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Innovations

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# How the United States is reinventing itself yet again

BY VIVEK WADHWA AND ALEX SALKEVER January 2 at 8:12 am



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The sun is rising, not setting on the United States. (Karen Bleier/AFP/Getty Images)

We have moved from the Great Recession to the Great Malaise. Despite massive government stimulus, the world's largest and most advanced economy continues to limp sideways. Unemployment remains stubbornly high. Growth remains slow and prospects for employment growth remain bleak. Wages continue to stagnate. Recent college graduates and young professionals may well be the first generation to live a life inferior to those of their parents, conventional wisdom holds. The United States has entered a period of slow decline, much like the sun finally setting on the British Empire in the 20th century.

And that's not all the pessimists say. They also argue that while the United States continues to dominate in the emergence of new technology powerhouses, the biggest IPO of the decade belongs to Facebook, a social network that is more media company

than technology innovator. Stifling red tape and regulations has driven costs of testing new medicines and medical devices so high that many drug companies have shifted testing regimes and market focus to Europe and Asia. Despite mounting evidence that skilled immigrant entrepreneurs have delivered a wildly disproportionate share of the country's technology innovation and technology job growth, the powers that be in Washington, D.C. have, even with broad bipartisan support, not mustered up the votes to reform the country's regressive and punitive immigration policies. Add to all of this an aging populace requiring more and more support from younger workers, ballooning health costs and a tax structure that beggars the young to underwrite benefits for the aged, and the United States looks more and more like a historical footnote than a superpower.

Peel back the layers of the onion, and the reality appears quite different. In fact, the United States stands on the cusp of a dramatic revival and rejuvenation, propelled by an amazing wave of technological innovation. A slew of breakthroughs will deliver the enormous productivity gains and the societal dramatic cost savings needed to sustain economic growth and prosperity. These breakthroughs, mostly digital in nature, will complete the shift begun by the Internet away to a new era where the precepts of Moore's Law can be applied to virtually any field.

Computer-assisted design and fabrication will reshape manufacturing forever. These technologies will slash waste and replace nearly all conventional manufacturing with more environmentally friendly and cost-effective additive manufacturing run with robots and computer programs. Complex systems resistant to modeling will succumb to advances in big data that allow mankind to finally make sense and improve upon the most intricate multi-faceted interactions. Where big data fails, ubiquitous crowd sourcing will harness untapped brain cycles to train systems and solve problems, one small activity at a time — on a global scale.

In this massively digital world, A/B testing or parallelization of R&D processes will become commonplace for just about everything from airline design simulations to online advertising to artificial organ construction. This will, in turn, allow for far more rigorous testing of products and processes. Dirt-cheap digital delivery platforms for educational content and improvements in the understanding of the way the brain learns will yield a sea change in how we gain knowledge. This will result in more open, flexible educational systems and structures — and a smarter, more learned, constantly learning populace. While the world will benefit from these changes, the United States is uniquely positioned to lead this sea change.





The cost per watt of solar and wind energy keeps falling. (Reed Saxon/Associated Press)

In the field of energy, even as Silicon Valley has turned cold on green startups, the cost per watt of solar and wind energy continues to fall. GTM research computes that solar has already by dropped by 97.2 percent over a 35-year period. Renewables have undercut old carbon-based power generation in swathes of the country — such as Hawaii and California — where electricity is costly. Less reliable has been progress in algal biofuels but progress in biotech drug development techniques and complex drug manufacturing will likely provide equivalent benefits to manufacturing drop-in carbon fuels based on algae fed with water and ambient carbon dioxide.

In the interim, the enhanced availability of natural gas extracted domestically via new fracking techniques has sent energy costs plummeting and has resulted in the usurpation of old-line coal-fired power plants for gas-fired generation facilities. In turn, this has driven a new wave of construction of high-efficiency steel and chemical plants along the Gulf Coast of the United States, close to shipping lanes and benefitting from cheap natural gas or electricity. Energy efficiency technologies, such as LED light bulbs, improved heating and cooling systems, and Internet enabled hardware like the Nest thermostat, can save enough money to offset the initial cost — often within a year or less.

