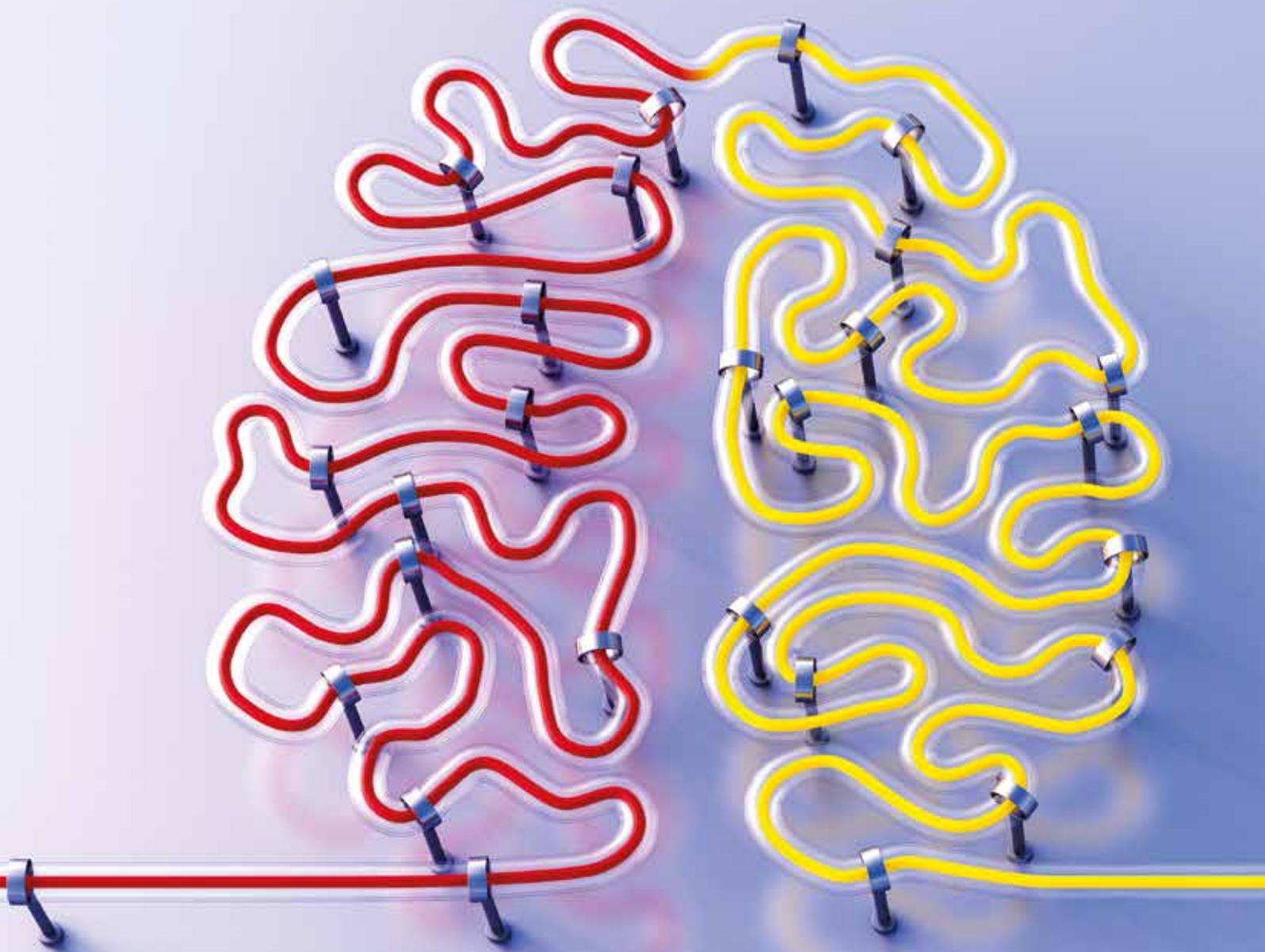


Eight megatrends driving digital disruption



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Seizing the upside of disruption



In a world where everything is changing, the biggest risk is standing still

We live in an age of disruption – when new technology and behavioral shifts that would have seemed unimaginable even a few years ago are transforming the way we live.

Artificial intelligence and robotics are fundamentally reinventing the workforce. Drones and driverless cars are transforming supply chains and logistics, even as they challenge policymakers to rethink existing approaches to infrastructure and regulation. Millennials are changing consumption patterns and demand for everything from cars to real estate.

Responding to disruption has become one of the biggest strategic imperatives facing today's business leaders and policymakers.

But in a world where everything from business models and value networks to political systems and social contracts are being disrupted, how do we seize the upside?

Some of the most disruptive technologies on the horizon (think artificial intelligence and robots) will disrupt not just corporate business models, but also society as a whole. But while these challenges are certainly palpable, how a company responds to disruption will ultimately determine its success.

In short, companies need to disrupt themselves before they're disrupted from the outside.

Understanding the full impact of disruptive trends begins with analyzing disruption through its root causes – technology, globalization and demographics – and asking the right questions.

So how do you disrupt yourself? Companies looking to disrupt their own business models could start by asking five questions:

1 What business are you in?

Disruption has a way of changing the very business that companies are in. You may have thought you were in the business of assembling steel and glass into motor vehicles – but disruption clarifies that the business you are really in is mobility. Customers don't necessarily want to own a car. Their real need is to get from point A to point B, which can just as easily be accomplished with a ride-sharing service.

Are you in the business of manufacturing compact discs – or the business of streaming music? Are you in the business of licensing human drivers – or the business of regulating algorithms in driverless cars? Understanding how your core activity has changed is the first step in re-inventing your business model.

2 Who are your customers?

Disruption does more than empower customers. It creates entirely new customer segments, with different needs and expectations. Are your customers corporations buying mainframe computers – or individuals buying PCs? Are you selling to doctors buying medical devices – or patients managing their health on smartphone apps? Understanding how your customer base has changed, and what the needs of the new customers are, are critical inputs for self-disruption.

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01

3 What's your value proposition?

To respond to the expectations of the new customer base, you need a different value proposition. The value proposition that customers traditionally appreciated may be entirely different from what new customers demand. The traditional value proposition of newspapers was authoritativeness and reputation. In a world of social media and blogs, they have had to create business models built on new value propositions – convenience, 24/7 access, customizability – to remain relevant.

4 Who are your competitors?

Responding to disruption requires making the right comparisons, including comparing yourself with the appropriate competitors. Since disruption attracts non-traditional entrants from other sectors, the peer group you used historically may no longer be relevant. Today, is it more important for auto manufacturers to compete with each other – or to understand how they are competing with sharing-economy start-ups that are disrupting their business?

5 What's the risk of standing still?

Lastly, time is not on your side. We tend to underestimate the speed of revolutions. In assessing the cost-benefit and risk of investments, we often make comparisons in the context of a world similar to today's. The more meaningful comparison, however, is against the environment that will exist in the near future, which could be radically different. The market potential of a disruptive opportunity may seem insignificant relative to the size of your business today – but that calculus could be very different in a disrupted environment, where the market share of the traditional offering has shrunk dramatically.

In a world where everything is changing, the biggest risk is standing still.



