# *Concurrent Session: City of the Future*

*Thursday, March 31st*
*9:45am – 11am*
*Marriott Marquis, Washington DC*

**Moderator:**
Stephen Theriot, CFO, Vornado Realty Trust

**Panelists:**
Eamonn Kelly, CMO, Deloitte Consulting LLP
Anita Kramer, SVP Center for Capital Markets & Real Estate, Urban Land Institute
Jesse Tron, VP-Communications, International Council of Shopping Centers

# REIT Wise®

NAREIT's Law, Accounting & Finance Conference

March 30 - April 1

2016

# City of the Future

March 31, 2016

# City of the Future

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|---|---|
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# Disruptive Technology & Innovation

# TECHNOLOGY ACCELERATION: A PROFOUND SYSTEMIC SHIFT

**Connectivity**

**Sensors**

**Smartphones & Digital Devices**

**Computing Power (Moore's Law)**

**The Cloud**

**"Application" & Developer Ecosystems**

**People**

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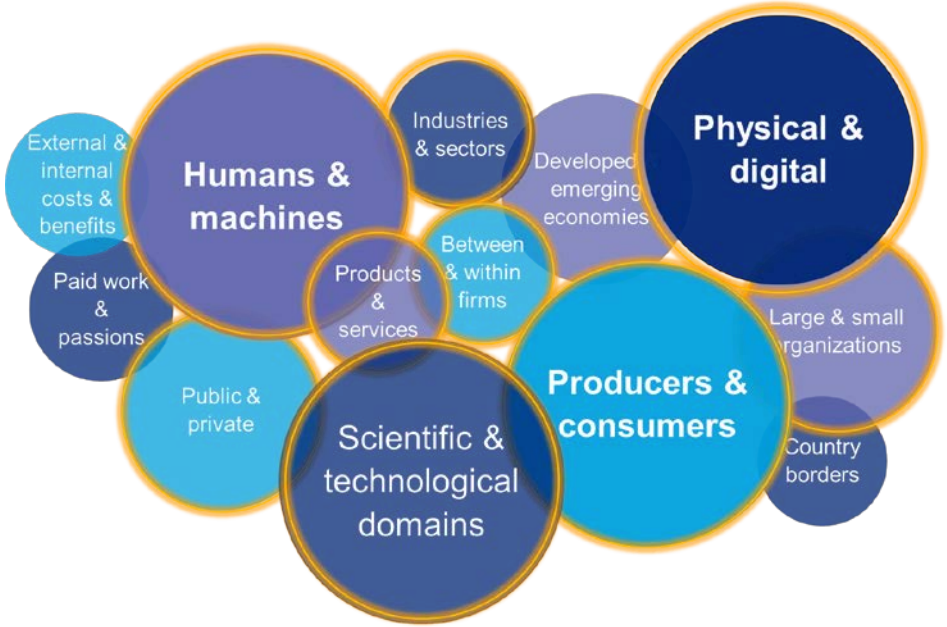
# SO WHAT? - BLURRING BOUNDARIES THAT MATTER!

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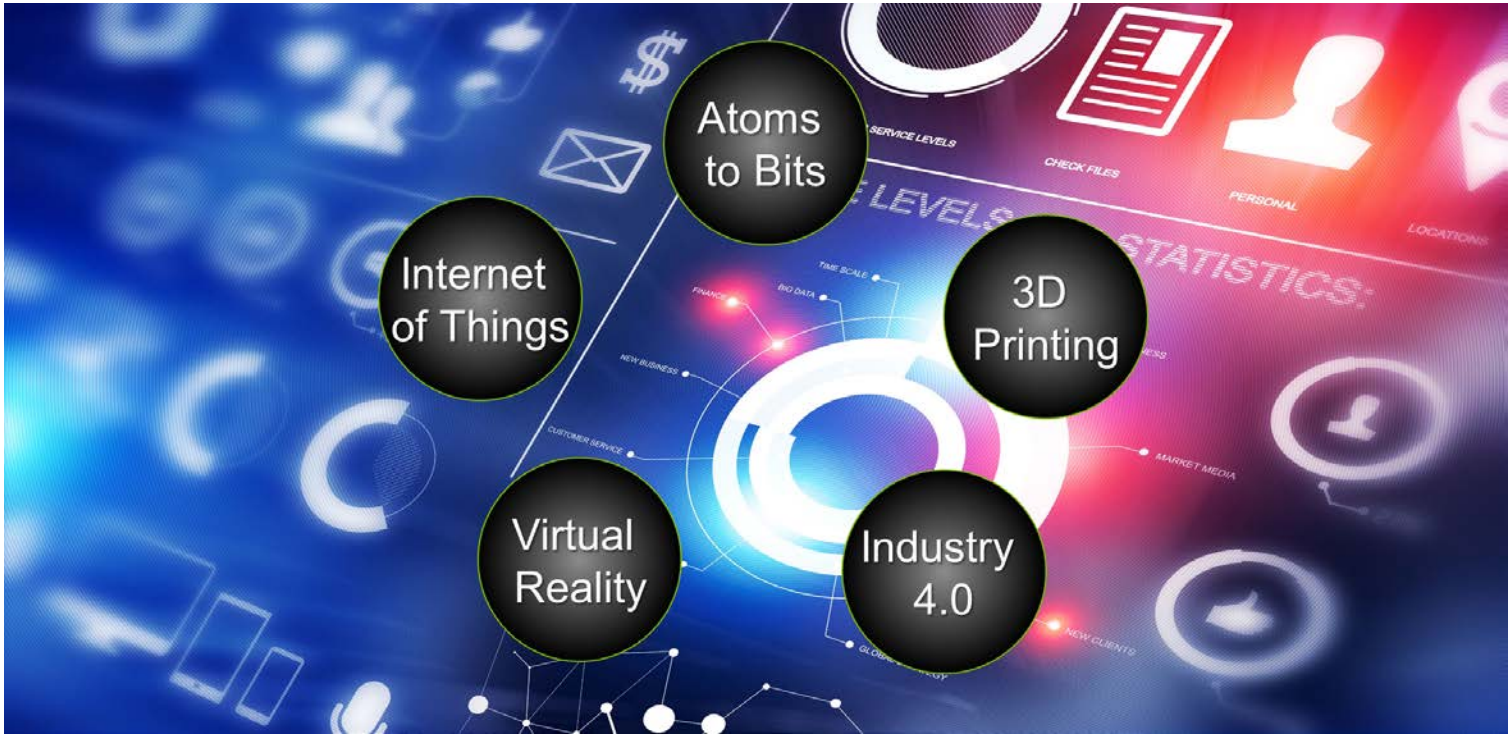
# PHYSICAL AND DIGITAL



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# HUMAN AND MACHINE



Moore's Law

+

Data as Feedstock

+

Improving Algorithms

+

New Collaborators from Multiple Disciplines

+

Open Sourcing

=

A machine learning revolution

…and a new age of robotics

VOICE RECOGNITION ▸ TRANSLATION ▸ VISION ▸ DIAGNOSIS ▸ WRITING ▸ EMOTION ▸ MANIPULATION

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# NEW ECOSYSTEMS



LEARNING

WELLNESS

MOBILITY

FOOD

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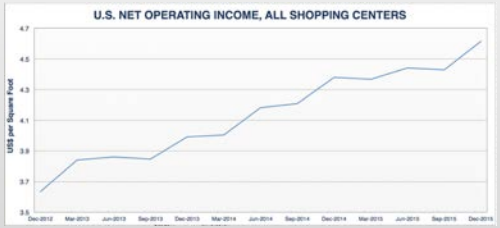
# Multi-platform Retailing

# INDUSTRY SNAPSHOT



- Year-end 2015 property data results showing healthy returns across key metrics including occupancy rates, net operating income, base rents, cap rates and construction value.

- Shopping center **occupancy rates** reached 93.2% at the end of in Q4 2015–the highest level since Q4 2007.

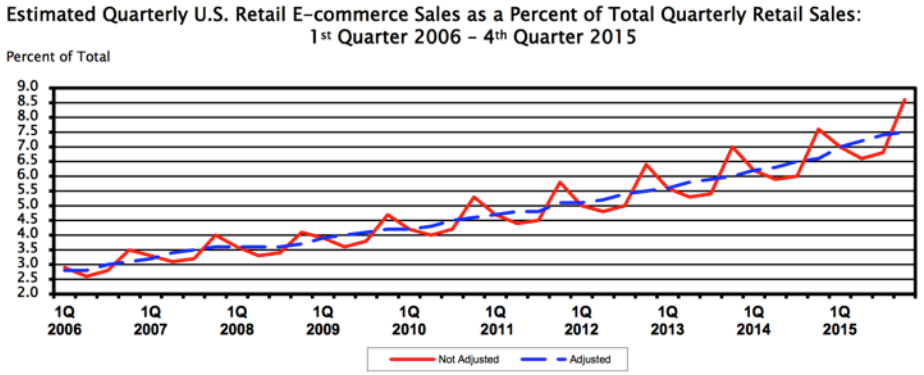

- **Net operating income** (NOI), a key indicator of strength, saw healthy year-over-year gains with a 6.4% increase from 2014 in the shopping center sector–and a 26% increase from 2010.

