



Stanford eCorner

Embrace the Entrepreneurial Journey

Jane Chen, *Embrace Innovations*

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Jane Marie Chen, co-founder and CEO of Embrace Innovations, describes how her social-enterprise startup's infant warmer for premature and low-birth-weight babies came into the world. She discusses how optimism fuels the drive to overcome setbacks big and small, how Embrace has expanded into retail to support its humanitarian efforts, and explains why we should "choose to see the world through the lens of beauty."



Transcript

(applause) - Thanks for having me, thanks for the introduction Tina. It's so great to be back on campus. I was reflecting yesterday that it has been indeed nine years since I took the design class that Embrace came out of, so I'm feeling extra old today. So I'd like you guys to go through an exercise with me before I begin. Please close your eyes and hold out your hands in front of you. And imagine what you could place inside your hands. An apple, maybe your keys? Now open your eyes. What about a life? What you see here is a premature baby. He looks like he's resting peacefully when in fact he is struggling to stay alive, because he can't regulate his own body temperature. Sadly, there are millions of babies like this born every year around the world.

In fact, 15 million pre-term and underweight babies are born annually. Three million babies die in the first 28 days of their life. That's six babies every minute. One of the biggest problems these babies face is staying warm, and that is the primary function of an incubator. But incubators are expensive, they cost \$20,000 upwards, they require a constant supply of electricity, they're difficult to operate, so you're not going to find them in rural areas where many of these babies are dying. In 2007 while I was doing my MBA here at Stanford, I took a class at the design school that would completely change my life. Many of you may be familiar with it, but Design for Extreme Affordability brings together students of all the different graduate programs with the goal of creating low-cost technologies for people living on less than a dollar a day. The challenge posed to my team at the time was to build a baby incubator that cost less than 1% of the cost of a traditional incubator, which in the U.S. is about \$20,000. So the first thing we did was to go on the ground to places like Nepal, and Uganda, and this is what we would often see.

So this is a hospital, neonatal intensive care unit that's completely overcrowded. Every baby in here is in need of incubation. And then you have a donated incubator sitting in the corner of the room that's empty. Why? There's no electricity to power it, no one has been trained on how to use it. If a part breaks there are no spare parts for replacement. So even when these incubators are free, when they're donated, they're not usable because of all these systemic issues. Instead people use solutions like this, these are old space heaters used to warm babies. You put your hand in front of one of these and you'll immediately feel it starting to burn. Or lightbulbs. These are the most common solution in India, where 40% of all the world's premature babies are born.

But in every clinic I visited you hear stories of lightbulbs shattering over these babies because of problems with the circuits, so completely unsafe and ineffective solutions out there. From there we traveled to the villages, and that's where I truly began to understand the problem. This is Sujatha, this is one of the first women I met in a village in South India. Sujatha gave birth to her baby two months prematurely. She took her baby to a village doctor who advised her to go to a city hospital so her baby

could be placed in an incubator. That hospital was over four hours away and she didn't have the money to get there. And so her baby died. And since then I've heard dozens of similar stories. But it was based on stories like that that we realized, what was needed was not just a lower cost version of what exists today, we needed something that could function without a constant supply of electricity that would be easy enough for a mother or a midwife or a healthcare worker in a village setting to use. So coming back to Stanford, we went to the drawing board.

We wanted something super intuitive to use, so we created a sleeping bag design. These are literally our first sketches of the product on the back of a napkin. And then we thought what could maintain heat at a constant temperature without the need for electricity. We went back to high school physics, to the concept that when a material changes phases, let's say from a solid to a liquid, or a liquid to a solid, it does so at one constant temperature. What if we could find a material that melted at human body temperature, and then put enough of that substance in that that melting period took place over hours at a time. We didn't know what that material was, so we prototyped with the closest thing we could find. This is butter in ziplock bags. We made quite a mess at the D School. From there we went to a Salvation Army, and we bought everything baby related we could find and literally started duct taping our first prototypes together. So if you can see here, our first prototype had a tube going down the side of the sleeping bag where you would pour the boiling water and that would melt the phase change material.

