

LONG READ | BEHIND THE BRAND

Inside Mark Zuckerberg's Bold Plan For The Future Of Facebook

Facebook is firing on all cylinders. Now Mark Zuckerberg is looking to the decade ahead, from AI to VR to drones.



Facebook CEO **Mark Zuckerberg**

HARRY MCCRACKEN | 11.16.15 | 6:00 AM

"Mark is fixing stuff."

I'm killing time in the Frank Gehry–designed Building 20, whose signature feature is its soaring 434,000 square feet of open space, the latest

addition to Facebook's campus in [Menlo Park, California](#). A PR handler is explaining why CEO Mark Zuckerberg is running slightly behind schedule for our chat. I express surprise. Mark still fixes stuff?

"To say he's actively involved," she confides, "is an understatement. He notices things that are broken before anybody."

As recently as 2012, the year Zuckerberg set a personal goal to code every day, that might have meant he had detected something glitchy on Facebook's site and was reprogramming it himself. When he emerges a few minutes later, unspecified stuff presumably fixed, we sit down on adjacent couches in a fishbowl conference room near his desk in Building 20, and Zuckerberg makes it clear that those days are gone. "If we're trying to build a world-class News Feed, and a world-class messaging product, and a world-class search product, and a world-class ad system, and invent virtual reality, and build drones, I can't write every line of code," he tells me. "I can't write *any* lines of code."

The Facebook of today—and tomorrow—is far more expansive than it was just a few years ago. It's easy to forget that when the company filed to go public on February 1, 2012, it was just a single website and an app that the experts weren't sure could ever be profitable. Now, "a billion and a half people use the main, core Facebook service, and that's growing. But 900 million people use [WhatsApp](#), and that's an important part of the

whole ecosystem now," Zuckerberg says. "Four hundred million people use [Instagram](#), 700 million people use [Messenger](#), and 700 million people use [Groups](#). Increasingly, we're just going to go more and more in this direction."

To further grow these services and any others that Facebook develops or acquires, Zuckerberg is betting his company's future on three major technology initiatives. One is developing advanced [artificial intelligence](#) that can help Facebook understand what matters to users. The second is virtual reality, in the form of [Oculus VR](#), the groundbreaking company that Facebook acquired in March 2014 for [1.88€ billion](#), which Zuckerberg believes will be the next major technology we use to interact with each other. And the third is bringing the Internet, including Facebook, of course, to the 4 billion-plus humans who aren't yet connected, even if it requires flying a [drone](#) over a village and beaming data down via laser. Given the robust health of Facebook's business, Zuckerberg is comfortable lavishing attention and resources on these visions. Facebook gave *Fast Company* wide-ranging access to Zuckerberg, his senior leadership team, and others to delve into the company's audacious plans to shape the next decade.

In the tech industry, there's nothing weird about setting goals so lofty that they sound unachievable. Google CEO [Larry Page](#), for

How Zuck Uses Facebook

Mark Zuckerberg has been using his own creation longer than anyone. Today, his posts give insight into

instance, is so invested in the virtue of gambling on disparate, wildly ambitious projects—from self-driving cars to smart contact lenses—that he restructured his company around the concept in August, making Google's core businesses a division of a new idea factory called Alphabet. Zuckerberg, by contrast, isn't interested in doing everything—just the things he views as deeply related to his company's central vision, and crucial to it. "There are different ways to do innovation," he says, drawing a stark contrast without ever mentioning Page, Google, or Alphabet. "You can plant a lot of seeds, not be committed to any particular one of them, but just see what grows. And this really isn't how we've approached this. We go mission-first, then focus on the pieces we need

his interests and activities—and no matter the subject, Facebook's mission of making the world more open and connected always seems to be top of mind.



HE'S STATESMANLIKE 140,140 likes

If you see a photo of Zuckerberg in a suit and tie, the odds are high that he's meeting with an international dignitary. In September, he hosted Indian Prime Minister Narendra Modi for a town-hall forum on Facebook's campus. Modi endorsed the power of social media to keep government accountable.



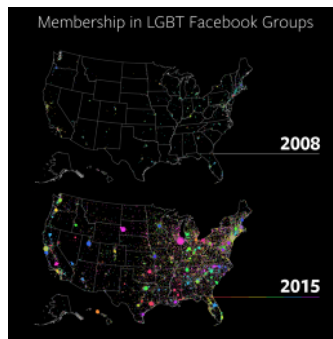
HE'S HUMAN 1,767,632 likes

On July 31, Zuckerberg posted that his wife, Priscilla Chan, was expecting a baby girl after three

and go deep on them, and be committed to them." Facebook's mission is "to give everyone in the world the power to share and make the world more open and connected," as Zuckerberg says, explaining that he is now spending a third of his time overseeing these future initiatives. "These things can't fail. We need to get them to work in order to achieve the mission."

When Facebook was morphing from Ivy League college project to Silicon Valley startup, Zuckerberg had not only "never run a company—he'd never been in a company," marvels [Marc Andreessen](#), the browser pioneer, venture capitalist, Facebook board member, and longtime Zuckerberg confidant. "He's learned everything he knows about business in the last 10 years. And now

miscarriages: "You feel so hopeful when you learn you're going to have a child. You start imagining who they'll become and dreaming of hopes for their future. You start making plans, and then they're gone."



Click to expand

HE TAKES STANCES

291,731 likes

When the U.S. Supreme Court legalized same-sex marriage, Zuckerberg posted a graphic showing the growth in Facebook LGBT groups since 2008. "Our country was founded on the promise that all people are created equal, and today we took another step toward achieving that promise."



HE CELEBRATES SUCCESS

he's one of the best CEOs in the world."

Whether because Zuckerberg, 31, started so young, or because he retains his youthful demeanor and gray-T-shirt work uniform, he has been underestimated for almost as long as his company has existed. *Facebook wouldn't work outside Harvard. It wouldn't work outside elite colleges. It wouldn't work among the general populace. It couldn't topple MySpace. It couldn't make enough money to justify its valuation. It couldn't hold on to teenagers once their parents signed up. It wouldn't matter as much on smartphones as it had on PCs. It couldn't make enough money on mobile to satisfy Wall Street.*

Zuckerberg and his team have overcome every doubt. Nine out of ten of the 1.55 billion people a month who use Facebook access it on a mobile device at least part of the time, and more than three-quarters of its 4.04€ billion in advertising

60,997 likes

"Our community reached a nice milestone today," Zuckerberg wrote in February. More than 2 million small businesses were buying ads on Facebook—which he said was good for those companies, their customers, and the economy. Left unstated: It's also very good for Facebook.