Empowered customer: Creating value through experiences

Chapter

02



In order to compete with online rivals, physical shops need to offer more than just the goods on the shelf

Online shopping continues to decimate traditional retailers. It's all over the news. Major retail chains are announcing new rounds of store closings. Members of *Generation Z prefer e-commerce over in-store shopping even more than millennials*. But is brick-and-mortar shopping really going away?

The reality is more complex and somewhat surprising. The U.S. Census Bureau reports that over 90% of all retail sales still take place in-store. New trends such as "click and collect" suggest that consumers like the flexibility of shopping on mobile apps but visiting stores to pick up their merchandise.

At the same time, consumer preferences are changing. Instead of spending on "things," such as purses and shoes, shoppers are increasingly inclined to splurge on experiences, such as a meal at a five-star restaurant or a unique vacation. A recent study by the Harris Group found that 72% of millennials prefer to spend their money on experiences rather than material goods.

For retailers, the intersection of these forces suggests new opportunities to reinvent the in-store model. In order to attract customers to stores, retailers must do things differently: they need to create value by delivering experiences.

Moving toward the experience economy?

In 1998, Joseph Pine first wrote about the rise of what he called the fourth or experience economy, following the agrarian, industrial and service economies. In the experience economy, value creation resides in creating memorable events for customers, with the event – and the lasting memory it creates – being the product that is sold.

"When we first wrote about it, we saw a nascent experience economy," says Pine, Co-Founder of consulting firm Strategic Horizons LLP. Today, advances in technology have laid the groundwork for experience to be embedded in sectors beyond tourism, sports and the various creative industries. "In 2011, the experience economy came – it's a phenomenon that's here," Pine says.

Pine says the shift will force some companies to rethink their business models. "The logical conclusion is that when you look at things economically, you are what you charge for. If you charge for activities, you're in the services business; if you're in the experience business, then you charge for time. It's logical that more and more companies will charge for time."

Redefining the in-store experience

Creating value by delivering better experiences is fast becoming a mainstay across sectors. Personalization is a big component of delivering a good experience. Pine highlights Neiman Marcus and Tesla as two examples.

Dallas-based retailer Neiman Marcus offers an app for customers to download so that when they walk into stores, the technology recognizes them, notifies their favorite salesperson, and keeps detailed information on each customer's preferences, such as styles or favorite colors, so the salesperson can better understand the shopper. Silicon Valley-based Tesla, which has eschewed the traditional car dealership model, has stores in high-end malls around the globe, allowing customers to personalize and design their own vehicles.

E-commerce king Amazon is slowly rolling out retail stores, turning on its head the notion that in-store shopping is obsolete. These stores offer dedicated areas that allow customers to play with Amazon devices such as Amazon Echo or Fire TV. The company's data-driven knowledge of its customers also allows it to experiment with formatting its stores differently; for example, placing seemingly unrelated (but popular) products adjacently.

Outerwear company The North Face is going to the extreme (in the literal sense) to create in-store brand awareness in the hopes of not only driving sales but also giving consumers a unique shopping experience. The North Face partnered with virtual reality start-up Jaunt VR, which describes itself as "pioneering the future of creative storytelling through cinematic virtual reality," to create two in-store experiences that give consumers an idea of what it's like to be an elite climber. The first is designed to allow customers to experience climbing the mountains of Yosemite National Park in California, while the other lets you see what it's like to climb Mount Everest in Nepal.

"As the brand builds out awareness of their products, the emotion, adrenaline and awareness of what it's like to be an elite athlete really comes across." Perkins says the campaigns have been highly effective, especially the Nepal video, calling it "one of the most popular experiences to date."

Delivering a good experience is a differentiator

It stands to reason that as companies continue to innovate and invest in experiences, shoppers will spend more, says Pine. A highly successful example is American Girl's flagship store in Chicago, which offers a live stage production, a café, a variety of birthday party packages and more, with the average visitor staying for four hours, spending more dollars.

The good news is that technology continues to improve, collapsing the boundaries between science fiction and reality. For example, smart mirrors now greet customers, read their emotions and display the weather, time and other information to enrich the retail experience. Companies such as Lego are implementing augmented reality (AR)-powered kiosks into retail locations. Advances such as these will continue to help retailers create new experiences and differentiate themselves from their competitors, Pine argues.

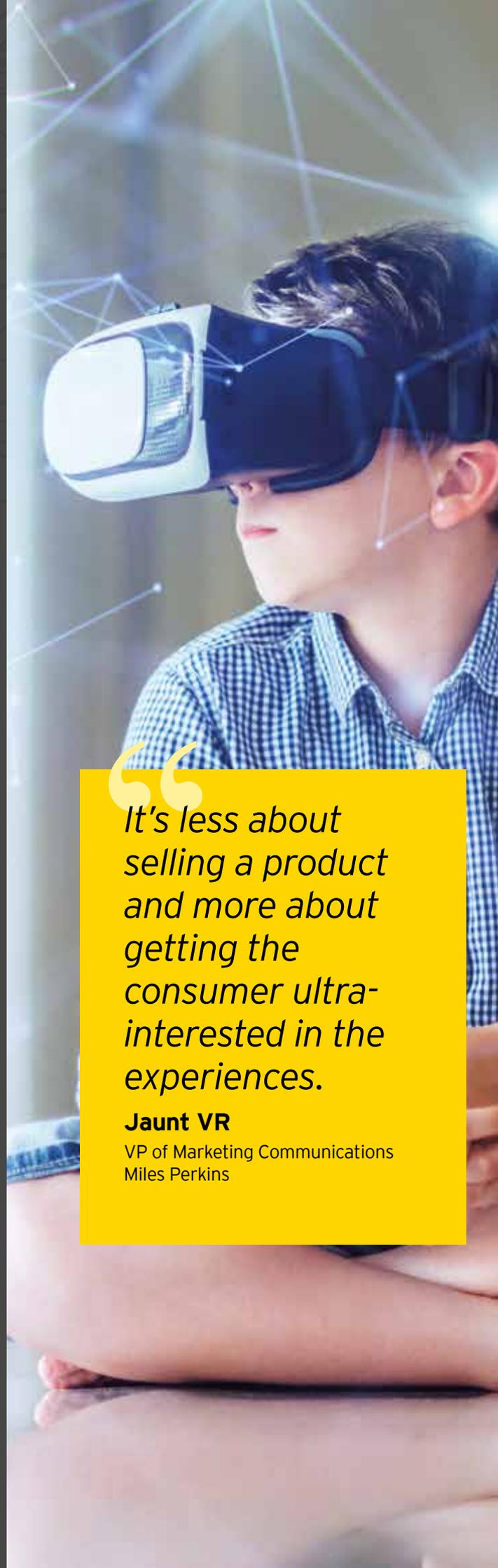
What's next?

Advances in consumer-based technology aren't just limited to a better retail experience for consumers. They can be used in the public sector as well. Pine cites the Cerritos Millennium Library Museum in Cerritos, California, as an example of one of the world's

first experiential libraries. It offers exhibits that combine print materials with web resources, wireless headsets, handheld computers and a host of other features to make the material more interactive for visitors.