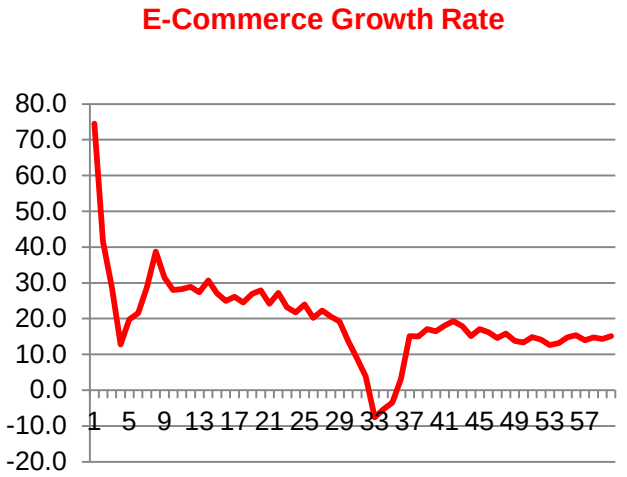
- Shopping center **base rents** rose 6.4% year-over-year in 2015, the fourth consecutive annual gain and a 23.1% increase from five years ago in 2010.

# E-COMMERCE



- While e-commerce sales seem to be rapidly rising, the rate at which e-commerce is growing is actually declining

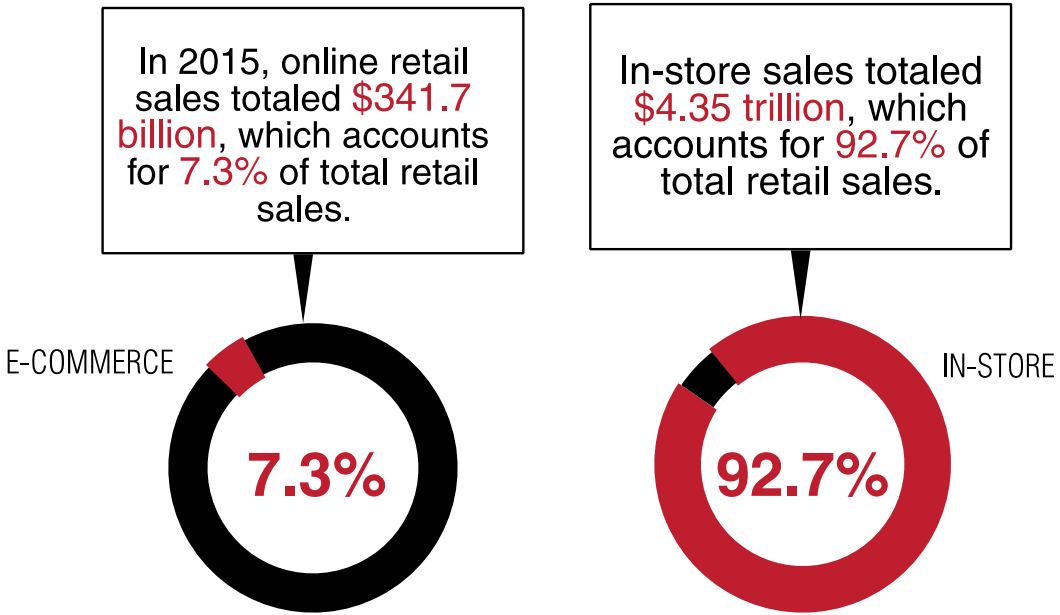


# CLICKS *VS.* BRICKS



Not quite the battle you might think.




*Source: U.S. Census Bureau*

# CLICKS *TO* BRICKS




FRANK & OAK

BAUBLEBAR

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RENTTHERUNWAY

BOSTON PROPER

NASTY GAL

ATHLETA




# AMAZON?!



The future of e-commerce: bricks and mortar

Amazon leads the way into the real world as online real estate - once heralded as the next frontier for retail - becomes crowded and expensive

**Amazon to open 2nd physical bookstore, this one in Southern California**

TECHNOLOGY

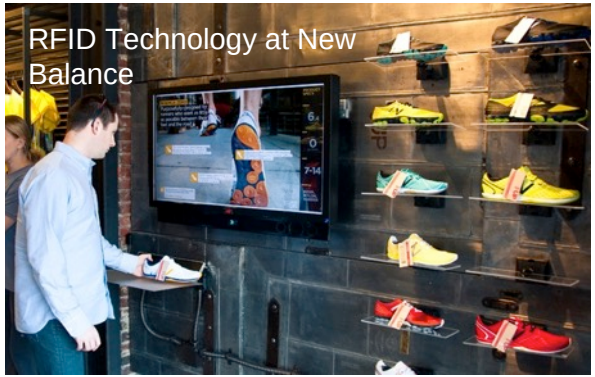
**How Amazon Could Reinvent the Brick-and-mortar Store Experience**

**Amazon bets on universities as its brick-and-mortar expansion continues**

amazon books

# CLICKS *AND* BRICKS



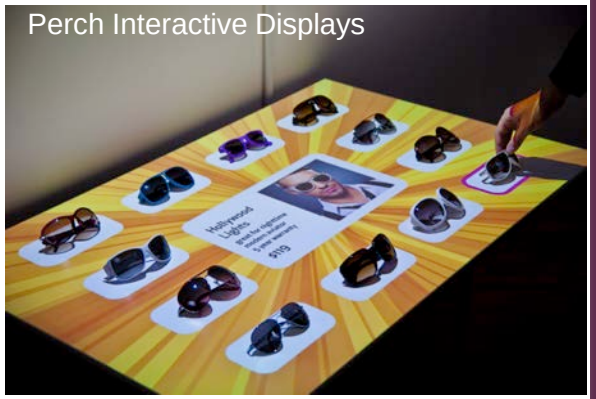

RFID Technology at New Balance

Kate Spade


Burberry Regent Street

Rebecca Minkoff


AdiVERSE


Perch Interactive Displays

Lowe's Holoroom


Barney's Flagship Ground Floor


The Chuck Taylor All Star

Made by Boss

CONVERSE
Made by you


Sephora Concept Store

deliv
delivery shortened


The Container Store Wearable


Tommy Hilfiger Samsung VR


Samsung Virtual Reality

# EXPERIENTIAL RETAIL







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# Commercial real estate redefined

## How the nexus of technology advancements and consumer behavior will disrupt the industry

Deloitte Center
*for* Financial Services

# Contents



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# Foreword

**Dear colleagues,**

In previous editions of our outlooks, we examined the marketplace to offer guidance on what might be of greatest importance to industry leaders in the coming year. But many of these day-to-day challenges and opportunities don't change that much from one year to the next. With that said, we are seeing our clients become increasingly concerned by the potential disruptions they may be facing not just next year, but over the next several years. Industry leaders are increasingly thinking about longer-term strategic issues and how they can stay ahead of the impacts, and so we felt it was necessary to similarly take a longer-term view in our outlooks.

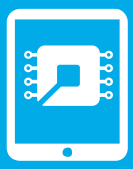
We are delighted to share with you our views on commercial real estate (CRE) industry trends and priorities over the next few years, based on the perspectives and first-hand experience of many of Deloitte's leading practitioners, supplemented by original research from the Deloitte Center for Financial Services.

Making predictions is an inexact science at best, but we are seeing the emergence of a number of dynamics that have great potential to fundamentally change the CRE business over the next decade. Technology developments—mobility, cloud computing, analytics and the Internet of Things, as examples—will have great influence on how properties are constructed, managed, sold, and leased. Several consumer trends, like urbanization and the sharing economy, are already coming together to shape how people live, work, and play. These trends also have changed the way that office space is used, for example, which will continue to evolve over time. And the convergence of additive manufacturing, electronic commerce, and innovative delivery methods will greatly change the "last mile" problem of getting goods to market, with consequent impacts on both retail and warehouse properties.

This outlook is organized to provide the reader with an overview of a few disruptive trends that we find are generating the most energy in client discussions at the moment. We have traced the development of each trend, with some pertinent examples that show how the industry is already, or will be impacted over the next decade. A series of bold predictions, in the form of a "CRE forecast," are offered that are based on our experience and analysis, and each section wraps up with actionable takeaways and strategies executives can consider to seize opportunities through these potentially disruptive clouds. We hope you find this report insightful and informative as you consider your company's strategic priorities for the coming years. Please share your feedback or questions with us. We would value the opportunity to discuss the report directly with you and your team.

**Bob O'Brien**
Vice Chairman and Partner
Global and US Deloitte Real Estate Leader
Deloitte & Touche LLP
+1 312 486 2717
robrien@deloitte.com

**James R. Eckenrode**
Executive Director
Deloitte Center for Financial Services
Deloitte Services LP
+1 617 585 4877
jeckenrode@deloitte.com



# A nexus of technology advancements and consumer behavior changes

Disruption is not a new phenomenon, yet it is a hot topic of discussion in every boardroom today. Many of these discussions center around the potential impact of technology on their business, and while this trend is also not new, nearly every traditional business is feeling the heat more than ever.

The convergence of one or more technologies, such as advanced cloud computing, mobile, social media, and analytics, is leading to fast-paced, big-bang disruptions in many industries. For example, this convergence is enabling high-quality Internet enabled services such as advanced payment systems, Internet of Things, and geolocation services globally. Furthermore, small and large technology companies are leading the charge by constantly experimenting with product innovation.[1] These companies use hackathons and other approaches to innovate products and services that unintentionally obliterate existing businesses.[2] As a result, traditional value chains are being transformed with transfer of power to the consumer. The technology advancements are increasing global interconnectedness, data ubiquity and transparency, and speed of information access and exchange. As a result, disruption in one part of the ecosystem is rapidly spreading to the broader world.

Other evolving trends are rising urbanization and changing global consumption patterns. Urban population is expected to grow to 66 percent of the global population by 2050, as compared to 54 percent and 30 percent in 2014 and 1950, respectively.[3] This rising urbanization is redefining how and where people live, work, and play. Consumption patterns are tilting toward more customized goods and services. Some consumers are increasingly environmentally conscious, preferring to reuse and share goods rather than own and acquire new ones.

