

'By far the best book I've
ever read on the how and
why of scaling'

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and CEO of Character Lab and *New
York Times* bestselling author of *Grit*

**How to
Make
Good
Ideas
Great
and
Great
Ideas
Scale**

The VOLTAGE Effect



JOHN A. LIST

PROFESSOR OF ECONOMICS
UNIVERSITY OF CHICAGO

The Voltage Effect

ABOUT THE AUTHOR

John A. List is the Kenneth C. Griffin Distinguished Service Professor in Economics at the University of Chicago, and the chief economist for Lyft, a position he previously held at Uber. He has served on the Council of Economic Advisers and is the recipient of numerous awards and honours including the Kenneth Galbraith Award. His work has been featured in *The New York Times*, the *Economist*, the *Harvard Business Review*, *Fortune*, *Slate* and the *Washington Post*, and on NPR, NBC and Bloomberg. List has authored over 250 peer-reviewed journal articles, several academic books and, with Uri Gneezy, the international bestseller *The Why Axis*.

THE VOLTAGE EFFECT

*How to Make Good Ideas Great
and Great Ideas Scale*

JOHN A. LIST



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*To my truly inspirational scaling partner, Dana,
and our wonderful eight children:
Annika, Genevieve, Eli, Noah, Asher, Greta, Amelie, and Mason,
who have taught me the true value of scaling*

Scalable ideas are all alike;
every unscalable idea is unscalable in its own way.

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The Voltage Effect

INTRODUCTION:

BUILT TO FAIL OR BUILT TO SCALE?

It was never my plan to work for Uber. To be honest, it had never even occurred to me.

In the summer of 2016, I was busy with one of the most ambitious projects of my career. Six years earlier, alongside my teaching responsibilities in the Economics Department at the University of Chicago, I had led a team that opened a preschool for three- to five-year-olds that also functioned as a living research laboratory—a huge logistical and scientific endeavor I hadn’t planned on undertaking and didn’t exactly have the training for. While I had learned a few things raising five of my own kids, I had zero formal expertise in early childhood education. On the other hand, observing and studying people “in the wild” has been my lab for over thirty years now. And launching a preschool full of wonderful, crazy kids is as wild as it gets, albeit in a whole different sort of way.

Many people believe that the discipline of economics is all about money, or how capital flows through society. But my work as an economist doesn’t involve things like analyzing fiscal data or predicting stock market trends. My specialty is conducting fieldwork in behavioral economics, going out into the real world to study the hidden, often surprising motivations behind big and small decisions we make every day.

This was why Tom Amadio and other administrators of the school district of Chicago Heights had approached me several years earlier. They knew about experiments I had done incentivizing peo-

ple to adopt all kinds of positive behaviors, so they wanted to see if I might have any ideas on how to incentivize teachers and students in ways that would improve the students' performance. A town of close to thirty thousand people a half hour's drive south of Chicago proper, Chicago Heights is a place society has left behind. Boarded-up storefronts abound, and violent crime is disproportionately high compared to the rest of the United States. Today, over a quarter of the population lives below the poverty line, almost double the state-wide average of 13 percent when I first visited Chicago Heights. Unsurprisingly, these economic disadvantages take their toll on children there. High school graduation rates are low, and many high-schoolers are at a third- or fourth-grade level in reading and math. And this, of course, excludes them from numerous future opportunities; life is an entirely different game without a high school diploma.

Eager to get involved in a project that sought to reverse these trends, I teamed up with economists Steven Levitt (of *Freakonomics* fame) and Sally Sadoff (my PhD student at the time) in early 2008. Thanks to a generous gift from the Kenneth and Anne Griffin Foundation, we got to work conducting experiments with students and teachers at a Chicago Heights high school. Sure enough, our interventions produced gains in achievement standards and test scores, yet the results weren't as dramatic as we had hoped. We concluded that by working with high-schoolers we had missed a critical window in these kids' development, during which we could have altered their life trajectories. Showing up so late left much of their potential on the table; in fact, it had already been lost, years earlier. In other words, we were dealing with the wrong student population to truly tackle this problem.

So we proposed starting our own preschool, which would double as an experimental research lab on childhood education and development. We once again received support from our angel donor—a whopping \$10 million from the Griffin Foundation—and that is how the Chicago Heights Early Childhood Center (CHECC) was born.