"The next step is to use experiences to ... help [customers] achieve their aspirations," Pine says. "What matters is the outcome – then the customer is the product, and you can help them with what they want to achieve." Such a shift will inevitably raise business model questions: will retailers begin to charge explicitly for delivering experience, and how will they measure the value created if not in SKUs sold?

Consumers in the developed world will continue to shop in physical stores, but traditional brick-and-mortar retailers must adapt and change how they do business. From delivering a frictionless experience that rivals online shopping to using in-store virtual reality to entice customers into buying a product to building stand-alone experiences that create indelible memories, it is "game on" for retailers seeking to maximize their physical presence.



It's less about selling a product and more about getting the consumer ultra-interested in the experiences.

Jaunt VR

VP of Marketing Communications
Miles Perkins

Future of work: Can gig economy companies thrive under regulation?



The rise of the gig economy is redefining work and creating ever-evolving regulatory challenges

Business functions and operations have a lot to gain from Digital infusion. Increasingly, companies are adopting digital innovation throughout the organization, shifting their focus from just front-office customer concerns, to operations, business functions, and, indeed, the whole value chain of internal processes and people management.

Technologies such as the internet of things, artificial intelligence and big data, coupled with ubiquity and agility provided by a mobile platform, are changing the traditional business ecosystem in distinct ways. Connectivity has become a hygiene, and with a low cost handheld, driving digital adoption is intuitive for most enterprises.

Digital innovation and mobility are now central to how industries conduct business operations and processes - manufacturing, back office, talent management. They also have a substantial bearing on the way relationship are changing with vendors and suppliers; such as real-time ordering, just-in-time delivery, new transactional models, virtual fulfilment, on the go inventory management etc.

Digital transformation enables businesses to strategize, implement, streamline and manage end-to-end operations across enterprises seamlessly. Streamlining the operations saves lots of money and time for any enterprise and ensures higher efficiency from all resources.

Employees or contractors?

A key point of contention is whether workers on gig economy platforms are employees or contractors. The issue is about more than semantics – contractors do not receive many of the benefits and worker protections afforded to employees.

Ride-hailing company Uber has taken the position that its drivers are contractors, not employees. It recently settled a class action lawsuit – covering drivers in California and Massachusetts – that instituted changes while keeping drivers classified as contractors and not employees.

Meanwhile, Internet-based grocery delivery service Instacart recently turned some of its contractors into part-time employees. With the increasing presence of contract workers, Instacart felt it was important its workers were trained to fulfill customers' needs, which include picking the best items, according to Co-Founder and CEO Apoorva Mehta.

Staying on the right side of legislation

With many services provided outside the traditional bounds of regulation, there are also concerns about whether service providers are paying relevant taxes.

Last year, Airbnb said it would work with municipalities around the world to pay its share of taxes, as well as provide data on its members.

In a November 2015 interview with The New York Times, Chris Lehane, Airbnb's Head of Global Policy and public affairs said "We have always said we want to partner with cities."

Airbnb has created a document, known as the Airbnb Community Compact, to work with the locales where it operates, including sharing anonymized data on hosts and guests, paying hotel and tourist taxes, and helping eradicate illegal transactions.

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The European Commission (EC), which after months of looking at the impact of the sharing economy, recently released a paper saying these types of companies should not be banned, with that measure coming only as a last resort. However, Europe is still struggling with how to deal with these types of companies in terms of legislation and taxation, including the need for value-added taxes on these services.

“The Commission is looking at how we can encourage the development of new and innovative services, and the temporary use of assets, while ensuring adequate consumer and social protection”, the EC says on its website.

Partnering with the public sector

As technology evolves, the regulatory paradigm is slowly shifting with it. In many cases, companies are partnering with regulators in creative ways.

For example, Didi has worked with existing taxi companies in a number of provinces where ride-sharing is still technically illegal.

Sun notes that the company has worked with local governments in China to show it's not competing against existing transportation infrastructure. Instead, Didi sees itself as a valuable supplement, going so far as to show taxi companies how to better manage their data.

“That's one advantage of having strong on-the-ground operations – it's not enough to have a cool online product, but you need real operations and real teams working with drivers and riders to show them why they want to use this structure and why regulators,” say Sun

Didi was the first ride-hailing company to receive an operating license in Shanghai.

Murky but promising future

Though gig economy companies are clearly working within existing regulations, the regulatory playbook is still being written.

New York University's Stern School of Business Professor Arun Sundararajan, who wrote a book about the sharing economy, has argued these companies should regulate themselves, akin to the nuclear power industry.

Public opinion is split on how best to regulate these companies: 42% of respondents to a Pew Research survey feel ride-hailing apps in particular shouldn't follow the same rules and regulations as taxi companies, while 35% of respondents feel they should, and 23% are unsure. Similar splits can be seen for home-sharing platforms, with 56% saying the platforms are legal and owners should not have to pay taxes, whereas 31% believe they're legal, but taxes should be paid.

Lawmakers are faced with the task of trying to craft legislation so that these companies pay their fair share of taxes and protect their constituents – while regulating them in ways that are relevant and do not stifle innovation.

For companies operating in this rapidly evolving space, perhaps the only certainty is that things will remain uncertain in the near term. In the absence of a larger framework, regulatory issues will likely be resolved one local jurisdiction at a time.

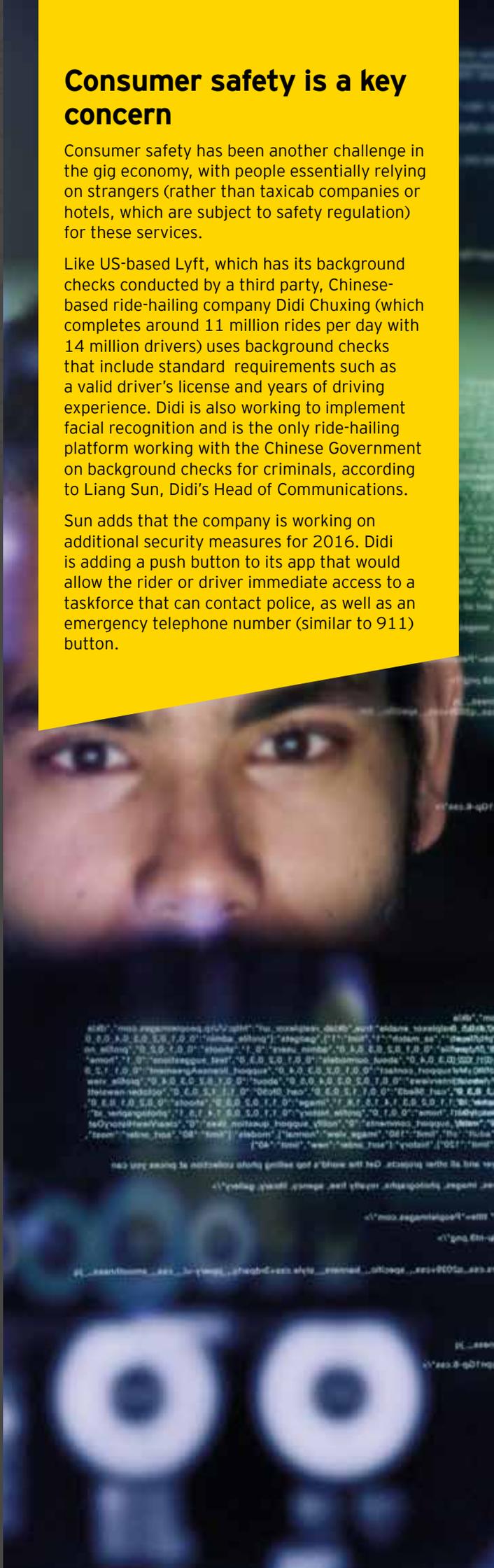
Wherever possible, partnering with authorities can foster constructive, longer-term relationships. Companies should remember that the media and consumers are following these developments with interest – and that reputations matter in business models based on social networking and transparency. It's entirely possible to win these regulatory battles and lose the PR war.