We believe the nexus of technology advancements and consumer behavior changes has the potential to redefine urban planning and fundamentally change the CRE demand-supply dynamics and business model, including real estate usage, site location, development, design, valuations, leasing, and financing. That said, as the disruptive trends evolve, regulators will likely have to develop policies and regulations to strike a balance between protecting public interest and enabling innovation.[4] We believe CRE organizations will have to be increasingly cautious about cybersecurity and the appropriate use of data.

In our inaugural longer-term outlook, we have identified four themes that we believe will result in significant disruption for the CRE industry over the next decade:

- Collaborative economy
- Disintermediation of brokerage and leasing
- War for talent
- The last mile

While there is no certainty about the extent of disruption in each of these trends, we firmly believe that CRE companies will have to be agile and flexible in embracing technological innovations to keep pace with their new competitors and maintain their edge. Mark Fields, president and CEO, Ford Motor Company, said "For me, it was exciting to have the opportunity to join a company that simultaneously built one of the world's most complex industrial products and the most interesting consumer products. Fast-forward 26 years, we now make one of the world's ultimate technology products as well."[5] This is one example demonstrating how traditional automotive companies are tackling both current technology-driven innovations, like electric vehicles, as well as emerging disruptions—like driverless cars. Could the CRE industry see similar innovation and disruption in their business?

# Collaborative economy

### Reshaping CRE demand and use

The collaborative, or sharing economy is a digitized format of the age-old bartering system. Essentially, consumers serve each other directly rather than being served by companies, and pay for the use or access of goods and services rather than own them. Based on the premise of "on demand," technology advancements, consumption and lifestyle patterns, along with societal factors are driving the rapid growth of the collaborative economy. Companies such as Uber and Lyft are leveraging technology to offer on-demand taxi services, while Zipcar provides on-demand car rentals. Combined, these services have reduced the need for car ownership. This trend can be equally applied to CRE, as collaborative space usage is gaining prominence in places where one lives, works, and shops.

Airbnb is an online marketplace for renting accommodations. With over 1.5 million global listings across more than 190 countries and in over 34,000 cities, the company is catering to more than 40 million guests and has revolutionized the concept of renting a wide variety of accommodations for business and leisure travelers.[6] Many consumers believe that it's more convenient to use such a service rather than reserve hotel rooms, and at the same time enjoy the unique customized lodging experience they are able to create for themselves.

In the office sub-sector, WeWork leases large office spaces and sub-leases them on demand. In another variant, companies like LiquidSpace,[7] Regus,[8] and Desks Near Me[9] are online marketplaces for a wide variety of short-term rentals of office space, ranging from day offices, hourly use of office space or meeting rooms, to virtual offices and other uses. In the retail space, online marketplaces such as Storefront offer a platform to brands, designers, and artists to find physical retail space for short duration.[10]

Going forward, we expect driverless cars to take car sharing to the next level. Likewise, real estate space sharing will expand to other property types: For example, WeWork is expanding the sharing concept to residences with WeLive. One of their properties in Crystal City in Arlington, Virginia, will include two floors of cosharing office, apartment, retail, and other shareable spaces.[11]

The success of a collaborative economy could be stymied by regulatory intervention, as many new services are perceived either to affect public interest or to potentially violate existing regulations.[12] Although state and federal governments have yet to develop policies to respond to the growth in the collaborative economy, companies such as Uber, Airbnb, and others are coming under significant regulatory scrutiny in various jurisdictions. For example, in the October 2014 report, "Airbnb in the City," the New York State Attorney General estimated that as many as 72 percent of the units rented through Airbnb were in violation of state zoning regulations or other laws.[13]

### How will the collaborative economy impact CRE?

The growth in the collaborative economy will likely create opportunities for incumbents to optimize rates on short-term space, creating more value while allowing tenants to obtain space that more closely meets their demand-based needs.

However, it can also impact the demand for existing real estate. For example, studies suggest that revenues of lower-end hotels are impacted by nearly 8-10 percent in areas with high Airbnb listings.[14] Separately, certain property types such as parking lots may not be required at their existing locations, as driverless cars become operational. (For more details, read our blog, "Commercial real estate sector: Get set to be disrupted by driverless cars.")

Incumbents will find it challenging to manage the use of existing real estate under current leasing and tenant approaches, because they may not have the flexibility to accommodate tenants' varying demand for, and use of space. Companies like LiquidSpace offer large open office spaces that can be adapted to each tenant's unique need by allowing the latter to scale their space requirements up or down based on short- or intermediate-term demand, rather than locking themselves into longer-term leases for more space than they need most of the time (or too little space during periods of rapid growth or project-related demand).

Corporations may reassess the need for long-term leasing of large office spaces as on-demand space availability fits in perfectly with the growing preference for flexi-work of many of their employees. There could potentially be an evolution of multi-tier leases, wherein a cluster of tenants such as WeWork lease large office spaces and subsequently sublease them. This would spur a broader subleasing phenomenon.

Beyond those possibilities, traditional CRE companies will face increased competition from individual real estate owners who are using online marketplaces like Airbnb to rent their physical real estate space.

## Our CRE forecast

The growth of the collaborative economy will have far reaching implications for traditional CRE players:


### Seizing opportunities through the clouds

Clearly, many existing hotel, office, retail, and health care spaces will likely lose utility as new players in the sharing economy redefine space usage. CRE owners need to rethink their approach to designing, developing, and redeveloping both new and existing spaces to accommodate the need for dynamically configurable spaces by the end tenant. Along with fluid spaces, companies should consider new ways to enhance tenant experience and optimize the value of space to tenants.

Traditional CRE owners may need to change business processes to meet the evolving demand, a daunting challenge to navigate. They can, for example, consider partnering with the coworking startups, as the latter have innovative value propositions and insights. Vornado Realty Trust, for one, is redeveloping existing spaces to make them leasable to WeWork.[15] In another example, W Hotels has partnered with Desks Near Me to provide guests access to premium workspaces.[16] Such collaboration will allow incumbents to use the unused and underutilized spaces more efficiently and maximize the value of their real estate assets.

Many CRE owners may have to adapt to a hybrid approach, as tenants are likely to prefer a mix of long-term lease agreements for core space needs and short-term flexible leases to manage peaks and valleys of workforce and project-related needs. As a result, incumbents will have to reinvent their leasing approach and lease administration processes as their traditional approaches become increasingly irrelevant. They will also have to adapt to a dynamic revenue model because the short-term leasing phenomenon will provide opportunities to drive better demand-based pricing on rental rates, but reduce predictability in their revenue streams.

# Disintermediation of brokerage and leasing

### Brokerage companies will transform into technology firms

Technological advancements are increasingly automating brokerage and leasing tasks and activities, bringing down barriers between potential tenants and real estate owners. Developments in cloud computing combined with mobile and social media are resulting in cost-effective and real-time availability of property information and are enabling many leasing activities online. This has reduced entry barriers for niche and smaller companies. For example, property listing websites provide several services ranging from basic aggregation of leasable space to offering an online marketplace for CRE owners and prospective tenants. Companies like Hubble[17] and 42Floors[18] provide office space listings in the United Kingdom and USA, respectively. Some also complete lease deals—startups such as Rofo are online marketplaces for property listings and potential tenants that also enable lease deals without broker intervention.[19] Additional relevant information, such as CRE lease comparables (comps), is increasingly accessible, which was available only privately in the past. Companies such as CompStak[20] and DealX[21] use technology to crowdsource lease comps and offer it for public consumption, including information such as tenant name, rent, lease duration, and landlord concessions. In other examples, companies such as Real Massive and VTS have even broader platforms, offering property listings as well as market and other related information to owners, tenants, and brokers. Such online marketplaces are empowering tenants to make more informed decisions without broker intervention.

Indeed, technology enhancements can further disrupt the traditional brokerage model that already obviates the need for human touch by revolutionizing data ubiquity and transparency, and by providing even more information to tenants.

For example, geospatial technologies aid and automate several activities with respect to site analysis, sales, and marketing. They also provide additional information that can allow more informed location-related decision-making for both CRE owners and tenants. In contrast to physical maps, online demography maps and reports for a particular area allow CRE owners to understand the purchasing behavior and socioeconomic status of the end consumers of their existing and potential tenants.[22] These technologies also allow tenants to make efficient and customized analyses that could combine details about a specific property, with market and competitor data. Companies such as eLocations, a global online marketplace, provide detailed location-based information to retail property owners, prospective tenants, and investors on an absolute and comparative basis.[23] The website allows tenants to choose their desired area and match it to a broker listing instantaneously.

Technology enhancements can further disrupt the traditional brokerage model that already obviates the need for human touch by revolutionizing data ubiquity and transparency, and by providing even more information to tenants.

Artificial intelligence and cognitive technologies will allow automation of many tasks that before only humans could do.[24] BrokerSavant's Property Index uses deep learning to scan property flyers, analyze the data, and provide the most relevant property information to the market.[25] DigitalGenius uses its proprietary natural language processing framework to offer scalable and automated human-like conversations, which facilitate communication with online leads and minimize the need for an agent.[26] Online property sites are also using virtual reality technology to offer property tours anytime, anywhere, including showing virtual space design possibilities to meet a prospective tenant's specific needs and tastes. For example, using a remote-control robot called Robot View, Brazilian real estate website VivaReal offers virtual access to model apartments.[27]

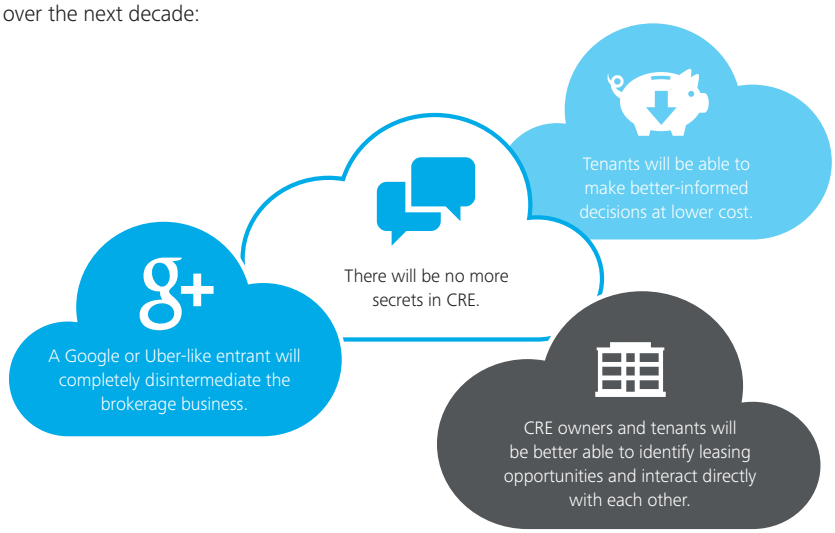
### How will disintermediation in brokerage and leasing impact CRE?