Then we showed this to some people and they said to us it's probably not a good idea to put boiling water right next to a baby's head. So we quickly scrapped that and moved on to our next prototype. Here we realized that babies in these countries often don't wear diapers, so we needed something, a material that was waterproof and really easy to wipe down. Those were the materials we identified here. And then with those early prototypes we went back to India, showed them to mothers, to doctors, to health care workers, and with their feedback we continued to iterate on the design. We realized the importance of sterility. Because these are all reusable we didn't want babies to cross-infect each other if they were sick. So we ended up creating this sleeping bag out of one entire piece of fabric where there are limited seams on the inside where dirt can collect. Here doctors requested a clear viewing window so they could observe the baby's breathing and color more easily. And then this was one of my favorite stories.

So on the wax pouch, there is a temperature indicator. It's a liquid crystal display that changes color according to the temperature so you know when it's too hot or too cold. And as we showed this to the mothers in villages, we heard something very unusual. They would say to us, we don't trust Western medicine. If you gave me a dosage of medicine for my baby. I would cut it in half because it's too strong. So if you told me to keep this at 37 degrees Celsius, or 98 degrees Fahrenheit, I'd keep it at a little less than that because that's probably too warm. So that led to a very important design decision to make it a binary happy face frowning face instead of a numeric scale. I think that that's really the key to great design, is empathy and all of these nuances that are culturally appropriate. When we needed to do more testing, we used our own family members.

This is my nephew that I stuffed into one of the early prototypes. And so it was in this way that we tested and retested hundreds of times over the course of several years until we were finally ready to launch the product in 2011. I've got it with me here today. So this is the Embrace Warmer, as you can see it looks like a little sleeping bag made out of waterproof materials, You've got the clear viewing window here, and in the back, you've got this pouch of wax that can be melted either with boiling water or with a short burst of electricity for places that do have intermittent access to electricity. And once melted it stays at the exact same temperature for up to eight hours at a stretch. And this can be reheated thousands of times. So you put it into a little pocket in the back and it creates a warm microenvironment for the baby. I'm going to pass this around so you guys can play around with it a bit. So I still remember in 2011 as we were launching the product in those weeks leading up to our product launch, everything that could have possibly gone wrong went wrong. The electricity in our manufacturing facility went out in the most critical moments, a part of our product got stuck in customs and they wouldn't release it, because the wash tags were sewn incorrectly, but somehow we managed to get that first product ready to ship to our first customer.

And then on the way to that doctor's office, we got a flat tire. (laughing) So the whole team jumped out, we piled into this auto-rickshaw that you see here, and we delivered our first product. I always tell the story because it's so representative to me of what entrepreneurship is all about, which is doing whatever it takes to get past the obstacles that come in your way and finally reach that end goal. And here is our very first customer. The most exciting part of this journey by far, has been getting this product into the hands of the families and the babies who need it the most. And we have been so lucky to get the support from people of all different walks of life, who really rallied behind us to help make an impact with this product. Which really led me to believe this quote from Paulo Coelho that I love. He says "When you truly believe something, "the universe will conspire to help you achieve it." A few years ago we were invited to present our work to President Obama at the White House, and that got great visibility for our efforts. We presented a commitment at the Clinton Global Initiative as well and formed some great partnerships through that. In 2014 Beyonce made a donation to us, a surprise donation that got our products into nine countries across Sub-Saharan Africa.

So with the help of all of these people, to date we have been able to help over 200,000 babies. The product is now in 20 countries, and I'd like to share just a few of the stories of the babies we've helped. So this is one of my all-time favorite stories, I

always tell this one. This is Nathan. About four years ago we started working with an orphanage in Beijing. A day after we delivered our product, they called us telling us they had found a two-pound baby that was abandoned on a street in central China. They brought Nathan in, kept him in the warmer for about 30 days, it was a very scary period for all of us, we weren't sure if he was going to survive or not. Seven months later I went to visit the orphanage, and I got to hold Nathan in my arms, he was this vibrant, interactive little boy, and it was a very very special experience. The orphanage told me this was the first time a baby of this size had ever survived there. A few months after this we got an email from a family in Chicago, saying they had adopted this little boy and were traveling to Beijing that summer to bring him home.