By the spring of 2010, we were on to the next phase of our work in Chicago Heights, and were joined by Roland Fryer, then a rising

star at Harvard who studied the impact of economic inequality on academic performance, and Anya Samek, a postdoctoral student of mine. From 2010 to 2014, our preschool served nearly 1,500 students annually. The bedrock of our four-year pedagogical experiment was a curriculum that emphasized important noncognitive skills that have been shown to have a profound impact on later success in life, such as socialization, active listening, and delayed gratification. Our curriculum of choice was called Tools of the Mind. Crucially, we also had created a new program called Parent Academy, which incentivized parents to involve themselves in their children's early educational development in specific ways. Once the four years came to an end, we shuttered the school, as had always been our intent. But we continued collecting data on the children who had attended—and we plan to continue collecting these data for decades to come—to compare it against the performance of children who had the standard curriculum and whose parents did not receive any behavioral nudges from Parent Academy.

In other words, we had come up with a hypothesis about improving long-term outcomes for the children in Chicago Heights. We had designed a study to test it, and now we gathered and analyzed the results up to this point, which were quite impressive so far. “Our” kids were doing great and taking strong developmental strides. Ultimately, our goal was to take the key features of Tools of the Mind and combine them with our other findings to create a new curriculum model that we could expand to other communities in the United States, and even some abroad.

So in the midst of all this, when a recruitment officer from Uber called to explain that they wanted to interview me for the newly created position of chief economist, I dismissed the idea immediately. It would be one more set of responsibilities in my already jam-packed life. On top of the Chicago Heights research keeping me busy, I was about to remarry and would soon have a happy but frenzied new household full of eight kids, along with two grandparents. Plus, what did my research on early childhood education have to do with the

pursuit of world domination by a ride-sharing company in Silicon Valley? The more I thought about it, however, the more I realized that my research project and Uber had one central goal in common.

Scale.

If you've spent any time around entrepreneurs, you're probably aware that "scale" has become a bit of a buzzword in the business world, where it typically refers to the process of growing a company. But scaling isn't just the domain of scrappy start-ups. It isn't simply about accumulating more users or capturing more market share. Defined more broadly, "to scale" means to achieve a desired outcome when you take an idea from a small group—of customers, students, or citizens, for example—to a much larger one.

Through my research and time working with policymakers, my personal credo had become that the only ideas worth pursuing are the ones with the potential to make a significant impact on human lives. And translating an idea into widespread impact requires replicating it at scale. The urgency of scaling up important ideas and enterprises impacts us every day, whether it's by protecting the health and safety of a community, improving the viability of a business, or enhancing the education and opportunities of a future generation, as I hoped to do in Chicago Heights by establishing a model that other school districts around the world might someday be able to implement.

Scale underlies all social and technological progress, since the innovations that change the world are those that reach the largest number of people. A social movement needs to scale to have an impact just as much as a new medical intervention does. But the scaling process isn't simple; there are pitfalls every step of the way, from the moment the seed of an idea is planted to well after you've launched a project, and even once you've successfully replicated that project again and again. Yet it wasn't until 2016 that I realized a secret had been hiding in plain sight in Chicago Heights: for several years, my research aimed at improving kids' educational outcomes had also been a study on scaling—why it sometimes worked, while other times it didn't. I wondered if working at Uber, a company that had managed

to scale at lightning speed to some seventy countries and serve nearly 100 million customers, might reveal new insights that could be applied elsewhere.

I also knew that Uber had a whole lot of data, and for an economist like myself, big data isn't just my bread and butter. It's my professional playground. It was rumored that Uber even tracked the colors of customers' residences, which side of the backseat men and women sit in, and the friendship networks among riders. I wondered what secrets about scaling lay buried in all of that information that I could translate into academic research. Pretty soon I began to think that maybe working for Uber wasn't such an out-there idea after all. Also, I like a challenge, and the Uber recruiter had warned me that they had already interviewed several other economists for the position and none had made the cut, so I shouldn't assume I would, either. So I flew from Chicago to San Francisco for the interview.

After walking through the doors of the sleek, muscular building on Market Street that housed Uber's global headquarters at the time, I took the elevator up, and was promptly whisked into a conference room for my interview. That was when I noticed a slogan printed on pillars in Uber's offices: *Data is our DNA*.