Consumer safety is a key concern

Consumer safety has been another challenge in the gig economy, with people essentially relying on strangers (rather than taxicab companies or hotels, which are subject to safety regulation) for these services.

Like US-based Lyft, which has its background checks conducted by a third party, Chinese-based ride-hailing company Didi Chuxing (which completes around 11 million rides per day with 14 million drivers) uses background checks that include standard requirements such as a valid driver's license and years of driving experience. Didi is also working to implement facial recognition and is the only ride-hailing platform working with the Chinese Government on background checks for criminals, according to Liang Sun, Didi's Head of Communications.

Sun adds that the company is working on additional security measures for 2016. Didi is adding a push button to its app that would allow the rider or driver immediate access to a taskforce that can contact police, as well as an emergency telephone number (similar to 911) button.



Behavioral revolution: What will it take to make us healthier?



It's our small, everyday behaviors – such as our eating and exercising habits – that collectively can have a massive impact on our world

If we don't take care of ourselves day in and day out, it can affect the global economy by lowering productivity and driving up health care costs. So how can we motivate healthier behaviors?

"It's going to take a lot of different changes to how we live our lives," says Jason Doctor, Director of Health Informatics at the University of Southern California's Leonard D. Schaeffer Center for Health Policy and Economics.

To encourage people to make significant changes, campaigns and incentives must come from many governing bodies, such as the government, nonprofits, businesses and major food companies. No single campaign or initiative will get everyone to improve, experts say.

Moving toward the experience economy?

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Pine says the shift will force some companies to rethink their business models. "The logical conclusion is that when you look at things economically, you are what you charge for. If you charge for activities, you're in the services business; if you're in the experience business, then you charge for time. It's logical that more and more companies will charge for time."

Employers are aiming to do their part with comprehensive, nuanced wellness programs that make getting healthy personalized and fun. Roughly 80% of US employers offered health improvement programs in 2015, spending an average of \$693 on financial rewards or prizes per employee who works toward getting healthier. This is up from \$594 in 2014 and \$430 five years ago, according to a survey.

Michelle Lee D'Abundo, a professor in Seton Hall University's Department of Interprofessional Health Sciences and Health Administration, sees a trend in employers offering personalized care by having wellness coaches meet individually with workers on-site to regularly discuss goals, progress and concerns.

Manufacturing company Draper Inc. and pharmaceutical companies such as Novartis and GlaxoSmithKline offer this perk.

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“Every individual is different and has their own set of motivations and personal values,” says Laura Hunter, Health Project Leader at United Kingdom-based GlaxoSmithKline. “Workers will respond to programs that meet them where they are at and are customized to their individual needs and goals.”

D’Abundo added, “The coaching process empowers individuals to identify what they want to change, what prevents them from changing and then how they can create an action plan to get what they want. Individualized wellness incentives like coaching help the employee feel valued, which I feel is the most important employee motivator in the workplace.

Other wellness incentives come in all shapes and sizes. For example, outside Draper’s Indiana office, employees have access to a communal garden, a track, workout stations, table tennis and volleyball courts. The company also has unique challenges with big rewards, including a yearlong step challenge. The worker who was the most active was rewarded with a trip for two to Hawaii.

Additionally, the company’s monthly newsletter, “Healthy Bites,” features employees nominated by their peers as a “Wellness Superhero” to celebrate their success and inspire others.

Switzerland-based Novartis offers subsidies for joining local sporting teams; health workshops on topics such as mindfulness and smoking cessation; free health screenings; and customized plans for employees who need to take extended leaves of absence. The global company’s cafeterias make the healthiest option on the menu the cheapest, according to Jessica Anner, head of the company’s global Be Healthy program.

“We’re constantly evolving our programs,” Anner says. “There shouldn’t just be a once-a-year event, and you shouldn’t just follow the latest health trend. It needs to be a sustainable, longtime program.”

A wide-ranging, sustained approach can pay off. Between incentives and personalized care, Draper has seen improvements in employee health since it started tracking in 2011. Over the last five years, workers’ health improved in the following areas: BMI by 6%; blood pressure by 19%; glucose by 1%; cholesterol by 10%; and smoking cessation by 16%.

But the goal is loftier than merely having healthy employees who work more productively.

“Healthy employees, healthy company, healthy community, is the broader objective,” says Linda Brinson, Safety and Wellness Director at Draper.

Perhaps these employer wellness incentives will inspire new campaigns from the top.

“There are more opportunities now with social media, advances in internet software, and more people tracking data on themselves and sharing that information,” Doctor says. “There are more capabilities to implement campaigns and incentives than ever before.”

The proliferation of wellness programs is a positive step – and a reflection of the increasingly urgent need to control health care costs. But turning the tide on chronic disease requires decades of consistent behavioral change, and only time will tell whether these programs can deliver long-term results. As companies experiment with different approaches, they are more likely to incorporate

“*Incentives are pebbles in a stream when you’re trying to build a dam – each can have a small positive effect, but you need a lot of them to make a difference.*”

Jason Doctor

Director of Health Informatics at USC’s Leonard D. Schaeffer Center for Health Policy and Economics



Future of smart: How is AI helping humans right now?



Despite fears of a dystopian future expressed by Stephen Hawking, Elon Musk and others, artificial intelligence is actually helping people live better lives already, and its future is especially bright

Artificial intelligence is not only here to stay – it is one of the few technologies that “could profoundly affect our economic well-being in the 21st century,” reshaping the way labor and capital are allocated, according to International Monetary Fund Managing Director Christine Lagarde.

Investment in the space has soared over recently, from \$45 million in 2010 to \$310 million in 2015.

“It’s likely that artificial intelligence will help humans make better decisions in many aspects of our lives, helping us better model which decisions are likely to lead to the best outcomes, helping us cure diseases, preventing accidents and natural disasters, and so on,” says Jan Dawson, Chief Analyst at Jackdaw Research.

Whether it’s making smarter financial decisions, improving health care and the patient diagnosis process, or simply handling mundane tasks such as booking hotels and restaurants, artificial intelligence is augmenting and improving life for the better.

Artificial intelligence in the now

Take something as difficult as predicting the weather – meteorologists have been trying to do it for years, with mixed success. Now, thanks to artificial intelligence, the predictions can be far more accurate with wider-reaching implications.

