DRIVING DIGITAL TECH TRENDS TRANSCRIPT "MIRRORED WORLD" WITH ANDY GREENBERG

AUDIO TRANSCRIPT

TOM: Welcome to Driving Digital in Biopharma and this bite-size episode focused on one of the trends identified at Accenture as 2021 Technology Vision. For more than 20 years, Accenture has developed the technology vision as a methodical review across the enterprise to identify emerging technology trends that will have the greatest impact in the coming years.

Our 2021 Vision Survey revealed that leaders don't sit back and wait for the new normal. They build it themselves. Big changes today require bold, innovative leadership that prioritizes technology, and it's not just about fixing the business, but upending convention and creating a new vision for the future.

Each of the five trends stacks strategically: Mirrored World, I Technologist, Anywhere, Everywhere, and From Me to We, are rooted in the disruptions and demands caused with the COVID 19 pandemic, it's at a high bar for life sciences companies, with many meeting or now exceeding those expectations.

Even with extreme levels of instability, 2020 shattered industry norms and showed what is possible when technology is driven by a renewed sense of purpose, focus and commitment to patients, customers and the general population.

In this series of short episodes, we'll talk with five Accenture Life Sciences leaders who helped shape our industry perspective the tech vision to inspire life sciences companies to embrace a new mindset to shape a better future. Their thinking is backed by a survey of 100 biopharma business and I.T. executives across seven countries that helped identify the key issues and priorities for technology adoption and investment.

In the biopharma industry, we've been seeing an acceleration of the adoption of data driven solutions and the use of artificial intelligence and machine learning across the value chain to augment decision-making, to improve efficiency and ultimately to better deliver impact for patients.

According to 2021 Technology Vision, one of the tech trends leaders must embrace as they define the future is Mirrored World, which is the topic for today's episode and aligns with this broader trend we're seeing in the biopharma industry.

TOM: I'm joined today by Andy Greenberg, who is a leader in Accenture's life sciences business and is focused on a range of technology and data enabled solutions across the value chain. Welcome, Andy to Driving Digital in Biopharma.

ANDY: Hey, thanks, Tom. It's great to be here.

TOM: So Andy, as I mentioned in my opening remarks, the biopharma industry has continued to invest in data and artificial intelligence, and we're hearing more about this concept of digital twins across the industry. So before we get into the details, maybe we start with what is meant by Mirrored World as one of the top tech trends for 2021?

ANDY: Yeah, sure. And it certainly fits into the description of where there's real opportunity for disruption. But really, when we say "Mirrored World," what we're talking about is these massive intelligent digital twins, which is essentially creating a digital replica or a digital simulation of the real world. And it's in a fascinating space now, but to really understand what it started as to then what it become, you actually go all the way back to April 1970 with the Apollo 13 mission—by the way, great movie for those of you who haven't seen it, Tom Hanks, Kevin Bacon, whole situation.

But essentially the storyline is that the astronauts were up in space and they had a catastrophic set of failures and were really at risk of not being able to come back to Earth alive. And so what NASA had done, in frankly a spot of genius, was they had created 15 simulators that simulated all aspects of the spacecraft and connected them together.

And so what they were actually able to do is test the reallocation of parts in the spacecraft, but on Earth and to simulate what happened with oxygen, et cetera, and were able to come up with a combination of steps to take that actually led to bringing the astronauts safely home. And so that really was the very first instance of this notion of a digital twin.

Now, what's happened is we've expanded that out from it being about a specific thing, a piece of hardware or so forth, to being an entire system where we could look end to end—with AI as the key enabling—and then that creates this massive network for an intelligent twin. And the reason this is so important is it creates the opportunity to ask these what if questions.

So within a factory, you look at things like what Unilever is doing with Microsoft, where they're able to ask, "What if I were to change some

aspects of when I build things, where I build things, how I transport them?" And what they were able to discover is by just changing those conditions, they were able to reduce power costs by one to three percent, which might not sound like a lot, but in a very tight margin business, it actually had a significant impact on their profitability.

And so what they're doing is they're now taking that single in-factory view and looking at it across their total supply chain. And we're seeing this across the industry now, where almost one in five companies, 19 percent are actually deploying some version of digital twin at scale, with another 25 percent, 24 percent are in active experimentation. So it's still early, but we're starting to see the opportunities and the value this can really unlock.

TOM: So as you say, there's still maybe relatively small adoption at scale at—less than 20 percent here. And we're seeing, I'd say, a larger number of companies beginning to investigate the potential here. What do companies need to do to fully leverage digital twins?

ANDY: Yeah. So, Tom, there's really a few things that need to be true to be able to get the value out of here.

And we like to describe this as fortify, extend and reinvent—as the different phases of things you need to be able to do. And when we start with fortify, what we really mean there is if I want to be able to move from, as an example, maintenance of equipment at a time based schedule that once every six months, I change this part, to having it be on a condition based model, well, at the end of the day, what I really need is good historic data.