I had thought such reverence for data was reserved for the ivory tower. Had I died and gone to heaven? This was clearly a place where the people spoke my language. I could immediately tell that just on that floor alone there was more science going on than at your average company.

Then the interview started and I no longer felt so at home.

During my opening presentation, one of the five executives in the room wouldn't stop interrupting me. He was a youngish guy, dressed in a T-shirt and jeans, with his hair beginning to show silver on the sides. After a few minutes, I realized it was Travis Kalanick, Uber's thirty-nine-year-old founder.

Travis struck me as the most confident person I had ever met. Which made sense; after all, you don't change the face of urban transportation worldwide and catapult a start-up to a valuation of

\$66 billion in a mere seven years if you aren't confident in your ideas and, above all, your own instincts. He did have a charm to him, but nevertheless, he was making it hard for me to get through the PowerPoint slides I had carefully prepared.

As I talked about different studies I had done on loss aversion—a favorite concept of behavioral economists, one that explains why loss is such a powerful motivator for decision-making—Travis interjected to question my results seemingly every other minute, all the while pacing at the back of the conference room like a lion poised to pounce on its unwitting prey. I was beginning to see why previous economists hadn't made it past the interview stage.

"That doesn't make sense," he said about an experiment I had done at a factory in China.

I told him he was wrong and explained why. I clicked to the next slide and began explaining another experiment. He interrupted me again as he continued to pace. I told him why he was wrong again. We did this cute little dance for about forty-five exasperating minutes. He got in his licks. I got in mine. Neither of us was backing down. Then, mercifully, the interview ended. I shook hands with everyone and left the conference room.

Well, that was a waste of time, I thought as I walked back to the lobby.

Just before I stepped into the elevator, one of the executives from the meeting rushed to catch up with me.

"Wait," he said, stopping the elevator. "Congratulations. We want to hire you."

Soon after, I began my tenure as the chief economist at Uber. This was how two drastically different worlds would intertwine for me—my long academic career in economic fieldwork and my new career in hyperspeed twenty-first-century business. This convergence would deepen my understanding not only of how to use data to evaluate the real-world viability of ideas but also of how to use data to scale those ideas to reach exponentially more people. Essentially, Uber became my new laboratory for studying the science of how to scale science.

Chicago Heights Early Childhood Center was a great idea. So was Uber. So are countless other ideas in countless other realms. But there is no rule anywhere that says a good or even great idea will meet its full potential. In fact, the one thing all great ideas have in common is that they are not guaranteed to succeed.

Be it a medical breakthrough, consumer product, technological innovation, governmental program, or any other enterprise, the path from early promise to widespread impact requires one thing and one thing only: *scalability*—the capacity to grow and expand in a robust and sustainable way.

Put simply: you can only change the world at scale.

The Voltage Effect

“To scale” has become a popular but imprecise term, too often used as a vague description or ambition when what we need is a clearly defined method with universal benchmarks. When is a thriving small business ready to open more locations? How does a tech start-up confirm that it has the right product/market fit? What are the signs for policymakers that an encouraging public health pilot project will succeed nationally? How do grassroots campaigns for change become national movements? Why is an organization’s culture floundering? And most basic of all for anyone who throws themselves full-throttle into a dream: How can I grow my idea?

My work—and everything you’ll read in the pages ahead—is about scaling in this broad and inclusive sense, toggling between the worlds of business, policy, and everything in between. In each domain, going from small to big is both the primary challenge and the primary opportunity.

My three decades in the field of economics have given me a unique and science-backed perspective with which to systematically answer these questions. When I completed my PhD in the mid-1990s, the social sciences were undergoing a credibility revolution, especially economics. At the time, much of the field dealt mainly in theo-

ries and computational models, but little of this research translated easily into compelling explanations of real-world phenomena. This was in large part because the evidence behind most advice was often based on arbitrary theories or correlations, rather than conclusions drawn from causal data on actual human behavior. This is where my specialty, fieldwork, came in.

My interest in this branch of economics grew out of something I'd been doing since high school: buying and selling baseball cards. Since the late 1980s, I had been studying the microeconomies of regional baseball card shows, a weird and wonderful little world. Analyzing this living and breathing market was how I came to see the world as my laboratory, and I soon began gathering scientific data in earnest from these markets. Studying real people making decisions out in the real world allowed me to arrive at credible conclusions about cause and effect and, in turn, better understand people and their motivations. Nothing was off-limits, from nerdy stuff like how markets can operate more efficiently to deeply pressing social issues such as why people discriminate.

