IYENGAR: That is very cool. And we have this amazing graphic display of this lightning bolt going through red blood cells and all of this. That was something that was extraordinarily eye-opening. That something like good design can change psychology and change behavior. That's something we took to Misfit. We understood [that] if we wanted people to use our product, we had to fit into them behaviorally, and coming out of diabetes and glucose, everyone talks about "Accuracy, accuracy, accuracy," right? Well, it turns out that the normal user and consumer, they don't really care about accuracy of a glucose meter. And the reason is: They don't question it. The healthcare professionals all knew it. But the end user's like: "Well, they're all the same. They're all FDA cleared, right? So, what's the difference?" So, that aspect of it never resonated. And with the behavioral aspects, it did. The design aspects did, even in diabetes.

> **"You can't go and raise money for a company that says, 'Hey, we're just going to make something really beautiful.' VCs, Silicon Valley investors—they don't invest in jewelry companies."**

So, we brought that over to Misfit. There were a couple of things we had to figure out. At the time, there was Nike+ Fuelband, Jawbone, and Fitbit, and they were all kind of getting off the ground, and we had to figure out what our differentiating feature was. Quite simply, our market research involved one intern sitting in front of a laptop for two weeks and reading every negative review on Amazon for the competing products. And we told her, "Look, just tell us what the top-three complaints are." And the number-one complaint, more than anything else, was recharging. This was 2011, so six years ago, [and] everyone hated charging their fitness tracker. Then the number-two complaint was [that it] had to be waterproof. Not for swimming pools, but think "washing machines," because people would leave their Fitbits in the little pocket. And number three, it had to look good and not be confined to the wrist. That was predominantly from females, from women who would never wear something like that on the wrist with a dress. That was a common theme. Those were the three things, and you can't go

Sridhar Iyengar

and raise money for a company that says, "Hey, we're just going to make something really beautiful." VCs, Silicon Valley investors—they don't invest in jewelry companies. [Beauty] was a necessary, but not sufficient, feature. We needed to have good design, but we also needed to have good technology internally—the functionality had to be there. It was an "and" function, not an "or" function. That's something we learned from the medical world: You need good science, but you also need good usability.

KEVIN YOUNG: So, that kind of leads us to where you are now. You're with ***Elemental Machines***, another company [that] you founded. You've talked about your past experiences, how they sort of influenced each other, and [how] the learnings from one led to you founding these other companies. Can you tell us a little bit, first of all, about your company now—what's your offering and how [did] your past experience [lead] you there?

SRIDHAR IYENGAR: Elemental Machines is an IoT for science company. So, what I mean by that is we make connected devices and connected sensors. We help pharmaceutical companies, biotech companies, material-science companies, any science-based company that deals in chemistry and biology—we allow them to accelerate their research and their manufacturing processes. So, instead of [seeing of us as designing] smart home products in the consumer world, think of us as building smart labs and smart factories. The idea behind this is, quite simply, everything I learned at Misfit applied to the problems I had at AgaMatrix. [Laughs] That's the simplest way to describe it.

"Think of us as building smart labs and smart factories. The idea behind this is, quite simply, everything I learned at Misfit applied to the problems I had at AgaMatrix."

When people that I've met more recently look at what we're doing at Elemental and they say, "Well, how did you come here from Misfit? You're now selling temperature sensors to factories? What does it have to do with Misfit?" Well, I have to take them back to AgaMatrix, because one of the things at AgaMatrix—one of our biggest competitive edges—was [that] we had extremely good manufacturing. That allowed us to have [a] very low cost for our product. We had a contract manufacturer in the Far East, and initially, when you get things off the ground, there [are] always yield issues—things aren't working the way you want them to. So, we overcame all that using a combination of sensors and analytics. We put sensors everywhere. We took data from everything we possibly could. This is before AWS, before anything in the cloud. So, all the data came to our servers, and we built models. We did predictive analytics before the phrase was sexy.

And what happened was, we could predict manufacturing issues two to three months in advance, so we could fix them before they became financial issues. The thing[s] that we were manufacturing were glucose strips, the single-use glucose strips. Those were chemistry-based products. There were screen-printed electrodes. There [were] enzymes and reagents and all that sort of stuff. And it would be three weeks between when they would be produced in the Far East to when we would be testing them here. And if we found something today that pointed to a screwup in manufacturing, there was three weeks of product that we may have to throw out. When you're making a couple of million per day, that's a couple of million dollars at risk. So, we basically had to figure out how to predict a few months into the future. So, we did that, and it worked, and we got our yields up to virtually 100%. And it was all good. It was just basically good engineering work.

So, then we go to Misfit, and after a couple of years, I turned around to Sonny (we had about a million people using our device around the world), and I said, "Sonny, I totally get it. We make fitness trackers. I totally get that. But you realize we've also kind of accidentally created a globally distributed sensor network."

That was sort of the aha moment, then: It was easier for me to get data from the million distributed sensors around the planet than it was for me to get data from a handful of sensors in one building in our contract manufacturer, and only about five years passed between those two experiences. In the case of Misfit, the sensor was an accelerometer—just a motion sensor—but when I looked at what we had done, we'd used technology that people use to build consumer products and consumer apps. Where you don't build 80% of the communication stack, you use third-party APIs. You put it on Amazon and use a bunch of data-handling infrastructure[s] that you don't have to build. And that allows us to rapidly scale distributed sensor networks.

Sridhar Iyengar

So, instead of using that, just to count how many steps you've taken, I said, "Well, there's an entire B2B enterprise opportunity here. I wish I had products like this, but instead of a motion sensor, I wish it was a temperature sensor, a humidity sensor, light sensor, oxygen sensor, CO2 sensor; all of the sensors that are required for chemistry and biology. Gee, I wish I had those sensors with this infrastructure." So, that was sort of the aha moment to say, "Let's do it."

KEVIN YOUNG: And it grew out of the necessity that you found at AgaMatrix.

SRIDHAR IYENGAR: It was a very, very acute problem. And then I started socializing that with a bunch of my friends in the industry, and everybody had a story to tell. I remember this one episode where we were making a glucose reagent. It was a chemistry thing. It took us about six months to figure out why this formulation was unstable. It turned out that the instability pattern was highly correlated with the humidity [of] the day that all the other chemicals were mixed together. And once you figured it out, fixing it was a matter of minutes: "Do it in the room over there that's controlled." But, "Six months to debug the problem?" That became the theme. In the world of chemistry, biology, very broadly speaking—it can be pharma; it can be material science; it can be food tech, whatever it is—you run through physical processes, you run through physical protocols, [and] it can take you months to figure out what went wrong. The same thing doesn't happen when you run through virtual protocols in computer science. When you write software, when something goes wrong, you have tools like debuggers to define what went wrong, and you can fix it. When you run through a physical process, whether it's a recipe for chocolate cake or a protocol for creating the next version of insulin, there's no debugger for physical processes.

And that's kind of what we're doing with ***Elemental Machines.*** Step one is [to] measure everything. Once you've measured "everything," then you can go back and do the analytics to find what the problems are. So, step one is putting sensors everywhere to measure things. If you think back to high school chemistry, temperature, light, and humidity are three things that greatly affect how chemistry works. So, you add on top of that oxygen and CO2, [and] you've got most of biology covered. So, it's not rocket science. But how do you do plug-and-play deployable sensors very effectively? You need to figure out a way to crunch all that data in a very efficient manner on the back end.

KEVIN YOUNG: So, you're able to provide sort of a dashboard of information for the companies that work with you to have better understanding.

SRIDHAR IYENGAR: There's a whole spectrum of analytics that we provide. On the simple end, it's things like: When something goes out of range, [we] send an alert, so a human can come in and take a look at it. That's kind of like table stakes. If you don't have that, you can't even enter into this world. At the higher end, we actually have tools that allow us to very rapidly spin up models based on the physical world. So, if you had a production line and you're manufacturing something, we can actually put a bunch of sensors on all the critical points, take the protocol or procedure, [and] virtualize that. As somebody runs that assembly line over and over and over again, our system learns where the critical variables are, and then alerts them and basically guides our customers to say, "Okay, step number 14 is the variability. [That] is what's causing quality problems in your product."

KEVIN YOUNG: That's really interesting. And I can imagine, or maybe you're already doing this, tailored or customized solutions for certain needs. I'm sure there are one-size-fits-all solutions, too, but I can picture the natural movement toward more customized [offerings].

SRIDHAR IYENGAR: There's always been this holy grail in in the world that we all occupy called "mass customization." And that's becoming easier [to achieve] with cloud-based technologies. We'll go in and work with a particular client, and maybe two-thirds of what we build is reusable [for] the next client and the next client. Over time, we'll end up building a huge set of basically Legos that we can rapidly configure and assemble. Now, the ultimate goal is to build this toolbox so the customer[s] themselves can configure their own solutions—but until we really understand what's needed, we're building these Lego building blocks, so to speak.

KEVIN YOUNG: One of the things I've noticed in the types of companies, the clients that we work with [in consumer health]. There is this sort of dichotomy… [The consumer product and medical industries are] obviously very different worlds. You talked about design and the fashion side of it. We've just watched these worlds try to understand each other. There's the sort of appetite for innovation overall, almost culturally, and I don't want to over-generalize different company cultures, but there is, I think, more of an interest or understanding, on the consumer side, in really pushing to innovate, trying new things, and deeply understanding consumer need[s], which you've talked about. And letting that drive versus letting perhaps a new technology drive. It's interesting, especially as we watch someone on the consumer side try to enter medical or vice versa.

Sridhar Iyengar

SRIDHAR IYENGAR: I think you and I have chatted before about the concept of building a better mousetrap. Honestly, that's been my playbook for all my companies [laughs]. This is to take an existing market and fill an unmet need in an existing market. And what I mean by that—and this is very, very true for medical and healthcare startups—is that it's very difficult to come up with a brand-new innovation, because the infrastructure to bring that to market isn't there. So, unless you're willing to invest a lot of time and money, educating the market, educating the regulators, and creating those payment pathways—whether it's reimbursement or whatever—the best thing to do, at least to get a new company or a new technology into the market, is to look at the current practice of medicine. Look at the current practice of therapy and however this market is being serviced, and build products and tools that either lower the cost of delivering that same service or allow the folks who are providing that service to reach a larger audience for less cost.

So, I'm a big believer in using software and hardware and new products to lower the cost of delivering an existing service. That service can be a counselling service. And it could be coaching, physician interaction, or it could be through a device. If you have a sleep apnea machine, it's providing a service—but [you could] make a better machine, one that will drastically lower the cost. The reason I say that is, if you're on the outside looking in, there's a lot of unknown unknowns. And the only way to change some of those into known unknowns is to just jump in and actually be part of that community.