And so when we talk about fortification, what we're really saying is, "How do I make sure that I have all the data that I need to be able to ask the 'what if' questions that I want?" And so, you know, we surely have talked a lot in other episodes around bias of data in terms of treatment of patients and otherwise. Well, this is a different view of that, but if I have the wrong data or inaccurate data, then my 'what if' models aren't going to be accurate—aren't

going to be accurate enough.

And what COVID taught us is that even if I do have very specific internal data models, what I learned was with COVID, those models won't allow for what happens if a pandemic shuts down multiple of my factories around the world—or certain cities I can't transport into. So what was learned is we talked about fortifying data, it was actually the need to think beyond just my own internal data and get outside it.

And there are lots of companies that are collecting data right now, but only 11 percent feel like they're actually making full use of the data they're collecting. There's companies like Snowflake out there that are able to house these massive amounts of data to make use of it—but what we need to do is really move from these time-based conditions to condition-based preventive maintenance. And so there's a great term out there as I do these things that I call humble A.I., which is we also need to make sure that our digital twin, our digital twin isn't making decisions based on faulty data.

So this idea of humble AI is to make sure that, "Hey, if I don't really recognize this situation, I go back into a safe mode of operating." But that then puts us in a place where we can test these things, learn from them, and that can drive up time, energy management and so forth. And so that's been where we've gotten to.

The exciting thing around this now is the introduction of synthetic data, where I actually can introduce what might happen. So some interesting ideas where we've seen some of the Tesla-type models, where we can look across what would happen if 100 pedestrians showed up at a time. I obviously don't want to really model 100 pedestrians walking in front of a car, but I can digitally model that and it allows me to test things in a very different way. So that's fortified.

Once I got that, it allows me to extend, and what extend means is now that I have this data, I can create this risk-free playground where I can start to test these ideas and have a real fail fast mentality. So, you know, in the notion of the idea of a digital twin for a human lung, to be able to test its ability to intake a certain size

molecule…

So again, I don't need to wait to actually test that within the human lung. I can simulate that whole model and rule out certain products before I even get anywhere into the range of starting to think about running a trial. So again, the idea of extending it is "How can I now run tests on things I never could have run before?" And then finally, with reinvent, this is what we were talking about before, where this isn't just me thinking about: how do I control just the individual—have data just about the individual things within my individual organization or my patients' or my supply chain...

But how can I now introduce a much, much broader set of data throughout a much, much broader ecosystem and really rethink my entire operating model and business model in ways that could drive cost out and revenue up that I couldn't have possibly considered before.

TOM: So helpful framework, as again, as you said, fortify, extend, reinvent, as you look across that that spectrum and you've mentioned now a couple of things here. So one, as I said earlier, is resaid of what you had said, about 19 percent operating at scale now with this. I think you said 11 percent of companies feel like they've collected the data that they need. Somewhere in there must be some great examples of how people are actually doing—within biopharma— how they're actually doing this and applying it. Can you share some examples of what you've seen?

ANDY: Yeah, Tom, for sure. And I think there's a couple of good examples that really fall at opposite ends of the spectrum. On the first side, there's let's talk about actually at the patient level, how can we use digital twins to deliver, you know, a better specific therapy to an individual patient? And at the other end, it's how can we look at creation of a new vaccine and its supply chain and so forth.

So in the first example, you know, companies like Siemens Healthineers were able to create a digital twin of the heart to simulate the use of cardiac resynchronization therapy, which is basically for treatment of chronic congestive heart failure. And it involves this advanced

pacemaker that does some really interesting resynchronization in the heart.

But what they were able to do, because they were able to fully create a digital twin of the human heart and the different conditions it would go through—and have a digital twin of the device—essentially, they were able to put those things together and test all sorts of different operating models of what might fail and what might work. And so were able to do huge amounts of testing and modifications before it ever actually made its way into the human body or even into animal testing for that model.

So on the one hand, it's how can I simulate the human body or a organ within the human body and how a particular medical device or other might impact that.

On the other end of the spectrum is, if you look at, you know, the Pfizer BioNTech vaccine, in literally five scientists were able to bring data and intelligence together through sharing data in the cloud and simulations, and we're able to ask all sorts of questions about how the vaccine, how the mRNA vaccine might work and test it before again ever getting anywhere near human trials.

And so the idea of sharing the development of the vaccine the recipes was and the predictability in manufacturing was the next piece. So was actually first digital twin of the vaccine itself, then of the manufacturing process, and then finally into the product lifecycle, supply chain and so forth.

So you can really see how I'm on both ends—both at the at the individual unit level of a patient, but also on the macro level of getting tens or hundreds of millions of doses of vaccine into the into the far reaches of the globe—the idea of a Mirrored World actually can have enormous implications on both.

TOM: And two great examples, like you said, two very different examples, but ones that are very relevant to today, but also as you look forward, the potential of what's out there.

If you're an organization and you're either sitting on the sideline trying to figure out how you get into the space or maybe just getting started, what are those key questions that you should be asking to look forward on this?