Later I branched out and began studying myriad other behaviors across a broad range of people and populations. This research took me all over the world, from central Florida to Costa Rica, then to Africa, Asia, and finally Chicago. Sometimes my research flipped conventional wisdom on its head, overturning assumptions about gender (women aren't inherently less competitive than men; it's a socially conditioned trait), charitable giving (a charity will attract more donations in the short run *and* long run if they attract initial donors by promising to never bother them again rather than with the traditional strategy of constant follow-ups), and motivation (the fear of losing a reward we have already been given is a more powerful motivator than the promise of some future reward). I was content to continue in this academic vein, but my career took an unexpected turn when I was offered a job at the White House as a senior economist for George W. Bush in 2002.

Putting aside personal politics and all of the (legitimate) criticism President Bush and his administration brought on themselves,

I can say that one thing the Bush White House did right and rarely receives credit for was the emphasis it put on evidence-based policies. (Except—ahem—for the whole weapons-of-mass-destruction thing . . . major lack of evidence there! I should note that I was hired before that whole ugly mess but never played a role in that issue.) In other words, the administration wanted research to drive decision-making. In retrospect, this was a watershed moment for the relationship between science and government. And it was also how I ended up on a team focused on benefit-cost analysis for policies and programs implemented by the federal government. My work spanned several areas, including advising Colin Powell and Condoleezza Rice on the economics of tightening border control, and working with then-senator Hillary Clinton and her team to design the auctions for the Clear Skies Act.

At its core, even though I wasn't fully aware of it back then, the thread that connected all of this work was scale—how to design policies that would produce the greatest positive impact on the largest number of people in the most efficient manner.

Too often, policymaking is conducted in an information vacuum. A policy is proposed, voted on, and signed into law (or not), with little consideration given to the impact that policy will have—relative to the costs—when it is scaled up in the real world. Unfortunately, such oversights can come with grave real-world consequences, ranging from unequal outcomes, in which some populations reap more benefits of the policy than others, to massive cost overruns and budget shortfalls, for which lawmakers must compensate by cutting other vital programs and services.

Of course, neglecting to assess the scalability of one's idea can produce similar consequences in many realms beyond just policymaking or government. Here's a true story I witnessed firsthand (with the names changed). In the early 2000s, a small school district in the Midwest had been struggling with the kindergarten-readiness of its students for decades. Administrators felt they had tried everything, with little success, and the district superintendent, a tireless

woman named Greta, was at her wits' end. A new member of the school board, Mason, who was a devoted follower of the science of early education, had recently read about a new program producing astonishing results in other districts. It had been peer-reviewed by academic experts and reported large gains on several school-readiness indicators. At the school board's last meeting of the year, as others were lamenting the district's woes, Mason brought a welcome glimmer of hope. "I've found the silver bullet," he told the group. "The benefit-cost ratio might as well be infinity, it is so high." The school board promptly voted to adopt the program. Good move, right?

That fall the school district carefully introduced the new initiative in an "experimental rollout" fashion so that it could credibly show the community the benefits of the fabulous new curriculum. Greta and Mason were so confident it would succeed, they mentioned it at every fish fry and Rotary Club meeting they attended. "Just wait until these students apply to college," Mason boasted at the Lions Club pancake breakfast. "Our first Harvard matriculants are coming soon." A year passed, and data on the benefits and costs of the intervention arrived. When Mason and Greta pored over the results of the standardized cognitive and behavioral tests, they were shocked. Much to their dismay, the program did not even *pass* a benefit-cost test (i.e., the costs exceeded the benefits!), much less yield the hoped-for silver bullet. Mason was speechless, only able to mutter, "I guess the science got it wrong this time."

But in fact the problem wasn't the science; rather, it was that the program, quite simply, *didn't scale*. Sadly, the story of Greta and Mason is surprisingly common.

A pharmaceutical company develops a promising new sleep medication in its lab, but the drug doesn't live up to its promise in randomized trials. A small company in the Pacific Northwest successfully launches a product, then expands its distribution only to find that it sells poorly on the East Coast. A venture capital firm invests millions in a new food-delivery app, which ends up only capturing the eyeballs

and clicks of a small slice of society. Scalability is critical not just for policy and science but for anyone who stands to benefit from the success of an idea. All too often, promising ideas collapse at scale.