The onslaught of technology in the brokerage and leasing business will have a two-fold impact on traditional brokers. On one hand, it enables usage of unproductive CRE by meeting demand and supply gaps in real-time. On the other hand, the rapid automation is making the traditional model for selling and aggregating CRE information inefficient and irrelevant. Armed with technology, new entrants are using innovative client acquisition and servicing strategies, which minimize the need for a broker to complete a CRE lease transaction.

Incumbents will also lose their edge on proprietary data as new entrants aggressively promote data ubiquity and transparency that offers more decision-making ammunition to clients. These factors have the potential to squeeze topline growth and margins from the traditional brokerage business. That said, the technology advancements create an opportunity for incumbents to extract inefficiencies from the current model. We may see a spike in global consolidation as traditional players acquire companies to achieve additional capabilities and scale, or as smaller firms find it unviable to remain in business. (For more on startups and their impact on CRE, read our blog, "Commercial real estate startups: Catalysts for disruption?")

### Our CRE forecast

There is every possibility that the current brokerage model will undergo a metamorphosis over the next decade:




**Seizing opportunities through the clouds**

We believe traditional brokers should consider diversifying their core business focus, from largely brokerage to consultative opportunities in space need and location advisory, as well as property and facility management. Similar to consulting firms, they should redirect their service delivery model toward central client relationship management, rather than regional. Further, incumbents use technology to offer innovative services to clients. To enable this, they should capitalize on their prior experience and client relationships. For instance, companies can combine the rich bank of tenant data with geospatial and cognitive technologies to generate superior insights on future choices.

Alternately, incumbents can consider investing in or collaborating with startups, as this would allow them to combine their client relations with the tools and technologies of the startups. As an example, JLL's HiRise venture is an online marketplace for renting office space, covering all aspects of leasing, including documentation.[28] This trend will be particularly beneficial for smaller companies that not only may lack the capital and infrastructure to enhance their capabilities and scale their operations to accommodate changing tenant expectations, but would also be likely to lose business faster than the larger brokerage firms.

# War for talent

### Revolutionize demand for office and mixed-use properties

Multiple forces in the employment marketplace are expected to result in a significant war for talent over the next 10 years. Slower US population growth combined with a significant number of soon-retiring baby boomers will potentially slow labor force participation.[29] Separately, employment patterns are likely to change, as health care, community services, and science, technology, engineering, and math (STEM) jobs are likely to be the fastest-growing occupational clusters.[30] Furthermore, cognitive technology-driven automation will eliminate or redesign some existing jobs, and create new kinds of roles.[31] These changes will result in a higher demand for knowledge workers with a minimum of postsecondary education and specialized skills. One estimate suggests that 60 percent of millennials will need to have some form of postsecondary education to fuel economic growth, which means 62 million new degree holders by 2025.[32] Unfortunately, at the current rate, only 39 million Americans will obtain that higher education by 2025, leaving a gap of 23 million.[33]

Can immigration fill the talent gap? We believe the current US immigration laws do not allow for the necessary and continuous flow of international talent with STEM skills to fill the widening gap. The current laws either serve other goals such as enhancing diversity,[34] or there are huge backlogs in immigration categories, where the wait for entry can stretch over decades. There are backlogs in certain categories in which annual caps are reached quickly, and regular surpluses in still other categories are also being observed.[35] Further, the time delays involved in the temporary categories frustrate employers who need to match workers with jobs within tight time constraints.[36] The United States will have to make significant changes to its immigration policies if it hopes to use this population to help bridge the talent gap and remain competitive.

Another transformative trend is the influx of a large proportion of millennials to the workforce, a group that generally demands a different employment experience. Having grown up in a technology-enabled world, Millennials, who will comprise 75 percent of the workforce by 2030, prefer an open and flexible work culture that allows them to work anywhere, anytime.[37] They expect employers to be less hierarchical and to encourage emotional and physical well-being. Globalization, the collaborative economy, and technology are also promoting the virtual work environment, which doesn't necessarily require people to come to their workplaces. Many millennials favor part-time, contract, or freelance employment.[38] An estimated 40 percent of the workforce will be freelancers, temps, independent contractors, and solopreneurs by 2020.[39]

How will the war for talent impact CRE? The talent gap and evolution in the talent marketplace will have a significant impact on where CRE is located and the way it is designed and used. There will be greater demand for integrated urban-lifestyle centers that cater to the live, work, play mantra.

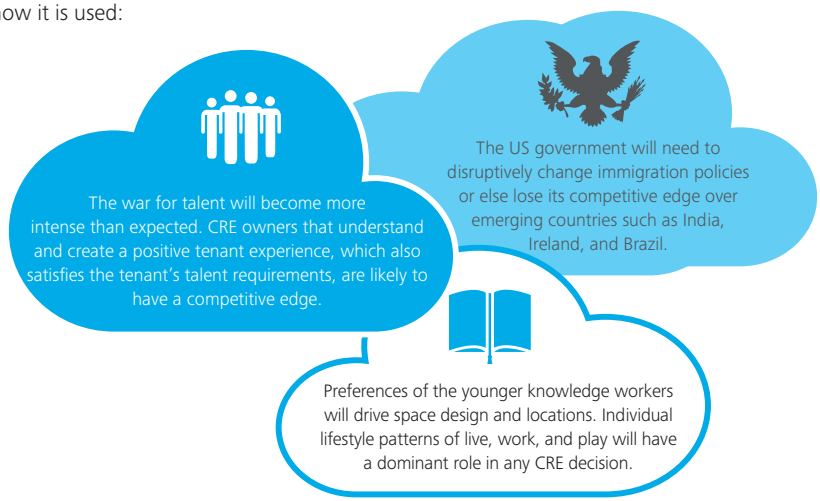
Because of this trend, mixed-use spaces that include office, residence, and recreation options will be favored over stand-alone properties. For example, Chicago's West Loop, which was once packed with large industrial buildings and warehouses, is undergoing this kind of transformation. Offices for large technology firms, retail spaces, and luxury condos are replacing many old industrial buildings.[40] Corporations too would prefer to have workplaces closer to where knowledge workers reside to reduce the latter's commute time.

In essence, office-space demand will tilt in favor of open, flexible, cosharing spaces, a trend made evident by companies such as Google, Facebook, and Hewlett Packard.[41] And the per-employee office space requirement is likely to shrink. According to a Deloitte Canada report, the average office space per employee is projected to decline from 250 square feet in 2000, to 150 square feet in 2017, and companies that have nimble workplaces would see a further decline to 90–100 square feet.[42] Offices could morph into an office-as-a-service model, acting as physical meeting points rather than daily workplaces. Further, the increase in contract workers, or talent preference for flexible work locations, will result in knowledge workers preferring to work from home, with many tenants demanding small offices in their apartments.

Millennials, who will comprise 75 percent of the workforce by 2030, prefer an open and flexible work culture that allows them to work anywhere, anytime.

### Our CRE forecast

We believe the war for talent will have a significant impact on where CRE is developed and how it is used:




**Seizing opportunities through the clouds**

CRE companies should consider a broader set of parameters for any location and design decisions on future development and redevelopment. As the war for talent intensifies, talent dynamics should be an integral factor in location-based decisions, especially for office property owners. Companies should estimate the future workforce using existing employment data, and evaluate areas where knowledge workers are likely to live, work, and play, which in turn would be closer to the regions where they study and grow. Such neighborhoods are likely to see a significant rise in rents. Further, CRE companies should evaluate areas where STEM talent growth will outpace the impact of retiring workers, as these regions will likely see an increase in business investments.[43] A Deloitte study identifies Texas, Florida, Nevada, Arizona, and Utah as the five states that are likely to see such growth by 2030.[44]

CRE companies must also strategize their redevelopment of existing property, tailoring it to the changing talent dynamics. One option could be to refurbish existing buildings. In such cases, property design will play a critical role in meeting the changing needs of the workforce. Companies may need to revamp their design and development teams, to build expertise for mixed-use and flexible properties. Alternately, owners of different property types could consider collaborating with one another to share both their expertise and the nuances of each property type.

Another option could be to dispose of a few existing properties, and acquire and develop new ones. For example, Kilroy Realty has sold nonstrategic office and industrial properties totaling $850 million over the last several years and reinvested the proceeds in both new developments and existing assets that will suit the needs of millennials.[45]

# The last mile

**Blurring lines between retail and industrial properties**

Retailers continue to evaluate and implement innovative solutions to enhance consumer experience by adapting to their changing preferences. Currently, a large part of experiential retailing is being driven by increased competition from the exponential growth (CAGR of approximately 15.5 percent for 2004–2014)[46] in online retailing, a trend that continues to lower entry barriers and fragment the industry. Online retailers are also fulfilling on-demand as well as tailored orders for individual consumers. Another evolving competitive factor likely to challenge retailers is the growth in 3D printing. 3D printing will not only enable small-sized, customized, and on-demand production, but its lower costs may even result in reshoring manufacturing activities. (To learn more about the impact of 3D printing on manufacturing, read our reports on dupress.com.) This essentially means that manufacturers will have the option to move to a build-to-order model rather than build-to-stock, which will allow them to connect, customize, and sell directly to consumers.