To do that successfully, you have to have a business. You can't keep raising money forever, hoping you'll survive. When you have established regulations, when you have established distribution channels, and you have [an] established reimbursement channel—in speaking more of the medical side—then use those as your strengths and your pillars and just play within those guidelines. More often [than] not, what you'll find is [that] there [are] going to be opportunities to build a better mousetrap, to build a service or a product that provides a service [that] is very similar to what's out there. But, if you can innovate on the delivery side, you can lower the cost, right? If you can lower the cost, you can gain market share. Once you gain market share, you can get in, you can play, and then you can really learn what some of the more innovative opportunities could be. But from the outside, it's really hard to do and really risky to do.

KEVIN YOUNG: Yeah, and I definitely see that path with AgaMatrix [and] with Misfit. With Elemental Machines, you're going a little bit beyond that, I think, right? Because there wasn't an existing solution to that problem—you've discovered that problem.

SRIDHAR IYENGAR: So, there are existing solutions. They're old school. When you look at sensors for factories, you don't really think of cutting edge. So, they exist. At least for our customers, the problem exists today and what we're saying is: "Listen, don't do it the old-school way. We're going to bring [the solution] to you in a more cloud-connected, seamless way." So, the problem does exist and it is being serviced—but we think not too well, by the others, by the incumbents, so we're gonna try and disrupt that.

KEVIN YOUNG: Solutions were out there, but compared to what you're doing, they were certainly very—

SRIDHAR IYENGAR: Very cumbersome.

KEVIN YOUNG: Given all of the context of the experiences that you've had—you've been in the medical space, and the consumer [space, and] now the B2B space—I'm sure each one faced very unique challenges, and [it] probably [is] difficult to compare, [but] looking at those areas: What do you see as the ones that were the most challenging, the categories that were the most difficult to work in?

SRIDHAR IYENGAR: What I found is that it's hard to say, "Is B2B harder or [is] B2C harder?" It really depends on who you are as a person. And I saw this very clearly between me and my partner, Sonny. So, he and I are night-and-day different. I'm a night owl; he wakes up at 6:00 a.m. I'm vegetarian; he will eat meat, raw meat, off the back of the cow [Young laughs]. He doesn't drink any alcohol, and I love my red wine. So, you name it, we're completely, you know, yin and yang. And in at the same way, he's very product-, market-, design-oriented, and I am very back-office, infrastructure-oriented. That meant that we have been able to work very well together. When I look at B2B or B2C, [the question] really was, "Well, whose strengths did it play to?" So, AgaMatrix really played to my strengths, because it was an infrastructure play. It was all about the technology inside. It was about the manufacturing, et cetera, et cetera. We look at Misfit, it was all about the design, the market, and the productization, and it was very forward-facing. So, my experiences at Misfit taught me one thing, which was, I'm not really that great of a B2C guy [laughs].

And the reason for that is it's all based on the personality. Sonny loved it. He was all over it. That was his world. And in a B2C company, oftentimes you can have 50 to 80% of your revenue in Q4 and the holiday season. And if you miss that product launch, then you're kind of screwed [laughs]. Yes. But if you hit it and you hit it well, you can do really well at it. If you think about: "How

Sridhar Iyengar

do you manage a business where half to 80% of your revenue comes in one quarter?" If you can get your head around that, and if you can understand the nuances and pick up the keys in the consumer market, then that is great. And Sonny has an amazing intuition for consumer psychology. And I've known that for many, many years, mainly because he's always been an early adopter of new technology. I used to joke with him about all these things on his belt. It was like Batman and his utility belt. He'd have all these gadgets strapped to himself. What I realized about him was [that] he had such a good intuition about consumer psychology. And to him, that was natural. For him, looking at manufacturing and back office wasn't his sweet spot; whereas it was for me. For me, I could look at an assembly line and say, "Okay, I know what's going wrong with this." That was something that [was] just very innate and I had intuition about that.

KEVIN YOUNG: It makes perfect sense, and it aligns with who you are, where your passions are, where your natural wiring is. Given your overall experience... let's say I'm an entrepreneur. I'm interested in getting into the consumer health space. Given the world of connected devices, of IoT: What advice would you give to someone who's thinking about entering the space? How do they spot an opportunity?

SRIDHAR IYENGAR: One of the best ways to spot an opportunity is to solve a problem that you've had yourself. I hear that over and over and over again. With Elemental Machines, it was true in my case. It wasn't so much true in AgaMatrix or Misfit. For most of the really good entrepreneurs that I've seen, they've all said, "I had this problem, so I solved it. And if I had it, somebody else probably does, too." So, if you start with: "This is a problem I have," and you socialize that, then you'll find out how to refine that. And you get enough data points and you see that there's a trend that's forming. So, the number-one [piece of] advice I'd say is: Solve a problem that you have. Or: Solve a problem that somebody you know has. Solve an actual problem that somebody has articulated. John Sculley used to advise us, he said: "If you can articulate the problem well enough, the solution is obvious." If the solution isn't obvious, then you haven't articulated the problem well enough.

KEVIN YOUNG: It's a nice reminder to avoid the trap of the technology push. Because it's awfully tempting, especially with what's happening in the world today and how fast technology is moving, to jump to that next opportunity through a technology push versus the human-need side.

SRIDHAR IYENGAR: Oftentimes, new technologies are the sexy, exciting things and solving problems is kind of boring. I mean, you look at [a difficult challenge] and you say, "Well, I have to solve that?" Whatever it is, solving an existing problem is generally not as exciting as working on a new technology. But if you solve an existing problem, it gets a foot in the door, you can build a business, and then you can start investing in the new sexy, exciting things that are swirling around.

KEVIN YOUNG: Well, I just wanted to close by asking what is my final question. Overall: Your thoughts on... the world of connectivity, the Internet of Things? Industries that you see leading or perhaps falling behind [here]? Where [do] you see things heading around the IoT space?

> **"Solving an existing problem is generally not as exciting as working on a new technology. But if you solve an existing problem, it gets a foot in the door, you can build a business, and then you can start investing in the new sexy, exciting things that are swirling around."**

SRIDHAR IYENGAR: Well, it's funny, IoT has been around for decades. So, it was just called different things. It was machine-to-machine back in the day. What's really changed now is the ease of use for spinning up a device and having it connected and, basically, having everything hosted in the cloud. What that's done is it's lowered the barrier for people to come up with new products, new solutions, and new innovations.

Now, having kind of spent many, many years in the med-tech world, I look at the pharma industry, and I say, "You know, there's a lot we can do to help pharma accelerate what they're doing. The traditional pharma method was: Invent a molecule, show that it helps in some disease state, and then market the hell out of it. And that's worked for many, many years. But in the last couple of years, you've seen this trend or this phrase kind of coming up: "Beyond the pill." What that means is that the therapy itself is no longer the single most important thing that a patient can rely on, because it's been shown that behavioral

Sridhar Iyengar

aspects can have a tremendous impact on how therapy works. So, the "beyond the pill" movement is augmenting therapies with digital tools. So, it can be therapy sessions, it can be apps that remind you to do X, Y, and Z. There was a study years ago that said, "Well, if you just put a put a weight scale in the bathroom and don't tell the person to even use it, after a couple of months, they lose weight. Because it becomes a habit. They look at it and they get reminded. There's a huge push towards the "beyond the pill thing."

Recently at the MM&M conference in New York, one of my friends, Kelton Galati, was giving the keynote. He was saying that pharma had just had its "Oh, shit!" moment [both laugh]. Kind of expounding on that: I think pharma is realizing that they need to embrace new technologies. And it's not in their DNA to do that. Because, again, they've come from this world where you minimize the downside risk at the cost of the upside risk. And, also, the upside gain. When you want to invest in a new unproven technology, their risk-assessment systems aren't set up to do that. But those who do start moving in that direction are going to be the winners and they've woken up to it.

That's why I'm sure you guys are getting a lot of inquiries from the pharma world to say, "Now help us." And what I would say is the best pharma companies are the ones who kind of know a direction and they come to you for help, as opposed to saying: "Help, we're lost. Bail us out."

The thing that I would say about IoT is: IoT is not a mysterious thing. All it is, is you now can get granular data at a much higher resolution, both in space and time, than you ever could before. That could be data from smart devices in the home, to see how folks are responding to a therapy; it could be smart devices in a factory, to make sure that whatever you're manufacturing is done in accordance, so you don't have to have a recall down the road. So, IoT is nothing more than a low-cost way to get highly granular data. What you do with that data is, it's kind of up to you guys. Not you, but them [both laugh].

KEVIN YOUNG: With the issues around adherence and compliance and just how difficult—you've talked about this today—behavior change is, just the opportunity for devices to communicate with each other to have these multiple kind of touchpoints, not just reminders, but [touchpoints that] encourage people to use their medication and look at it more holistically: It's exciting for me because you can just imagine the potential for having a greater connected experience in pharma.

SRIDHAR IYENGAR: You've hit the nail on the head, because once people have that information and data, it becomes relevant. We had this saying at Misfit: The accuracy of your step count wasn't the thing we were solving for. It was wearability. Because if somebody doesn't use your product, you get zero data. I'd rather get more complete data that's less accurate than [accumulate] highly accurate data and [have] zero data points because no one uses it. So, if you make it a relevant experience to their lives, people are going to start getting into habits, and once they get into a habit, that's when you start changing behaviors.

> **"IoT is nothing more than a low-cost way to get highly granular data. What you do with that data is, it's kind of up to you guys. Not you, but them."**

WE NEED TO TALK ABOUT DIGITAL TRANSFORMATION

3

What does digital transformation actually feel like in the workplace? What might it be like in the future? These conversations dig into what digital transformation is doing today, and might do tomorrow, to business.

Today's physicians are not, alas, as a class, doing well. Many suffer from ***burnout***. They're often forced to toil in the unfertile fields of electronic health records. They're limited to hasty conversations with their patients and they've been losing agency for decades, morosely watching as the once-close bond with patients unravels. Dr. Eric Topol, author of ***Deep Medicine***, sees all this, and calls for a time out. In his new book, he argues for the idea that new, transformative technologies—artificial intelligence and machine learning—can bring humanity back into healthcare. In an at-times emotional conversation with Jonathon Swersey, Principal at EPAM Continuum, he asserts that doctors need to use artificial intelligence and machine learning to assert themselves and say: "We're not going to take it anymore. And we are demanding time with our patients. And we're gonna use this gift of time in a way which has previously never been used. We're going to take it back and turn inward."

"If You Combine All These Features that AI Could Bring Us, It Really Gets Us to a New Plane Whereby Doctors Have Time, the Gift of Time, to Spend with Patients"

—Eric Topol

Listen to the ***audio version*** of this conversation.

Mentioned in this Conversation

Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again Medicine isn't what it used to be—something that's abundantly clear to Eric Topol. In his latest book, he explores how revolutionary technologies like AI can help bring the doctor-patient relationship back to its former glory.

Reducing Firearm Injuries and Deaths in the United States: A Position Paper from the American College of Physicians In this article, the American College of Physicians (ACP) provides policy recommendations that "build on, strengthen, and expand current ACP policies approved by the Board of Regents in April 2014." The article aligns with a position that the ACP has maintained for more than 20 years regarding the need to address firearm-related injuries and deaths in the United States.