These cases are all examples of a *voltage drop*: when an enterprise falls apart at scale and positive results fizzle. (The term “voltage drop” comes from the literature of implementation science and can be traced to the work of Amy Kilbourne and co-authors.) Voltage drops are what happens when the great electric charge of potential that drives people and organizations dissipates, leaving behind dashed hopes, not to mention squandered money, hard work, and time. And they are shockingly common. According to Straight Talk on Evidence, a venture created to monitor the validity of research across disciplines ranging from software development to medicine to education and beyond, between 50 and 90 percent of programs will lose voltage at scale.

The Voltage Effect is about the science of scaling: why some ideas fail while others change the world, and how to give every idea its best chance at success. Success and failure are not about luck. There is a rhyme and reason to why some ideas fail and why some make it big. Certain ideas are predictably scalable, while others are predictably unscalable. You will undoubtedly find much fortune and create impact if you choose to scale those ideas that are predictably scalable.

Most of us think that scalable ideas have some “silver bullet” feature: some quality that bestows a “can’t miss” appeal. That kind of thinking is fundamentally wrong. There is no single quality that distinguishes ideas that have the potential to succeed at scale from those that don’t. But there are five specific traits that scalable ideas must possess—the “key signatures” of ideas that scale, or what I call the Five Vital Signs. I call them Vital Signs because an assessment of the vitality of your idea is necessary before scaling, and I pinpoint five such vitals. A deficiency in any one can render an idea unscalable, even for the most ingenious among us. And no enterprise is immune to voltage drops—not successful companies like Uber, not the

U.S. government (or any government), and not well-meaning administrators like Greta and Mason, who make the all-too-common mistake of thinking that what works elsewhere works everywhere. The consequences can be profound, which is why it is critical to guard against voltage drops from first inspiration to launch, and even after success.

But this book is not only about losses in voltage and how to avoid them as you scale. The voltage effect goes both ways, which is why I will also outline proven techniques for engineering *voltage gains at scale*—types of incentives, cultural features, and economic principles that will not only hold up at scale but allow your impact to multiply. Ultimately, this book will offer a concrete, step-by-step guide for anyone who wants to cull bad ideas and scale great ones to their fullest potential.

It should be clear why this is so important to me. I want Chicago Heights Early Childhood Center and other initiatives like it to pass the voltage test, bringing dramatic change on the largest possible scale. I want innovative businesses to succeed and make our lives better and our economy stronger. I want government policies and programs to benefit all people equally, and cost taxpayers less. When great ideas scale, we all win.

The evidence-based insights about scaling that I lay out in this book are part of a new terrain that we are all charting together in the twenty-first century. They are not only a product of a confluence of research questions, business experiments, and urgent problems that the world's smartest minds are trying to fix. The lessons about voltage gains and losses you will read about here are also the result of the historical moment the entire human race is living through—the age of big data. How we harness and use that data is up to us, but one thing is clear: the vast quantities of data we are all able to collect today on practically every type of human behavior, combined with the computational capacity we now have to analyze it, can yield valuable insights for anyone attempting to scale their enterprise.

It is understandable that many people find the deep reach of big

data disconcerting. It can feel like an invasion of privacy, especially with regard to the very serious concerns about what governments and companies can do with the data of their citizens and customers. But the innovations of big data also represent a seminal opportunity for humankind. Data-based insights into causes of death around the world, for example, have allowed us to scale new public health interventions that have improved the well-being and longevity of millions, perhaps even billions, of people. For the environment, big data can help to scale targeted programs to enhance household and firm-level energy conservation. Big data even reaches into our bedrooms. For example, roughly 10 percent of American women have fertility troubles. Biologically, tracking ovulation is one of the most effective ways for women to know when their body is ready to get pregnant. Big data is now used at scale to help women get pregnant by tracking critical fertility signs, and giving them the data they need to avoid costly, unnecessary trips to fertility treatment centers.

