

BUILT FOR CHANGE

EPISODE 38: OUR BODIES ELECTRONIC

VIDEO TRANSCRIPT

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MOHA: I am the son of Libyan immigrants. My parents came to Costa Rica from Libya in 1980.

JOSH: This is Moha Bensofia, an angel investor and tech entrepreneur.

ELISE: Moha grew up in Costa Rica, but during a visit to Libya when he was an adult, he was inspired to stay in his parents' home country, and do some good.

MUS

MOHA: Just being in a place where I felt there was a need and that there was something that I could contribute. I ended up becoming an English teacher and I ended up opening a school and we ended up teaching a lot of people for free.

JOSH: Moha happened to be there just as political tensions in Libya were about to boil over.

MOHA: This is in the middle of the so-called Arab spring. And I was there right before things kicked off in Libya and that's where I stayed.

ELISE: This was a time of daily protests and bombings, leading to civil war. For Moha - being in the middle of all that turmoil was a traumatic experience.

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It brought emotional struggles from his childhood to the surface.

MOHA: The many ailments that I have include PTSD and all sorts of stuff. My time in Libya obviously made that part very, very bad. Having bombs go off all the time and not knowing if you're going to wake up the next day. But that tension, not being able to sleep, that PTSD, that waking up in the middle of the night were issues that I already had from long before.

JOSH: Moha had daily nightmares – but he'd learned to live with his anxiety, and he tried to ignore the trauma he experienced in Libya. He figured there just wasn't a whole lot he could do to change the way his brain worked.

ELISE: Then, a few years later, while living in Sweden, where he'd become a successful investor, he met an engineer with an idea that would change his mind.

MUS OUT

MOHA: He pulls out this device and he goes this thing right here can cure – and he used the word cure, right – things like ADHD, depression, anxiety PTSD.

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JOSH: The device was a headband that would measure the wearer's brain activity, providing real-time visual feedback, and allowing them to train their brain with a technique called 'neurofeedback.'

MOHA: I had never heard the term neurofeedback. I was of course skeptical, and, uh, I put it on and I start using it.



ELISE: It sounded like the stuff of science fiction – but his doubts began to fade when he saw the results. His sleep started to improve. He stopped having nightmares. And even other people in his life noticed a change in him.

MOHA: I've always been kind of like an irritable person, I can be a little bit jumpy, I guess. I had an ex-girlfriend of mine, she says to me, you're so much nicer. You're just more pleasant and that really resonated. So for me, that was a big aha moment.

THEME

JOSH: Moha was such a strong believer that he became the first private investor in the company – Mendi. Today, Moha is Mendi's Chief Evangelist, where he's devoted to the promise of the device that he says changed his life.

3:00

ELISE: I'm Elise Hu.

JOSH: And I'm Josh Klein.

ELISE: And this is Built for Change, a podcast from Accenture

ELISE: So Josh, does Moha's story resonate with you at all?

JOSH: Yeah, absolutely. I mean, I certainly didn't experience anything like what Moha did in Libya, but I've certainly struggled with anxiety and having the ability to get real time feedback as you try and work through that sounds amazing.

ELISE: Right, and he's not alone in his experience.

JOSH: Yeah, it sounds really far-fetched, but we've already seen a lot of really impressive developments in wearable technology just in our lifetimes.

ELISE: No, not so far fetched actually, right? Because I have spent a lot of time reporting in these areas and have tried all sorts of things like this too – wristbands, headsets – even that's old news now, right? The tech has already evolved so far beyond this. And it keeps accelerating.

JOSH: Yeah. I mean, think about the different smartwatches that people wear and the kind of information they get from them, or,

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or like blood glucose monitors. I mean, we've had huge leaps forward in sensor technology and in miniaturization.

ELISE: Exactly. The stuff that used to feel like science fiction, as they say, is looking more and more like it's going to become ingrained into our daily lives. We're talking about entirely new interfaces between humans and technology.

JOSH: And that means a whole new world of opportunities and considerations for businesses. So, that's what we're learning about today. The myriad of new ways that humans are interfacing with technology, and the importance of building technology that understands humans better.

THEME OUT

MARY: We're really thinking about tech that by design is more human-like and better integrated in how we like to interact, to be able to understand us.

JOSH: This is Mary Hamilton, Lead of Accenture Technology Innovation for North America and

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Latin America. A big part of her job is to help business leaders access new technologies that drive innovation. And lately, she's been exploring developments in a new area called the "human interface."