The Patient Will See You Now: The Future of Medicine Is in Your Hands As doctor visits grow shorter and shorter, patients are losing patience with the cumbersome experience. Eric Topol asserts that it doesn't have to be this way and shares how technology can change medicine to provide better healthcare to all.

A Doctor's Touch The current state of medicine has lost its traditional human touch. In this TED Talk, physician and writer Abraham Verghese describes how, today, patients are merely data points and calls for a return to the traditional one-on-one physical exam.

Computer Diagnosis of Primary Bone Tumors This article suggests, to Jonathon Swersey, that many of the issues we're currently facing in medicine aren't as entirely new as we thought.

Eric Topol

JONATHON SWERSEY: Dr. Topol, I just want to thank you very much for taking the time to speak with me, and [I] need to start off [by] asking how your knee is doing.

ERIC TOPOL: Oh, gosh, well, thanks for asking. It's never been right since the surgery. I can get by, but it's definitely a sub-optimal outcome. So, I still have to wrap it every day and [there are] certain things I can't do, but at least I'm not in pain. That part is the improvement. Thanks for asking.

JONATHON SWERSEY: You've been on quite a journey and you shared a lot of that story in the book. And I'm just curious: Why choose to start the book with that story, it's so personal?

ERIC TOPOL: I think it is an exemplar of the problems we have in medicine. That is, the outcome I had—which I was obviously affected by and was quite adverse—it could have been prevented. The lack of having information readily at hand. The lack of having an individualized approach, understanding each human being—the patient—at depth. Lack of compassion in medicine. All these things were highlighted by my own experience, and they certainly affected me. And I hope that would grab people [in regard] to the shallow medicine we have today and the opportunity to go deep.

JONATHON SWERSEY: We think a lot about humans here. EPAM Continuum is... really grounded in human-centered design. It strikes me that so much of what we've built in healthcare really has de-emphasized humans. What I mean by that: [Healthcare is] not just patients, but it's providers and advocates and caregivers and other people who are involved in care. So much of what we've done [in the healthcare system] is really built around billing and reimbursement. And I'm wondering how we can begin to think about using AI and ML to bring humanity back into medicine.

ERIC TOPOL: Right. Well, I couldn't agree with you more with respect to the erosion of the inter-human bond, and the fact that, over the years, it's been this steady, what I would consider horrendous, erosion of the patient-doctor relationship, and as an outgrowth of that the burnout, depression, and [highest] number of suicides ever in the medical profession. So, can we turn this around? And I do think that the ultimate goal of AI, which has some short-term [benefits] like accuracy and speed and efficiency, but the longer-term potential here is that we have a rescue. That we essentially reduce the load on doctors, make life easier for them [by making it easy to] assimilate information, to outsource a lot of things to machines, and also offload [responsibility] to patients who wanted more responsibility, provided they have the algorithmic support. So, if you combine all these features that AI could bring us, it really gets us to a new plane whereby doctors have time, the gift of time, to spend with patients to re-establish the trust, the presence, the relationship, the compassion, the reason why we went into the medical profession in the first place.

JONATHON SWERSEY: When you went to medical school, was there a course in using your electronic health record and how to talk to a patient while you're typing?

ERIC TOPOL: No, there wasn't. I'm too old for that. But there was, in my medical school—which was in Rochester, New York—there was a big course on listening to patients. And that was really interesting that, in contrast to today—where there's so little time and doctors interrupt patients within seconds of them starting to talk—we were taught to just sit there, listen, and then oftentimes, the diagnosis would be made by the patient just by listening. The listening was an art that demonstrated compassion and true care. So, that kind of went by the wayside when all these things happen[ed], like [the] electronic health records that you alluded to, relative value units, and the big business of medicine, which is responsible for its attrition and dehumanization.

> **"I think the idea that technology could enhance humanity medicine is alien in this country."**

JONATHON SWERSEY: And that perspective, that the technologies can help bring humanity back into medicine: Is that core in medicine now? Or is that still a peripheral sort of view of it? What are your colleagues thinking?

ERIC TOPOL: I think the idea that technology could enhance humanity medicine is alien in this country. Because there's so few examples—and many people harp on the digital health record, how that was an abject failure, a fiasco—and so, they think [in] terms of technology and medicine as the EHR. And that was dreadful. But here, we're not talking about that. Here, we're talking about all the different mechanisms that we can re-establish—not just time but the bonding between people. I think it's possible, but I also would be the first to admit that if we have improved efficiency

Eric Topol

and productivity, we can actually make things even worse with that, by the [intervention of the] overlords—that is, the managers and administrators—demanding doctors to do more, see more patients, read more scans, and on and on. So, there's a liability there, that technology could also make things considerably worse, if that's even conceivable.

JONATHON SWERSEY: So the primary care visit goes from, you know, [a] half hour to 15 minutes to seven minutes. Now you've got some more technology, and you're playing [the game of] "How fast can you get it done?"

ERIC TOPOL: Yeah, like in Asia, they're down to two minutes in many places. So, why not squeeze doctors more? This is the bean-counter attitude, that [attitude of], "I need to squeeze everything I can get out of our clinicians, and not just doctors and nurses, you know, [but] physicians' assistants, everyone." It's across the board. This is a serious problem we've seen, which is that eking out of all the productivity and all the relationship. We need to be activists to turn this around, because that's the default mode. That's the one [mode] we've been in now for decades and we've watched this happen. And that's the problem. We've watched it. We've never revolted, rebelled. It's time to be thinking about that.

JONATHON SWERSEY: And as you think about that, on this call for activism, who is it that we're calling to be activists? Is it physicians, nurses, patients, administrators?

ERIC TOPOL: Well, probably not the administrators. They are not really ready for that. There are some places, as you know, that physicians are the administrators, but they are the rare exception. And that's been shown to be a very good model. But for the most part, we're talking about the doctors because they will lead the charge. And then, whether it's nurse practitioners and physical therapists and physician assistants and all the other health professionals, [they] would likely follow them. I think that's where we need to see the breakout [with] doctors leading this charge, getting organized, and saying, "We're not going to take it anymore. And we are demanding time with our patients. And we're gonna use this gift of time in a way [that] has previously never been used. We're going to take it back and turn inward."

JONATHON SWERSEY: It's a wonderful vision. One of the other things I think about as I'm listening to you is how doctors are viewed in society. There was a time [when] maybe it was almost a God complex, the reverence was so high, where it led to maybe a resistance to being questioned or resistance to engagement. Are physicians wanting to become more accessible? Are they wanting to engage more with patients and caregivers?

ERIC TOPOL: That's a really important question. And I guess I would say yes. And the reason I say that is not so much for this cause, which is the ultimate one, but we have seen more physician activism in recent times than ever before. So, a great example of that is the NRA. ***When the Annals of Internal Medicine published their new policy recommendations about guns,*** the NRA said, "Stay in your lane," and then doctors came alive. That was the most vivid recent demonstration.

> **"This is the bean-counter attitude, that [attitude of], 'I need to squeeze everything I can get out of our clinicians, and not just doctors and nurses, you know, [but] physicians' assistants, everyone."**

As you know, a lot of these were women doctors, who were apt to be the most outspoken activists, and often they're young. So, [we have] a new generation of doctors that [is] not used to [physicians] that are being passive. But what we've seen now with #ThisIsOurLane and other examples, about, for example, gender equity, #TimesUp, and other things that are important matters in medicine—we've seen how social media and really sharp, outspoken, often female—but not only, of course—physicians have taken charge and have shown leadership. So, I think that is a beginning, the core capability to build on. It's likely going to be the younger generation of doctors who are watching colleagues burn [out]. Some of them have experienced firsthand severe depression [or], not of themselves, [but of] colleagues. Or [have] even known of a colleague who's taken their life. And it's time to really turn this around. We didn't [previously] have a chance. We didn't have a mechanism, a path... but I think we do now. And

Eric Topol

that's why this organized front is going to be really important. Social media is clearly helping amplify this, and we can take advantage of that capability.

JONATHON SWERSEY: This is great. I want to step back from ***Deep Medicine*** a little bit and just briefly touch on one of your other books in conjunction with it, which is ***The Patient Will See You Now***. I first encountered that book in 2015 when it came out. At the time, my then-four-year-old daughter was in treatment for Stage 4 Rhabdomyosarcoma. And when I heard the title of the book… I can't even begin to tell you how profoundly it just impacted me. It was about managing the complexities in healthcare, using technology, empowering ourselves as caregivers. If we take that book and we combine it with ***Deep Medicine***, I feel that there's an overarching story that you're telling, as a body of work. I'm wondering if you could talk to that a little bit.

ERIC TOPOL: Surely—but first, let me ask what happened with your daughter.

JONATHON SWERSEY: Thank you for asking. She is thankfully in remission. We ended up switching hospitals in the middle of our treatment, for a whole host of reasons. I was just counting today: I had opinions and medical teams in from 12 different facilities around the country and in Canada, who[m] I was engaging in our care. But I am really very, very grateful that she's here. She's now eight years old.

ERIC TOPOL: Wow. That's fantastic to hear that she's doing well. Getting back to your question: That book was about democratization of medicine, as you touched on, and the fact is that patients have been suppressed. They have been basically treated with medical paternalism.

JONATHAN SWERSEY: Yep.

ERIC TOPOL: We're starting to see [that patients have] the ability to generate their own data [and], through various sensors and apps, to access their data. They need to own their data. If you were really looking after your daughter, you'd want to have all her data, and fortunately, at the time, she [was] only four, so there was only a limited amount from birth to then. But each of us should have all [our] data. Because it's our body. We paid for it. We have the most vested interest [here] and our lives could certainly depend on it. So, we don't have that set up yet. That's important.

But [the idea that] "the patient has to drive much more" now is not for everyone. There are certain people who are very happy to be suppressed, to be dependent fully on doctors, but what we've learned is that, these days, to have that dependence isn't always necessary. There are a lot of things that are emerging, where you aren't going to need a doctor. I mean, routine things like diagnosing urinary tract infections, ear infections, skin rashes, and all sorts of things; you'll be able to do that with AI and apps [that] are [as] accurate, or if not more accurate, than going to a doctor. So, we already have seen things that are making this democratization possible. And there are going to be many more of these capabilities, for those patients who were willing to take charge [and take] more responsibility. One other point: This idea of outsourcing or offloading [tasks] to patients who are willing is a big way to decompress the crazy lives of doctors, which they should be appreciative of. [Which] they should be embracing. They're not yet. And that's largely because of this historic issue of control, the authority, the control-freak nature [of physicians]. We need to get out of that mode, and hopefully someday we will.

"Don't get stomped upon any longer, now that there's going to be a way to re-establish the way medicine used to be. That's the ideal goal here. If you go back to what medicine was like in the '60s and '70s: It was a precious, intimate relationship."

JONATHON SWERSEY: Interesting. So, the first book was about democratization and access to information and empowering patients. And ***Deep Medicine*** focuses, I would say, more on the use of technology to let doctors be doctors again.