The implications of these shifts are tremendous. Manufacturing in this country will rebound. The economies of scale that benefitted cheap labor and cheap locations overseas will be stood on their head as the percentage of cost of manufacturing products consumed by labor continues to drop due to automation and mechanization. People will learn more, faster, more easily and with far more enjoyment. Healthcare costs will fall dramatically as the old doctor's office centric and one-size-fits-many treatment approaches give way to personalized medicine. Connected hardware — cars, thermostats, cell phones, pacemakers, appliances, heating and cooling systems — will supply an endless stream of useful data that will allow us to optimize for efficiency and live more comfortable lives.

Because the United States continues to lead the world in its ability to adapt to, incorporate and develop new systems and new technologies, we are uniquely poised to reap a disproportionate share of the benefits of these shifts. Even better, these advances will remedy the very weaknesses that have straightjacketed the U.S. economy and confined economic growth to the upper classes while causing income and life expectancy to stagnate for the lower 70 percent of the country's population over the past three decades.

The Internet is in the very early stages of a driving an exponential economic growth curve akin to what electricity earlier wrought during the later half of the Industrial Revolution. Let us remember that the Internet only achieved semi-mass adoption a decade ago. (We say semi because, unlike electricity, not everyone has access to the same quality of Internet and that is, actually, an area where the United States lags the rest of the developed world).

We have exponentially increased our ability to access knowledge. Search engines we take for granted deliver access to knowledge that would have been unimaginable two decades ago. Social networks have increased our ability to reach out to millions of

people to request information and advice. Everything from real-time stock prices to reviews of consumer electronics to food safety violations for restaurants is now online and available virtually anywhere on Earth to anyone with a mobile device. As Peter Diamandis writes, “A Masai warrior on a cellphone in the middle of Kenya has better access to knowledge than President Reagan did 25 years ago.”

*Wadhwa and Salkever are authoring a book on how technology will transform our lives, which is expected to be published in Fall 2014. Wadhwa is a fellow at the Rock Center for Corporate Governance at Stanford University, director of research at the Center for Entrepreneurship and Research Commercialization at Duke's engineering school and distinguished scholar at Singularity and Emory universities. His past appointments include Harvard Law School and University of California Berkeley. Salkever is a writer focused on cloud computing and new technologies. He was formerly the technology editor at BusinessWeek.com.*

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**President of Awesome** wrote:

1/3/2014 5:38 PM PST

I like the future because apparently everything will be radioactive. I want my NEAT thermostat to calculate my rad dosage while I crowd source a cool facebook comment that gets re-tweeted about how I saved more money than my solar-panel enabled neighbors. Then I want to read an article about it. But I don't want them to report my rad dosage, because that is what talk to my personalized, Obama-care doctor about, in private - except when my digital medical records are used as big-data by the NSA to help project the necessary financial manipulation of the fiat-currency needed to allow journalists to report that everything is better than ever.

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**freedomev** wrote:

1/3/2014 7:05 AM PST

The author is correct especially in the energy field where so much money to be made.saved making home/building made energy.

Facts are there are multiple ways to get near free energy and the machines that catch, make like PV are already well under utility costs and they are just 2-4kw heat/steam motors driven by solar, biomass, waste heat, etc, more simple than a moped, mostly rather old tech upgraded for modern materials.

And these like many other things can be made locally making jobs there, not in OPEC, etc.

But add finance, food, transport, etc and it'll all be very different in only 10 yrs and completely different in 30 yrs with fossil fuel priced out of the energy market .

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**pippini** wrote:

1/2/2014 3:27 PM PST

I am not sure why I should pay any attention to these guys since they don't even have their basic facts correct. Massive government stimulus? ??? In what alternate universe? The austerity policies forced on us by the Tea Party has done nothing but crush growth except for the wealthiest among us.

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**Bora Bora** responds:



1/3/2014 6:31 AM PST

Massive "green" government stimulus that failed under the Obama administration, such as Solyndra and Fisker...