HE'S PLAYFUL

991,333 likes

In April, Zuckerberg donned sunglasses to pose with action star Vin Diesel, who dropped by Facebook to talk about what it's like to have 87 million followers. He was stoked—"I'm looking forward to seeing *Fast & Furious 7* tonight!"—and noted that Diesel writes all his own Facebook posts.

revenue in the third quarter of 2015 came from mobile users. The company runs four of the six largest social platforms in the world (all but Google's [YouTube](#) and [Tencent's WeChat](#)) and is wildly profitable. Three years ago, when the company revealed that 1 billion people logged in to the service in one month, the news was astounding. Last August, 1 billion people used Facebook on a single Monday, and it felt inevitable.

When I ask people close to Zuckerberg how, exactly, he has pulled off these achievements, I don't hear a lot of anecdotes about him swooping in and personally making genius-level decisions that suddenly changed everything. Instead, they praise his inquisitiveness, persistence, ability to deploy resources, and devotion to improving Facebook and himself. He has a knack for carving up grand plans into small, doable victories. "Most of our conversation was about long-term strategy, and then we'd backtrack from there to what we should do over the next month," says [Bret Taylor](#), who worked as Facebook's CTO from 2009 to 2012 and who was at the company when it corrected course after a famously bumpy first attempt at putting the service on smartphones. "It's one of the main reasons why Facebook is where it is today."

Zuckerberg "is a total inspiration in how much he cares about his work and in how hard he works," says [Chris Cox](#), who dropped out of a Stanford graduate program in 2005 to join the company as a software engineer and is now chief product

officer—and is so integral to its culture that he still speaks with every new employee as part of his or her orientation. "For all of us who work with him, it's like, Man, he is so good at improving."

Sue Desmond-Hellmann is a Facebook board member and CEO of the Bill & Melinda Gates Foundation, which puts her in close proximity to two prodigies who quit Harvard to seek fortunes out west. Both Zuckerberg and Bill Gates, she says, "have this sense of relentlessness. 'Why can't that happen? Why can't we accomplish this?' It can be fun to be around that. It can also be like, 'Oh. My. God.'"

When I meet with COO Sheryl Sandberg, she shares a personal story of a family gathering involving the making of s'mores. It captures several of Zuckerberg's preternatural gifts. "Mark said, 'I'm going to make a marshmallow,'" she tells me in her conference room, which is adorned with a framed drawing of her as Spider-Woman. "I looked at my friend and said, 'He's going to make the perfect marshmallow.' Because he's going to be the one out of all of us who is going to have the patience. In order to make the right marshmallow, you can't do it right in the fire, because then it gets burnt. You can't walk away. You actually have to sit there for five to 10 minutes with the marshmallow above the flame, but not too close, so that it gets completely heated but doesn't burn. And the only person who's actually willing to do that is Mark. Because he is that focused and that determined. I've never met

anyone with more perseverance than Mark Zuckerberg."

In hindsight, there were two particular moments that have put Facebook in the enviable position of being able to pursue its most audacious dreams. The first was a recruiting spree back in 2007–2008, when the company concluded that it needed more players with serious Silicon Valley experience. A significant percentage of the current leadership joined during this time, including Sandberg, who came from Google to be the principal architect of the business. From Mozilla, the Firefox browser purveyor, Zuckerberg hired [Mike Schroepfer](#)—known universally as Schrep—who ultimately replaced Taylor as CTO.

"The amount of trust and bandwidth that you build up working with someone for five, seven, 10 years? It's just awesome," says Zuckerberg. "I care about openness and connectedness in a global sense. [Sandberg] has the emotional warmth and ability to connect with people that allows us to live that mission inside the company. She's even better than people think she is." As for Schrep, "he's just extraordinary at the patience and composure you need for managing long-term projects."

"One of our goals," Zuckerberg says, "is to get better

Zuckerberg, unlike many of his rivals, has been able to keep his leadership team stable. Their cohesiveness led to the second key moment: the

than human level at all of the primary senses."

Instagram acquisition and its subsequent success.

When Facebook announced that it was buying the photo-sharing juggernaut in April

2012, less than six weeks before its IPO, a flurry of articles followed with titles such as "Five Ways Facebook Will Ruin Instagram." Instead, the deal became a model for how businesses in Facebook's portfolio get managed. Zuckerberg left cofounders [Kevin Systrom](#) and [Mike Krieger](#) in charge, encouraged them to preserve their own culture, and gave them access to tools—from Facebook's recruiting team to its spam-fighting technologies—that helped them get where they were planning to go anyway, only faster.

"Schrep and I work day-to-day, operationally, on how we build our team, where we hire from, organizational stuff," says Systrom, Instagram's lanky, bearded CEO. "Mark and I work most closely on product. And Sheryl and I work most closely on advertising and strategic issues around policy. Imagine getting to have Mark, Sheryl, and Schrep on your board. Many companies in the Valley would kill to have that. And we get it by default, which is pretty sweet." Instagram's user base tripled in the 10 months after the acquisition announcement, to 100 million monthly users, then doubled in the next 13 months. (It now boasts 400 million users.)



Naomi Gleit VP, product, social good: "We are taking a data-driven, product-driven approach to doing good in the world. You're interested in certain causes, and you're also interested in the causes that your friends are interested in, so we're trying to take a social angle."

The lessons Facebook learned from the deal may have been as valuable as Instagram's revenue potential. It began pursuing major acquisitions more aggressively—it acquired WhatsApp and Oculus in early 2014—and then found itself looking at its own services with fresh eyes. Zuckerberg hired PayPal president [David Marcus](#) to run its chat product, Messenger, and decided to remove it from Facebook's smartphone version, forcing users to download a stand-alone app. "We were all incredibly uncomfortable with that," says

a former Facebook employee who was present when Zuckerberg explained his rationale. "But he had thought it through carefully, the core use cases and the competitive situation." A little over a year later, Messenger's active user base more than tripled.

Splitting Messenger off from Facebook let Marcus begin to build his own business model, one akin to China's messaging behemoth WeChat. Messenger has its own app store, with partners such as ESPN offering animated GIFs, and a feature that allows companies (including e-commerce retailers [Everlane](#) and [Zulily](#)) to conduct customer service—from delivery tracking to returns—within Messenger. "We're not in a rush," says Marcus. "But over time, we can build a really good business out of these interactions."

