

Vivek Wadhwa

Author, Academic, Speaker, Entrepreneur

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About Vivek Wadhwa

Vivek Wadhwa is a Distinguished Fellow at Harvard Law School's Labor and Worklife Program. He is the author of five best-selling books: *From Incremental to Exponential*; *Your Happiness Was Hacked*; *The Driver in the Driverless Car*; *Innovating Women*; and *The Immigrant Exodus*.

He has been a globally syndicated columnist for *The Washington Post* and held appointments at Carnegie Mellon University, Duke University, Stanford Law School, UC Berkeley, Emory University, and Singularity University.

Vivek is based in Silicon Valley and researches, speaks, and writes about advancing technologies that are transforming our world. These advances – in fields such as robotics, artificial intelligence, computing, synthetic biology, 3D printing, medicine, and nanomaterials – are making it possible for small teams to do what was once possible only for governments and large corporations to do: solve the grand challenges in education, water, food, shelter, health, and security.

In 2012, the U.S. Government awarded Wadhwa distinguished recognition as an "Outstanding American by Choice" for his "commitment to this country and to the common civic values that unite us as Americans."

He was also named one of the world's "Top 100 Global Thinkers" by *Foreign Policy* magazine in that year; in June 2013, he was on *TIME* magazine's list of "Tech 40", one of forty of the most influential minds in tech; and in September 2015, he was second on a list of "ten men worth emulating" in *The Financial Times*. In 2018, he was awarded Silicon Valley Forum's Visionary Award, a list of luminaries "who have made Silicon Valley synonymous with creativity and life-changing advancements in technology."

Select Keynotes

- **Exponential technology 101: the basics and progression**

By 2023, a \$1,000 smartphone will have the computational power and storage capacity of a human brain. Since every technology that becomes information-based also traces such exponential progress, similar advances have begun in fields such as artificial intelligence, digital manufacturing, medicine, robotics, sensors, nanomaterials, and synthetic biology.

We will illustrate the driving forces behind certain related technologies, as well as what they may enable.

Artificial Intelligence

- What led artificial intelligence (A.I.), the stuff of science fiction, to failure in the '90s, and the new methods of data analysis and the advent of the GPU that revived it
- Separating fact from fiction: the difference between today's "narrow" or "weak" A.I. and tomorrow's artificial general intelligence and superintelligence
- How A.I. can provide the cheap, reliable, industrial-grade digital smartness to transform decision-making in everything from stock trading, document review, and financial analysis to security, intelligence, fraud detection, and law enforcement
- Classes of machine-learning strategies – supervised, unsupervised, and reinforcement – and their application in business

- Cutting through the hype: the limits and practicalities of business A.I.
- Regulatory and reputational concerns arising from A.I.'s opacity

Digital manufacturing

- Advances in 3D printing, and its relatively slow progress
- Uses of 3D printing: household goods, electronics, automobiles, and food
- The dream of being able to emulate nature in design

Medicine

- Sensor-based medical devices as consumer appliances; epidermal electronics and the Fantastic Voyage into the human body; and the possibilities of telemedicine
- How we have become data and our doctors are becoming software
- Virtual psychologists, brain-computer interfaces, and robotic surgery
- Advances in bionics and prosthetics
- DNA sequencing and the dream of precision medicine
- How medicine's new frontier, the microbiome, could disrupt the very foundation of Western medicine

Nanotechnology

- The dream of nanotechnology and the reality
- Quantum effects: how properties such as melting point, fluorescence, electrical conductivity, magnetic permeability, and chemical reactivity change as a function of particle size
- New materials and the materials genome
- Nanotechnology of science fiction: molecular assembly and micromachines

Robotics

- What exactly a robot is, and why we don't have the robots depicted in science-fiction movies in the past 60 years
- The progress of robots: what they can do today, and what we can expect in the next decade
- Robots for manufacturing, delivery, retail management, surgery, and personal use

Sensors

- How advances in MEMS sensors – microfabricated from miniaturized mechanical and electro-mechanical elements – underlie IoT devices and the possibility of a new generation of smart cities
- Microfluidics/nanofluidics and “humans on a chip” technologies