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MARY: The most basic definition of the human interface is really about creating technologies that can understand people and understand them in a very natural way.

JOSH: Many attempts to make technology more intuitive don't really hit the mark when it comes to the way people's minds actually work. It's not uncommon for people to find themselves really frustrated with things like the smart speakers in their homes, or the navigation apps in their phones.



MARY: In a lot of cases technology is hard to use, but also it's missing context and it's missing understanding of what people are actually trying to achieve, what their intentions are.

JOSH: But now, Mary says, technology is quickly becoming far more intuitive than we could possibly have imagined.

MARY: So we're seeing a

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whole generation of technology start to emerge that really is about actively leaning in to meet us on our terms. It's technology that can sense us, that can understand us, knows where we are, how we act in a natural way.

JOSH: This is technology that predicts and analyzes human behavior. For example, self-driving car companies are rapidly improving software to better monitor pedestrians and anticipate their sometimes unpredictable moves — like determining when they're about to step out onto the street.

MUS OUT

MARY: The technologies that we're really looking at here, include some of the sensing technology like motion detection, eye tracking...

JOSH: Other new developments operate much closer to the human body, like wearable health devices that track vitals. Devices popular today, like smartwatches and blood glucose monitors, are really only scratching the surface of the potential.

MARY: So being able to capture heart rate, blood flow, advanced prosthetics, and brain computer interfaces to understand what's actually happening in your brain.

7:00

JOSH: So why are so many advancements in human interface technology accelerating right now?

MARY: There are troves of data all around us that could really improve technology's usability, but that could also provide insights and help us improve ourselves.

JOSH: This data comes from a variety of sources — our heart rates, our eye-movements, our brain activity — and then analyzing it to glean insights that can help to build more human and more intuitive technology. The applications are vast. We're not too far off from seeing hands-free robotic collaborators that use human data to streamline warehouse operations. And Mary even says that a beauty company is tapping into the tech...

MARY: They're using neuro responses to understand different scent families for perfume, and then helping customers understand how those scents made them feel.

JOSH: Electroencephalograms, or EEG machines, are a powerful tool for experts to measure the electrical activity in people's brains.

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But they're not the most accessible or practical option.

MARY: One of the things that's always been challenging when doing EEGs is that the devices, one, are very expensive, but two, they're very sensitive to environmental noise. You have to sit very, very still and there can't be anything going on around you. There are some companies out there that now have created just very simple headsets, that are far less sensitive. They're more resilient to noise and to movement.

JOSH: Simple headsets like Mendi's, which detect blood flow in the brain rather than electrical activity. And as the cost to build a lot of this tech goes down, we'll likely see a wider adoption of human interface tech among consumers.

MUS

MARY: And as we've seen with every wave of technology, expectations are going to shift. So as this becomes more natural, people are going to be unwilling to go back to the old way of doing things.

JOSH: Meaning that on the whole, consumers are going to expect all of their technology to be more intuitive — and understanding —



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and organizations are gonna have to adapt to meet those expectations.

MARY: There's a lot of opportunity in collaborating with universities... Companies that are going to embrace it are really going to be the ones that start redefining the new norms.

JOSH: Mary says that a great place to begin is to think about what technology needs to be developed and improved, what data you need to make that happen, and then collaborate with others in your industry and beyond.

MARY: My advice would be to think about how do we improve the sensing technology, and the data and the collaboration around that? It could be manufacturing, it could be education. Coming together to think about the ethics and the standards that need to be in place. People are going to have a set of expectations and if we can move an industry forward you know that's going to really and shape that for everyone.

JOSH: With so much sensitive data in the hands of both private companies and governments, we should see a lot of new standards for how that data is handled and protected.

MARY: I think biometric privacy standards

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need to be updated. New neuroethics safeguards need to be defined, right? For how to handle brain and biometric data.

JOSH: But, Mary says, the pace of change is happening at a much faster rate than governments and lawmakers can keep up with.

MARY: We do need enterprises to really be thoughtful and to be ethical about how we're using this technology.

JOSH: On the whole, businesses need to think big and get creative about the ways that they can leverage human interface technology at all levels of the organization.

MARY: I think if you look at these technologies and only see change in small increments, you're not thinking about how to rework processes

altogether, rework job functions, think about new ways of training, reskilling, upskilling your workforces, those companies are going to be left behind.

JOSH: And even though the human interface will change so much about the way we work, Mary says its implications go well beyond that. Brain computer interfaces could

11:00

very soon become commonplace, and digital twins of our bodies could take monitoring our physical health to a whole new level.