Three thousand miles away from Facebook's Menlo Park headquarters, in an office building in New York's Noho neighborhood that was once a [Wanamaker](#) department store, a researcher named [Rob Fergus](#) is showing me software designed to identify objects in a video stream. Computers have long struggled to learn what's happening in video, which contains so much more data than text or a still photo. He points a webcam that's attached to a laptop running his program at a remote control. The software, which is so computationally intensive that it causes the cooling fans inside his laptop to kick in at a full, ear-piercing blast, thinks the remote is a turtle.

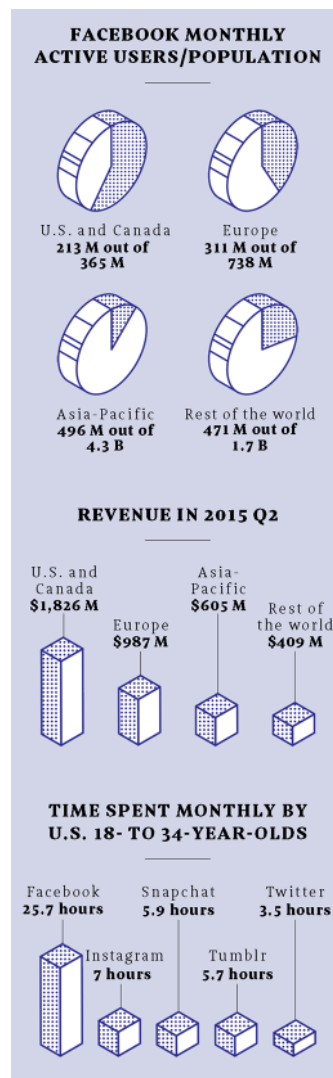
He focuses the camera on a computer mouse. Once again, it thinks it's spotted a turtle. Only occasionally does it correctly identify an item.

Fergus looks sheepish. But the point of the demonstration isn't to prove that Facebook is ready to roll out this AI feature, just that they're working on it.

If you've ever felt like your Facebook News Feed is filled with people you don't care about sharing thoughts you didn't particularly want to hear, you'll appreciate why Facebook is pushing to further the art of artificial intelligence. In its current form, the social network is still far better at collecting vast amounts of data than understanding what that data means. Advanced AI could help emphasize the stuff that's truly relevant to you, keeping you on the service longer and boosting your attractiveness as a subject for targeted

Up And To The Right

Facebook's growth machine is what gives the company its currency to pursue AI, VR, and connectivity.



FACEBOOK MONTHLY ACTIVE USERS/POPULATION

U.S. and Canada: **213 M out of 365 M**
 Europe: **311 M out of 738 M**
 Asia-Pacific: **496 M out of 4.3 B**

advertising. "Facebook is working to be at the center of the world of AI because it will affect Instagram, WhatsApp, and Messenger," says Systrom. "It's broadly applicable to all social products."

Facebook has dabbled in AI for years. In 2010, for example, it introduced facial-recognition technology to identify people in photos. In late 2013, though, Zuckerberg came to believe that AI—which he calls "one of the hardest engineering challenges of our time"—was central to the company's future and decided to establish a lab devoted to it. He began courting [Yann LeCun](#), a New York University faculty member and world-class expert in deep learning, to run it. Unlike the archetypal young turk Facebook employee, the 55-year-old, Paris-born LeCun is an *éminence grise* of his craft, with decades of experience studying machine vision, pattern recognition, and other technologies with the potential to make the social network smarter.

LeCun, however, was disinclined to leave academia or New York. When Zuckerberg thinks Facebook needs something, though, he refuses to treat obstacles as obstacles. He offered to let LeCun set up Facebook AI Research's headquarters in Manhattan and retain his

Rest of the world: **471 M out of 1.7 B**

REVENUE IN 2015 Q2

U.S. and Canada: **1,714€ M**

Europe: **927€ M**

Asia-Pacific: **568€ M**

Rest of the world: **384€ M**

TIME SPENT MONTHLY BY U.S. 18- TO 34-YEAR-OLDS

Facebook: **25.7 hours**

Instagram: **7 hours**

Snapchat: **5.9 hours**

Tumblr: **5.7 hours**

Twitter: **3.5 hours**

Sources: Facebook 2015 Q2 Earnings Report; comScore 2015 U.S. Mobile App Report

professorship on the side. LeCun came aboard.
Problem solved.

Because Zuckerberg would not be able to interact with LeCun in person on a daily basis, he had the AI researchers who did work at Facebook's main campus sit near him so he could learn from them. "When we moved to the new building, we ended up being separated from Zuck by about 10 yards," LeCun chuckles. "He said, 'No, this is too far, move closer.'" And so they did. (This is a signature move that Zuckerberg uses to absorb new material; when the team prepared Facebook's Timeline feature in 2011, he placed key design talent near his desk, and he seated Systrom near him after the Instagram acquisition.)

The mandate for the 50-person AI team is also vintage Zuckerberg: Aim ridiculously high, and focus on where you want to go over the long term. "One of our goals for the next five to 10 years," Zuckerberg tells me, "is to basically get better than human level at all of the primary human senses: vision, hearing, language, general cognition. Taste and smell, we're not that worried about," he deadpans. "For now."

In part, the AI effort is an attempt to prepare Facebook for an era in which devices from wristwatches to cars will be connected, and the density of incoming information which the service will have to deal with will grow exponentially. "There's just going to be a lot more data generated about what's happening in the world, and the conventional models and systems that we have

today won't scale," says [Jay Parikh](#), the company's VP of engineering. "If there's 10x or 20x or 50x more things happening around you in the world, then you're going to need these really, really intelligent systems like what Yann and his team are building."

But Fergus and his fellow researchers have the freedom to start small rather than think immediately of the massive data problems posed by services with several hundred million users or more. [Antoine Bordes](#), who relocated from a French university to join the New York team (though there's now a Paris branch because the city is also a hotbed of AI talent), is teaching a computer concepts such as "John is in the playground" and "John picked up the football" in order to help it learn to answer queries such as "Where is the football?" Everything draws on a vocabulary of just 50 words, a purposefully dinky number chosen so that researchers can tell exactly what's going on. "This is not big data," says Bordes, who is wearing a T-shirt depicting a robot boxing a dinosaur. "This is supersmall data."