IBM’s purchase of The Weather Company for a reported \$2 billion-plus spurred the creation of its new hyper-local predictive model, Deep Thunder, which uses historical data to train machine learning models to precisely forecast the weather and its impact on businesses. In addition to being able to predict the weather, IBM will help its clients increase efficiency by predicting consumer behaviors during even the slightest changes in weather patterns, helping them market and stock products in real time.

Not all artificial intelligence is created equal, however. It’s important to understand the differences between what you might see every day when you check your smartphone first thing in the morning and what goes on behind the scenes at a big corporation.

Soft AI, which includes services such as Apple’s Siri and Amazon’s Alexa and Viv that function as intelligent assistants, is already here and aiding in simple tasks, such as sending texts, booking hotels or restaurant reservations, and ordering taxis.

There is also hard AI, in which the software actually makes decisions on its own and augments human intelligence.

Artificial intelligence isn’t likely to be limited to products and services; it can also help with creative tasks – things humans have traditionally excelled at over machines, says Chris Mazzei, EY Global Chief Analytics Officer.

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"An example of this is various pieces of music – some have been composed by people, others by machines, and people were asked to tell which were composed by man and which were machine," Mazzei states. "The punch line is that people couldn't tell the difference, demonstrating the creative process can be handled by AI and machine learning, with boundaries being stretched and challenged on things humans are uniquely qualified to do."

AI is also a huge component of the future of smart technology and connected devices, the so-called Internet of Things, in which everyday objects have network connectivity, allowing them to send and receive data.

Boosting efficiency

Chinese ride-hailing company Didi Chuxing is using artificial intelligence to help make drivers' routes more efficient. Didi's Head of Corporate Communications, Liang Sun, notes the company is working with municipalities to help make better sense of their data.

"We've got to make sure the technology is good enough to handle demand fluctuations and not have drivers sit in congestion, losing income," Sun says. "This is where we're putting our money into changing the broader traffic picture and changing people's lives – no one is going to wait for 15 minutes for a car, even if they're getting a little subsidy."

Artificial intelligence can also be used to improve call centers and improve customer service. Amelia, developed by IT services firm IPsoft, has algorithms that can understand instruction manuals and guidelines to help customers, tasks that ordinarily would take a person weeks or even months to fully comprehend.

"Amelia learns with every transaction and builds a mind map on the fly," IPsoft CEO Chetan Dube said in a 2015 interview with Entrepreneur. "As more incidents come in, this mind map is rapidly building, just the way humans build their mind maps. Soon it represents the cumulative intellect of all the different [employees] who have been fielding these different calls."

I suspect there are very few fields which won't be touched in some way by AI over the coming decades, and in many cases AI will entirely transform the way we do things.

Jan Dawson

Chief Analyst at Jackdaw Research

Resourceful planet: How will economic energy storage help the world work better?



Efficiently storing energy created by renewables has been a significant barrier to their adoption. But that might be about to change...

Imagine a world where it's cheaper to drive an electric vehicle powered by solar energy from your roof than one burning fossil fuels. Or where every home is an energy trading platform, helping to green and optimize the grid. Or where light and new productivity is brought to millions of people who lack regular access to electricity without building fossil fuel power plants.

This transformation could come faster than most expect.

The precipitous fall in renewable energy equipment costs drove the first wave of clean energy disruption, challenging utility business models as businesses and households adopted onsite solar energy. Global residential solar capacity increased nearly ten-fold over the last decade, according to data from Bloomberg New Energy Finance.

Now energy storage is following a similar path of cost improvement and scale, which will enable new business models and value streams that will transform both our energy systems and our lives.

The cost of lithium batteries, for example, is expected to decline around 50% over the next five years, according to a report by financial advisory firm Lazard. All told, energy storage costs could fall up to 70% over the next 15 years, according to a report by the World Energy Council. In other words, let the disruption begin.

Economic energy storage improves the value proposition of rooftop solar by empowering the energy customer to store self-generated electricity and use it when grid energy is more costly. It also creates opportunities for the customer to participate in energy markets in new ways.

Take German company Sonnen Inc., which two years ago launched a residential energy storage system in its home country called the "eco," optimizing the use of self-generated solar energy for half the cost of other options on the market. It's now bringing its storage offering to the US market to respond to the growing demand for rooftop solar systems enhanced with energy storage.

However, it is reducing the cost of its US product by 40% through the use of value engineering, which leaves out some components of a regular system, such as back-up power. "We don't see our competitors doing this in the US," says . "This will put us in a cost leadership position in the US."

Sonnen also recently launched a community energy storage system that has the potential to disrupt conventional utilities by allowing German residential users to trade their self-generated renewable electricity among one another and sell the excess to the market.

The new US product "can completely disrupt the way we consume and are exposed to energy and electricity," von Bormann says. "We have a more structured, small-centralized approach rather than a large, centralized one."

Sonnen sees this kind of product as an example of how new forms of energy storage can transform the entire energy industry.

"Energy storage is key to unlocking renewables in the long term," says von Bormann. "That can completely disrupt the way we consume and are exposed to energy and electricity."

Further on the horizon are the household energy trading possibilities enabled by blockchain. Earlier this year, one household in a microgrid in Brooklyn, NY, sold self-generated solar energy to another household through a blockchain transaction. As households increasingly integrate distributed energy resources, grids become smarter and technologies such as blockchain democratize

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transactions, we're likely to see the emergence of the home as an energy trading platform.

Innovations in the materials used in lithium-ion batteries – powering everything from smartphones to electric cars – are another potential source of disruption. Researchers are now substituting the traditional graphite anode with silicon, which yields 10 times the charge capacity. While in the near-term that will allow for 40% to 50% higher battery life, it's projected that silicon anode Li-ion batteries will soon store more than 10 times as much energy as the current graphite anode technology.

"This will allow energy-dependent devices to be much more powerful and integrated, and allow devices to be invented that aren't even thought of yet," says Jeff Norris, CEO of Paraclete Energy, which specializes in silicon anode materials for batteries. Norris explains that more powerful batteries can impact devices such as mobile phones and vehicles, as well as entire communities through smart cities. "By impacting the battery and making it more powerful, you create a whole new economy."

For electric vehicles (EVs), the majority of which run on lithium-ion batteries, these performance improvements could accelerate a tipping point. Allowing drivers to travel much farther without stopping for a charge addresses the range anxiety that deters many consumers from purchasing an EV.

Tesla has already taken a "baby step toward the direction of using silicon in the anode," in the words of CEO Elon Musk, which contributed to a 6% increase in the range provided by its high-end battery pack¹.

But these developments will also improve related value propositions, such as vehicle-to-home and vehicle-to-grid applications, and battery second use, which improve the overall economics of EVs.

Despite Sonnen's swift growth, it has only sold systems to 12,000 households globally. "You have to make it so affordable that you can deploy storage and create a large penetration," von Bormann says. "We're still in infancy if you look at energy storage."

While energy storage is catalyzing disruption in markets with established grids, its biggest impact is likely to be felt in regions without an electric grid. One billion people lack access to reliable electricity or don't have it all.