ANDY: Yeah. And I think, as we often see, a lot of this will come down to the people process and technology and what your current capabilities are there. But really, as we think about it, there are there are three fundamental questions that I think are important to ask¬—and again, we see this across a lot of different parts of digital within life sciences.

But the first is just, is that business ready to take this on? And some of this goes back to the question we asked earlier about fortify—what data do I actually have and have access to? Is it good enough yet to make some of the decisions I want to be able to make and where are my gaps?

And so, so on the one hand, it's "Do I have the core assets from a data perspective?" But the other is from a capabilities perspective, do I have the streaming analytics, both technology and people to take advantage of this data, from ingestion to orchestration and analysis end-to-end. Because without the combinations of the data and the people to take advantage of it and learn from it, I really can't maximize the value.

The second is really need to rethink your innovation process and how can twins change how I think about innovation. Where can the biggest impact be had? And look, as we talked about, this is still early days. So depending on the organization, proving the value of some of these tools may be critical to continue moving forward. So looking at where can a digital twin have an immediate impact on driving value and a big impact might really be this the way to start.

And by the way, in some cases, those can be decidedly unsexy areas in manufacturing or supply chain, but with huge, huge value. And then having the ability, having an innovation hub or an innovation lab, to be able to quickly test and prove or fail or change what I'm looking to learn. So it's that combination of how do I use twins in my innovation process?

And then the third piece is, "How does this tie into the broader ecosystem of companies and

partners that I work with?" Because as I said at the beginning, there's value to be generated just by understanding maintenance of individual pieces of equipment. But the real business transformations will come when I look at how does my digital thread go all the way from early stage development, through it winding up in the hands of a patient and all of those steps in between.

And there are a lot of players that are at me that are involved in that. And so it really is understanding how engaging ecosystem partners will really play into that model.

TOM: And those are great points, and I'd say as you went through, there was a lot of recurring themes that we have had through pretty much all of these episodes, right? There's an element of people, process and technology, which seems to be core and central as we think about the adoption of digital and really driving an impact through it and needing to have some balance across all of those.

The ability to think about innovation in a fairly rapid way, experiment and then turn experimentation into scale. But with that, which I think you said in there, which is just being value oriented becomes essential at the end of the day. One, to get momentum behind it, but also, two to create the basis for trying to scale. But and then your final point, I think it's also a great one, is the sense that you can't do this alone, right? There is an ecosystem that needs to be considered, whether that is from a technology or data or sourcing model standpoint. There's a lot of different players that have to come together in order for this to be successful.

So again, it's interesting. It plays out also in this space, as we've had, that is a it's a pretty recurring theme, as I mentioned throughout a number of these sessions.

ANDY: Yeah, absolutely. And I think that's a positive, not a negative, right? There's a confluence of these things coming together.

TOM: Yeah, without a doubt. So let's close it a question of looking forward here. So if you take out your crystal ball and peer into the future— you've highlighted some examples of things that

have happened and not only within this industry, but also outside of the industry and interestingly, going back quite some time with your walk back in history here— what do you see as some of the more exciting opportunities here in the future for this space, particularly in this industry?

ANDY: Yeah, and you know, I think this is a fun question and a really exciting one with, you know, there's a lot of road to get to—but when I think about, you know, again, starting in 1970, when we first talked about digital twins, we were talking about how it was for an individual machine, right? Call it, in that case, you know, Apollo 13.

But what that's transformed into is now actually looking at a full end-to-end system from initial product idea all the way to being in a patient's hands or a surgeon's hands, or whatever that might be. So this idea of expanding out where I think there's going to be just enormously exciting future opportunity is, on the other side we talked about replica of the human heart, a digital twin of the human heart or the human lung.

And of course, we've seen all sorts of exciting work around digital twin of the DNA and experimentations with things like CRISPR and otherwise… where I think the really exciting view of this is, as we start to expand the data set to really understand the full human, not just from a biological perspective—so what diseases might they be most likely to get and how can we have a precise treatment to address that—but also behaviorally, because we know so many of the chronic conditions that exist are behaviorally driven.

So when I start to think about the digital twin of a human. The future of you to me, is that our intervention strategies are about driving long-term health and longevity. So think of the digital twin not only being about the medicine I take, but also the nudges with companies like Noom or Almada [spelling?] trying to make sure that I'm doing the healthiest, best things for me there as well… and really to take this whole philosophy that has historically been around machines and delivery systems and really apply that same thing using AI and enormous amounts of data to actually helping humans live

longer, better lives.

TOM: It's a great way to bring it together, and I think that's at the end of the day, that's the mission of what we're doing in this industry. So again, tying it all together, that that's why we why we focus on it and that's what we're trying to accomplish. So I do appreciate you joining today and really helpful to take a, I guess, a couple of things, right? A look back where this has been a view of where we're at right now, and then just as you went through that, that peer into the future and I think we're just starting to see and realize the potential of what could be here.

And I think again, as we've talked about, there's a number of constant themes as we go through this of what it's going to take to be successful and I appreciate your you run through today with us. So thanks for joining.
ANDY: Thanks, Tom. I really enjoyed it. Great to be here.