"I joke that the lab has paid for itself over the next five years with work they've already

LeCun has given Facebook a lab with a strong universitylike feel. Rather than having to make sure their work lines up with Facebook's product plans, researchers—many of them fellow academics—can pursue their passions while a separate group, Applied Machine Learning, is

done," says Schroepfer.

responsible for figuring out how to turn the lab's breakthroughs into features.

"The senior research scientists, you don't tell them what to work on," LeCun says. "They tell you what's interesting."

Technologies incubated by LeCun and his team are already popping up in Facebook products such as Moments, a new app that scours your phone's camera roll for snapshots of friends, then lets you share those photos with those people. "Most researchers do care about their stuff having practical relevance," says Fergus, who is technically still on leave from NYU, where he worked alongside LeCun. "In academia, a great outcome is you publish a paper that people seem to like at a conference."

LeCun's work is directly affecting Facebook's bottom line, in the form of better spam-prevention tools and software to verify that ads are up to company standards, a task that was once a labor-intensive manual process. "I joke that the lab has paid for itself over the next five years with work they've already done," says Schroepfer.

Palmer Luckey and I are flapping our arms in adjoining isolation-booth-like rooms in Oculus's quarters in Building 18 on Facebook's campus. In the virtual-reality world we're sharing, though, Luckey, the endearing 23-year-old wunderkind who founded Oculus VR in his parents' garage in 2011, has transmogrified himself into a hovering,

cartoony head and hands, and we're playing antigravity Ping-Pong. Next, we set off fireworks together and he shoots me with a zap gun, which instantly shrinks me to the size of a gnat as he towers above me.

A few days later, when I meet with Zuckerberg for our first conversation, he's eager to talk about Oculus Ping-Pong even before I begin asking him questions. As he delineates the pleasures that user-adjustable physics bring to table tennis, his expression takes on some of the same goofy glee I'd experienced. (Zuckerberg, a gamer himself, is a devotee of Civilization, a venerable game series that Oculus CEO Brendan Iribe worked on in a previous life. The goal of the original 1991 version of Civ—"build an empire to stand the test of time"—neatly encapsulates its appeal to the Zuckerbergian brain.)



Mike Schroepfer, CTO: "I have one hand in the day-to-day and one hand in the future. It's a little bit crazy-making at times, but it's important that our core business continues to do well. Because that is what allows us to aggressively invest in these longer-term things."

Anyone who's had his or her mind blown by a few minutes of Oculus time in a 3-D, 360-degree world can appreciate why Zuckerberg is grinning. But if Oculus was only about games, it wouldn't be an obvious fit for his mission-first vision of Facebook's future. His interest in VR dates back to his experience with, of all things, phones. When the modern smartphone was being born—Apple's [iPhone](#) debuted in 2007 and Google's [Android](#) in 2008—Facebook was a red-hot startup, but there was no way it could have written its own mobile

platform from scratch, let alone persuaded the rest of the industry to adopt it. By 2013, when it had a bit more clout, Facebook created [Home](#), which slathered a Facebook-based veneer on top of Android. The notable flop reinforced the limitations of building on someone else's operating system. "One of my big regrets," Zuckerberg says wistfully, "is that Facebook hasn't had a major chance to shape the mobile operating system ecosystem." (The company has done okay on smartphones: Multiple studies show that Facebook captures more of users' mobile time than any other service.)

Oculus, then, represents two big bets in one: that VR will be the next major computing platform, supplanting phones the same way that handheld devices usurped desktops—and that human nature won't change. "If you look at how people spend time on all computing platforms, whether it's phones or desktops before that, about 40% is spent on some kind of communications and media," Zuckerberg says. "Over the long term, when [Oculus] becomes a more mature platform, I would bet that it's going to be that same 40% of the time spent doing social interactions and things like that. And that's what we know. That's what we can do." Already, Oculus helped out with Facebook's new 360-degree video feature that debuted last September.

Before Zuckerberg's vision can be realized, Oculus needs to start shipping its Rift headsets. The Facebook acquisition didn't change the company's near-term goal, which is to offer a version of Rift

aimed at hard-core gamers. The closest Iribe has gotten to disclosing how much the headset will cost is saying that the all-in investment, including a PC, will be about 1,408€. That includes an Xbox One gamepad, provided through a surprise deal with Microsoft. The Oculus Touch hand controllers, which are as much of a revelation as the headset and necessary for tasks such as wielding a Ping-Pong paddle, will cost extra and arrive later.

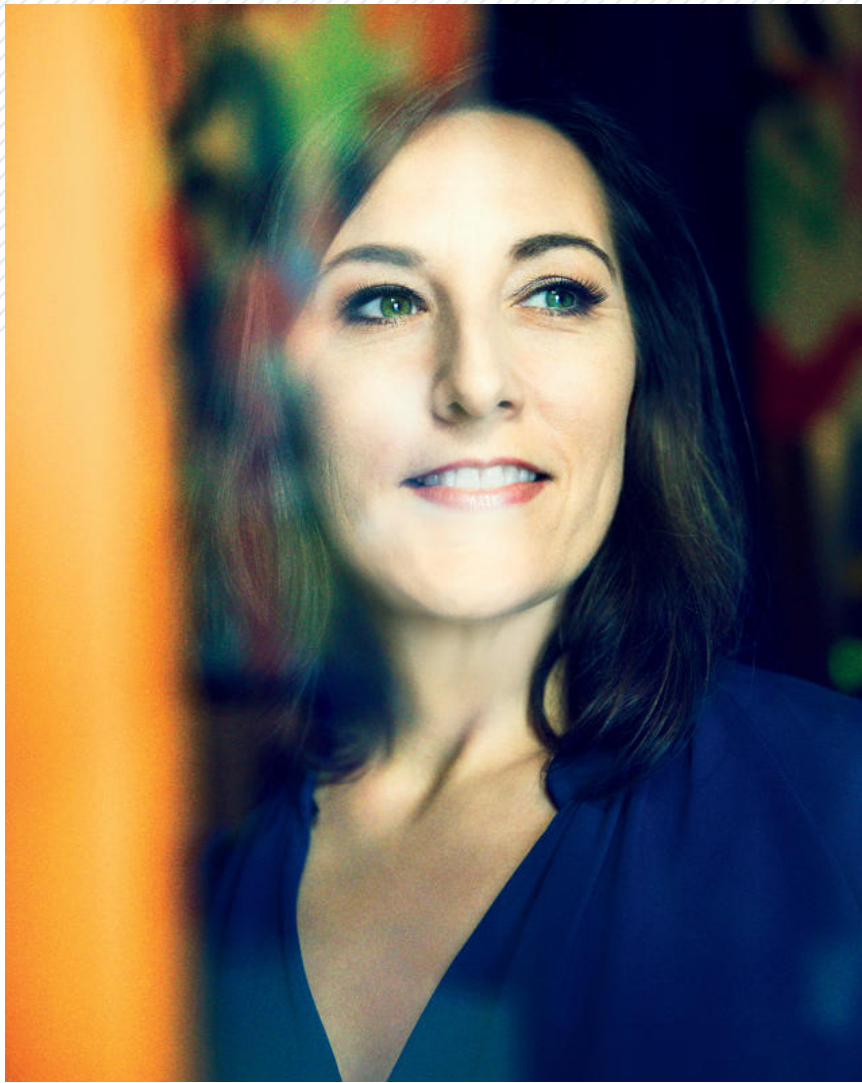
Oculus might have prospered as an independent company; among other accomplishments, it had already scored the most spectacular hiring coup imaginable by signing on legendary game programmer [John Carmack](#) (who helped create the landmark first-person shooter Doom) as its CTO. But like Instagram, it has benefited from Facebook ownership. "We have supercharged recruiting," says Iribe when I chat with him moments after the June media event in San Francisco, where he showed off the [Oculus Touch](#) controllers for the first time. "We were 60 or 70 people when we got acquired. And we're 360-plus today. It's just incredible how fast we've been able to grow."