However, most people and organizations let data come to them—they make use of whatever data already exist. As a field experimenter using the world as my lab, I prefer to go out and generate data, leveraging partnerships with school systems, Fortune 500 companies, governments, nonprofits, and start-ups to try to learn the *whys* behind the data. Why do some people give to charity under certain conditions, while others don't? Why do some inner-city schools fail while others prosper? Why did one idea work at scale when another that was initially more promising failed? We can change the world by generating data to not only identify voltage gains and voltage losses but also understand why they occur.

The set of strategies you will learn in this book grow out of the marriage between big data and the economic way of thinking that has defined my research and my career. The book calls upon policymakers to move their attention from evidence-based policy to policy-based evidence. For entrepreneurs, *The Voltage Effect* lays out a set of scientific principles to guide decisions concerning which ideas have the best chance to scale.

The Living Lab

We all gain knowledge and wisdom over the course of our lives that we would like to share with others. So you can think of this book as my humble attempt at scaling the insights I have gained during my three decades as an economist. The core of these lessons emanates from a challenge. As we sat in a Market Street café a stone's throw from Uber headquarters in San Francisco, my wife, Dana Suskind, challenged me to produce science around scaling based on my previous experiences and past academic work. Never one to back down from a challenge, I accepted. But I knew that if I was going to succeed, I would need a few good partners. I chose Dana and my former PhD student and frequent co-author Omar Al-Ubaydli. In the past several years we have produced a series of academic articles on the science of scaling, complete with tedious math, plenty of Greek symbols, and obscure jargon. In this book, I've taken this new understanding and distilled it in a way that people everywhere can implement: from classrooms to boardrooms, nonprofit offices to research labs, the White House to your own house. In short, *The Voltage Effect* is for anyone who wants to increase the likelihood of their idea or enterprise succeeding.

This book is split into two parts. The first half will teach you that scaling is a fragile concept. It unpacks the Five Vital Signs, or the five key signature elements that will cause voltage drops and prevent an idea from taking off. The first is false positives—these are cases where there was never any voltage in the first place, though it appeared otherwise. The second is overestimating how big a slice of the pie your idea can capture. Often this is the result of failing to know your audience—or assuming that the small subset of people who have bought into your idea are more representative of the general population than they actually are, so that when you expand your idea it falls short for a broader set of people. The third is failing to evaluate whether your initial success depends on unscalable ingredients—unique circumstances that can't be replicated at scale. The fourth is when the imple-

mentation of your idea has unintended consequences, or spillovers, that backfire against that same idea. And the fifth is the “supply-side economics” of scaling—for instance, will your idea be too costly to sustain at scale? After you clear the hurdles of the Five Vital Signs, you will know you have an idea that scales.

The second part of the book is about how to produce voltage gains by adopting the practices necessary for maximum-impact scaling. It will unpack four proven techniques for increasing positive results at scale: using behavioral-economic incentives, such as the loss aversion principle, to create rapid gains; exploiting easily missed opportunities on the margins of your operation; knowing when to quit in the short term in order to win in the long term; and designing a high-voltage culture that is sustainable at scale.

Along the way, we will look closely at real-life stories that illustrate the lessons of the voltage effect. In the chapters ahead, you will gain a new perspective on how Theranos founder Elizabeth Holmes managed to defraud investors and deceive the public, why celebrity chef/entrepreneur Jamie Oliver’s restaurant empire collapsed, and why a well-intentioned campaign to improve automotive safety backfired after it reached a critical mass. I will tell you about behavioral nudges I designed to help the airline Virgin Atlantic save millions of dollars and the government of the Dominican Republic to collect \$100 million more in taxes from its citizens. I will also relate the story of my time at Uber and give you my inside perspective on Travis Kalanick’s downfall and what insights we can gain from it about building a scalable culture. And I’ll tell you how I moved to Uber’s rival, Lyft, where I gained other new data-based insights into scaling as Lyft’s chief economist. These stories didn’t play out *in vitro*—that is, in the lab. They are demonstrations of the science of scaling *in vivo*, with the world as my living laboratory.

The problems we face as individuals and as a global community in the twenty-first century are the direst and most far-reaching that humans have ever had to deal with. Which means we need innovations that work at scale if we are to solve those problems before it’s

too late. Whether you are a founder, an executive, a civil servant, a researcher, a concerned citizen, or a parent, you have ideas with the potential to scale positive change within your community, your company, your family, or society at large.

So let's begin turning up the voltage.