ERIC TOPOL: And take back the profession.

JONATHON SWERSEY: And take back the profession.

ERIC TOPOL: And basically stand up for patients. That is: Don't get stomped upon any longer, now that there's going to be a way to re-establish the way medicine used to be. That's the ideal goal here. If you go back to what medicine was like in the '60s and '70s: It was a precious, intimate relationship.

Eric Topol

JONATHON SWERSEY: Yeah.

ERIC TOPOL: Trust. When you saw a doctor, it was one of the things that you really looked forward to because he was somebody that you really could turn to when you were in pain, when you were suffering, or when you were worried. And now, that's the rare instance—and we've got to get that back. I think there's a way to do it, but it won't happen by accident.

JONATHON SWERSEY: Absolutely. And that makes a lot of sense to me as well. I want to switch gears a little bit because I think we started to touch on this. So, we've been talking a lot about patients and physicians. One of the other major constituents in healthcare are caregivers and advocates. And I think you certainly touch on it [in ***Deep Medicine***]. Sounds like your wife, Susan, played that role for you and your care. And I'm just wondering if you could talk a little bit about the role of caregivers and advocates within healthcare today.

ERIC TOPOL: Well, they are essential and, in fact, [this is] largely because we don't have that tight [physician-patient] relationship. [What's] even more important than ever, is that the caregiver is giving the care that's missing in healthcare. The problem is that the true emotional attachment, the true embodiment of what medicine is all about, used to be emanating from the doctor-patient relationship. What's happened is, caregivers have taken on a lot of that role [formerly assumed by doctors]. I think what we can do now is, not that we should diminish the importance of caregivers, but [that] they should be supplemented. If we had a stronger core relationship, the role of caregivers, it would still be important, but [the patients and doctors] wouldn't be as dependent on them. My experiences that you reference, where my wife helped me so much because I could talk to her and she knew how I was suffering. But all the doctor wanted to do was have me get anti-depression medications, which was farcical. Being roughed up by a doctor is much more common than most people recognize.

JONATHON SWERSEY: So, you were talking about Susan and saying how her role was essential for you...

ERIC TOPOL: We just celebrated our 40th wedding anniversary. We've been partners for a long time. She's helped me out. I've tried to help her out. And yeah, the caregiver thing: She was doing that for [her] parents into their 90s before they died, and they lived with us even. We understand the whole caregiver story, but also think that we've had to rely on that more than we used to. Part of that, of course, is the aging population with multiple comorbidities. But part of that is because the core relationship is threatened.

JONATHON SWERSEY: When you look at people who are providing care for older parents, and when [they also] have a sick kid, [they're] getting it from both ends, right? I wonder about that, the potential for these technologies, whether it's artificial intelligence or machine learning, to be able to help caregivers as well.

> **"When there's data flow, and it's going as it already does through a smartphone, it can be relayed to a caregiver, [and] in many instances, the caregiver will be much more facile and equipped to deal with the feedback from the data, that generation, and the algorithm."**

ERIC TOPOL: Oh, I think so. When there's data flow, and it's going as it already does through a smartphone, it can be relayed to a caregiver, [and] in many instances, the caregiver will be much more facile and equipped to deal with the feedback from the data, that generation, and the algorithm. Yeah, the idea that caregivers will not just provide emotional support, but also interpretation of algorithmic feedback from sensors, from the collective data, from [the] virtual coach, if you will, for various conditions. And ultimately, when we get rid of hospital rooms, when patients are more apt to be monitored in their own bedroom, with exquisite vital sign monitoring that's equivalent to [what's found in] an intensive care unit, the caregiver[s] will be a critical part of that loop, because they're going to be getting the alerts (the ones that don't work well in hospital rooms with the alarms going off every few minutes). [In the future,] we'll see ones that really work well, and they'll alert caregivers that something isn't right with their mother or father or relative.

JONATHON SWERSEY: Those are really great examples. And I know in your typical hospital room, if it's shared, you may

Eric Topol

have multiple sets of people all engaged, and each medical team running on its own clock. And so, that adds a lot of complexity in the environment, I would imagine.

I talk with a lot of our clients about artificial intelligence and applications for it. And I recently read an abstract of a paper entitled "***Computer Diagnosis of Primary Bone Tumors.***" It was a preliminary report. It was published in Radiology. They were using computers to evaluate X-rays with quite good results. That paper was back in 1963. And so, what I'm wondering—as you think about this, and as I talk with people—is in the context of a problem space that's been around for a long time, the application of computer technologies to support diagnoses or identification of maladies: What's different now, in a material sense?

ERIC TOPOL: Well, there are many things that are very different than these projections from the '60s and '70s—the Schwartz article in the *New England Journal* in the '70s, [for instance]. And the difference is that we didn't [then] have a way to deal with the massive torrent of data, which, of course, in itself is different. We never generated terabytes of data for any given individual. We didn't have a way, until now, [and] that's chiefly deep learning, a relative subtype of AI really, that's been growing in momentum in the last decade. So, we have new tools. We have far more data than ever before, exceeding the capacity. And essentially, we have no choice. We have to resort to machine help, because [there are] not even super humans that can handle this. And fortunately, at just the right time, we've got the computer hardware capabilities with GPUs, [and] we've got the type of AI that will support this. And we've got so many things [moving] in the right direction, except for the embracement, the goal of incorporating this, to bring back what is the bright aspects of medicine, emphasizing the humanity.

"Essentially, we have no choice. We have to resort to machine help, because [there are] not even super humans that can handle this. And fortunately, at just the right time, we've got the computer hardware capabilities with GPUs, [and] we've got the type of AI that will support this."

JONATHON SWERSEY: As you speak about that, and I think about these torrents of data, I can almost feel the complexity that we've added to the practice of medicine and what we're asking our physicians to be held accountable for.

ERIC TOPOL: That's right, because as it turns out, if we're going to have deep learning, we have to have inputs that are comprehensive, which we don't have today. Because the output from a neural network is only as good as the inputs. And right now, we have only fragments of people's data about their health—whereas we should have every part of their data from when they were in the womb, up to the present moment. Right now, we're talking about adding a genome, gut microbiome samples... everything that would be in their paper and electronic record. So, we're way behind in getting that comprehensive data source to have maximum output from AI tools.

JONATHON SWERSEY: We have just a minute left. I want to come back to something you talked about earlier, which was the role of young physicians and the emerging physicians, and helping to get these things adopted to help bring the humanity back into medicine. If you could change one concrete thing about the way doctors are trained today, the way medical students are trained, what would it be and why?

ERIC TOPOL: Well, I think it's that kind of patient-centered aspect [of medicine that] has been lost. Abraham Verghese has written a lot about this, and he wrote the foreword to the book, but it's about the idea that we're treating a scan, a data set, and not a human being. It's about listening. It's about true presence. It's about time. Going back to what I mentioned earlier, which is that relationship, that willingness to listen and cue in, and show compassion and empathy. That's what it's all about, and we have get back to that. I don't know that in our 150 US medical schools that is cultivated nearly as much as it should be, and reinforced.

JONATHON SWERSEY: Just one last question for you. As we look to continue these discussions, who should we read next after you, and who should we be speaking with?

ERIC TOPOL: Well, I certainly recommend Abraham at Stanford, because he has a presence initiative. He's leading the charge. He's our leading medical humanist today in the country, I think. But there's so many people out there that understand the technology side of this, and also are cued in to the importance of getting care back. He's the first person I would think of, but there's, I'm sure, many more.

Everyone has opinions on digital transformation. Few people have actually overseen a successful one. And even fewer—far fewer—have managed to distill that experience into an insightful, and surprisingly extremely readable, narrative of 464 pages. We're talking Alan Rusbridger, editor of ***The Guardian*** for two decades and author of ***Breaking News: The Remaking of Journalism and Why It Matters Now***, a fine book on how he transformed ***The Guardian*** from a British newspaper into a viable global brand. In this conversation with our Ken Gordon, Rusbridger talks about what it feels like to participate in a digital revolution: The costs, the benefits, the causalities of building a digital business on top of a successful analog one. He is particularly eloquent in expressing what it's like to lead a transformational moment, telling us how, in the midst of going digital with ***The Guardian***, "The effort of producing a newspaper is as difficult as ever was, but then suddenly you say to your staff, but by the way, we want you to update things every five minutes, every 10 minutes. We want you to do it and video and audio as well as text. We want you to be on social media. We might want you to do live events as well. And by the way, you can't go home at nine o'clock because the story keeps updating till midnight."

Listen to the ***audio version*** of this conversation.

"The Point About a Revolution Is You Have No Idea Where It's Going to End"

—Alan Rusbridger

Mentioned in this Conversation

Breaking News: The Remaking of Journalism and Why It Matters Now In *Breaking News*, Alan Rusbridger pinpoints how major shifts in the news business model occurred and what it means for the future. During his time as an editor for *The Guardian*, he helped the world-renowned publication pioneer digital journalism and oversaw its transformation.

My Paper Chase: True Stories of Vanished Times Spanning five decades of tumultuous social, political and creative change, Harold Evans tells a nostalgic tale of what journalism once was, as well as his personal journey of adopting a crusading reporting style and using journalism to better people's lives in *My Paper Chase*.

Good Times, Bad Times When Harold Evans was the editor of the *Sunday Times*, Rupert Murdoch approached him to become the editor of the daily Times of London, guaranteeing editorial independence. Evans departed after a year of unkept promises but shared his behind-the-scenes story of Murdoch's ascension in *Good Times, Bad Times*.

Play it Again: An Amateur Against the Impossible Alan Rusbridger knows what it means to abide by the twenty-four-hour news cycle. If that wasn't enough of a challenge, he set out to learn Chopin's magnificent Ballade No. 1 in G minor by heart. Rusbridger eloquently describes how he mastered this Ballade in his book.

Alan Rusbridger

KEN GORDON: It is an historic moment over in the UK right now, and I was wondering: Do you ever wake up and sort of wish you were still editing *The Guardian*? Does it feel strange to be studying and teaching about the news rather than actually producing it?

ALAN RUSBRIDGER: Well, I have great pity on anybody [who] has to cover this story because it's kind of unknowable where it's going to go. So, you see an awful lot of journalists on television and in print [who are] really at a loss to be able to describe the situation we're in or have any way of predicting what's going to happen next. I'm really rather relieved not to have anything to do with it.

KEN GORDON: Congratulations. Now, I would like to begin by having you read something, if that's all right, from the epilogue from your wonderful book, *Breaking News*. Would you mind doing that?

ALAN RUSBRIDGER: "This is a story half told. There is no ending, happy or otherwise. It would be nice for this book to have been a retrospective from the shelter of the other bank, safely reached. But, for the great majority of news organisations, the other bank is still tantilisingly distant. For many, it's practically invisible."

KEN GORDON: Was it a challenge for you as a memoirist to know that you couldn't conclude on the "far bank of digital transformation"? Did you have a sense that that's where you had to head at the end of this book?