Oculus has also taken full advantage of Zuckerberg's penchant for strategic acquisitions. "We come to him and say, 'Hey, there's this brilliant group of computer-vision scientists, and if they were here and working on this feature, it might be able to land in the next product or a product in two generations,'" says Iribe, who has quietly snapped up five small companies since

Oculus officially became part of Facebook in July 2014. "And he's like, 'Okay, let's go do this.' "

As usual with a new venture, Zuckerberg is taking an uncommonly patient approach to making money from Oculus. "Over the long term, we need to make sure it's sustainable," he says. "But sustainable could mean selling it at break-even and having a business around software or some other part of the platform, which is actually something that we're much better attuned to."

For Facebook, judging Oculus based on its potential is second nature. "We've got a five- to 10-year R&D road map for Oculus that's very clear about what problems we need to go take down and how we're going to do it," Schroepfer tells me. "And so we're just going to build better and better sensors and hardware and software that's going to allow you to do more and more and that's going to create these amazing experiences."



Lori Goler VP, People: "People here want their work to matter and their contribution to matter. And they want to work with an amazing team of people who challenge them every day. They actually say, 'I don't ever want to be the smartest person in the room.'"

Not everyone is as convinced of Zuckerberg's VR dreams. Wall Street, for one, is having trouble peering quite so far ahead. "I worry a bit about expectations," says Colin Sebastian, senior analyst at [Robert W. Baird](#). "Consumers have dreams of seamlessly entering these interactive environments and interacting with friends. The tech is early and the virtual environments are very basic." And the competition is intense. [Sony](#) and [HTC](#) also have VR headsets coming out next year. Then there's Google, with its [Cardboard](#) viewer

that offers VR using just a smartphone and a paper case for as little as 14€. Cardboard is nowhere near as compelling as Oculus, but it's cheap, approachable, and available right now.

Zuckerberg has bigger ideas in mind for what Oculus could become. When he discusses the company, he consistently refers to "VR and AR," the latter being augmented reality, the technology that layers virtual objects into the real world. (Imagine a fictional character appearing in front of you to interact with you in your home.) AR underpins Microsoft's forthcoming [HoloLens](#) product as well as the stealthy, much-buzzed-about [Magic Leap](#). In October, both Zuckerberg and Iribe confirmed publicly that Oculus is indeed working on augmented reality. If Oculus can squeeze its technology into something that looks more like a pair of glasses and lets you see the real world as well as the virtual one, "it could be the last electronics device that a lot of people need to buy," Zuckerberg muses. And this time around, Facebook would be the company selling it.

"If you're the average connected Facebook user in the U.S., you spend a dollar a day implicitly on data,"

Facebook has succeeded because it has continuously found a way to scale—its service, its business, and its ambitions. "The Facebook of today is in so many ways exactly like the Facebook of 2008," says VP of people [Lori Goler](#), who joined the company that year, when it had a mere 80 million users

Sandberg explains.

and less than one-twentieth its current head count. "The culture is the same. The values are the same. Mark's

tremendous vision, intellect, learning mind-set—all of that is the same. What's changed is we have a lot more resources now in terms of the business growing and the number of people we have to help us move the world forward."

With the company now reaching almost 1.5 billion people, Zuckerberg can raise that last part—moving the world forward—to a new level. In August 2014, he appointed product VP Naomi Gleit, one of the company's longest-serving employees (she joined in 2005), to manage dozens of staffers dedicated exclusively to implementing functionality that helps Facebook members do good. A donation tool, launched last year, allows users to respond to disasters by giving money, a task that—Facebook being Facebook—it sees as an engineering problem that should be attacked through continuous iteration. "I geek out on this, but with the [Ebola](#) campaign we asked users to select a donation amount," explains Gleit. "We also asked them to pick a specific charity that they wanted to donate to." This proved confusing to users and did not produce as much giving as Facebook hoped. "With the [Nepal](#) campaign we reduced it from five steps to two," Gleit says. "We had a preselected donation amount, and we chose multiple charities and then distributed among them equally."

Tools like this "maybe only can happen on Facebook, or can happen uniquely well on Facebook," says Zuckerberg (who, along with his wife, Priscilla Chan, a pediatrician, has given 1.5 billion to various causes). "I think about the organ-donation listing work that we did. The [Safety Check](#) stuff that we've done, where 150 million people were notified of their friends being safe in the [Nepal] earthquake. You can only do that if you've mapped out what people's relationships are, and you have a sense of where people are in the world, and you have a tool that they're checking every day." He's right: Facebook can indeed do things no other company can.