So here Nathan is with his new family. And when he turned two, we sent him a warmer for his birthday. You can tell he's outgrown it by just a little bit. And the next story I'm going to show a short video. This is Nissima from Uganda. (guitar music) - So it's just a few more pictures of the product being used around the world. This is twins in Uganda while using the Embrace Warmer, and a few months later. These are some images of the product being used across Sub-Saharan Africa. So it's been incredibly rewarding and exciting to be a part of this effort and to create this type of impact. But I would be lying if I were to tell you that it was all roses and flowers and that we didn't face some extreme challenges along the way.

It's always wonderful to have a vision of what you want to do, but, as Mike Tyson says, "Everyone has a plan until they get punched in the mouth." This has happened to us repeatedly. I could tell you about our challenges for days. But I'll tell you about one pivotal moment for us that really kind of redefined the business, and taught me a lot about life as well. So in 2014 I had lived in India for four years. I moved back to the U.S. and at that time we had been working on a global distribution and financing deal with a major medical device company. I had been working on this deal day and night for almost a year at that point, and then about a week away from signing the deal, we found out that this company let go of their healthcare CEO, who was the main advocate for the deal, and they pulled the plug on our financing. We had seven days of cash left in the bank, and I was completely devastated. I had no idea what we gonna do. All of us thought we were gonna have to shut down the company.

And then a miracle happened. Nine months prior to that, I had gone to the World Economic Forum at Davos, and one morning I went to a meditation session, which maybe five out of 3,000 people showed up for. And I happened to sit next to Marc Benioff, who is the founder and CEO of Salesforce. Marc and I started talking, after the meditation session and I shared with him my work at Embrace. Coincidentally, he was about to make a donation to create the Preterm Birth Initiative at USCF in partnership with the Gates Foundation. So if there were anything in the world that would make me believe in serendipity, it was the universe seating me next to this man. I kept in touch with Marc, and when this crisis hit, I sent him an urgent email telling him what had happened, asking for his help. John Hennessy was one of our advisors, also reached out to Marc asking for his help. And a few days later, he wrote back generously agreeing to fund the company. So I'm just so indebted to Marc for saving the company, we would have had to close our doors if it weren't for that.

And it was a really pivotal experience in a number of different ways, but one of the things it forced me to do at that point was to take a step back and really re-evaluate our strategy. You know, at the time we were selling our product primarily to the Indian government. And working with government contracts can be extremely painful, you don't know when the contracts are going to come through, when you're going to get paid. It wasn't leading to a sustainable business model. At the same time I had started to look at models like Tom Shoes and Warby Parker, and the team was thinking, what if we could leverage our technology and create a product for the U.S. market and then use the profits from that to fund the expansion of the Embrace Warmers in developing countries. And so that led to the birth of our newest initiative which is called Little Lotus. I was just laughing to myself as I was preparing this presentation because this was coincidental, but a lotus, the representation of a lotus, it's a flower that comes from these dark and muddy waters and turns into something beautiful. So from all the chaos that we've experienced, we came up with this really cool product. And what it is, it's a line of baby products for the U.S.

market, so sleeping bags, swaddles and blankets that have a technology akin to the Embrace Warmers. The fabric of these products is lined with microns of wax. So this was first used in NASA spacesuits. And what it does it serves to absorb or release heat to keep babies at an ideal skin temperature, helping them to sleep better. Our informal studies have shown that babies sleep on average an hour longer with our product versus existing products, because of less temperature fluctuations. But the real impetus for doing this was to implement a TOMS Shoes inspired one-to-one model. So for every Little Lotus that we sell here in the U.S., we help to save a life in a developing country with the Embrace Warmer. And I think the ethos behind doing this, as I came back to the U.S. and started doing research, I talked to lots of parents, and moms in particular. I would often hear them say to me, you know when I became a mother for the first time, I felt an instant comradery with every other mother in the world, and if I saw a baby in need, I would do anything to help that child.