ALAN RUSBRIDGER: It would have been lovely, but I mean, that's the point of the book. The book tries to describe what it's like to live in a revolution. And the point about a revolution is, you have no idea where it's going to end. There is nothing in the past that guides you to the future. It would have been lovely to have left *The Guardian*, to have tied it up in a pink ribbon and say, "There, it's all sorted; it's all safe," but that's not the way the world works at the moment.

KEN GORDON: Do you find yourself still in conversation with *The Guardian* editors now?

"The book tries to describe what it's like to live in a revolution. And the point about a revolution is, you have no idea where it's going to end. There is nothing in the past that guides you to the future. It would have been lovely to have left The Guardian, to have tied it up in a pink ribbon and say, 'There, it's all sorted; it's all safe,' but that's not the way the world works at the moment."

ALAN RUSBRIDGER: I have obviously lots of friends still there and we talk and engage about these issues, but I think anybody who's done a job for a long time is acutely aware that their advice might not always be welcome. So, you don't want to be a backseat driver.

KEN GORDON: One of the things I loved about Breaking News was that there were so many different elements to the story. The narrative was very rich and full. And I read it as a book about digital transformation—that was the lens I was using to look at it. Your standard book about creating a digital business lacks many of those dimensions. You, because you're no longer in the business, could be forthcoming about profit-and-loss data, internal politics, even those private meetings with the Fleet Street elders. The narrative, to me, had a kind of novelistic wholeness to it that I find lacking in almost all business books about digital transformation. I was wondering, was there anything significant that you think about in retrospect that you regret leaving out? Or that you might have been interested in saying now that you think about it afterwards?

ALAN RUSBRIDGER: I think I'm pretty happy with the balance. And I didn't want to do a conventional autobiography. Nor did I want to do a dry and dusty book about the business of media or journalism. So, I hope what I did was to get a right blend of the personal and broader reflections on the way journalism is going to go. I'm sure I could have written a more indiscreet book about, you know, the people who I worked with or rubbed up against, but that really wasn't the kind of book that I was interested in writing.

KEN GORDON: One of the things I like is when you talk about describing to your young students how the old-fashioned newspaper business used to work. You do a very good job of outlining [the story] and [illustrating points] with the stick figures, and everything else that you put into it. I wondered: Has your comfort level with teaching changed over time? Obviously,

Alan Rusbridger

you've been in the classroom for many more hours [since the publication of ***Breaking News***]. I can imagine you've developed more techniques and more comfort with teaching as a profession.

ALAN RUSBRIDGER: Well, I like teaching and, when I was a journalist full time, I liked the business of explanatory journalism, of taking a complicated issue and telling it in a way that would interest and be clear to people. [In the section on teaching in ***Breaking News***,] I thought it was necessary to go into pre-history as it were, i.e. 20 years ago. Because if you're under the age of 40, you have no idea how the world organized itself before. So, the point about printing presses, for instance—not many people had a printing press and they were usually billionaires. And from that ownership model stemmed a form of 'expertise' (I put that in inverted commas). You were, as it were, literally, almost literally handing down a tablet of stone. You were saying: "Here is the news. We are journalists. You don't really have any other way of accessing this, so you're going to have to take our word for it. And thank you very much—we'll take your money." And, unless you know that until comparatively recently, that was for 350 years the way that information worked. It's impossible to have any perspective on the way that information works now. And so, that's why I included that chapter. You have to begin by explaining the world as it was.

KEN GORDON: Sure. And have students taken an understanding from that, and has that deepened their approach to journalism?

ALAN RUSBRIDGER: I must say they look mildly interested.

KEN GORDON: [Laughs] That's what's so funny about it.

ALAN RUSBRIDGER: [It was like] describing how to make fire in a cave. "It's quite interesting, but why would you make things that complicated?" [Gordon laughs] But nevertheless, I still thought it was important to include.

KEN GORDON: At one point, you talked about editorial downsizing. And you write: "Asking a smaller team to carry on producing the same output was punishing, and we began to have concerns about the mental welfare of an increasingly stressed workforce." When I read this, I thought, "Well, what about Rusbridger's mental health?" It must have been incredibly stressful to go through some of the things you are talking about in this book. You don't really reflect on that too much on the pages [of the book], but I imagine that must have been a factor.

ALAN RUSBRIDGER: About a year after stepping down from editing, I became aware that I just felt differently. And I realized that if you [are a modern journalist]—particularly in an age where you're creating news almost around the clock … so, it's not like the days when you just had one deadline at nine o'clock in the evening; people are wanting updates all the time—that leads to adrenaline. You've constantly got adrenaline coursing through your system. And suddenly realizing what a body feels like when it's not got all that adrenaline was really quite significant. You almost have to stop doing it, in order to realize how extraordinary it was what you were doing.

KEN GORDON: One of the things that's certainly valuable [about ***Breaking News***] to people who aren't even in the journalism business was this notion that when you're trying to build a digital business on top of your ordinary analog business, it's like having another career on top of your career. And your entire company has to add these functions and layers of meetings and concerns that they didn't [have] before.

ALAN RUSBRIDGER: You're still producing a newspaper.

> **"The effort of producing a newspaper is as difficult as ever was, but then suddenly you say to your staff, 'But by the way, we want you to update things every five minutes, every 10 minutes. We want you to do it in video and audio as well as text. We want you to be on social media. We might want you to do live events as well. And by the way, you can't go home at nine o'clock because the story keeps updating 'til midnight.'"**

Alan Rusbridger

KEN GORDON: Right.

ALAN RUSBRIDGER: And the effort of producing a newspaper is as difficult as ever was, but then suddenly you say to your staff, "But by the way, we want you to update things every five minutes, every 10 minutes. We want you to do it in video and audio as well as text. We want you to be on social media. We might want you to do live events as well. And by the way, you can't go home at nine o'clock because the story keeps updating 'til midnight." So, the stress on journalists in their working lives now is very much more considerable than I think it was 30 years ago.

KEN GORDON: I'm curious about the composition of your book. You must have taken extensive notes while it was happening. Did you ever find yourself becoming self-conscious about what was going on at work because you knew you were also preparing to tell this story? And I was just wondering if there any other books you look to as models. I believe you talked about ***Harold Evans' memoir***. Are there other ones that you used?

ALAN RUSBRIDGER: I don't think I knew at the time that I would write this book. Although, it's a sort of habit of mine to make notes all the time and to collect things. I discovered when I went back through my emails and my various digital storage devices... I'm an inveterate hoarder. So, it was quite easy to recover contemporaneous material. I can't quite think of a book that is quite like this. I mean, Harry Evans wrote two great books about his journalistic career. But both were written in the recollection of tranquility afterwards. Whereas I suppose mine was a bit more sort of near to the bone because it was immediately after stepping on.

KEN GORDON: One of the things that we hear repeatedly in the book is this idea of "reach before revenue." And it seems like, to me, the true insight is that *The Guardian* recognized that the readers were a community, and that treating readers as community members rather than an audience was what really allowed you to grow the business. A sort of idea of revenue follows community perhaps—and I was wondering how you thought about that.

ALAN RUSBRIDGER: I think most people would now accept that the thing that we talked about recently, that a passive audience just waiting for the news to be handed down to them, is disappearing, and especially amongst younger readers. So, younger readers, their experience of the world is something that you contribute to and you can challenge and contest and share and distribute and alter and correct. And that's how you win trust. I think there are new techniques of trust that involve not saying, "Take my word for it because I am a journalist," or "Because I work for *The Guardian*," but because "Here's my evidence," or "I'm willing to be challenged and to enter a discussion about this," or "Here's a link." So, there are techniques that are developing that are very different [from what came before]. And I think it was hopeless, in the early part of this century, simply to demand that people handed over a lot of money for the kind of content we were producing. If you're the *Financial Times* or the *Wall Street Journal* [that model seemed possible], but nobody on *The Guardian* thought that was going to work. And so, you had to build up a much larger community. Because we all know that the revenues are much smaller. Thankfully, now, *The Guardian* has a huge community of people who I don't think just feel like passive recipients of wisdom from above. And the business model is now sort of falling into shape, but it was a bumpy ride.

"Younger readers, their experience of the world is something that you contribute to and you can challenge and contest and share and distribute and alter and correct. And that's how you win trust."

KEN GORDON: One of the things that that your book gets across is this idea that well into the 20th century, the newspaper was *the* platform for information. And part of the reason newspapers were blindsided by the rise of digital platforms is that they couldn't come to grips with that quickly enough to realize the relative power that a newspaper suddenly had, compared to these other platforms. I was wondering: When that came to you, was it painful for you to realize this? That these crazy digital platforms were kind of usurping your place?

ALAN RUSBRIDGER: There was nothing not to like about the old world. If you were a journalist 30 years ago, working for a very solvent news organization with ample resources and a passive audience that looked up to you—that was really nice. [Gordon laughs] In some ways, I wish we could go back to that, but it's never going to happen. And so, you have to accept reality, and the reality we all know is that, virtually everywhere in the world, newspaper circulations are in permanent decline. Digital things are in permanent ascent. Now, there's an awful lot that is hateful and wrong about the digital world. But there's an awful lot that's good. But there's no good [outcome in] wishing for a world that's never going to come back. The task while I was editing was to keep the print revenues coming in. Because we couldn't afford to turn off

Alan Rusbridger

print and try [to] simultaneously imagine what this digital world was going to require. That was a very complicated question because it required new techniques, new philosophies, new approaches, and running two types of newsroom[s], simultaneously. Convincing the skeptics that this had to happen even if you couldn't see where the money was. Reassuring the traditionalists. It wasn't easy. But it was really interesting. [Gordon laughs] I mean, it was a fun time to be there because it was there all to be remade and reimagined. That's fascinating.

KEN GORDON: Do you see what's happening now with this deepfake technology and the ability for somebody with the right tools to put out stuff that's undetectably false—stuff that seems true? I imagine that'd be a real challenge.

ALAN RUSBRIDGER: It's one of the biggest issues of our age now—that people don't know what to trust. I've seen surveys that said two-thirds of people now can't tell a good news source from a bad news source. And soon, as you say, we won't be able to trust the evidence of our own eyes because even video, which seemed to be really real, is gonna be fake.

This is potentially catastrophic for society. Because if you can't have an agreed basis of facts, then nothing works. You can't have law, you can't have science, you can't have government. And so, we're looking at a very frightening place where I hope people will yearn for some kind of return, not to the techniques of news production, but to ways of establishing very basic things like, "This is true; that isn't true. This happened; that didn't happen." That should give journalists hope because, actually, that's what we do. We're quite good at that.

KEN GORDON: Do your students feel the ethical responsibility that's going to come along with this? The necessity of building trust that they're going to be charged with when they get into the world?