Retailers and some retail real estate owners are using different and flexible delivery options such as same-day or next-day delivery to create differentiation at the last mile. For example, Deliv, Amazon Prime, and Google Express are offering same-day delivery.[47] Sidecar Deliveries and UberRUSH are leveraging their driver networks for same-day delivery and instant pick-up and delivery within individual city limits, respectively.[48]

A large part of experiential retailing is being driven by increased competition from the exponential growth in online retailing, a trend that continues to lower entry barriers and fragment the industry.

Indeed, same-day delivery competition is on the rise, as it is an important consideration in consumer purchase decisions. A recent survey suggests that one-in-four shoppers are open to abandoning an online shopping cart in the absence of same-day delivery.[49] It's no surprise that retailers are constantly experimenting with new concepts to improve last-mile delivery. For example, Tower 24, a Germany-based company, and Amazon Locker are offering automated electronic lockers, which can be accessed with a security code to retrieve packages.[50]

We believe the use of drones for last-mile connectivity can result in ground-breaking changes in delivery options. Amazon.com, Inc. with its "Amazon PrimeAir"[51] and Google with its "Wing"[52] are working on enabling package deliveries through the aerial route by using unmanned drones. However, according to industry leaders, the Federal Aviation Administration (FAA) has been slow in developing rules and regulations for commercial use of drones, although it recently allowed Amazon Inc. to test drone delivery.[53] That said, if successful, drones would take the last-mile competition to the next level from same-day to even less-than-an-hour delivery.

**How will the last mile impact CRE?**

We believe disruption in manufacturing and retail and consequently last mile connectivity will significantly impact retail and industrial properties.

Brick and mortar stores will still remain integral to creating customer experience, but primarily for products that require 'touch and feel' or have significant service components. The store-in-store concept where one retailer provides dedicated space to another retailer in its own store, will also continue to find favor, although there may be less demand for stand-alone stores. As a result, there will be less demand for large stores and weak overall demand for traditional stores. Further out, analysts expect 50 percent of American malls to close by 2030.[54] We believe retail properties will instead be utilized in different ways. They could double up as fulfilment centers, especially for commoditized products that do not necessarily require touch and feel for purchase decisions. Many neighborhood mom-and-pop stores could end up being package pick-up and drop-off points.

On-demand retailing and manufacturing will reduce inventory holding, and potentially the demand for large warehouse spaces. In addition, traditional CRE owners will be challenged by new and innovative on-demand storage space providers such as Lockitron, Boxbee, Roost, and Swapbox.[55] Existing distribution centers developed on a regional basis to serve on the logistical chain between global manufacturers and large box retailers will increasingly be disrupted by smaller, local distribution and fulfillment centers promising efficient, same-day or next-day delivery to the ultimate consumer. As such, there will be fragmentation of warehouse space, with higher demand for smaller warehouses and distribution or fulfillment centers spread out at frequent intervals within city limits.

The upshot is that physical real estate spaces that support last-mile delivery are being preferred by institutional investors over traditional industrial and retail space, which may not bode well for incumbents from a pricing and valuation perspective.[56]

### Our CRE forecast

We believe technological developments and consumer demand for speedy delivery will significantly impact last-mile connectivity as well as the demand for both industrial and retail real estate:


**Seizing opportunities through the clouds**

Retail property owners should continue to try different store formats, tailored spaces, and innovative techniques to enhance end-consumer experience. This would require incumbents to embrace sophisticated technologies. For example, a few large retail property owners have made strategic investments in Deliv to enable same-day delivery for their tenants.[57] Retail property owners can also consider offering tag-reading robots that would use radio frequency identification (RFID) technology to help their tenants optimize in-store inventory.[58] They should continuously evaluate the number, location, and optimal size of stores, based on the need for "touch and feel of products" and consider revamping the nonstrategic stores into fulfillment centers. Ultimately there may be opportunities for retail property owners to become distribution infrastructure providers by using their nonstrategic assets or repurposing vacant space in cities as local distribution hubs for smaller and fragmented retailers.

Distribution and fulfillment centers should be a prominent part of industrial real estate owners' property portfolios. As incumbents plan new development, they will likely benefit from acquiring and developing smaller and flexible spaces within city limits that meet the demands for rapid delivery to end consumers. Alternately, they can partner with the new on-demand storage space providers to offer a mix of long- and short-term leases and extend their tenant-servicing capabilities. Industrial real estate owners will be well served to evaluate both the evolving needs and business strategies of their tenants, as well as the changing requirements of their tenants' end consumers, as these will likely be impacted significantly by technology and new logistical strategies. Accordingly, it will be important for incumbents to evaluate and reposition existing warehouse space, particularly the larger ones, to improve their utility. They can consider multi-tenant solutions to reduce costs and enhance capabilities for manufacturers preferring to sell directly to end consumers. Further, the use of advanced RFID technology, geotagging, and Internet of Things would enable smart, intelligent, and efficient use of space and enhanced services to tenants.

The location of retail stores and distribution centers will be more important than ever. Companies should use geospatial technologies and predictive analytics to identify strategic retail and warehouse locations. They will also need to understand the nuances of managing and operating both industrial and retail properties given the likely overlap in their use.

# Disrupt or get disrupted?

**The writing is on the wall: CRE usage will undergo a metamorphosis over the next decade**

Deeply rooted in the convergence of technology and evolving consumer behavior, the physical and digital worlds are blurring fast. While the collaborative economy will redefine the use of every kind of property, the war for talent will promote demand for mixed-use space. Disintermediation in brokerage and leasing will disrupt and significantly transform the age-old brokerage business. And retailers' and manufacturers' rush to meet ever-increasing consumer demand for speed through last-mile delivery will blur the lines between retail and industrial properties. These disruptive forces have the potential to redefine the current property market segmentation of primary, secondary, and tertiary, and consequently, valuation. Incumbents will have to be smart about their location strategy as property location will be more important than ever. They will have to focus significantly on designing or redesigning flexible physical space that can be customized to tenant and ultimately consumer needs in order to remain relevant.

Incumbents' traditional business models are unlikely to work. They will need to have dynamic strategies and respond with dexterity to the rapid changes in the business landscape. Interestingly, the technology that is disrupting their businesses is the one that will help them meet these new challenges as well. Of course, appropriate cybersecurity measures will be equally critical. Companies will have to re-engineer operations and figure out optimal ways to organize and access talent. As incumbents combat this disruption, intangibles such as tenant relations will be their biggest assets.[59]

We firmly believe that it's a myth that traditional players will remain insulated from these disruptive forces. They will have to make a choice between proactive responses to the evolving business landscape or be disrupted by the new entrants and lose their competitive edge.

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# Contacts


**Industry leadership**
**Bob O'Brien**
Vice Chairman and Partner
Global and US Deloitte Real Estate Leader
Deloitte & Touche LLP
+1 312 486 2717
robrien@deloitte.com

**Deloitte Center for Financial Services**
**Jim Eckenrode**
Executive Director
Deloitte Center for Financial Services
Deloitte Services LP
+1 617 585 4877
jeckenrode@deloitte.com

**Adam Schneider**
Chief Advisor
Deloitte Center for Financial Services
Principal
Deloitte Consulting LLP
+1 212 436 4600
aschneider@deloitte.com

**Author**
**Surabhi Sheth**
Research Leader, Real Estate
Deloitte Center for Financial Services
Deloitte Support Services India Pvt. Ltd.
+1 615 718 8364
susheth@deloitte.com



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Steven Bandolik, Director, Deloitte Services LLP
Sheila Botting, Partner & Canadian Real Estate Leader, Deloitte LLP
Darin Buelow, Principal, Deloitte Consulting LLP
Britt Dayton, Director, Deloitte Consulting LLP
Christopher Dubrowski, Partner, Deloitte & Touche LLP
Michelle Kerrick, Partner, Deloitte & Touche LLP
Ken Meyer, Principal, Deloitte Consulting LLP
Dustin Schultz, Partner, Deloitte & Touche LLP
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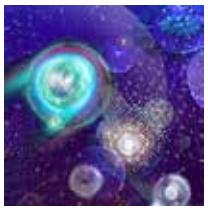
Business ecosystems
come of age
Deloitte
University
Press
Part of the Business Trends series

# This report explores how forward-looking leaders and organizations can thrive in a world of business ecosystems.

## A CHANGING WORLD



### Business ecosystems come of age

Businesses are moving beyond traditional industry silos and coalescing into richly networked ecosystems, creating new opportunities for innovation alongside new challenges for many incumbent enterprises.

### Blurring boundaries, uncharted frontiers

Long-standing boundaries and constraints that have traditionally determined the evolution of business are dissolving, allowing new ecosystem possibilities to flourish.

## LIBERATING POTENTIALS

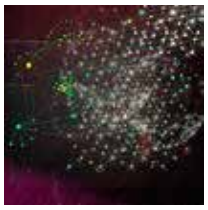
### Wicked opportunities

"Wicked problems"—ranging from malaria to dwindling water supplies—are being reframed as "wicked opportunities" and tackled by networks of nongovernmental organizations, social entrepreneurs, governments, and big businesses.

### Regulating ecosystems

As ecosystems enable more rapid, cross-cutting innovation, regulators are challenged to create policies and solutions that protect the public's interests and are also dynamic enough to keep pace with innovation.

## EVOLVING ENTERPRISE STRATEGIES



### Supply chains and value webs

Supply chains are increasingly becoming value webs that span and connect whole ecosystems of suppliers and collaborators; properly activated, they can play a critical role in reshaping business strategy and delivering superior results.