So we really wanted to create a global community of parents helping other parents. Another cool aspect of the Little Lotus, you will notice that there are handprints all over the front panel of the product, and that comes from an artwork called Touch Our Future, so I collaborated with another Stanford alum, Drue Kataoka, she's an amazing artist, and her concept was to collect the hand traces of mothers and babies from all over the world. From 14 countries, many of whom have been directly

helped by the Embrace Warmers. In addition to that, we got the hand traces of the Dalai Lama and about 20 Nobel Peace Prize Laureates, and a bunch of Hollywood celebrities as well. So it's been a really fun way for people to literally lend their hand to this cause. And with the one-for-one model, our hope is that over the next few years we are able to reach 1.000.000 babies with the Embrace Warmers and truly get the product into the hands of every baby and every family who needs it. So that is my story, that is the last 10 years of my life. And this is where we're at today. And I thought I would end by just sharing a few of the key lessons that I have learned in this journey. So the first lesson is to lead with the WHY.

I got this from Simon Sinek's TED talk. If you haven't watched it I really recommend it. Why do you do what you do? And how does this align with your own purpose and your own values? And this is so much more important than what you do or how you do it. And I think being really rooted in your purpose and being clear about that why, it will get you through your toughest moments and get you through all those obstacles that you're going to face. And at the same time it will allow you to inspire others and rally people behind your cause, so give a lot of thought to why it is you want to do the things you do. My second lesson here, from Winston Churchill who said "Success is not final, failure is not fatal. It is the courage to continue that counts." And I have a picture of me surfing here, because this is a sport I picked up about a year and a half ago, that I have become completely obsessed with. One of the things about surfing, it's so humbling, because most of the time I'm not on my board, I'm falling off my board, and having to find the courage to get back on, and paddle back out for the next wave. And to me, this is the most important trait of being an entrepreneur, is persistence and tenacity, because you will inevitably fail. Over and over again.

And you need to have the courage and that persistence to get back out there, learn from your mistakes, and try again. The other, related thing I've learned from surfing and the ocean, is this idea of impermanence. Everything in this world is constantly changing. And nothing teaches you that more than being in the ocean, where your conditions are changing minute to minute, and what that's taught me about is this concept of non-attachment, to not be attached to anything, including an outcome. I think I had become so attached to this end outcome for Embrace, that the thought of the company shutting down in that story I told you, really threatened my own sense of identity, and what I learned from that process is that we are not defined by our successes or our failures, we are defined by our values and by the journey that we take. So as cliché as it sounds, the journey is truly more important than the destination. Make sure you're having fun in that journey every step of the way. And my last lesson here, is to choose to see the world through the lens of beauty. Because we get to choose the perspective by which we see the world. After living in India for a few years, I could see myself becoming jaded, and really pessimistic.

I was dealing with some of the most vulnerable populations in the world and saw so many sad things. I was working in a very corrupt and broken system. And then at some point I caught myself. I realized that for every horrible thing that I saw, I saw something equally as beautiful. All of the wonderful people who had come together to help us in this cause, all of the noble doctors I met who stayed up all night in these villages to see patients. The most beautiful thing I got to see in my work was a love a parent has for their child. It's the purest and most selfless form of love in the world, and I realized that a mother, no matter how poor or uneducated or impoverished, will do anything to save her child. And that's the beauty I got to see every day in my work. So I encourage you to see the world through the lens of beauty, because that will give you the optimism to keep changing the world. And I wanted to leave you with one last thought.