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Add your thoughts...



**rrg44** wrote:

1/2/2014 2:23 PM PST

All rubbish.

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**hwpratt** wrote:

1/2/2014 2:00 PM PST

"A slew of breakthroughs will deliver the enormous productivity gains" ... in other words, don't expect big improvements on the unemployment/underemployment front, folks.

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**Doug Wenzel** wrote:

1/2/2014 1:20 PM PST

" Renewables have undercut old carbon-based power generation in swathes of the country — such as Hawaii and California — where electricity is costly."

Bull - Electricity in California is costly because of the subsidies provided to renewables, including netting out renewable feed into the grid. The grid was expensive to build and is costly to maintain; why should those with solar panels on their roofs be entitled to sell excess power at retail rates, as opposed to at the lowest current wholesale price then being offered to the ISO?

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**KathyR** wrote:

1/2/2014 12:47 PM PST

Peter Diamandis writes, "A Masai warrior on a cellphone in the middle of Kenya has better access to knowledge than President Reagan did 25 years ago."

So too should President Obama, but it seems that having access to knowledge and acting on it to help economic growth are two very different things.

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**noslok** wrote:

1/2/2014 12:33 PM PST

"A Masai warrior on a cellphone in the middle of Kenya has better access to knowledge than President Reagan did 25 years ago."

Ok... bad example!

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**salik3** wrote:

1/2/2014 12:28 PM PST

Ah yes, but how do we feel about this innovation? Will it change the dysfunctional view of our fellow human beings we now hold? Except for the algae-based fuel to be produced for the internal combustion engine and the

fact that a Masai warrior has more information at his fingertips than Ronald Reagan, I see little hope for a bright future until I see a successful start-up in the field of actualizing spirituality in an innovation of delivering kindness domestically and therefore internationally.

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**Peebles Squire** wrote:

1/2/2014 12:22 PM PST

Wind power is an American success story, one that promotes energy security while continuing to support domestic manufacturing.

Already, wind power employs more than 80,000 people across multiple sectors, including construction, development, engineering, and operations, working in 550 manufacturing facilities located all over the country.

Wind turbines are increasingly American-made, too, with domestic content composing approximately 70% of new turbines.

According to Lazard, one of the world's preeminent financial advisory and asset management firms, renewable energy is already cost-competitive with conventional energy resources in many markets.

Renewables are beginning to match or beat fossil-fueled electricity on price, and with continued growth, deployment and innovation, renewables are becoming more widespread every day.

Securing permanent offsets in carbon dioxide emissions, using virtually no water and producing reliable, affordable power, wind power is a win-win for consumers and the environment.

Peebles Squire  
American Wind Energy Association

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**Citizen60** wrote:

1/2/2014 10:25 AM PST

These comments that new/enhanced technologies will improve or yield useful new data that can be useful in facilitating change. That pre-supposes the people who will invest or pay for changes want to do so--data driven or not. Congress, among many others with the economic or influence to change things have proven in spades that they will make no changes unless they have the will to do so--data notwithstanding. Shutting down the government? Refusing to set rates for drugs across Medicare when it's saving billions in the VA System? Not making the immigration law changes that companies & economists demonstrate with hard numbers will increase GDP? Where's their proof that all these new processes & data will generate will?

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**capbillie** wrote:

1/2/2014 9:42 AM PST

There are still some die-hard conservatives who are still trying to justify the Bush Tax Cuts, followed by two of the longest and most costly wars in US history, all of which was unfunded.

As bad as Lyndon Johnson was, at least he had the sense to impose a "surtax" to partially pay for the spending on the war in Vietnam. It was of course not adequate to fully pay full cost of that devastating and fruitless war, but at least he did not CUT taxes!

The deficit spending during the war in Vietnam was the reason for the period of hyperinflation during the Nixon administration, and the reason why Nixon imposed wage and price controls. The wage and price controls, known as "Phase I and Phase II", were ineffective in curbing the inflation, which continue to rage well into the Carter years. It wasn't until Carter appointed Paul Volcker as Fed Chairman that action was taken to curb the inflation. Double digit interest rates finally brought inflation under control, but exacted a terrible price on the housing industry, and gave rise to the term "stagflation".