But it can't do anything for people who remain disconnected from the digital world. "If we really want to connect everyone in the world and give everyone the ability to have a voice and share what they want with the people around them, then you can't just build the biggest Internet service," Zuckerberg says. "You also have to help grow the Internet." In 2013, Facebook enlisted Nokia, Qualcomm, Samsung, and other tech giants to help it found [Internet.org](#), the global-connectivity initiative dedicated to bringing the Internet to the 60% of people worldwide who aren't yet online.

The effort is a hybrid of short-term altruism and long-term capitalism. "The fundamental connectivity problem is a financial one," Sandberg explains. "For 90% of the people, it's cost. The [World Bank](#) puts absolute poverty at about 1.17€ a day. One in six people live under that. If you're the average connected Facebook user in the U.S., you

spend a dollar a day implicitly on data. So the business models have to change, and the cost needs to go down. And that's what we're trying to do."

"It's not lost on our businesses that as economic standings improve, there will be opportunities, but that's not the initial goal," adds [Matt Grob](#), CTO of Qualcomm. "We've seen throughout the world that when you provide improved connectivity, people are more able to educate their children and participate in political and government activities and sell their wares or find jobs."

Internet.org's first effort—an app offering [free access to Facebook, news, search, job listings, and other services](#)—is live in India, Indonesia, Pakistan, the Philippines, South Africa, and 24 other countries. Facebook has deployed it in collaboration with local wireless carriers, and 15 million people are using it. But the app has received pushback on multiple grounds, particularly for offering only certain curated services rather than the full, unbridled Internet—a violation, critics say, of net neutrality principles.

The debate has been particularly heated in India: Investor [Mahesh Murthy](#) charged that giving poor people free access to a sliver of the web amounted to "economic racism," and several major media companies that had joined the effort pulled out.



Yael Maguire director, Connectivity Lab: "Our focus is technologies that can advance the state of the art by at least an order of magnitude. We don't want to make something better by a factor of two or three, because the rest of the industry is going to do that." *Photo: [Christophe Wu/Facebook](#)*

For Facebook, releasing something, gauging reaction, and then tweaking as necessary is not only normal but also a badge of honor—after all, one of the company's guiding principles is "Done is better than perfect." When I ask Zuckerberg about the controversy, he says, "Internet.org is working. We've learned a lot from our efforts already. We've listened to a lot of feedback from people in the communities we're connecting and have responded by making significant changes to

the program." Among other adjustments, it's made the app more secure and private and now lets any third-party service submit itself for inclusion, subject to technical restrictions. Given time, the company might get the Internet.org app to a place that's relatively uncontroversial. Even now, it has its allies. "I firmly believe that at this point, some Internet is better than no Internet," says [Helani Galpaya](#), CEO of LIRNEasia, a communications think tank based in Colombo, Sri Lanka.

For the places on earth where there's currently no Internet, Facebook and Internet.org are tackling that issue too. In terms of land area, explains [Yael Maguire](#), director of Facebook's Connectivity Lab, "there's only 10% of the world that is not able to connect if they pulled out a phone. The focus for this lab, going back to the mission of the company, is to figure out how we can connect the last 10%."

Talking with Maguire, you quickly see why Zuckerberg entrusted him with this challenge: The way he rattles off stats and facts and calmly deconstructs goals that sound nearly impossible is reminiscent of his boss's own manner. Facebook opened the [Connectivity Lab](#) in March 2014, and Maguire and his team have concluded that the answer to their challenge is a drone—although Maguire prefers the less-politicized (though not exactly catchy) term HAPI Link, which is short for high-altitude platform Internet link. By charging an unmanned aerial vehicle's battery via solar power and flying it at 60,000 to 90,000 feet,

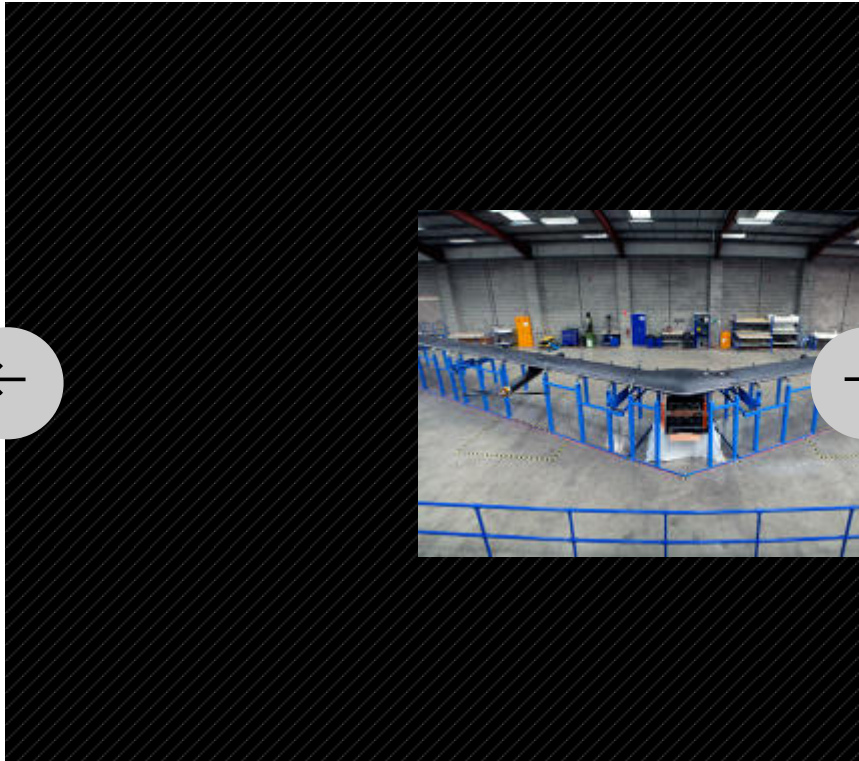
above weather and conventional aircraft, the company believes it could efficiently send high-speed Internet access down to where it is needed via laser.

Facebook began the project with more hardware engineering experience than you might imagine. It started accumulating this more than a half-decade ago, when execs decided that the best way to deliver Facebook reliably and efficiently to hundreds of millions of people was to construct its own data centers and fill them with its own servers. That path led to the [Open Compute Project](#), Maguire's purview at Facebook prior to the Connectivity Lab, which created power-efficient, easy-to-repair servers that the company could install by the thousands in data centers located everywhere from Prineville, Oregon, to Luleå, Sweden. Rather than treat its designs as proprietary, Facebook shared them with the rest of the industry via a not-for-profit that grew to include support from Apple, Dell, HP, Intel, and Microsoft, among others.