ALAN RUSBRIDGER: They're part of this generation that is also trying to negotiate their way and, in a way, an academic start to life is quite useful because, you know, that's what universities do. They teach you how to evaluate sources and how to think about footnotes and how to think about the value of evidence. But I think there is a danger that we're going to have a sort of two-speed society in which you have elites, who are able to afford good information and have the techniques of evaluation, and then everyone else who has to make do with whatever information is out there and may not be so well equipped. So, you're going to have rubbish information and good information. We can see the danger [of] that playing out in lots of countries already.

KEN GORDON: I noticed that *The Atlantic* recently put a paywall back up. It was a shock to me when I saw it, but I understand why they did it.

> **"I've seen surveys that said two-thirds of people now can't tell a good news source from a bad news source. And soon, as you say, we won't be able to trust the evidence of our own eyes because even video, which seemed to be really real, is gonna be fake."**

ALAN RUSBRIDGER: We all understand that people are scrambling around for any model that's going to pay. I quote Dean Baquet, the executive editor of the *New York Times* in this book. His organization has created one of the most successful paywalls of all, and yet, there he is, he's an African American saying: "I worry about the 97% of America that doesn't read the New York Times." In the book, I explore the example of Sweden, where there are really good newspapers that are quite expensive and not much read in terms of the overall population. Meanwhile, the playing field of information is being flooded by Neo-Nazis and anybody who wants to go and then stir up horrible feelings and instincts in society. And that's having a rather bad effect on Swedish politics. So, information inequality is something that is for us all to consider.

KEN GORDON: I agree. Now just moving away for a second from journalism: Are there other any non-journalistic industries, like healthcare or retail, that you think have reached the far shore of digitization?

ALAN RUSBRIDGER: Well, I don't think anybody can say there's another bank and that they're safe on it. That's almost the point of the digital age: That you're always going to be vulnerable to people who can pick up something better, quicker, faster.

Alan Rusbridger

The music business is probably a bit further down the road than the news business. The digital entertainment video businesses [have] sold some things, but you're always going to be vulnerable to somebody [coming] along and doing something better. It's a sort of cliché now to refer to the age of Gutenberg and say that [comparatively] this is a comfortable age we're in. But if you go back to Gutenberg, it took about 150 years for that to sort itself out. We're about five minutes into this [age] and yet people are saying: "Facebook, please sort yourself out by next Monday." And they're not going to sort themselves up by next Monday. This is going to take 20, 30, 40 years before we begin to establish a new set of rules and procedures and understandings and the education to be able to deal with even some of the implications of what's happening at the moment.

KEN GORDON: That's true. And it reminds me of one of the things that's really amazing about your story. The story of *The Guardian* is how you were able to take what was a—I don't want to say provincial, but a British paper—and make it into an international news organization because of connectivity and because of what happened after 9/11 and all the other things [involved here]. The sun really never sets on today's *Guardian*. It is a global voice. And you started that. I'm curious to see how you see the paper expanding their empire, building beyond moving into America and Australia and everywhere else.

ALAN RUSBRIDGER: Well, I think it's fairly apparent now, in 2019, what doesn't work. What doesn't work is what most people have tried. You see declining revenues, declining readership, and you cut the newsroom. You have fewer reporters. It becomes a less interesting and valuable news organization. The decline accelerates even faster, and you get into a circle of death. That's not great. We know that doesn't work. And in a way *The Guardian*, because it doesn't have shareholders, had the luxury of being able to do the opposite. Saying, "Actually, let's try the alternative approach—which is to say, we will invest as much as we can afford to in the journalism." In the last five years I was editing, we did just fabulous investigations. We did tax, torture, rendition, the Snowden revelations. We did policing. We did tax avoidance. We did an environment [focus]: Toxic dumping, climate change. All very intensive, expensive, often legally fraught stories. And that seemed to be in defiance of any sensible business model. But that's the first stuff your cut. In the end, it turned out to be the business model.

> **"I don't think anybody can say there's another bank and that they're safe on it. That's almost the point of the digital age: That you're always going to be vulnerable to people who can pick up something better, quicker, faster."**

Because, when we went to the readers and said, "Look, you're going to have to pay us something," we tried asking them two questions. We said, "Look, you can pay us something as a private good so you can read *The Guardian*, but no one else can." That's how news was financed for 350 years, and nobody really wanted that. So, we said, "Well, what about news as a public good? So, you pay *The Guardian* not so only you can read it, but that's how everybody on the planet can read it." And *Guardian* readers loved that idea. There's now a million of them paying. Not one of them has to pay because you can get *The Guardian* totally for free. I think *The Guardian*'s ambition is to double that—now they want two million. As long as they keep doing journalism that matters, I think the readers will support them. They will say, "If that's the kind of journalism you're going to do, that is the kind of journalism the world needs. I will support that." Then I think the potential for expansion and other forms of more conventional revenue then become much easier.

KEN GORDON: Now, finally, I have the most important question for you. Are you ready, Alan?

ALAN RUSBRIDGER: I'm ready.

KEN GORDON: Are you still playing Chopin? And if not, what do you play?

ALAN RUSBRIDGER: Okay. My previous book, this is what you're referring to, was a book called ***Play It Again***. That was about really trying to find something in the midst of all this tension and stress that, just for 20 minutes a day, kept me sane. That, with me, was playing the piano, and I played a big piece by Chopin [that] took me 18 months to learn ...And that was my other life. Short answer to your question is: Yes, I'm still playing. I'm not playing that piece any longer because it's very, very hard. [Gordon laughs] But in Oxford, where I'm now based, there are lots of musicians and I have even more time to play the piano than I did before.

KEN GORDON: Do you play any other genres besides classical?

ALAN RUSBRIDGER: I mean, if given enough drink [Gordon laughs], I will sit down and play show tunes all evening. But that doesn't happen very often.

It's difficult for individual healthcare professionals to understand—really understand—how artificial intelligence and machine learning will shift their work environment, their knowledge base, even their future mission and vision. Many see that change is coming, but few have a concrete idea of how it will affect them. One smart response to this uncertainty is ***AI for the Rest of Us***, a Cambridge, Massachusetts-based initiative led by Sunandini Chopra, whose day job is working on oncology and genomics for IBM Watson Heath. In this spirited discussion with Toby Bottorf, we learn how Chopra and her group are engaging, via a series of regular salons, in a kind of small group for professional development. AI for the Rest of us is made up of people looking to form a more complete understanding of the impending digital transformation of healthcare. "They could be experts in data analytics but are new to the field of healthcare. They can be physicians who know about patient care and physician protocols but are new to the world of data analytics. Each of the members, or all of us in some way, know a lot about something but don't know a lot about something else."

"The Future Is Almost Two Futures: One that's the Future for Cutting-Edge Technology, and One the Future for All the Other People in the World to Get Access to Basic Care"

—Sunandini Chopra

Listen to the ***audio version*** of this conversation.

Mentioned in this Conversation

Connected, but Alone? In her TED Talk, Sherry Turkle explores the affect that technology is having on our interpersonal relationships: "As we expect more from technology, do we expect less from each other?" By studying how devices are changing our connections with others, Turkle pushes us to think about what the future of relationships will look like.

Sunandini Chopra

TOBY BOTTORF: For folks who haven't met you... your day job is working on Watson Health, but we're here to chat about what you are leading on your own initiative, which is a group called ***AI for the Rest of Us***. I think I must be in "the rest of us." Who's "the rest of us"?

SUNANDINI CHOPRA: That is an interesting question that has been asked multiple times, actually. To answer that question, I will have to talk a little bit about the group to help you to make the decision whether you are in "the rest of us" or not. The goal of AI for the Rest of Us is to bring together groups of people [who] are interested in the application of data analytics, machine learning, and advanced technologies in healthcare. The people [who] we attract and the people [who] are part of the group are different types. So, they... [are typically] people who are on the interface of two different fields. They could be experts in data analytics but are new to the field of healthcare. They can be physicians who know about patient care and physician protocols but are new to the world of data analytics. Each of the members, or all of us in some way, know a lot about something but don't know a lot about something else. So all of us, in a way, are part of "the rest of us." It just depends on how you look at it. But for this group, in particular: It's for anyone who is interested in both the facets: Technology and healthcare. They could know one and want to learn the other, or they could know both. For me, "the rest of us" depends on the context.

TOBY BOTTORF: Unless you know a lot about everything, you're in "the rest of us." So listen up, folks: This is a good group for you to be a part of. I definitely count in "the rest of us" because my background is in interaction design, interface design... and AI is completely upending everything we thought our work was based on. For the last 30-plus years, we thought it was a visual system—and it turns out it's becoming a conversational one.

SUNANDINI CHOPRA: Absolutely.

TOBY BOTTORF: At a past [AI for the Rest of Us] session, you had Roy Smythe from Philips talking about different jobs for AI. Those are the kinds of questions that are very intriguing to us at EPAM Continuum. Personally, I think a lot about jobs for people versus jobs for digital systems. But let's dive into what he outlined. He had three things that he thought we should focus on. One was workflow and streamlining workflow. The second was full-on automation, potentially even of clinical tasks. And the third was in decision support. Do you have a point of view on where you're excited about the potential for AI in these?

SUNANDINI CHOPRA: Sure. I do agree with what Dr. Roy had said. So automation, workflow management, and clinical-decision support systems are probably three simpler areas for AI to impact in the near future. A lot of the work that is being done by our physicians and our caretakers in the healthcare system—some of [these] are mundane tasks that happen at a regular cadence, and those tasks [are] very easy to automate and give the caretakers an opportunity to work on the more interesting aspects of patient care, the more human aspects of patient care, where they can interact with [patients] and [the] processes that can be built into the system to automate them. And in particular, I want to mention clinical-decision support systems and their impact on healthcare. So, as more and more real-world evidence and outcomes about patient data gets fed into these systems, they will have the capability to suggest better treatment options to physicians when they are doing treatment planning. And this can really play an important role in areas, not just such as the United States, but also the developing world, where you have a shortage of skilled labor, where you have a shortage of skilled positions. These technologies can really help advance the developing world, but also remove the disparities in care, and I think that's very exciting.

> **" There's a lack of medical care, and the alternative isn't a doctor or AI; it's nothing or a doctor supported by AI potentially."**

TOBY BOTTORF: That's really crucial to keep in mind—the bigger picture, the more global perspective. What we're talking about [are] tools, really, that are massively needed in terms of just the existing availability. There's a lack of medical care, and the alternative isn't a doctor or AI; it's nothing or a doctor supported by AI potentially. Sherry Turkle [has] written about this—Sherry Turkle at MIT—the question of loneliness in the elderly. And as you pointed out to me earlier today, [loneliness affects] teenagers also. AI may be not as good, obviously, as human connection, but it's certainly better than nothing.

SUNANDINI CHOPRA: Yeah, I completely agree. The way we are evolving as human beings is [this:] We definitely have more isolated lives. Everyone is busy in their own days [with] their own chores. As you mentioned, the geriatric population and the teenagers, they are both very comfortable with texting, with engaging with WhatsApp or

Sunandini Chopra

chatbots. People don't very often prefer just picking up the phone and making a call these days. These technologies are being studied and will have an impact in helping reduce loneliness, potentially depression. So they have a strong, strong way forward.