### The new calculus of corporate portfolios

The rise of business ecosystems is compelling strategists to value assets according to an additional calculus, often generating different conclusions about what should be owned.

### The power of platforms

Properly designed business platforms can help create and capture new economic value and scale the potential for learning across entire ecosystems.

## CRITICAL CAPABILITIES

### Minimum viable transformation

Leaders are taking lessons from the startup playbook on "minimum viable products" to launch minimum viable transformations—lightweight and readily adaptable versions of potential new business models.

### Beyond design thinking

Ecosystems are dynamic and co-evolving communities of diverse actors who create new value through increasingly productive and sophisticated models of both collaboration and competition.

# Preface

WELCOME to Deloitte's latest *Business Trends* report.

The purpose of these reports is straightforward: to provide business leaders with fresh and well-informed perspectives on important dynamics that are disrupting "business as usual." While change is nothing new, the speed, scale, and impact of a variety of fundamental shifts—in globalization, technology, and societal expectations—are undeniably transforming the business landscape today. We conduct and share this research as part of our commitment to serve as **guides and "wayfinders"** to our clients as they navigate their new terrain and shape the future.

In periods of disruption, uncertainty and challenge are inevitable. However, these times often also uncover new opportunities. Addressing both risks and potential rewards takes **confidence**, in decisions and actions alike, and in the solid analysis that should precede them. Uncertainty should not be denied or ignored—instead, it should be mastered, and grounded in both a deep understanding of the changes afoot and their potential consequences.

In this report, we focus on a critically important transition that has considerable implications for society, the economy, and businesses everywhere: **the continued rise of "business ecosystems."** Driven particularly by digitization, connectivity, and new modes of collaboration, important core structures of the industrial economy are quickly and dramatically reshaping, as many long-standing boundaries blur and dissolve. The "art of the possible" is expanding—enabling new approaches to serious societal challenges, and new, often platform-based, business models.

In *Business ecosystems come of age* we explore in detail what lies behind these changes, where they might take us, the new options—and threats—they present to many incumbents, and the strategic and operational shifts they enable and demand. We sincerely hope that these perspectives are helpful as you undertake your journey into a fast-changing future.

**Mike Canning**
National managing director
Strategy & Operations
Deloitte Consulting LLP

**Eamonn Kelly**
Chief marketing officer
Strategy & Operations
Deloitte Consulting LLP

# Blurring boundaries, uncharted frontiers

*By Eamonn Kelly*

## Overview


THE business environment has never been static, simple, or certain: Profound change, sometimes abrupt, sometimes gradual, has been reshaping the world for centuries. As recently as 1900, European empires straddled the globe, and the British empire alone contained 400 million people—25 percent of the world's population.[1] Only a tiny minority had ever stepped foot on foreign lands, or even travelled more than 50 miles from their place of birth. Well over 80 percent still lived on farms or rural communities.[2] In the United States, already the world's wealthiest country, life expectancy at birth was 47 years; about 7 percent of students completed high school; 1 percent of citizens held investments in public companies or mutual funds;[3] only 19 percent of women worked for pay;[4] just 3 percent of households were lit by electricity, and less than a third had running water.[5] While scientific knowledge and technological capabilities had progressed greatly since the Enlightenment, they remained almost primitive by today's standards.

But history was in motion. Between 1900 and 1905, Kodak would launch the Brownie—the first mass market camera; Marconi would transmit and receive transatlantic radio signals; the first narrative movie would be watched by millions around the United States in the first "nickelodeons"; the Wright brothers would take flight at Kitty Hawk; Hubert Booth would invent the first modern vacuum cleaner; a young Japanese playing card company, Nintendo, would start trading internationally; Henry Ford would incorporate his eponymous automobile firm; John A. Fleming would create the first practical vacuum tubes; Rutherford and Soddy would introduce their general theory of radioactivity; and the 26-year-old Albert Einstein would propose his theory of relativity and postulate the existence of photons. All of these—and many more events in that one brief historic window—were either enablers or manifestations of a rapidly expanding universe of new knowledge, capabilities, and potential.

Disruptive change is hardly a new phenomenon: Preceding generations have enjoyed and endured rapid shifts arguably even more transformative to their lives and work than those

we experience today. And yet, it does appear inevitable that change will continue to accelerate. Knowledge begets knowledge; today's technologies fuel and catalyze each other's development; fast-spreading tertiary education opportunities around the globe are creating tens of millions of new actors in multiple fields of expertise; and massively enhanced connectivity combines, melds, and disseminates this increasingly rich mixture to accelerate learning and innovation.

The story of change in our time, however, is not only a story of speed. Even more disruptively, long-standing boundaries and constraints that have powerfully determined the evolution of business, the economy, and society are now blurring and even dissolving. As a result, a new era of extraordinary possibility and potential is unfolding. Unprecedented opportunities are inspiring entrepreneurs and innovators. But these are also challenging incumbent leaders and businesses to adapt and act with confidence in order to thrive in the future.

## What's behind this trend?

Many factors are together driving the transformation of the business environment. The global economy has changed beyond recognition. Newly powerful nations and organizations are growing, consuming, and helping to set new rules. Sustainability challenges, demographic shifts, and the needs of a new global "middle class" are increasingly important sources of innovation. Social and cultural shifts occur everywhere, empowered by an increasingly influential generation of entrepreneurial and impact-oriented "digital natives." New ways of collaborating and interacting are creating new organizational forms, business models, and approaches to talent engagement. Evolving societal expectations and scrutiny of businesses are reshaping the regulatory environment and challenging the "license to operate" and "license to grow" for multiple industries.

Fueling all of these, however, is rapid technological advancement. Few would dispute the central importance of technology, especially digital technology, as the key source of change in recent decades. Nor would they deny that it will continue to play an absolutely critical role. As writer Stewart Brand has observed, computing is not like previous technologies—it is "autocatalytic," or self-accelerating, as each development allows the next one to come about faster.[6] Seymour Cray, when told that Apple Inc. had bought one of his Cray supercomputers to help design the next Macintosh computer, declared: "I just bought a Mac to help me design the next Cray!"[7] Computers have also catalyzed rapid advances in other fields, including engineering, materials science, nanotechnology, and biotechnology.

Few would dispute the central importance of technology, especially digital technology, as the key source of change in recent decades.

Moore's Law—which defines the remarkable exponential growth in computing power and decline in cost—has held for 50 years, despite recurring concerns it would hit technological limitations.[8] It appears likely to endure longer; yet even if the pace should slow, the stage is already set for continuing digital disruption. After all, the process is still relatively new. The Internet only started entering the mainstream economy less than 20 years ago. Broadband access only overtook far slower dial-up modems about 10 years ago. Mobile devices designed for a digital economy—notably smartphones and tablets—arrived about

seven years ago, and cloud computing and storage became truly effective shortly afterward. Even more recently we have witnessed the growing reach and power of software "applications," already altering the worlds of individuals and enterprises alike. Today the "Internet of Things" (connecting objects just as the Internet has connected people) is poised for takeoff. And the ability to analyze and interpret massive amounts of new data will grow, as machine intelligence continues to evolve, generating powerful new insights and predictive capabilities.

Digitization of the economy has already had tremendous impact, but we are only beginning to witness the sheer scale and scope of its transformative power.

## The trend

Increasingly, businesses operate in complex, dynamic, and adaptive ecosystems. A variety of phenomena—including feedback loops, stocks and flows, scaling and network effects, power laws, and so on—must be understood to properly appreciate and anticipate how systems behave and might evolve. But one major change is already underway. *The fundamental boundaries that have specified the relationships, interactions, and possibilities of most businesses are rapidly blurring and dissolving*. Historically, when boundaries have moved—geographic, scientific, technological, institutional, or cultural—the results have been momentous. When multiple boundaries shift simultaneously—as happened during the Enlightenment and the Industrial Revolution—truly extraordinary breakthroughs and great strides in human progress occur, through the creation of new connections, possibilities, and ideas.

Many long-standing boundaries have been blurring in recent decades. Industries and sectors have been converging, reducing the clear lines of demarcation originally defined and codified almost 80 years ago.[9] Boundaries between and within firms have been weakening. Old distinctions between products and services are breaking down as businesses traditionally specializing in one seek to integrate the other, to create fuller "solutions" and more compelling experiences that serve customers' growing expectations. The historically profound gaps between the capabilities and influence of large and small organizations are steadily declining. For many individuals, the boundary between paid work and passionate pursuit of interests and hobbies is falling.

Even the respective roles and contributions of the private, civic, and public sectors are blurring. Businesses were historically driven by market values, and the civic sector by moral and social values; governments set the rules and provided public goods. Today, they are merging and becoming increasingly interdependent through new partnerships and collaborations—often in pursuit of shared goals in light of another blurring, as externalities become internalized within market-based solutions. The liberalization of trade policies following the demise of the Soviet Union has served both to soften borders between countries, and also greatly diminish the vast dividing line between the "developed" and "emerging" economies. Cross-fertilization and increasing collaboration across scientific and technological domains are dissolving multiple knowledge boundaries.

These are all crucial changes and are already impacting every sector and almost every business today. But three key types of blurring are poised to have growing and ubiquitous impact.