"When I joined, we didn't have mechanical engineers," says Open Compute Project Foundation board member [Frank Frankovsky](#), who headed hardware design for Facebook's servers before leaving in 2014 to cofound a storage startup. "We hired some of the best in the world. And guess what? Drones need mechanical engineers, too."

The company acquired instant expertise in unmanned aeronautics in March 2014 by

plunking down 19€ million for [Ascenta](#), a U.K.-based startup founded by Andrew Cox, whose previous efforts included a military drone that set a world record by staying aloft for almost two weeks.



01/04The Aquila drone has a 138-foot wingspan

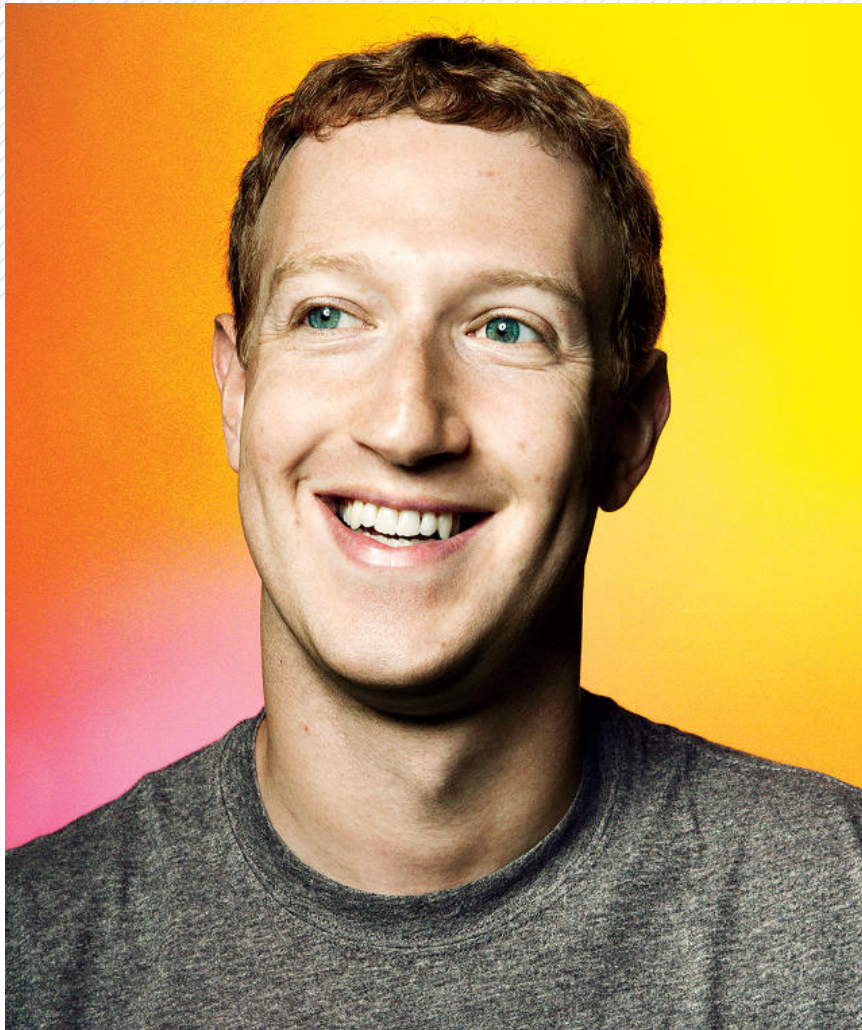
As in the past, hearing Mark Zuckerberg explain his vision proved to be a powerful recruiting tool. "I personally called up the guy who's leading our laser-communications effort, who was working at [NASA's] Jet Propulsion Laboratory," he recalls. "And he said, 'What? Why are you calling me?' And I said, 'Because we're connecting the world, and I want you to come in and meet the team, and this is something that's really important to me, and I think we can make a big difference.'" Even in the retelling, Zuckerberg makes it sound urgent.

Fourteen months after the Ascenta acquisition, Facebook announced that it had a full-scale prototype, dubbed Aquila and crafted from ultralightweight carbon fiber. An empty next-generation Boeing 737-600 airliner weighs upwards of 80,000 pounds and has a 113-foot wingspan; Aquila has a 138-foot wingspan, yet weighs only 880 pounds. The company plans to begin test flights by the end of 2015. Once the planes are manufactured, Facebook plans to partner with local telcos to deploy them.

For all the quick progress the Connectivity Lab has made, much remains to be done. It's still developing the battery technology necessary to keep the drone in the air for three months, the company's goal. And though it's figured out how to use lasers to transmit data at blistering speeds in the tens of gigabits per second, thanks to technology borrowed from Facebook's data centers, it is still ironing out the details of drone-to-ground communication.

Then there are the FAA regulations, which require that every drone have a dedicated pilot on the ground controlling it, a restriction that Maguire says would make Aquila economically unworkable (the same is true of Google's Project Loon Internet balloons; the two fierce competitors are collaborating to work through some of the policy implications). The solution? Computer science. "We need good machine-learning algorithms and control algorithms," Maguire says, "to make it so that you have 1,000 planes per pilot or . . . I don't

know what the number is, but somewhere between 25 and 1,000."



Zuckerberg on Facebook: "Very few people thought it was going to be a good business early on, which is why almost no one else tried to do it."

Zuckerberg, who personally researched and wrote a meaty, unsigned Facebook white paper on the state of connectivity, is, as usual, unfazed. And with 54% of the voting power of Facebook stock in his control, bouncing ideas off his board of directors is as close as he ever gets to seeking permission for his plans. "The myth is that Mark makes decisions and informs the board," says

director Andreessen. "The reality is that we have very detailed discussions."

As Zuckerberg recalls, the board asked him, "You're going to spend how many billions of dollars on this? And how is this going to make money?" And I said, 'Well, I don't have a direct plan now, but I just believe that if we connect these folks it will be good. And it will help those economies grow. And those people have better lives. And I think some portion of that will come back to us over some period of time.'

Zuckerberg has earned the right to trust his gut. "At the beginning of Facebook, I didn't have an idea of how this was going to be a good business," he tells me. "I just thought it was a good thing to do." He pauses. "Very few people thought it was going to be a good business early on, which is why almost no one else tried to do it."