TOBY BOTTORF: There are some promising companies that seem to be able to deliver cognitive behavioral therapy to people with depression, and they're backed by AIs. The other example I've heard of is: People suffering from post-traumatic stress [disorder] may actually find it incredibly burdensome to process what they've been through in front of another person, and a robot or an AI is a better place to start their therapy.

SUNANDINI CHOPRA: Yeah.

TOBY BOTTORF: Chatbots, though. You had mentioned personalities. We think of chatbots as being kind of like the vocal equivalent of plastic, right? [Chopra laughs] But they're starting to get more variable in their personalities. And you've done some work there, right?

SUNANDINI CHOPRA: I had interned with Microsoft Research in 2016 as the summer intern, and my core project was not chatbots—one of my colleagues was developing chatbots with three different personalities. I had just helped her with one of her assignments, where I helped talk to the chatbot and then answer[ed] some questions for her research. Chatbots [are] a great way for creatives to just go crazy with different kinds of personalities. It's basically giving them different perspectives—the way they talk, the kinds of things they're [talking about]—and you can develop different personalities based on [an] area of interest. And then, depending on what an individual is looking for, you can provide that individual with that particular personality of chatbot to communicate with.

TOBY BOTTORF: A few years back, I worked on a project that was looking to build a digital coaching platform for people managing a variety of health conditions. We were looking at weight, weight management, and one of the things we saw loud and clear was that the ideal [coaching situation] for people was really varied—that some people wanted, they admitted, to be bullied a little bit, somebody to hold them accountable. And others wanted a more nurturing, more supportive personality from the support system that we were trying to build.

SUNANDINI CHOPRA: I think that's a great point that you brought [up], because one size doesn't fit all. We need systems, as far as chatbots are concerned, [that] start talking to an individual and then learn from the individual what works for that particular person and then change and modulate their own selves to suit the needs of [their interlocutor]. I don't know if we are there yet, but I think that would be an interesting system to work with.

TOBY BOTTORF: What are the emerging design skills? I mentioned my background in interface and interaction design, which was, for most of my career, a visual medium. What's going to change now as systems start to get multi-modal (they're able to talk, they're able to listen)? There will obviously be cases where visual representation of data is still above and beyond the best way to go, but maybe the way we interact with them is going to change dramatically.

SUNANDINI CHOPRA: Going forward, [here are] a few trends that I see… evolving as the key trends. Obviously, texting. I think people are very comfortable with just texting… either with a chatbot or with another person. Audio texting is another new trend that's upcoming. I've read about some reports in China, where people are very comfortable with just leaving voice messages, and they communicate in that way. [An] area where all of them sort of can get tied in is [with] your Amazon Alexa or your HomePod. That's a very interesting technology that can combine some of these facets because it's linked with your phone, with your television, with the speaker in your house. It can take you through the whole route of a digital-visual experience, a texting experience, and an audio experience. That's an interesting platform to build upon for future technology.

"We need systems, as far as chatbots are concerned, [that] start talking to an individual and then learn from the individual what works for that particular person and then change and modulate their own selves to suit the needs of [their interlocutor]."

Sunandini Chopra

TOBY BOTTORF: I think [the fact] that you bring up texting is fascinating, because it's a bit counterintuitive. People think of AI and they think of sci-fi, and [not] something as mundane as texting... [With texting], we don't have the problems of trying to simulate a human voice in a way that gets out of the uncanny valley. Text is more forgiving in that regard, I would imagine. And it's already been adopted. It's one of the ways in which we may underestimate the long-term effects of technologies that settle in a really natural way into our regular daily habits.

SUNANDINI CHOPRA: When I say texting, [I mean something] more like chatting. If you go to your bank website, or your workday website, all of those [sites] have a phone number and an option to chat. And almost, I think, 70% of the time [visitors] would just want to chat with someone. I think those are areas where you can use machine learning to add more flavor, to make sure that the right resources are being connected with the person who's looking for certain information.

TOBY BOTTORF: And obviously, more broadly than just healthcare, but they're also a great source of customer [or] patient understanding. In the early days of websites, the search box was a great way to learn what people were looking for. The same is true now of the queries that they give to chatbots or chat channels, whether they're people or AI systems. [They're] just another way to learn about people, the people that we're trying to serve.

SUNANDINI CHOPRA: You were talking about the why people do certain things. The little time I've been in the space of advanced technology for healthcare, I have come to realize that, in healthcare in particular—as far as physicians and care teams are concerned—they really care about the *what*. They care about that patient getting the right treatment. Or getting the right diagnosis. Or getting the right indication about the disease. They are sometimes not very concerned about how that's happening. However, a lot of these technologies that are based on machine learning or data analytics, they sort of solve this how question. It's like: "How are you getting to that answer?" It's because you're using really advanced technology and algorithms that are processing the data in a certain way. You mentioned the concept of *why*. So, where does it all fit in? I'm trying to understand that healthcare professionals care about the what. They care about what's being done. They might not have a lot of appreciation for how it's been done.

"I'm trying to understand that healthcare professionals care about the what. They care about what's being done. They might not have a lot of appreciation for how it's been done."

TOBY BOTTORF: I think it's the difference between science and a broader understanding of care. My favorite science writers have a very humanistic perspective about [their work]. They recognize that people who get sick and are dying and... lose loved ones, and [that suffering is] a part of what they are working on and wrestling with. It's not enough to treat diseases or conditions; it's people [who] need care. And oftentimes, somebody might be sitting in a badly furnished room, wearing a gown that doesn't close in the back, waiting to hear some news that might completely upend their life. That has very little to do with the what and everything to do with the how. For me, personally, I would rather have 25 minutes with an RN than 12 minutes with an MD, to be able to have conversations and make connections between my last visit and my present visit. None of that is managing anything too, too serious.

Part of the problem also is that the same focus on the what looks at healthcare as a series of crises and pays more attention to the war on disease than the baseline—people's everyday health and wellness and the management of that. We've talked about conversational systems as a way of helping people manage their weight. One trend I see is that health feels more and more like a chronic condition that you manage, because we all have more and more devices to help us measure and regulate—whether it's our diet, our exercise, our sleep. We're becoming equipped with a lot of data, and a lot of data analytics, to help us make smarter choices for our own selves. So here's a silly question: Who's your favorite robot?

SUNANDINI CHOPRA: I think we talked about it a little before. [Bottorf laughs] I don't follow robots very much. But I would say... R2D2 to from *Star Wars*—and then there was a movie that I'd seen a couple of years ago, *Chappie*. I think the robot there was endearing.

TOBY BOTTORF: One of the things that I find interesting: R2D2 is, I think, adorable. I see a lot of autonomous vehicles being made with those same cuteness qualities. I think it's a way of helping persuade us that they're harmless, even though they might not be—but then again, [neither] are humans [necessarily harmless] behind the wheel of a car. My favorite robot, for the record, is Bishop from the second *Alien* movie, because we know he's an android and he knows his job. He's kind of like a Spock figure. And he's willing to die for the mission.

Sunandini Chopra

SUNANDINI CHOPRA: And actually on that note, there's some work that's being done by some companies—I've read about one called *Affectiva*—[and] they try to have interfaces, interfaces of technologies, [that] mirror or map the needs of the individual, the human, that's working with that technology.

TOBY BOTTORF: Sort of like the mirror neuron idea?

SUNANDINI CHOPRA: Maybe. I fear that I might misrepresent the company. I was reading about them, [and I read that] if you are working on an iPad, and if your iPad knows that you're just upset... then it will change colors in a way to make you feel a little more comfortable and help to calm you down. So, things like that. This technology might be incorporated in other technologies that interface [with] humans in the future.

TOBY BOTTORF: There's a company called *Mindstrong* that claims to be able to detect depression and other mental conditions by the variable patterns of how you interact with your everyday devices. Are you impatient? You know, the gyroscope tells you a lot about whether your movements are sudden, slow, variables that can be interpreted.

SUNANDINI CHOPRA: Yeah, I think a lot of great work is being done in the space—in healthcare in particular. However, I wish that, at some point, we [will] begin to take more disease-specific care models in mind. So, you have this app for patients with depression, for example. That app is looking at one aspect of depression. There are so many different facets to it. That person might be on medication. Or the nutrition of the person needs to be managed as well. Or maybe [the] lifestyle of that person needs to be assessed as well. So, I almost feel, for healthcare, having access to this plethora of technology and tools for data analysis... [it would be better] if we [could] move to more disease-specific, comprehensive models, where you have a comprehensive way of assessing and monitoring how a person—I wouldn't say patient necessarily—how a person is [faring] in [the context of] that specific disease. This could be for depression. This could be for heart failure, diabetes, cardiovascular diseases. I really hope that someone is working on that.

TOBY BOTTORF: So, zeroing in on individual diseases leaves open another dimension to this, which I find intriguing. On the one hand, I think AI provides the potential for highly individualized medicine, down to the genetic level; on the other end of the spectrum, it could help us reach breakthroughs at the population level. There's big data in terms of billions of people, but there's also big data just in terms of what's governing my own internal processes. Is there a tension between those two? Or can we get after both ends of the spectrum?

> **"When I had just started reading about the space of data analytics—I've always been interested in healthcare—I almost drew this parallel between weather data and health data."**

SUNANDINI CHOPRA: Of course we can get at both ends of the spectrum! In fact, when I had just started reading about the space of data analytics—I've always been interested in healthcare—I almost drew this parallel between weather data and health data. How the prediction of weather, how that technology evolved was, basically [the following]: Earlier you were able to just create a log of historical data for different regions. Based on that, you would make predictions of the future weather for a certain region. As technology progress[ed], you were able to add some instantaneous variables, such as humidity, wind, sunshine. And as technology further progressed, you [were] able to have better prediction models. So basically, that's how we can now make really strong predictions as far as weather is concerned. I feel something similar would happen in healthcare as well, where you have your genetic data, [and] you would have your population-wide data [and] we can use data analytics to probably process and better understand [both]. So, that will give you your historical weather data equivalent. And then on top of that, you can have the instantaneous variables; they could be your vitals, your changes in different diagnostic results, and your mood, and your nutrition, and so on and so forth. And when you feed that information [into] population health, you get a stronger predictive model.

TOBY BOTTORF: Yeah, because you're looking at it in a bunch of different ways.

SUNANDINI CHOPRA: Basically, you're adding more and more solid, good variables into your prediction algorithm. So, you could reach a point where you could predict, with a decent accuracy, whether a patient [in danger of having a] stroke is going to have [a] stroke or not. So, that is what I hope for healthcare and what really excites me. But I think we have still a lot of work to do as far as that is

Sunandini Chopra

concerned. But it's possible. It's happened for weather. It's obviously extremely difficult to do something similar in health because it's an extremely complicated space, but it would be interesting to see [what transpires]. Going back to your question, I certainly think [in] population health and individual-level health [it's] equally important to be able to get the right data [for the] outcomes from these technologies that we wish to get.