MUS out

MARY: I think that when we unlock the potential of our bodies with technology, we're going to find new ways to understand people more deeply, to understand intent more profoundly, to build better interactions with technology and then I think ultimately help humans become even better at what we do.

MUS

ELISE: Are there any futuristic human interface technologies that don't exist yet that you would like to be using on the regular within the next few years?

JOSH: Oh man, yes, absolutely. Uh, I'd love to see, uh, real time cortisol monitoring or brain wave pattern, uh, monitoring over long periods of time. I'd love to see how different joints respond to stressors as you do different exercises at different phases of your – I mean, there's just so much data that we could collect and use.

ELISE: Right, and I'd love to see data that

12:00

wasn't just about us as individuals. I'd love to see data that helps us connect to other human beings better.

JOSH: Yeah, and, and the thing is, that stuff doesn't seem unreasonable anymore, at least not based on how fast Mary says we're seeing these innovations happen.

ELISE: Exactly, the idea of increased

accessibility is really promising.

JOSH: Right, and as we heard from Moha, that was what was so enticing for him when he first learned about Mendi's neurofeedback device. So, let's turn back to Moha now to learn more about how he and his team are democratizing their contribution to the human technology interface.

MUS OUT

MOHA: The thing to remember is that Mendi didn't invent neurofeedback. Neurofeedback has been around for like seven decades.

JOSH: Mendi's mission was to democratize access to a science that had previously been confined to highly specialized therapy clinics. EEG machines would measure patients' brain activity in real-time while they played computer games, and using that

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data, would train them in self-regulation to improve their focus. But EEG machines are costly and cumbersome. Patients have to put a sticky gel on their heads and wear a cap made of electric wires. And plus, it would often take many trips to the clinic for patients to see results.

MUS

MOHA: The whole premise of building Mendi was how can you impact a lot of people if you're bringing them into a clinic and you're seeing four people at a day, that's just not going to work.

JOSH: Mendi was founded by two engineers named Sammy Saldjoghi and Rickard Eklöf. They'd both seen neurofeedback work in a clinical setting, and they had a lot of hope about its potential to change people's lives. But they knew that regular visits to a neurofeedback clinic wasn't something many people could fit into their schedules – or their budgets.

MOHA: If you're going to really be able to tackle something like the big ADHD problem or all these ailments that people have, you're gonna have to create something that the housewife

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with four kids that's struggling to pay rent is gonna be able to have access to. That person does not have the time to go pay a hundred or a hundred and fifty dollars per session, drive her kid two hours out of town, to go do 20 sessions. Let's see if we can replicate what these clinics do. Let's see if we can improve it. And let's see if we can adopt a very, very transparent scientific protocol so that we can get some of the best people in the world to come in.

JOSH: So, Sammy and Rickard decided to build a device that could provide a real-time picture of patients' brain activity, but at a fraction of the size and the cost of the machines used in clinics. They built a simple, ergonomic headband with optical sensors that rests against the wearer's forehead. Instead of directly measuring electrical activity, Mendi's headset instead uses optical technology called Functional Near-Infrared Spectroscopy, or fNIRS. fNIRS technology monitors and tracks blood flow

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dynamics in the prefrontal cortex in response to changes in neural activity. After Moha joined the Mendi team, the company launched a crowdfunding campaign. And Moha says that transparency about the science ended up being a big part of it.

MUS OUT

MOHA: And obviously the first thing that happens is everybody saying, oh, this is snake oil. This is a lie. You're never going to get the devices. This is a scam. We ended up getting so many attacks from just random people, from skeptical people. And my response to that was always the same. I would write my name and I would write my phone number.

JOSH: Moha encouraged the skeptics to reach out to him so he could share not only his personal account of how much his mental state improved from using Mendi's neurofeedback device, but also to simply explain neurofeedback to them –

MOHA: It is a very high quality device. It's not a toy. Basically what it's going to do is it's going to read the amounts of oxygenated blood flow

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to the prefrontal cortex. And the prefrontal cortex is that front part of your brain, which controls your executive function.

JOSH: As the wearer's neural activity increases, so does the blood flowing to their prefrontal cortex. And with daily use of the device, they begin to reinforce neural patterns in the brain — associated with desired behaviors, like better focus.

MOHA: That is going to make you feel more in tune, more relaxed, more in the zone. It's going to calm your anxiety. It's going to make you feel better. It's going to help you focus. It's going to teach you how to control things that you normally wouldn't.