Steve Johanns, President and CEO of Chicago-based Veriown, which installs microgrids in the US and in rural areas of India and Africa, says: "Right now, the demand is so high and the math makes more sense in places like India, and East and West Africa. We're effectively replacing kerosene or the current batteries they use. It's a massive market. In the US, this is an evolution, evolving from traditional fossil fuels, and moving down toward more distributed systems. But in the energy markets, it really is a revolution."

Realizing the upsides

Key stakeholders stand to benefit by staying ahead of the curve as the adoption of energy storage solutions as cost and performance gains propel widespread adoption.

Corporations need to understand the pace of change and potential market impacts to realize the potential upsides, whether in terms of new revenue opportunities, operational competitiveness or sustainability objectives.

Governments should assess for gaps between the present regulatory frameworks of energy storage and the potential net benefits to consumers, resource efficiency and resilience.

For entrepreneurs, the declining costs of energy storage technologies combined with digital innovations opens the opportunity to disrupt and capture new value streams. Similarly, investors, whether venture capital, private equity or institutional, must develop a view on the energy system of the future implied by uptake in energy storage and determine the right place to play for a given asset class.

¹Tesla tweaks its battery chemistry: a closer look at silicon anode development," Charged Electric Vehicles Magazine website, <https://chargedevs.com/features/tesla-tweaks-its-battery-chemistry-a-closer-look-at-silicon-anode-development>, accessed on 15 July 2016.



Urban world: A tale of two cities



Increasing urbanization will alter our existing cities and create new ones too

More than half the world's population currently resides in cities and that number is set to swell to 66 percent by 2050, according to the United Nations. This likely doesn't come as much of a shock to people already living in a bustling metropolis like New York City or Hong Kong, where one need only to peer outside, or better yet – glance at their monthly rent check to appreciate the rising demand for urban real estate.

But beyond the rise in demand, cities are becoming powerful drivers of economic output. By 2030, the world's 750 largest cities are projected to account for 61 percent of global GDP and gain 220 million additional middle-class consumers. Urbanization will engender radical change across a broad range of industries, transforming agricultural economies into thriving manufacturing hubs and creating countless service jobs in emerging markets like India and Nigeria.

In the meantime, many global cities are already starting to grapple with the demographic implications of urbanization: namely, how to connect and efficiently serve a rapidly growing population. To get a sense of how this is playing out on the ground, we took a look at two rapid growth market cities on opposite ends of the globe: Medellín, Colombia and Zhengdong New District, China.

Retrofitting a bloody history

Residents and academics alike generally regard Medellín through the lens of two distinct epochs: pre- and post-Escobar. Little more than two decades ago, the city was the narco-trafficking capital of the world, home to the feared Medellín Cartel and source of much of the cocaine that flooded American cities throughout the 1970s and 1980s. Its name was synonymous with violence, corruption and crime.

Although Colombia today is still reportedly the world's top producer of coca, the city of Medellín has little in common with the violent, outlaw image that defined its identity in the past. Crime continues to be an issue, albeit a much smaller one. A 2012 profile by the New York Times mostly describes a bustling metropolis, host to some 3.5 million residents and a flourishing tourist industry.

Like others, the Times credits Medellín's revamped metro and cable car system as a key driver in the city's resurgence. The system's greatest victory is arguably one of inclusivity – linking together the city's poor and peripheral neighborhoods to Medellín's core. This

in turn has not only opened up vocational opportunities where they previously didn't exist, but has also helped to foster additional economic development from both the public and private sectors.

The mass transit system – comprising trains, gondolas and enormous hillside escalators that turn a 30-minute climb into a 5-minute ride – also represents a point of pride for many locals.

Since the Metro was implemented, the citizens have embraced it as a very valuable community heritage," said Elkin Tamayo, a Medellín resident. "What is very interesting is that even the poorest neighborhoods, where law enforcement was once nonexistent, where citizen culture is supposed to be very scarce, users are very proud of the cable cars and overall system. It has enhanced quality of life for hundreds of thousands of people in the city."

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In retrofitting much of its existing infrastructure, Medellín represents a success story in transforming that which was old into something new. But across the globe in China, the city of Zhengdong New District is a case study in the opposite approach: building from scratch.

A Tabula Rasa in the East

In 2013, CBS' 60 Minutes dispatched a news crew to China to film a segment in Zhengdong New District, located in Zhengzhou, Henan province. The story posited a simple but captivating premise: that Zhengdong was part of a troubling new trend of so-called "ghost cities" popping up around the country – built to accommodate millions but inhabited by virtually no one.

This proved to be a tantalizing notion in the West, inspiring no shortage of follow-up stories. The problem, according to Wade Shepard, author of *Ghost Cities of China*, is that this narrative only tells part of the story. He says the 60 Minutes crew arrived just five or six years after construction had begun in earnest, well before the city was in shape to support the population it was ultimately designed for.

That seems to be an assertion borne out by evidence. Today, Zhengdong New District is home to more than 2.5 million residents and that number is expected to double by 2020.

"What we see in Zhengdong is one of the most vibrant economic areas in China today," Shepard said. "Zhengzhou sits at the crossroads of north-south and east-west high-speed and conventional rail lines, as well as China's main highway network. It's really the crossroads of the country, and they made Zhengdong New District kind of the heart of the country."

In building from scratch, China was able to adopt a relatively simple strategy: the country looked at what was wrong with their existing cities and built the opposite. At the outset of the construction boom, this ironically meant importing many Western values. For one, cities were designed to be more car-centric. Many were also built to reflect the aesthetics of American upper-middle class suburbia.

Today, China recognizes that much of its domestic policy on urban planning is predicated on dated paradigms, but in spite of its size, the country is able to shift toward new programs with surprising agility. The government's new mandate, according to Shepard, is for condensed, walkable cities that are eco-friendly.

"As they say in China, everything in China changes every five years," Shepard said. "The power that the government has to entice change is extreme. The entire country can do a complete about-face, turn 180 degrees and start going in the opposite direction tomorrow."

That level of control comes at a price. According to William Hurst, an associate professor of comparative politics at Northwestern University, an initiative like Zhengdong New District can be called many things, but "egalitarian" isn't one of them.

"[Zhengdong New District] amounts to urbanization through administrative fiat," Hurst said. "An area of roughly 250 km² – larger than the city of Boston – that had previously been rural was requisitioned by the prefectural government. Farmers were evicted and hundreds of buildings, along with hundreds of miles of streets, electrical and telephone lines, sewers, and all the other physical trappings of urban infrastructure were put in over the following decade or so. To date, however, few people or businesses have moved there, though this may now be changing."