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**mojourner** wrote:

1/2/2014 9:20 AM PST

This piece is more evidence that the wonks at various "Centers" are on the periphery of reality. I kept looking for evidence of these claims that the computerized, networked future will benefit us all, but there was nothing,

really. Sure, natural gas is cheaper now than it was, and one effect is newer manufacturing on the Gulf Coast, but another is a massive transfer of natural resources overseas as gas is exported so that one-percenters can reap profits. Yes, there are new advantages to be had from networked systems, but also new vulnerabilities. This reads like the sales pitches for many a failed venture in the New World, for the unending prosperity of a nuclear powered world, or any number of booster/huckster pitches for effortless wealth that's just around the corner.

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**cgillespie** wrote:

1/2/2014 9:15 AM PST

Big Data is not going to accomplish what is claimed in the article. For Big Data to work on a large scale, business leaders need to understand statistical inference to a degree that would allow them to challenge certain methodologies as compared to alternatives. Mathematical literacy among business leaders is nowhere near high enough for that to be the case on a large scale. Without such understanding, Big Data will work only for industries and business models that are already well-understood, i.e. not innovative industries. Also, as the dataset gets larger the cost of analysis goes up exponentially, and "Big Data" does not address that reality.

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**Bora Bora** responds:

1/3/2014 6:38 AM PST

Big Data = more bad data analysis?

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Add your thoughts...



**capbillie** wrote:

1/2/2014 8:31 AM PST

"Unemployment remains stubbornly high. Growth remains slow and prospects for employment growth remain bleak. Wages continue to stagnate."

Sad, but true. But, to see where we first made a conscious decision to abandon the tried and true formula for economic success, one need only go back as far as the start of the administration of George W. Bush.

The Bush Tax Cuts fundamentally changed the equilibrium between the working man and the investor class. In exchange for several points of federal income tax relief, working people allowed the effective tax rate for wealthy investors to be cut in half, and taxes on their heirs to be eliminated in most cases.

They essentially took a system that has worked for more than sixty years, and broke it.

The end result: It no longer pays to work. The only winners in this new equation are the idle rich, whose income derives primarily from gains on passive investments. The other big winners are multi-national corporations who hide \$billions in foreign earnings in offshore bank accounts. There is no justice or economic sense in that. These corporations and their investors enjoy the protections of the US Military and Department of State, and pay no taxes. What could possibly be the rational for that?

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**ChrisBieda1** responds:

1/2/2014 9:19 AM PST

"They essentially took a system that has worked for more than sixty years, and broke it."

You weren't an adult during the original Age of Malaise (Carter Administration) were you? The term "stagflation" ring a bell?

It was an article of faith as deep as any current profession thereof that the system was broken back then. Hindsight has not improved the view.

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**7891** responds:

1/2/2014 1:29 PM PST

And that is why we need a system change. The insistence on "jobs" is so 19th and 20th Century. The classical model that one has to "work" for a living has been altered by mechanization. For example, if a factory can buy a machine that does the work of 100 people, it means that 100 people are left without the wherewithal to survive while the same amount of goods are produced as before. And the factory owner pockets the profits.

We need a new system where the excess profits gained by cutting out workers is distributed to them. Whether in the form of guaranteed life payments, or by coupons to receive manufactured goods, the produced wealth must be distributed instead of being kept by the owners of the means of production. It was not the intention of the scientists and engineers who developed mechanization to pronounce a death sentence on the workers who were displaced by their inventions.

When one machine produces for 100, at least 90% needs to be redistributed. The rest goes for owner profit, investment, and R&D. The classical work model is functionally dead but has been around so long that it seems like a moral imperative. "In the sweat of thy brow shalt thou earn thy bread" has been superseded by the advent of the industrial robot. There are too many people and too few jobs. Something needs to change.

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