Synthetic biology

- The ability to “print” DNA and create up new life forms and school experiments from “biobricks”
- Advances in CRISPR: how plants, animals, and humans genes can now be “edited”
- Creating drought-resistant and extra nutritious plants, adding features to animals, removing disease from humans, resurrecting the woolly mammoth and dinosaurs
- Where and how we'll draw the line ethical and legal boundaries

Quantum computing

- Whether the phantom effects of quantum physics – which Albert Einstein called “spooky action at a distance” – are real and practicable
- Applications in machine learning, tumor treatment, logistical planning, ever smarter trading algorithms, airline scheduling, the search for Earth-like planets
- Breaking the world's most sophisticated cryptography system in minutes

Solving the grand challenges of humanity

The solutions that technology is enabling to the problems that have always plagued humanity, including disease, ignorance, energy shortfalls, and hunger – creating many new problems but solving the oldest:

- an era of unlimited, clean, and almost free energy through advances in technologies such as solar and wind generation
- the capacity to educate and retrain almost every person on the planet through inexpensive smartphones, artificial intelligence, and virtual reality
- health care affordable to billions via inexpensive diagnostics and A.I. doctors
- unlimited supplies of synthetic meat and produce from vertical farms.

• Convergence, disruption, and opportunity: how existing industries will be disrupted and new, trillion dollar, industries will emerge

Not long ago, you could see your competition coming. Management guru Clayton Christensen coined the term “disruptive innovation” to describe how competition worked: a

new entrant attacked a market leader by launching low-end, low-priced products and then relentlessly improving them. Now Christensen's frameworks have themselves been disrupted – because you can no longer see the competition coming. Technologies are no longer progressing in a predictable linear fashion, but are advancing exponentially and converging.

Practically every industry will be disrupted over the next few years, including finance, insurance, health care, manufacturing, transportation,

education, I.T. services, and communications. By the early 2030s, all but a very few of today's Fortune 500 companies will have fallen off that list; they will go the way of Blockbuster, Kodak, RIM, Compaq, and Nokia. This is not all bad news, because disruption creates opportunities. New industries will emerge, and companies that lead the change will have the trillion-dollar market capitalizations.

We will explain how technologies converge and disrupt industries, and the S-Curves that they form — which make it very hard to pick specific winners. And we will detail some of the technology convergences in a range of industries — all of which will affect one another.

Agriculture

- Robots have advanced to a point at which they can do the grunt work that humans do in farming.
- Innovative structures and designs have led to dramatic improvements in LED technology and enabled it to be optimized for plant growth. The combination of LED lamps, A.I., and sensors is facilitating rapid advances in vertical farming.
- Using sensors, A.I. drones can now monitor crop growth, watering, fertilizer application, and harvesting.
- Meatless meat, made of plants and vegetables, is now the rage in Silicon Valley, and technologies such as CRISPR will dramatically accelerate progress. In vitro cloned meat is also becoming a reality.

Communications

- AT&T, Verizon, and Sprint have seen their landline businesses disappear.
- Wireless networks far exceed the reach of landlines, and smartphones are leapfrogging PCs, tablets, and mobile broadband.
- A race is on to provide Wi-Fi everywhere, via drones, balloons, and microsatellites.
- What comes next for mobile carriers?

Finance

- How peer-to-peer marketplaces and startups are forcing a redesign of every part of the financial system
- The promise of digital currencies, and a sober assessment of where today's cryptocurrencies are heading and what makes them valuable
- How India and China have already built the cashless societies that the Western world thinks are still science-fiction
- Cutting through the hype to find blockchain's killer apps
- Why tokenization and smart contracts will fundamentally transform the way we own, access, and share resources

Additionally, this lecture will cover transformation of manufacturing, education, energy, insurance, real estate, transportation, health care, retail, and technology services.

• **Exponential Vulnerability: building new defenses for a fastchanging world**

The rapid pace of technological change is creating unprecedented security risks for companies. Though there seems to be a new story every day of a corporation that has been hacked, such intrusions represent a small fraction of the potential vulnerabilities. Executive e-mails, employee health information, and industry contracts are all fair game in this new age of security threats.