JOSH: So, while one component of Mendi is the device that measures brain activity, the other is a mobile game — users control the movement of a little ball on their screen using only their focus.

MOHA: At first it's a little bit confusing. You don't understand it, but it's kind of like, you just have to blend into it. You just have to relax, and you just have to keep at it, right? It's kind of like doing your first workout at the gym and not seeing results.

JOSH: Mendi's

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headset tracks the blood flow to the user's prefrontal cortex while they play the game.

MOHA: So when you talk about the feedback, the feedback is in the game. So what the wearable does on your head is it reads what is happening in your prefrontal cortex. What the feedback is showing you on your mobile phone is a gamified version of the activity in your brain. So you play a game and you control the score of the game by controlling your brain.

JOSH: The game is essentially a workout for the brain, which may increase its overall neuroplasticity... Or, put another way, users can improve the flexibility and stamina of their brains. As a result, they're often less distracted, they're more energized throughout the day, and they have an easier time sleeping at night.

MUS / BEAT

JOSH: Moha and his team hoped that making the science more transparent would help them get more attention and support. And eventually, with backing from investors and support from their crowdfunding campaign, they were able to make Mendi available to tens of

18:00

thousands of customers.

MOHA: We've delivered, you know, 40,000 Mendi devices, we deliver thousands of devices every month and my dream is that we start giving them away for free.

JOSH: And while Moha is proud of the numbers, it's the feedback and reactions from users that mean the most to him.

MOHA: As somebody that is not a scientist, it's more valuable to me when I hear a parent literally cry telling me that their 15 year old daughter is not having panic attacks anymore. Or a veteran tells me that they can sleep for the first time. To me, these things are very, very emotional.

JOSH: Moha says that one of the next steps for Mendi is leveraging the company's B2B potential, to help employers help their employees through neurofeedback. Which holds a key lesson for business leaders...

MOHA: If you look at companies as collections of human beings with feelings and husbands and wives and children and issues and disease and this and that, you start looking at things very differently. You have a collection of people

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and you can give them a tool that makes them collectively feel better, feel less stressed, can help with their burnout, that is game changing. That is good for business.

MUS OUT

MUS

ELISE: It was really cool, Josh, to hear Moha talk about the science behind Mendi's product.

But really the possibility for how many lives it can reach, how these innovations that start as therapeutic, as they become more accessible to more people end up being really game changing, and perspective changing.

JOSH: Yeah, absolutely. I mean, a lot of this stuff is kind of hard to wrap your head around, but at least for me, the more I learn, the more interested I am in how these new technologies work in conjunction with the human body.

ELISE: It's very cool stuff. It's not just the brain. It's our hearts and our blood, even our limbs and our joints too.

JOSH: Exactly. It's the way we operate and interact with the world. It makes sense that we'd want to be able to gather more data so we can be better people.

ELISE: Absolutely.

JOSH: So that's why we

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talked to an MIT professor who developed a wearable ultrasound sticker that showcases the immense promise of human interface technology.

MUS OUT

XUANHE: If you think about the majority of wearable devices, these are actually machines trying to merge with the body.

JOSH: This is Professor Xuanhe Zhao, who researches mechanical, civil and environmental engineering at MIT.

XUANHE: Over the last century we developed more and more sophisticated machines all the way from, you know, wearable devices, to, uh, implants, like pacemakers.

JOSH: In his lab, Professor Zhao tries to figure out how to combine advanced interfaces with other traditional methods of diagnosis that doctors and clinicians use everyday. The goal is to make diagnosis and treatment of various diseases both more accurate

21:00

and more accessible.

XUANHE: What if we can invent a much more advanced interface, but still leverage existing sophisticated machines? Can we achieve better diagnosis and therapies for diverse diseases? We believe if we can develop much better human machine interfaces, in this broad definition, uh we can potentially achieve these goals.

MUS

JOSH: One day, one of his students, Chonghe Wang, approached him with an idea – a wearable ultrasound sticker.

XUANHE: He was so enthusiastic about the wearable ultrasound devices. He persuaded me to switch a part of my research group to devote it to this direction.

JOSH: The idea was this: what if they could make a device the size of a postage stamp

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that adheres to the skin like a sticker and has the power of a full size ultrasound machine –

XUANHE: Imaging is a crucial component for diagnosis and even for long term monitoring of disease. Seeing is believing. Can you see a diverse deep internal organs?