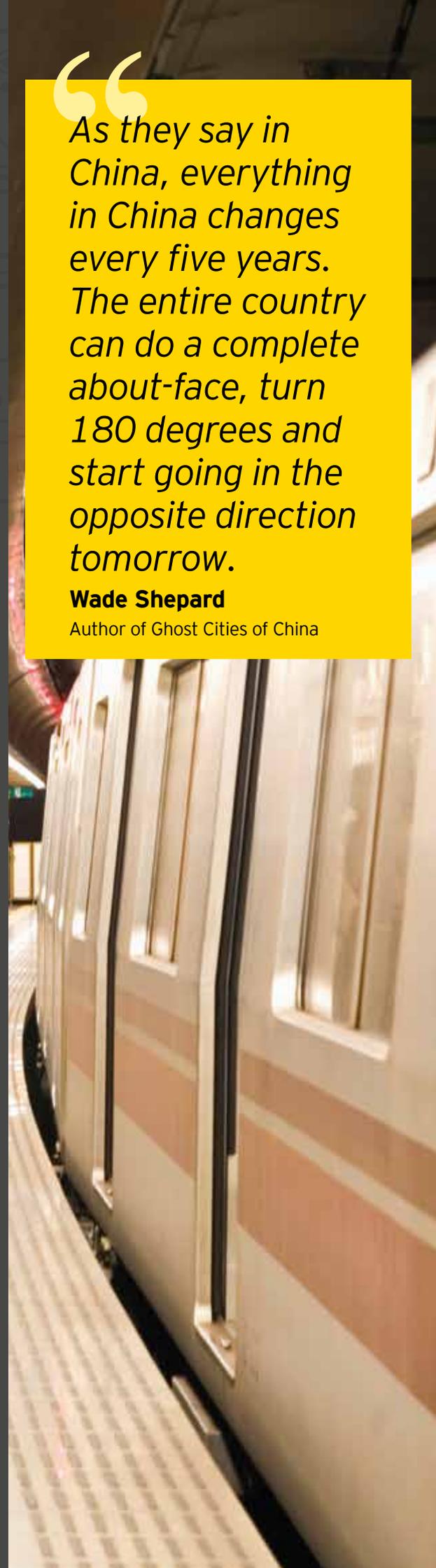
For his part, Hurst disagrees with the assertion that Zhengdong is blossoming into a vibrant economic area – arguing instead that the few residents who've gone there are lured primarily by cheap housing and the promise of government subsidies for establishing a new business.

In either case, one thing is certain: Zhengdong and cities like it represent a bold attempt at imagining a new urban future. Whether that vision is accurate remains to be seen.

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Wade Shepard

Author of *Ghost Cities of China*





Health reimagined: How mobile apps are improving maternal care in rural Africa

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Mobile connectivity is now giving many more people access to medical advice and treatment, at a fraction of the previous cost

When 20-year-old Mitike Birhanu's baby girl was born, she wasn't breathing. It had been a difficult childbirth – Birhanu had experienced severe back pain, then fell unconscious, and when health workers in her rural Ethiopian town of Gimbie saw her lifeless baby, they were unsure what to do. Instead of panicking, they took out their mobile phones and sought advice from a mobile application called Safe Delivery App. It instructed them to remove fluid from the baby's nose and give her oxygen. Soon, the baby began to show signs of life.

The app, developed by the Copenhagen-based nongovernmental organization (NGO) Maternity Foundation, is part of a burgeoning global effort to use wireless technology to improve maternal health care in rural Sub-Saharan Africa. From mobile apps featuring videos on childbirth to text messaging about prenatal checkups, there's one main goal: to ensure safe and healthy pregnancy.

There is certainly a need. More than 300,000 women die every year from complications related to pregnancy, according to the World Health Organization (WHO).

Ninety-nine percent of these deaths occur in developing countries, and mortality is higher in poor, rural areas. Still, as the Maternity Foundation points out, helping health care workers gain the right knowledge and skills can prevent more than 90% of these deaths. A host of local and international NGOs, in conjunction with local health ministries, are working to provide that quality instruction through mobile technology.

The mobile phone: platform of choice

Why mobile phones? While not all rural African areas have doctors and clinics, most residents do have mobile phones. Indeed, the growing popularity of cell phones there makes them a practical and cost-effective platform for education, says Darrell West, Director of the Center for Technology Innovation at the Brookings Institution and author of the book, *Going Mobile: How Wireless Technology is Reshaping Our Lives*. "People like the convenience and accessibility of phones," he says.

The Maternity Foundation has taken that cue. It developed the Safe Maternity App three years ago, using WHO guidelines on maternal care to create sketches and videos that could be easily accessed on a phone. Now, a quick download from the App Store or Google Play can give anyone in the world access to 10 videos on subjects including the manual removal of a placenta, neonatal resuscitation or preventing infection. The app also includes lists of relevant drugs and procedures, as well as push notifications with quizzes that encourage health care workers to test their knowledge.

The approach sounds effective, but how do the organizations funding them know they're having an impact? Some, like the Maternity Foundation, have set out to measure this. The organization conducted a study with 126 Ethiopian health workers in 2014; half of them were given access to the app's videos and the other half were not. One year later, Danish professors tested the two groups on their knowledge and skills and evaluated their skills by running childbirth simulations. The results showed the workers with the app were twice as likely to have the skills to resuscitate a newborn or manage postnatal bleeding.

Older tech as well as new

Apps aren't the only effective platform. The Cameroon-based organization Gifted Mom, for instance, created an SMS service that sends text messages aimed at educating mothers about maternal care.

"We still have many women who don't have access to education and don't know about health issues," says Mounira Moustapha, the group's communications manager.

The messages also remind women to go to the hospital for checkups. While the WHO recommends a pregnant woman receive at least one prenatal checkup every three months, some women in rural parts of Cameroon go six months or more without one.

"Many women in rural areas don't go to the hospital because they think they have to pay. We send information to tell them they have free resources," says Moustapha.

Gifted Mom reports a 20% increase in attendance at prenatal appointments over the past six months.

There are other new frontiers in mobile health that may impact maternal health care as well. Doctors are starting to give patients remote monitoring devices that feed the physicians information about patients' heart rates, blood pressure and other vital signs, even though they are sometimes hundreds of miles apart. If doctors see a spike in blood pressure, for example, they can send a text message to a patient recommending they seek medical care.

"They would text the person and say they have noticed a particular problem and engage the person," says West.

Such remote monitoring isn't as common in maternal health care, but that won't last long. "This is the next wave," he says.

As for mobile apps, their reach is growing fast. The Safe Delivery App, which was first rolled out in Ethiopia, is also in Kenya, Laos and Myanmar, and it's being used by Red Cross workers.

"The focus now," says Maternity Foundation CEO Anna Cecilia Frellsen, "is to get it in the hands of as many health workers as possible."

The crossbreeding of wireless technology, apps and health care has opened a new – and hopeful – degree of accessibility for lifesaving information in areas that were previously denied basic maternal health care. With growing cost pressures and significant unmet medical needs in many parts of the world, we expect the use of mobile health approaches to become more commonplace.



Industry redefined: convergence means survival of the fittest



At the heart of some of the most game-changing technologies of our time – from 3-D bio-printing to self-driving cars – is the concept of industry convergence

Industry convergence – the blurring of two or more previously distinct industries – has different flavors. A technology company with a unique business model can enter a legacy industry with a better idea and grab market share quickly. Incumbent companies are then forced to innovate in unexpected ways in their own industries, as well as go beyond their own sector walls to remain competitive. A company that collaborates with an organization from an altogether different industry is yet another form of convergence.

Why is it happening now?

Several reasons are behind this phenomenon. The rise of new technologies, including artificial intelligence and 3-D printing, as well as the proliferation of data and stronger connectivity, has made it possible to serve consumers in new ways, attracting fresh competitors that specialize in these technologies. Empowered consumers themselves are shaking up industries by redefining what's important to them. Given the rising costs of health care, climate change and urbanization, there is also a growing need for interindustry partnerships and alliances to solve big problems.