### The human-machine boundary

From the advent of the most basic tools, technologies have always replaced and expanded upon human endeavor. The Industrial Revolution brought widespread mechanization of *routine manual* labor—a process continued ever since through multiple manufacturing innovations. The advent of office machines, especially computers, expanded automation into the *cognitive* domain—again, mainly in routine areas, as software algorithms captured well-codified and rule-based procedures and expertise, enabling faster, cheaper, and more reliable business

operations. Meanwhile, since General Motors introduced the first industrial robots in the 1960s, machinery has been steadily extending its reach into *nonroutine* manual work.[10] Recently, for example, the US Navy tested a prototype bipedal firefighting robot equipped with multiple sensing and actuation capabilities.[11] General Electric is designing robots that can, for example, climb and maintain wind turbines.[12]

There will be further machine encroachments into manual work and routine cognitive fields, but the new and transformative blurring boundary today is occurring in the *nonroutine cognitive* domain, which has historically largely defied automation. Artificial Intelligence (AI), including machine learning, natural language processing, knowledge representation, machine-to-machine communication, and automated reasoning, is evolving fast.[13] Investment here has exceeded $17 billion since 2009, with private investment growing around 62 percent a year.[14] The extraordinary consequences are already becoming manifest. Apple's Siri voice recognition software applies natural language recognition to interpret and act upon spoken words. Google Translate has over 500 million active users every month, and now features a "conversation mode" that enables real-time bilingual conversations.[15] Self-driving vehicles have been road tested for millions of miles.[16] Symantec's Clearwell software, designed to address the explosion of "e-discovery" efforts in legal matters, uses language analysis to review and sort hundreds of thousands of documents in just hours.[17] IBM's Watson, having won *Jeopardy!*, is now detecting and diagnosing medical conditions and outlining patient-care plans.[18] Financial services firms such as Betterment and Wealthfront provide automated, customized investment advice. The Associated Press (AP) is implementing a system to automate the writing of corporate earnings reports, allowing reporters to concentrate on tasks that require more ingenuity and add more value—"more journalism and less data processing" in the words of the AP's Lou Ferrera.[19]

Looking ahead, the implications of increasingly autonomous non-human intelligence are profound, though still uncertain. Many, including scientist Stephen Hawking and entrepreneur Elon Musk, have voiced serious, perhaps existential, concerns regarding the potential consequences.[20] More immediately, however, we need only look backward at the transformative impacts of automation on manual and routine cognitive work—growth, productivity, and prosperity, alongside challenging social disruptions—to get a sense of the sheer scale of what likely lies just around the corner.

## The producer-consumer boundary

Another clearly drawn line quickly losing resolution is the distinction between producers and consumers. In the first half of the twentieth century, powerful producers forged and dominated the new industrial era; consumers were the passive recipients of their output, far from active participants. In recent decades, increased choice enhanced consumers' power in the marketplace, but they were engaged rarely and weakly, through mechanisms like focus groups. Persuasion prevailed over participation. Even today, many businesses declare themselves "customer-centric," but still strategize around "value chains" that relegate consumers to the far end of increasingly complex production arrangements.

Such approaches are becoming increasingly inadequate as the old boundaries between producers and consumers blur in a variety of ways. Consider YouTube, where millions of users create and share 300 hours of content *every minute*.[21] Today, we also see people contributing real value to many communities of shared interests and needs—related to, for example, particular medical conditions or hobbies—and to blogs, citizen journalism, and other knowledge- and opinion-sharing portals. Five of the ten most popular web content sites worldwide are primarily user-generated.[22]

But consumers have also become deeply engaged in the production of physical products. In some cases, ecosystems of "makers"

empowered by newly accessible and affordable technologies, are actually leading the evolution of products—for example, drones.[23] More commonly, consumers help design, improve, and prioritize within existing categories, on powerful platforms established by many firms explicitly for "co-creation." UK-based startup MakieLab, for example, allows customers to create one-of-a-kind 3D-printed dolls using its FabLab app. A similar concept underpins the successful fashion company Threadless, which gets all the graphics for its T-shirts as submitted designs and allows visitors to its site to vote for the ones Threadless should produce. Such approaches are being further spread through the increased deployment of prizes and competitions, and the growing success of crowdsourcing businesses such as Applause, the world's largest open community dedicated to professional testers of software.[24]

More recently, peer-to-peer networks have proliferated, enabling individuals to "share" their assets, skills, and time. Businesses like Airbnb, Uber, and SoMoLend, for example, are creating radically different and fast-scaling options in hospitality, mobility, and finance, respectively. In some instances these are making previously "idle" assets productive, thereby benefitting society; but as such networks spread to other parts of the economy, they will threaten the existing business models of many incumbents.[25]

Consumers are also prolific producers of arguably the most valuable commercial resource today—massive volumes of data. Consider the data exhaust captured by Google's aggregation and prioritization of our searches. Or Amazon's "collaborative filtering" which captures our preferences to promote suggestions to like-minded people. And, as companies increasingly enable their customers to customize their own products, services, and experiences, they will accumulate ever more prodigious amounts of individual and collective data. As more of our lives move into the digital arena, almost every action and choice will create and transmit dynamic data with latent value—posing both new opportunities, and new dilemmas.

Now, the physical and digital worlds are converging rapidly in the form of increasingly "smart" objects.

## The physical-digital boundary

Digitization began influencing the physical economy 50 years ago, with information technology automating many business processes. The advent of the Internet increased the pace, scope, and scale of that process, with some commentators initially distinguishing between an "old" physical and "new" digital economy: "E-commerce" was different from "commerce," "bricks and mortar" separate from "online."[26] That boundary, however, quickly blurred, with terms such as "clicks and mortar" and "omni-channel" emerging in retail, for example, to describe a much more blended and integrated reality.

Now, the physical and digital worlds are converging rapidly in the form of increasingly "smart" objects. The Internet of Things (IoT) is enabled by many factors, including increasing capabilities and falling costs of sensors, actuating devices, and wireless connectivity, and the massive expansion of the Internet Protocol registration regime, IPv6. By connecting far-flung devices, objects, and infrastructure, the IoT enables not only remote real-time awareness, but autonomous adjustment and control to optimize performance, while creating yet more data. For example, the Nest Learning Thermostat senses your presence or absence at home, tracks your heating preferences over time, and adjusts temperatures accordingly. By aggregating what it learns from your and every

**Figure 1. Fundamental boundaries are rapidly blurring in the business environment and economy**


Source: Deloitte analysis.

Graphic: Deloitte University Press | DUPress.com

other household, it continuously improves its algorithms based on large-scale patterns.[27]

The IoT is spreading across the economy. Gartner has estimated about 26 billion connected objects (excluding smartphones and tablets) by 2020;[28] Cisco predicts 50 billion;[29] and Morgan Stanley 75 billion.[30] Every sector, from health care to security, will be altered. But this is not the only technology blurring the boundaries of the physical and digital worlds. 3D printing enables production of an expanding range of physical goods from digital files, from OwnFone's simple yet customizable made-to-order mobile phones to NASA-designed tools that can be printed in space.[31] With significant innovation broadening the array of "printable" materials, this will only accelerate. For example, Organovo is today printing scaled-down human livers,[32] which it sells to pharmaceutical companies for drug-testing purposes, while researchers in Australia have figured out how to print stem cells,[33] a step toward lab-grown hearts and brains. In another interesting twist, AutoDesk has recently offered as a free public beta its Memento software, which enables non-experts to turn digital images (scans or photos) of physical objects back into 3D models that can then be physically printed![34]

Looking ahead, there is perhaps an even more profound blurring of the physical and digital worlds, as advances in virtual reality technology enable increasingly lifelike "alternate" digital worlds. While virtual reality is

today deployed primarily in the gaming space, Facebook's recent $2 billion acquisition of Oculus VR perhaps hints at a future of fully immersive connections for maintaining social relationships and sharing information, weaving even more digital threads through the physical fabric of our lives.

## Implications

Boundaries typically produce constraints, limiting choices and actions and reducing efficiency. As they diminish, wonderful new opportunities flourish. So, too, does upheaval. The old boundaries and constraints were limiting, but also clarifying. They provided definition and focus, framed what was possible, pointed clearly to sources of advantage, and informed the key elements of business strategy and operations for many decades. Therefore, blurring boundaries are creating extraordinary new potential for the economy and broader society, and enabling remarkable innovation and entrepreneurship; and at the same time, they are also creating new challenges, especially for incumbents who have been masters of the previous game. Successful leaders will have to address increasingly urgent issues regarding cybersecurity and the "fair usage" of data; figure out optimal ways to organize and to access talent; and adopt more dynamic approaches to strategy with far greater built-in optionality.

### Cybersecurity and data

The blurring boundary between the physical and digital worlds is a fundamental driver of transformation, creating connections, data, and capabilities that are reshaping almost every part of our lives. But it also presents two substantial and unresolved challenges. First, maintaining a secure, global, open Internet; and second, determining the appropriate use of the mushrooming data we are all generating every day in myriad ways.

Of the various threats to the Internet, the greatest is arguably "hacking"—for fun, for illegal profit, for access to confidential information, for malicious disruption and damage, and for various ideological reasons. The number of detected cyber-attacks increased by nearly 50 percent in 2014 (reaching some 120,000 per day), while identity theft (up 70 percent) and cybersecurity (up 61 percent) were the top two security concerns for American citizens.[35] President Obama's urgent call in his 2015 State of the Union address for more collaboration between government and business on this front raises the prospect of greater collective prioritization—and innovation—for years to come.[36]

Similar collaboration and innovation will also be occurring in the domain of data—their capture, ownership, distribution, and monetization. An order of magnitude more data will be produced in the years ahead, analytics will continue to get far smarter and more predictive, and opportunities to create value will proliferate. Yet critical issues regarding privacy, ethical questions posed by the ability of data to be used in discriminatory ways, and tensions over ownership of and value extraction from data produced through the activities of citizens are all rising.[37] There have been substantial breaches of trust in the past—some occurring because data was not adequately protected from theft or hacking and others because the data was inappropriately exploited by those stewarding it—and there will be more in the future. The resulting erosions in public trust are becoming more costly and are rapidly rising on the corporate agenda as businesses increasingly view the data they are co-creating with customers as one of their more valuable assets.