TOBY BOTTORF: It's fascinating that you brought up the analogy [of] weather, because there's a term in weather prediction that I try to apply when I'm thinking about the future more generally, which is the "cone of uncertainty." It's a way of acknowledging that we don't know too much. It describes the potential path of a hurricane or a storm. And the farther out you project, the more variability and margin of error goes up. That's kind of what I am most excited, most optimistic about, and also a little bit... concerned about: The unintended consequences. I think there will be some uses for AI that we can't see coming, possibly because they're so mundane, like texting, but also others that [involve asking], "How do we look around the corners?" or [that] at least acknowledge that we don't know how something's going to play out.

SUNANDINI CHOPRA: The future is obviously very, very promising. However, I think it's the current [moment] where sometimes I, as an individual, get concerned. Through the meetup group that I [am] part of... a lot of my speakers alluded to the fact that running these algorithms is not the hard part. Getting the right data and the right form, which is filtered and curated and accurate, I think that's the key. Sometimes I feel that, as an industry, we are focused more on the algorithms and the [computations] and, you know, [the idea that] faster is better. Sometimes I feel we are neglecting the fact that we need to be able to collect more data from our patients, maybe [by] remote patient monitoring or [by] being able to identify new biomarkers, [by] being able to identify new ways of diagnosing certain diseases. So, a lot of the work that needs to be done in data collection and data curation, I think it's as important, if not more important, than developing these algorithms and making them better and better. Because, unless you feed them the right data, they can only go so far.

> **"What's exciting to me is obviously helping to introduce these cutting-edge technologies, but also very, very importantly, making sure that the 98% of the people in the world get access to at least some technology and some care."**

TOBY BOTTORF: What are you most excited about, [as we're] talking about the future?

SUNANDINI CHOPRA: I think I'm most excited about the fact that, with technology, we would be able to identify trends, we would be able to identify aspects [of disease prevention and treatment] that we have not seen yet. What excites me are things that I probably don't know yet, or we as humans don't know yet... About just simple things in terms of population health, like patterns, like mapping out disease progressions based on geographies. I think that kind of data analysis hasn't been done yet. When I talk about the future, I do like to link it with the more grounded reality. So I grew up in India, and I've been part of the developing world, and then I've studied here in the US and [have been] part of the extremely cutting-edge technology space. And so the future is almost two futures: One that's the future for cutting-edge technology, and one the future for all the other people in the world to get access to basic care.

TOBY BOTTORF: Yeah.

SUNANDINI CHOPRA: What's exciting to me is obviously helping to introduce these cutting-edge technologies, but also very, very importantly, making sure that the 98% of the people in the world get access to at least some technology and some care.

TOBY BOTTORF: Hear, hear. Thank you for that. We can all get behind that. Sunandini, thanks for coming in. This has been a great chat.

SUNANDINI CHOPRA: The pleasure's all mine. Thank you.

What's in Your Digital Transformation Library, Jeff Wilcox?

What does it take (really take) to pull off a successful digital transformation? The job calls for a systemic understanding of technology, people, business, culture, history, and change. How do we know this? We asked Jeff Wilcox, Vice President of Digital Transformation at Lockheed Martin, for a list relevant books, and his response suggested that successful digital transformation requires the people overseeing said transformation to read widely—and well.

Any serious attempt at transformation has to begin with a respect for the complexity of the interconnected systems that make up the enterprise and the ecosystem within which it operates. ***Thinking in Systems: A Primer***, by Donella Meadows, is the book I use to teach the Systems Thinking class at Georgetown University—and it has formed the basic framework I employ to approach our transformation efforts. Engineers are well-trained in the reductionist way of thinking, but to move a complex system forward effectively, we need to develop a systems lens as well. This book gives the reader the basic tools needed to develop a view of the enterprise as a system and introduces the concept of "leverage points," where systems can effectively be engaged. In the concluding chapter, Meadows notes that, "Living successfully in a world of systems requires more of us than our ability to calculate. It requires our full humanity—our rationality, our ability to sort out truth from falsehood, our intuition, our compassion, our vision, and our morality."

Thinking, Fast and Slow, by Daniel Kahneman. A necessary component of viewing transformation through a Systems Lens is the recognition that our lens is distorted by how our brain interprets the world. Kahneman's work provides a great framework for understanding the biases we bring to how we view the system we are seeking to transform. Any attempt to make change has to be grounded in a recognition that the present state has deeply carved grooves in our systems, processes, and consciousness that will need to be seen through and addressed. Kahneman's model of System 1 and System 2 thinking is a helpful framework for getting people to recognize the biases that will limit our potential to transform ourselves and our enterprises.

The most useful analogy I've found for describing organizational transformation is that of the operating system. With your home computer, you can upgrade your graphics card, your memory, or your monitor. You can't simply upgrade your enterprise. There's a temptation to believe that the technologies of the Fourth Industrial Revolution can be "plugged in" to your organization. No matter how much you spend on upgrades for your home computer, it won't matter if you are still running Windows 95. At work, if your operating system—the means by which information moves through the company, decisions rights are allocated, and work is prioritized—is still based on 20th century management principles, you won't see an improvement in productivity through technology. Aaron Dignan's book ***Brave New Work: Are You Ready to Reinvent Your Organization?***, and his team's associated writings, podcasts, and newsletters, have been enormously helpful to me in thinking through how to make meaningful change, starting today.

The Innovators, by Walter Isaacson. I believe that understanding the history of prior industrial revolutions is important grounding as we learn to usher in the Fourth Industrial Revolution. Isaacson's work on the history of the digital revolution describes the interplay of people and institutions that bring forth transformative change. In particular, his description of how academia, the private sector, and the public sector each provided key ingredients that yielded the tremendous value created by the digital age hold useful models for current public-private partnerships that can foster transformation.

Composing a Life, by Mary Catherine Bateson, was recommended to me by a colleague at the World Economic Forum. The conversation was about how career paths were changing from a linear progression to one marked by discontinuities in our professional

What's in Your Digital Transformation Library, Jeff Wilcox? (cont'd.)

lives wrought by technological change. Bateson's book describes the lives of five women as they respond to "discontinuities" as they compose their lives. There are many useful lessons here that apply to "composing a career." As we consider the impact of digital transformation on the nature of work, we would do well to consider, mode of action that is in Bateson's words, "responsive rather than purposive" and "based on looking and listening and touching rather than the pursuit of abstractions."

In ***How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics***, N. Katherine Hayles calls out something that is implicit, but never addressed in digital transformation efforts: The fact that we have disembodied information in the creation of the digital commons that serves as the foundation of transformation. Something is lost in the disembodiment of information, and whatever that something is, we need to be aware and respectful of that fact.

The Resonance Test Is A Networked Team

By Ken Gordon

A zillion years ago, back in the fall of 2015, I was asked to work on some copy for a radio ad about Continuum (as we were known before being ***acquired by EPAM***). I'd never essayed this genre before, but as the content guy, and a long-time NPR listener, I gave it the old innovator's try.

The copy turned out OK.

The next part of the assignment, however, was the antithesis of OK. I was instructed to transmogrify the copy into an audio recording, and to embed those spoken words between real radio sounds—to place them gently between two "bumpers," as they say in the business—creating an oral artifact that was remarkably radio-like.

Sonic prototyping was way beyond my ken… but I immediately knew the two people I could partner with to make the experiment appropriately real.

1. **Pete Chapin**. Pete was, and still is, our most extroverted strategist—a guy with a strong voice and some excess charisma. He would be a natural narrator.

—and—

2. **Kyp Pilalas**. Kyp is our talented-yet-modest IT guy, in his spare time, an award-winning filmmaker (one of his shorts was shown at Cannes!). Kyp would know how to record and edit the whole she-bang together—and would do so with competence and speed. He might even, I thought, enjoy something that didn't involve trouble-shooting software issues for our more non-technical colleagues!

With great trepidation—I was anything but sure they'd find this worth doing—I asked both to help me out and, as I recall, they were quick to say yes.

Here's what I remember of the experience: It was easy. The process was absurdly smooth, as though we weren't a hastily assembled group following a capricious content order, but rather an ensemble who'd been working together on a radio show for decades. I knew immediately that this ***trusty team*** was meant for something better than a one-shot radio ad prototype.

We were destined to start a podcast.

It was to be called ***The Resonance Test***, after our organization's ***method*** of having customers and employees "evaluate mock-ups to ensure that the experience we've created meets their needs, is relevant to them, and delivers the appropriate value." The idea was to feature one prominent person (an outside innovator, author, professor, sometimes a client!) chatting intensely with one of our own subject matter experts.

Over the years, we've brought a whole bunch of people into our circle and widened our ***Resonance Test*** network quite a bit. Our ***networked team*** is a lot like what Jon Campbell describes here: "Imagine that a networked team can be turned

on or off like a utility—a faucet or a light switch," and when "a client comes in with a challenge, we automatically assemble the right team."

The power of ***The Resonance Test*** resides in how Pete, Kyp, and myself keep adding more and more nodes of expertise, internal and external, to the team.

For instance...

- I started chatting with ***Tom Peters*** on Twitter, and that led to a ***phone interview and then an article in Fast Company*** and eventually a ***podcast episode with Jon Campbell.***
- Another relationship was the one with futurist David Rose. Toby Bottorf interviewed him long before the birth of The Resonance Test—they talked about Rose's book ***Enchanted Objects***—and they very recently followed up with a new convo when David joined our organization.
- Our episode with ***Megan Burns*** led to another one with ***Gary David***, who contributed this wonderfully funky annotated bibliography of books on customer experience to *The Dialog Box*.
- A conversation with Harvard Business School professor Tarun Khanna led to a few co-authored ***blog posts***, and—because Khanna is a Trustee of the Museum of Fine Arts, Boston—that led to a great ***project*** and then a podcast with the ***MFA's Katie Getchell and Julia Propp.***

And?

Maybe you should be part of the *Resonance Test* network. Who knows, if you've brought some amazing innovation into the world and/or have published a thoughtful new book, we'd be happy to invite you into the dialog box! A good way to kick things off: Chat with us on our lively ***LinkedIn page***. Let's talk.

The Dialog Box: A Resonance Test Magazine

is a project of EPAM Continuum. EPAM Continuum integrates business, experience, and technology consulting focused on accelerating breakthrough ideas into meaningful impact.

Editor: Ken Gordon | **Creative Director:** Toby Bottorf

Contributors: Christina Agapakis, Clare Bond, Toby Bottorf, John L. Brooks III, Megan Burns, Jon Campbell, Sunandini Chopra, Gary David, Mike Dunkley, Ken Gordon, Sridhar Iyengar, Kelly Lyons, Meredith Mendoza, Tom Peters, Cassidy Reid, David Rose, Alan Rusbridger, Jonathon Swersey, Hillary Tiene, Eric Topol, Jeff Wilcox, Kevin Young, Phillip Soffer, Dom Costanzo

The conversation continues:

WWW.EPAM-CONTINUUM.COM/