So this is the Milan Cathedral. The great cathedrals of Europe were built over centuries, this one the construction began in 1385, it wasn't finished until 1965. What that meant is oftentimes the people who spent their whole lives working on these cathedrals never lived to see the fruits of their labor, nor did their children, nor did their grandchildren. So why did they dedicate themselves so tirelessly to building these monuments? I believe it was because they believed in a cause that was far greater than themselves. So I ask each of you to think about, what is the cathedral that you want to build? And what is the legacy that you want to leave? My cathedral is a place where no baby dies from being cold. It's a place where every parent is empowered to save their child, and it's a place where the brightest minds come together to change the world for the better. One baby step at a time. Thank you. (applause) - [Tina] So, would you take some questions please? - Yeah, absolutely. - [Student] You said that Beyonce gave a donation but your company also was funded, so can you clarify whether it's a non profit or a for profit company? - Yeah, sure.

- [Student] And then the reasons behind choosing, you know. - Sure, yep. So we started as a non-profit, as a 501(c)(3), in 2008 that's when we first started out. In 2011 we actually spun out a for-profit arm of the company, and the idea was that the for-profit would sell the product to governments and emerging markets and then pay a royalty fee to the non-profit. We really hoped that that would create a self-sustaining model, at the time a lot of impact investors were coming into play as well, encouraging us to explore a for-profit route, which is an easier way to raise capital. So the real reason for doing it was so we could leverage both philanthropic capital to donate the product to the poorest places, as well as private capital to do the more capital intensive parts of our work. Yes? - [Male Student] Can you speak to the design constraints or some of the thinking behind going down this approach versus something like NeoNurture, which is basically an incubator run by a car battery and a couple of Toyota headlights. I know that was an alternative approach some tokens met. - Sure, so I think it goes-- (instructor mumbling) Yes, and so the question was the thinking behind, going behind this design approach and creating something that

could be used kind of in a home setting as opposed to, there's another product out there that's used out of spare car parts, for example, that looks more like a traditional incubator, so I think for us, our a-ha moment was the story I mentioned where we went into the villages, and we realized that we could design for a big city, hospital setting, but that wasn't where the real problem was and we really wanted to create a product that could sit in a village setting, that would require very minimal training, because that's where we felt the root of the problem was. Yes.

- [Female Student] Hi, I noticed that you seemed to be working with people from the region. So are they becoming part of your team? How was the dynamics? When you moved from the U.S. to places where you didn't have actual partners, how do you work with these people? Are they your partners, are they just helping you, can you talk about this? - Sure, in India we were situated there for the first four years, really built up a local team and hired people on the ground as well as worked with partners, both in governments and non profits, and so on. In other countries that we worked in, we do work with a partnership model, so we work with the Millennium Villages across Sub-Saharan Africa. We work with a non-profit in Afghanistan, for example, we've just started a project with one in Nepal. So our thinking there is that we really rely on the expertise of our local partners who are already working on newborn care issues, who can then easily integrate the Embrace Warmers into those programs. So it's very unusual that we will have our own staff on the ground, we really train our local partners to implement the product. Yes? - [Male Student] The design of this is so much easier to use and so much cheaper than the solutions in developed countries. Is there a reason why that product can't enter into those markets? - Into developed countries? - [Male Student] Yeah, like, say in the U.S. healthcare? - Okay, so the question is why can't the product enter the U.S.

healthcare system. It definitely can, in fact we have done a first study at Lucile Packard showing that you can wean babies off of incubators and put them in this device instead. It just requires a different road in terms of getting an FDA approval, for example, putting our resources there, and then really changing behavior here, and that's a whole other set of issues, because although kind of intellectually it seems like a much easier product to use, changing doctor's behaviors and changing systems around that can be very challenging, and so for the time being, we've decided to focus the warmers on emerging markets and really have the consumer product here that allows us to fund that. Yeah? - [Female Student] People in developing countries are very critical (male coughing) of the product, so how to teach? - The question was how did we get people over their criticism of the product. You know, I don't know if I would use the word criticism, but it did require us to show doctors, for example, clinical studies and show the evidence that this works as well as the standard of care in these settings, and then have enough experience there that with influencers especially and key opinion leaders in these markets, that they could influence others and really use that word of mouth and the trust in the product and the company to get it out there further. Also I think it was also helpful for people to see that we had really situated ourselves locally, that we were catering towards the market, it wasn't just something we had developed here at Stanford and try to implant in these countries, but we had really taken into account all of the systemic issues that led to the product being more appropriate. It took the first, well, the development of the product took about two years in the clinical assessing, probably two and a half years, and then it's been, you know that was 2011, so it's been 5 or 6 years since then, yeah. And it's still ongoing. We're barely at the tip of the iceberg here in terms of the impact we hope to create. It's been much more challenging and taken a lot more time than we anticipated.