We will provide a roadmap of what corporations can do to position themselves for success, taking concepts that everyone in business needs to know and distilling the most practical knowledge without getting lost in technical specifics. Customers, clients, and boards are ultimately holding executives responsible for the security of their company. Executives will need to adopt proactive defense rather than the status quo of reactive response.

The changing nature of breaches and attacks

- Multiplying points of failure and the new risks that companies face daily
- Why companies will face the same threats as countries and how they can protect their reputation and resources while under attack
- How to design security considerations and controls into every level of a company Securing connected devices
- How the global debut of Ransomware simultaneously in more than 150 countries has made us rethink management of embedded computers
- The next generation of Internet of Things and what securing it will necessitate
- The new insurance products, financial strategies, and market-based remedies changing how we think about liability

Building resiliency into corporate security

- Why everything will be breached, and the new defining question: what happens afterward
- What blockchain can and can't do to prevent data loss
- How hackers make systems stronger by exposing vulnerability — and how to have them work for you rather than against you

The new realities of data collection and analysis

- The changing nature of what and how machines communicate about us
- How new architectures are enabling companies to capture user data while limiting their exposure to risk
- Navigating regulation and changing social demands for privacy and data security

Preparing for the next generation of cyber threats

- Preparing for the arrival of quantum computing, its threat to encryption, and the security crisis unfolding exponentially
- How offensive and defensive A.I.s will come to define the future of corporate security
- Rethinking our current infrastructure and designing new protocols for tomorrow's technologies.

• **How to innovate in the exponential era – pt. 1**

By the end of the 2020s, three-quarters of 2021's S&P 500 list will be replaced, because today's corporate leaders are unprepared for exponential disruption.

We will cover some new factors affecting innovation, including new work patterns (we are always connected; everything is urgent; adapt or perish) and important differences between large companies and startups. We will explore which kinds of people are becoming entrepreneurs and the implications of cloud-based information, of the instantaneous spread of knowledge, of ideas' coming from anywhere, and of the dependence of success on sharing rather than hoarding knowledge. We will illustrate the new techniques of crowdsourcing, crowd-creation, and contests and discuss the importance of building an entrepreneurial culture that empowers employees.

The new constraints on corporate survival, management, and work

- Companies believing they will succeed because what they're doing has worked in the past, as against startups focusing on building new markets and fearing nothing
- Why the silos that companies organize themselves into will ultimately spell their doom
- How markets have moved power from buyer to seller; intellectual capital and brand can no longer lock in customers, and one-way messaging no longer works; and how companies must build loyalty through value or perish

What works and what doesn't work

- How companies and countries have wasted billions on top-down programs and expensive R&D, merely to demonstrate that you can't buy your way to innovation
- Why traditional hierarchies don't work for knowledge workers, and why managers must facilitate rather than control
- Why innovation is really all about people and ideas, and how to make great leaps forward without spending huge amounts of time or money

Exponential methods

- Why to develop minimum viable products and put them into the hands of early adopters in order to learn whether you're solving the right problem
- How to develop incentive prizes to jumpstart industries and change perceptions of what is possible
- Why ideas can come from anywhere, localization is everything, and the best entrepreneurs steal

The Silicon Valley way

- How moonshot thinking and demanding tenfold improvement establish new mindsets, encourage lateral thinking, and challenge norms
- What makes the ideas economy truly exponential, and why data are the new currency of the information age
- Silicon Valley's enduring advantage: spreading, sharing, and collaborating on ideas

How to prepare for exponential disruption

- Making the cultural transformation from traditional linear to entrepreneurial exponential
- How to incubate ideas, invest in startups, acquire runaway successes, and partner with companies that provide strategic advantages
- Why bold leaders disrupt themselves.

• How to innovate in the exponential era – pt. 2

Silicon Valley has invented the world's most sophisticated toolkit for fostering innovative thinking and building cutting-edge companies. How was Elon Musk able to beat Wall Street and defy the odds with both Tesla and SpaceX? How did AirBnB transform the very idea of what a "hotel" is? And what does it look like to apply these ideas to entirely new industries?