JOSH: In a traditional ultrasound, a patient makes an appointment with a clinician or sonographer at a hospital. They're then covered with an aquasonic gel and have to lie down in often uncomfortable positions while the sonographer moves a handheld probe over their skin. The sound waves from their body are then sent to a computer that converts them into images. It's a very common and frankly essential procedure, but it's not perfect.

XUANHE: The patient needs to go to hospital. And the imaging is a snapshot, basically a very short time frame. The patient cannot walk, cannot run like in daily life –

JOSH: Meaning that the images the ultrasound

23:00

produces don't reflect what's happening in their bodies throughout a given day. Their doctors have to make diagnoses and other decisions based on a limited amount of information. So, Professor Zhao and his team wanted to make an alternative to the traditional ultrasound that would give doctors more comprehensive data to work with — and would be immensely more convenient for patients. First, they tried shrinking the larger ultrasound probe that clinicians use in a hospital setting. They started by 3D printing a version that was about the size of a postage stamp and just a few millimeters thick.

XUANHE: Over the timescale of half a year, we achieved this thin, rigid, high quality ultrasound probe.

MUS OUT

JOSH: Next, they created a soft component to help tune the probe to the right image quality, and adjusted the quality of the sticky ultrasound gel used in traditional ultrasounds to develop a substance that wouldn't dry out too quickly. Because ultimately, their goal was to create an alternative ultrasound that people could wear

24:00

away from the hospital, for weeks or months at a time.

MUS

XUANHE: And then the imaging, instead of being snapshot, will be long term continuous over days to months, and the patient or even healthy person during the whole process can do their daily activity. They can walk, they can run, they can do all kinds of sports, even swim, uh, no problem.

JOSH: That much continuous imaging produces an enormous amount of data. So Professor Zhao and his team used AI to develop an algorithm to help clinicians process all that data and make a diagnosis in real time.

XUANHE: Then after the application, very simply, you just peel off the sticker, you throw it away, but you keep the probe there for the next time use.

JOSH: Even in the early stages of development, the team knew that their ultrasound patch would have immense implications for both doctors and their patients. A breakthrough like this could help pave the way for a

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new era of health technology — making diagnosis more thorough, more accessible and more convenient. Once they got approval to use the patch in their own lab, Professor Zhao's students tested it on him. He remembers what it was like to see it in action for the first time.

XUANHE: So they just, uh, one day came to my office, stick this patch on my neck, and then they show me this image on the computer. I was, uh, shocked. So beautiful, it just clearly see the arteries and veins. Just a shocking result. Immediately I realized this will be impactful.

MUS OUT

JOSH: The team published a paper about their ultrasound patch and received comments from clinicians who'd read it. Then they started collaborating with those clinicians to monitor different types of diseases in patients. And now, their next step is to create a startup, with an ultimate goal of producing enough ultrasound patches to make the technology as accessible as possible.

XUANHE: Our goal is quite ambitious. Within the time

26:00

of, uh, three to five years, we want to see FDA approved products. We will either collaborate

THEME

with existing companies, or we will, uh, develop our own distribution channels to sell this, uh, product, maybe initially to hospitals, for broad application of this technology

JOSH: But beyond his ultrasound patch, Professor Zhao is very excited about the prospects of human interface technology beyond the field of medicine — for humanity as a whole.



XUANHE: Now the data from all these wearable devices can be analyzed by AI, many things are possible and the data potentially will change the future of a human society.

ELISE: What do you think, Josh, about this ultrasound the size of a postage stamp?

JOSH: I think it's genius. I mean, as with so

27:00

much of modern medicine, to date we've had to do with really intermittent checkups or really intermittent data gathering, when really what we need is data that's gathered to see how things change over time. This is a fantastic example of using modern technology to deliver on that promise.

ELISE: It really makes me optimistic about the ways that machines can improve human health and our well being on a broad scale.

JOSH: Yeah, it's enormously exciting. What a great time to be alive.

ELISE: Yes. Yes.

JOSH: So to learn more about what we discussed in today's episode, download the Accenture Foresight App. There you'll find Accenture's Tech Vision 2024 report, which covers human interface technology and many other trends that are shaping the future of business.

ELISE: A big thank you to Accenture's Mary Hamilton.

JOSH: And to Moha Bensofia and Professor Xuanhe Zhao for talking to us.

ELISE: Built for Change is a podcast from Accenture.

JOSH: More episodes are coming soon. Follow, subscribe, and if you like what you hear, leave us a review.

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