Today, everyone understands: Not worrying about whether Facebook was a good business turned out to be a great way to do business. Zuckerberg has recalibrated his ambitions accordingly. As Andreessen tells me, "This is a guy who's 31. He's got a 40- or 50-year runway. I don't even know if there's a precedent."

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How Does Mark Zuckerberg Generate Innovation?

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[Photos: [Pari Dukovic](#)]

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[STEVEN MELENDEZ](#) | 02.18.17 | 6:00 AM

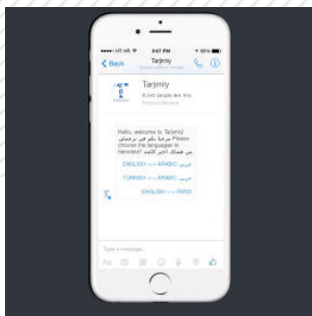
For refugees escaping conflict in the Middle East and elsewhere, simply communicating with people in new countries can be a big challenge.

Groups helping refugees in [Canada](#) and the [United Kingdom](#) have found language barriers make it harder for newcomers to integrate into society and find work. And even in some refugee camps, aid workers who speak the same language as the people they're there to assist can be in short

supply, says Abubakar Abid, one of the cofounders of [Tarjimly](#), a new Facebook Messenger bot designed to connect refugees and people assisting them on-site with volunteer, real-time translators who might be somewhere else on the globe.

"All they do is message the [Facebook] page and they are routed to whatever translator is available in the language they are seeking," Abid says.

"They can send text messages, snippets of text, voice notes, pictures, or whatever media they like."



Tarjimly

Tarjimly's cofounders, who are Massachusetts Institute of Technology alumni, were inspired by a friend's experience volunteering at a camp in Greece. "He went there expecting to help with operations or logistics," Abid

says. "He actually spent more than 90% of his time serving as a translator because he happened to be able to speak both Arabic and English."

The founders announced the project January 30 and have since received sign-ups from more than 1,500 volunteers interested in serving as translators. They plan to test the tool with small groups of translators and users over the next few weeks and aim for a wider release in early March. They're also exploring options for funding, including accelerators and incubators focused on social enterprises. Abid believes that using the

Facebook platform to handle message routing should make it easy for the app to scale.

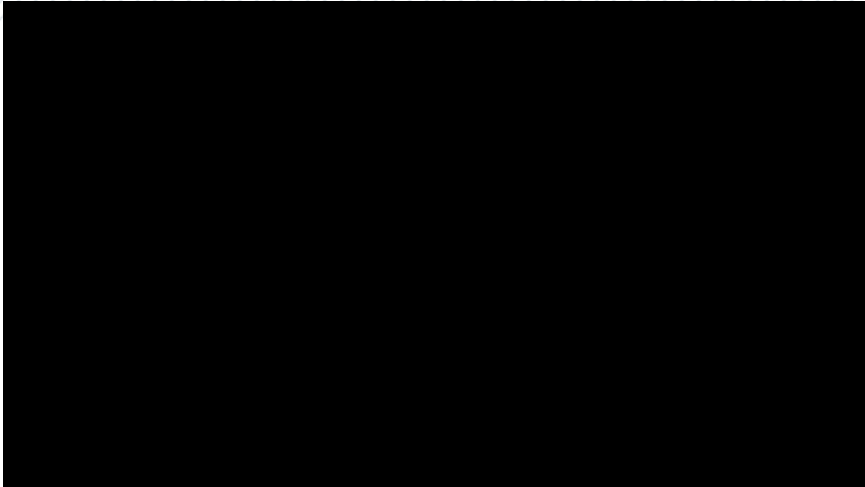
Tarjimly is just one of many apps and digital tools aiming to help refugees communicate, navigate, and find resources as they make their way in unfamiliar places. While refugees often leave their homelands in haste with limited possessions, those traveling from Syria and elsewhere in the Middle East have typically made sure to bring mobile phones. They're often packed in a waterproof bag alongside identity papers, says a journalist based in Germany who operates the online directory AppsForRefugees.com under the pseudonym "John Tucker." He says he adopted the name to avoid online harassment from anti-refugee trolls.

And since refugees began arriving in large numbers in Europe, software developers have sought to build apps to assist them. Tucker says the most visited apps from his site have included phrasebooks and dictionaries. Other popular apps include those that connect refugees with people who are offering items like furniture and household items and another that puts them in contact with locals looking to cook meals together.

"The people [arriving] here in Germany had no idea how to deal with authorities, with daily life, with the language, and so on," Tucker says. "There are lots of apps on the market and websites which try to fill these gaps to connect these people with each other and give them some information about the country they're in."

In the United States, aid to refugees took on new urgency for some activists after President Donald Trump's executive order, now blocked by a federal appellate court, banning new refugees and people from seven majority-Muslim nations.

The London-based makers of the [Refugee Aid App](#), which catalogs assistance available to refugees in particular areas, quickly deployed the app in 19 U.S. cities after Trump's order went into effect. "Our whole team just kind of worked round the clock to call these different organizations in these cities where there were airports where people were getting stranded," says Shelley Taylor, CEO of [Trellyz](#), the company behind the app.



The app, also known as RefAid, provides a menu of assistance, from legal advice to nearby health care. Taylor and her colleagues wanted to make sure that information on legal support would be available to refugees stranded in U.S. airports, provided they had time to access their phones

before being detained. "We wanted to make sure that they could make phone calls to local organizations to get legal help before too many bad things happened to them," she says.



Trellyz works with aid organizations around the world to help spread the word about their offerings and to assist them in digitally coordinating with each other.

The company also relies on those same organizations to inform potential refugee users about the app's existence. According to an [October blog post published by the Office of the United Nations High Commissioner on Refugees \(UNHCR\)](#), many refugees prefer to receive information from speaking directly to aid organizations, rather than from digital sources, especially with legal issues and other factors in flux.

That's especially true after some apps released in haste during refugee crises reportedly failed to deliver on their promises, which AppsForRefugee's Tucker acknowledges can be an issue. "It's not always clear where these apps come from, and the quality is very diverse, let's say that," he explains.

But developers willing to ensure that their offerings actually match the needs of refugees and the people working with them can still make a difference, according to the UNHCR post.

"There's also just an incredible desire of people around the world to help refugees," says Abid. "And I think being able to tap into that is very, very valuable."



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