In this lecture, we will provide an overview of how to apply design thinking to business practices, what you can learn from the Lean Startup model, the methods that software startups use to constantly update their products and keep them relevant, and why platforms are the ultimate technology-enabled business model.

First principles

- The limitations of reasoning by analogy
- What reducing an industry to its core truths reveals of the process of developing innovative solutions – through outstanding examples
- How fashion and design principles can drastically improve product quality – through a case study in medical devices and prosthetics

Design thinking

- Approaching business problems using designers' frameworks and tools, in a threestep process
- Specific methods and tools that technology startups employ to test concepts and learn what people want
- Case studies in major corporations' major cost reductions and service improvements through design thinking

Lean startup

- A methodology for learning what does not work as fast as possible
- How to turn anyone into an entrepreneur regardless of age, position, or industry
- The importance of metrics; examples of their successful application; and a new framework for tracking progress
- The importance of the continual cycle of building, measuring, and learning Platforms
- Why the fastest-growing companies own no assets, and how that is the key to their exponential growth
- What platform owners gain by giving away control; and how Apple, Facebook, and Alibaba have employed this effect to overturn industry after industry

- The power of “network effects”, and how they account for the continuing success and dominance of platform companies.

- **Society, Law, and Ethics**

As technology change continues to accelerate and overturns entire industries, it raises some very serious questions about our legal and ethical systems. Technological advances will undermine all technologies and all legal systems, on many different fronts, simultaneously. Executives need to understand what’s coming and to assess the risks and issues they will have to grapple with in the near future.

The type of changes that would take centuries and generations to take place now occurs in a matter of years or months. But where there is disruption there is opportunity. In this lecture, we will proceed, technology by technology, to understand how we will need to approach these new systems, applications, and business models in order to maximize their advantages but limit their destructive potential.

Transitioning to an abundant future

- Why everyone in the West can enjoy a standard of living that even in recent history was accessible only to kings and popes
- Why and how enormous social progress will continue to be made over the next decade
- How we move from a mindset of scarcity to one of abundance; and the problems that doing so brings

The differences between laws and ethics

- Technology’s prompting of law reform – steel and property; railroad and eminent domain; printing press and copyright – and what makes this time different
- Why we will have to rapidly reach consensus on issues that we used to have decades or centuries to sort out
- The differences between laws and ethics, and how one follows the other

Why the public will look to the private sector for leadership

- The new institutions, frameworks, and systems we will need in order to cope with change
- How models’ inability to predict change delays regulatory guidance on new technology
- The unavoidable truths of technology’s concentration of wealth and control

Ethics principles and scenarios:

- (1) where and how autonomous cars and robotics can be successfully integrated into society
- (2) the requirements of effective government versus the ability of entrepreneurs to overturn existing systems
- (3) how companies can defend intellectual property despite digitization of physical objects
- (4) the ethical dimensions of creating general A.I.; and the safeguards advisable
- (5) how societies, governments, and companies can deal with rapid job elimination
- (6) under what circumstances we should permit use of a technology such as gene editing via CRISPR, and how it will affect our humanity
- (7) how humanity can transition to a jobless future, and what that looks like for individuals.

Select Book Titles

- **2018:** Acclaimed Technology Authority (June 2018)
- **2017:** The Driver in the Driverless Car: How Our Technology Choices Will Create the Future - co-written Alex Salkever and Vivek Wadhwa
- **2017:** Your Happiness Was Hacked: Why Tech Is Winning the Battle to Control Your Brain—and How to Fight Back
- **2014:** Innovating Women
- **2012:** The Immigrant Exodus

Select Articles

- [Why we will all benefit from the next space race](#)

Regardless of the risks, the era of space exploration has begun and we can expect many exciting breakthroughs. We can also start dreaming about the places we want to visit in the heavens.

- [Latest from Vivek Wadhwa](#)

Why liberal arts and the humanities are as important as engineering,

- [Washington Post: How today’s technology is rapidly catching up to Star Trek](#)
- [MIT Technology Review: Laws and Ethics Can’t Keep Pace with Technology](#)
- [Washington Post: Move over, humans, the robocars are coming](#)
- [Wall Street Journal: How technology will eat medicine](#)