Yes? - [Woman] Wonderful presentation. Two questions. What is the cost per warmer, and how do you pick societies to participate in the program? Do they reach out to you, or do you reach out to them? Because you know there's a whole bunch of politics and ecological issues. How do you choose between these? - Sure, so the question was what is the cost per warmer and how do we decide to go into certain communities? So the cost per warmer is about \$200 per each warmer, and that includes the sleeping bag, the wax insert that you saw, and a separate heating unit. The product is entirely reusable and so we estimate the cost of saving a single life with the product, including shipping, logistics, everything else, is roughly about \$10 per life saved. And in terms of going into communities, we really, I think a lot of it depends on the partners we were able to find. Because even with a great technology you really need to find effective partners who can implement, who can do the training, who can do the data collection and monitoring. And so we really rely on this wonderful network of NGOs on the ground that are specifically focused on newborn care, that that's already a part of the work that they're doing, and then we can kind of slot this technology in. With India though, we just chose to move to India right away purely because of the numbers. As I said, India has 40% of all the world's premature babies, and so it was a no-brainer that that's where we were gonna start.

(mumbling and coughing) - [Tina] What do you see, what would your talk be eight years from now? What will happen between now and then? - (laughing) That's a great question. So I think for us it's a couple of things. It's our hope to really get this into the hands of every baby who needs it, make it universally available and adopted technology. The other thing though is we would love to work on new technologies. The dream was always how do we create a platform by which we introduce other technologies that reduce infant deaths around the world. If you look at the Millennium Development goals, reducing infant mortality was one of them, and that was the one we made the least progress on, over a decade of time. And so it's always ironic to me that we sit here in Silicon Valley with all of this high-tech everything around us and yet so many babies are dying every single day, you know, how could that be? And so we are currently working on integrating sensors into the product, and trying to do a remote monitoring and eventually leveraging AI, we'd love to do predictive diagnostics. Yeah? - [Female Student] So this product requires like a really deep knowledge of biology and healthcare systems, and I was wondering what kind of

techniques or advice you had for people who want to develop products in fields that they're not very knowledgeable or experienced in? - Yeah, that's a great question. We have three co-founders and none of us had any experience in material science, or medical experience and we came up with this. I think the key is really just to surround yourself with a group of advisors who do have that depth of knowledge.

We formed a wonderful advisory board both here locally as well as one in India, and they really led both the clinical studies and collecting all of that scientific data around the product. Also with this, there was no set regulations on how to do this, we didn't fit neatly into a regulatory system, and so they provided that deep guidance as well. And then once we moved to India, we had this team of people who were really enthusiastic and passionate and could see things through a different lens. It is important to counterbalance that with people who have deep experience of things like creating a rigorous quality control system and who know manufacturing. So I would say surround yourself with experts, either advisors or people that you bring internally into your organization. - [Tina] I'm gonna ask another question. So this story is so impressive, and it's one that's used often to celebrate the design thinking process. And you guys were in the first class of the-- - Second class. - [Tina] Second class of Design for Extreme Affordability. Are there other examples that have come out of that program and that process that are equally inspiring? - Absolutely.

DeLight is a company that I really look up to, so they make very very low cost LEDs, and they came out of the exact same class one year prior, and I think they are shipping something in the order of 100,000 units a month, and so in terms of scalability and really finding that sustainable business model, in addition to a cool technology, they've really nailed it. - [Tina] Great. Well if we don't have any questions, I'm sure you'll agree this has been incredibly inspiring. Please join me in thanking Jane Chen. (audience applause)