“As industry boundaries become more porous, existing companies in an industry will face competitive threats from start-ups with new and disruptive business models, as well as from formidable companies in previously unrelated sectors,” according to EY’s report on megatrends.

Whether incumbent or start-up, companies with the most sophisticated capabilities, such as the ability to effectively develop algorithms or analyze big data and turn it into actionable insights, are in a good position to succeed in different markets.

Many technically proficient companies crossing industry boundaries are large and well-established. Google’s parent company – Alphabet – is developing self-driving cars with Google’s software and map information. And GE has pioneered the Industrial Internet, an open, global network that connects people, data and machines to maintain optimal performance of manufacturing plants, energy companies and utility companies.

Smaller, entrepreneurial companies will also continue to shatter industry walls. FinTech start-ups are reshaping banking, which, in the past, has been slow to adopt new technologies.

Kabbage’s online lending platform aims to make it easier for small businesses to get the funding they need to grow. By using data points culled from multiple sources, such as buyer feedback ratings, selling history, turnover, accounting data, bank account information and other metrics, it can quickly provide access to a line of credit for qualified applicants. Rather than focusing on a founder’s credit score, Kabbage relies on these other data points to gain a broader understanding of a business’s financial state, which banks weren’t previously able to do.

But agile competitors won’t necessarily cut banks out of the picture. “Banks are in the best position to serve these businesses, but don’t have technology,” said Kathryn Petralia, Kabbage’s co-founder and COO. “That’s the reason why we have this platform.”

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Several large financial institutions have partnered with Kabbage to provide loans more quickly to business customers.

“Data and technology is the future of this industry and we want to be part of it, not compete with banks,” Petralia said. “Banks will need to partner with tech companies to stay ahead.”

Petralia says that 10 years ago, Kabbage – started in 2009 – couldn’t have existed due to the lack of online data and the analytics.

Driving improvements in health care

Analogous to what’s happening in the banking industry, health care’s convergence with technology has also made access to care more affordable and efficient. Digital health start-ups, such as MUrgency, are using mobile technology to allow users to summon an emergency response via a quick tap on their smartphone. Ireland-based GlowDx uses DNA-computing technology to create a fast, easy-to-use and inexpensive diagnostic tool for dengue fever and other tropical diseases in the developing world.

23andMe, a genetics testing start-up, uses a technology called genotyping to provide reports at affordable rates. Reports reveal whether the person is a carrier of genetic variants for diseases such as sickle cell anemia and cystic fibrosis. It can also reveal whether a person has the variant for lactose intolerance.

The user provides a saliva sample from home, mails it to the company’s lab and 23andMe delivers the report.

Eighty percent of 23andMe customers consent to participate in research with their saliva sample. Their data is used to help power the work done by 23andMe scientists or third-party researchers. A customer who opts in to research contributes to hundreds of studies that range from Parkinson’s disease to lupus to asthma

Seizing the upside

In an era of convergence, industry boundaries will become increasingly blurred. Companies will face competition from start-ups and established businesses, some from unrelated sectors and even some who may have been partners in the past.

But the news isn’t all menacing. Convergence may be rendering conventional value chains obsolete, but it also offers huge opportunities for growth to those willing to seize the upside.

The future belongs to those who are willing to think differently and look beyond their own industry borders to identify new problems to solve, to engage customers in creative ways and form unexpected partnerships.



*To seize the upside of disruption, organizations must examine how every one of these **eight megatrends** may impact upon their strategy.*

Summary



EY contacts

Asheesh Malhotra

Partner - Digital Advisory Services

E-mail: asheesh.malhotra@in.ey.com

Guru Malladi

Partner - Advisory Services

E-mail: guru.malladi@in.ey.com

Pradeep Sharma

Senior Manager - Digital Advisory Services

E-mail: pradeep2.sharma@in.ey.com

Our offices

Ahmedabad

2nd floor, Shivalik Ishaan
Near C.N. Vidhyalaya
Ambawadi
Ahmedabad - 380 015
Tel: + 91 79 6608 3800
Fax: + 91 79 6608 3900

Bengaluru

6th, 12th & 13th floor
"UB City", Canberra Block
No.24 Vittal Mallya Road
Bengaluru - 560 001
Tel: + 91 80 4027 5000
+ 91 80 6727 5000
+ 91 80 2224 0696
Fax: + 91 80 2210 6000

Ground Floor, 'A' wing
Divyasree Chambers
11, O'Shaughnessy Road
Langford Gardens
Bengaluru - 560 025

Tel: +91 80 6727 5000
Fax: +91 80 2222 9914

Chandigarh

1st Floor, SCO: 166-167
Sector 9-C, Madhya Marg
Chandigarh - 160 009

Tel: +91 172 331 7800
Fax: +91 172 331 7888

Chennai

Tidel Park, 6th & 7th Floor
A Block No.4, Rajiv Gandhi Salai
Taramani, Chennai - 600 113
Tel: + 91 44 6654 8100
Fax: + 91 44 2254 0120

Delhi NCR

Golf View Corporate Tower B
Sector 42, Sector Road
Gurgaon - 122 002
Tel: + 91 124 464 4000
Fax: + 91 124 464 4050

3rd & 6th Floor, Worldmark-1
IGI Airport Hospitality District
Aerocity, New Delhi - 110 037
Tel: + 91 11 6671 8000
Fax + 91 11 6671 9999

4th & 5th Floor, Plot No 2B
Tower 2, Sector 126
NOIDA - 201 304
Gautam Budh Nagar, U.P.

Tel: + 91 120 671 7000
Fax: + 91 120 671 7171

Hyderabad

Oval Office, 18, iLabs Centre
HITECH City, Madhapur
Hyderabad - 500 081

Tel: + 91 40 6736 2000
Fax: + 91 40 6736 2200

Jamshedpur

1st Floor, Shantiniketan Building
Holding No. 1, SB Shop Area
Bistupur, Jamshedpur - 831 001
Tel: +91 657 663 1000
BSNL: +91 657 223 0441

Kochi

9th Floor, ABAD Nucleus
NH-49, Maradu PO
Kochi - 682 304
Tel: + 91 484 304 4000
Fax: + 91 484 270 5393

Kolkata

22 Camac Street
3rd Floor, Block 'C'
Kolkata - 700 016
Tel: + 91 33 6615 3400
Fax: + 91 33 2281 7750

Mumbai

14th Floor, The Ruby
29 Senapati Bapat Marg
Dadar (W), Mumbai - 400 028
Tel: + 91 22 6192 0000
Fax: + 91 22 6192 1000

5th Floor, Block B-2
Nirlon Knowledge Park
Off. Western Express Highway
Goregaon (E)
Mumbai - 400 063

Tel: + 91 22 6192 0000
Fax: + 91 22 6192 3000

Pune

C-401, 4th floor
Panchshil Tech Park
Yerwada
(Near Don Bosco School)
Pune - 411 006

Tel: + 91 20 6603 600
Fax: + 91 20 6601 5900

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