### Evolving organization designs and talent models

Few organizations today bear much resemblance to their counterparts of 30 years ago. As the changing business environment has heightened the imperatives of innovation, agility, and resilience, organization design has changed dramatically. Multiple layers of "command and control" hierarchies have been reduced. Many isolated internal siloes have been connected

and integrated. Core competences have been prioritized, the rest assigned to sophisticated supply chains or otherwise outsourced or "virtualized." Key business processes have been automated. Digital technology and connectivity have enabled these developments, which have been transformative. But this journey is far from over. As value creation across ecosystems continues to grow in importance, organizations will continue to be further optimized for effective networking, collaboration, and fluidity.[38]

Recently, talent models in particular have evolved. Long-term employment has been eroding while contracting talent only "as needed" becomes more common. An Intuit report estimates that over 60 million Americans will be "contingent" workers by 2020;[39] 87 percent of executives leading global human resource functions have altered or are considering changes to their talent sourcing strategy;[40] and 70 percent of Millennials expect to spend part of their career working independently.[41] An enabling infrastructure of crowdsourcing and competitions has been growing fast. Specific tasks can increasingly be allocated through TaskRabbit or Amazon Mechanical Turk; entire projects can be planned and responsibilities distributed using, for example, Elance and oDesk; invention ideas can be crowdsourced, designed, and commercialized through Quirky; and marketing needs can be addressed by Tongal's platforms of tens of thousands of creatives. Talent models will be changed further by increased automation of some types of knowledge work. Companies such as HCL Technologies and Wipro are already talking about the "hourglass" structures that will replace existing "pyramids" as artificial intelligence extends deeper into software testing and IT support functions.[42]

## Dynamic strategy

More than anything, business leaders will have to adopt new approaches to strategy. Successful business strategy will remain anchored on setting clear aspirations, making well-informed and integrated choices regarding where to play and how to win, and developing the essential capabilities to support these ambitions. However as boundaries blur, the universe of options for creating value is increasing substantially; "winning" increasingly requires collaboration as well as competition with others; essential capabilities need not necessarily be owned or directly controlled; capturing value is becoming more challenging, often requiring the creation of new business models; and the need for enhanced agility means our strategies must be increasingly capable of rapid flex and adaptation.

Approaches to strategy are likely to evolve as a consequence, in a variety of ways that are already becoming evident. More emphasis will be placed on designing and renewing business models that take fuller account of the importance of relationships outside the firm.

More than anything, business leaders will have to adopt new approaches to strategy.

New models for profit capture will proliferate including, for example, subscription-based pricing, "freemium" services, micropayments, and other newly possible tools. Shared, cross-firm approaches to strategy formulation, often built on opening up hitherto closely guarded and proprietary data, is also increasing—notably between large retailers and their suppliers. The use of scenarios that paint alternative futures, first pioneered 45 years ago by Royal Dutch Shell, is likely to become increasingly common. And the smart analysis of increasingly abundant data to detect early signals of directional changes and enable dynamic adjustment of strategies will only rise in importance, with big data and analytics already being the top investment priority among CIOs given additional budget.[43]

## What's next?

The significant erosion of long-standing boundaries will likely result in two very different outcomes: **New possibilities** will be discovered and deployed that will have transformative impact; and some **new boundaries** will surely also arise to present different challenges. Writer William Gibson has suggested that "The future is already here—it's just not evenly distributed yet." We have already seen powerful cross-cutting ecosystems transform the once-separate sectors of computing, telecommunications, and media. As digitization spreads everywhere, we must expect similar blending and dynamism across the economy. Just as we have seen the growing phenomenon of temporary "pop-up" restaurants and even retail outlets, might the future hold "pop-up firms"? After all, as writer Clay Shirky has noted, it is becoming increasingly possible to "organize without organizations."[44] Just as automation has started to make serious inroads into non-routine cognitive work domains, might AI move next into the world of creativity? Software programs are, after all, already producing distinctive gallery exhibited drawings and composing music.[45]

New boundaries are already visible as well. Geopolitical tensions that were relieved following the collapse of the Soviet Union appear once more to be rising. Fundamentalist belief systems—an obviously divisive force in human affairs—are proving tragically consequential. While the gap between "rich" and "poor" globally is on some measures declining, the divide between the extraordinary wealth of those at the top (the 10 wealthiest individuals own around half a trillion dollars)[46]—and the vast majority of the rest is of growing concern. Our dynamic economy greatly rewards restless entrepreneurship. Might new fault lines evolve between those well equipped for such a world and those more suited to a steadier and less frenetic world of employment? Inevitably, as old boundaries and frictions disappear, new ones will appear.

Yet if we can figure out how to live together on our shared planet, the future prize is extraordinary. The new art of the possible—from far more effective deployment of assets and resources to collaborative integration of expertise and passion—can help smarten and strengthen Adam Smith's "invisible hand" to create a more sustainable, global, and prosperous civilization. Today, that prize is within our reach, but not yet—not quite—within our grasp. That will perhaps be the greatest challenge ahead, shared by the leaders of today, and tomorrow.

# My take

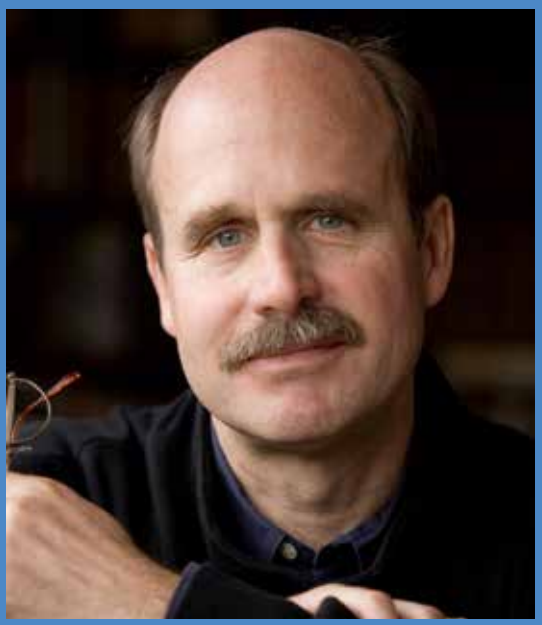
*By Paul Saffo*

Paul Saffo is a technology forecaster based in Silicon Valley, where he teaches at Stanford University and chairs the Future Studies and Forecasting track at Singularity University. Saffo's essays on the future of technology have been featured in publications such as *Harvard Business Review*, the *New York Times*, *Fortune*, and *Foreign Policy*.

Let's consider the grand sweep of this story. Once upon a time there was just the physical, analog domain. We then started creating and linking digital machines. The resulting bubble of cyberspace was initially small, but it has been growing rapidly since. As it expands, it encroaches on the analog, not in a science fiction kind of way, but in a very real kind of way. Now, even the basic notion of a boundary between digital and the analog is increasingly passé. The world has become more permeable, with much of the most interesting innovation coming from economic "edges" rather than from the historic centers.

"Interfacing" is what once happened through screens, keyboards, and other operating panels that separated humans and machines while still allowing them to connect. Today, we no longer interface with machines—so much as we interact with them. The distinction is subtle, but important because today's more intimate human-machine mingling allows for practically instantaneous and transparent two-way communication enabled by sensors, monitoring, and environmental feedback. Leading firms today are often forced to acknowledge that some of their most important employees are actually machines.

Increasingly, no hard border needs to be crossed in order for insight to exchange "hands" from a person to a thing. Planes, trains, and subways, for example, may still have human operators, but none of them could successfully complete their assigned tasks without guidance, and even fundamental coaching, from machines. The drivers don't need to ask for advice, because the supporting technology is smart enough to simply reach in and offer it. These transactions can be so seamless, and effective, that some organizations are now putting measures in place to guard against human overreliance on technology. For example, next-generation autopilot design now includes machine-generated prompts reminding pilots to remain engaged.

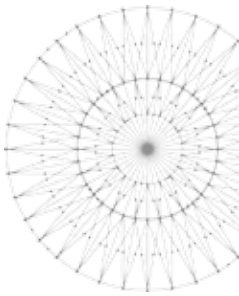


We tend to structure our organizations to reflect our dominant communications systems. In the age of telephony and mainframe computing, organizations were more hierarchical and centralized. As networked communications have evolved, we have increasingly drawn upon organizational designs that are decentralized and even more organic. If I could offer one piece of advice to today's leaders, it would be to read more broadly in ecology and biology. Key ideas like symbiosis and co-evolution are central in that literature and businesses will increasingly need to master them to thrive. Many leaders can also borrow important biological lessons about sharing resources and cross-pollinating ideas in the "intertidal zones" that increasingly link businesses and turn out to be fantastically rich places to innovate.

# Author

**Eamonn Kelly** is a director with Deloitte Consulting LLP, chief marketing officer of the Strategy and Operations practice, and a widely published author and business thought leader.

# Endnotes



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# About the authors

**Mike Armstrong** | mikearmstrong@deloitte.com

Mike Armstrong is a principal with Deloitte Consulting LLP in the US Strategy service line Monitor Deloitte. Prior to joining the firm, he was a partner in the Monitor Group and chief executive of Monitor's M&A Advisory practice. He has worked on a variety of corporate strategy projects and inorganic growth mandates across a range of industries including heavy industry, specialty chemicals, life sciences, and consumer durables. Armstrong had previous careers as a lawyer and investment banker. As a banker he worked on a variety of M&A mandates including acquisitions, hostile takeovers, private company divestitures, portfolio analysis, and private placements. Client industries ranged from mining to consumer goods to high-tech. He began his career as a corporate attorney with a large national law firm, focusing on M&A, securities law and financial restructurings. He received his BA and law degree (JD) from the University of Toronto and an MBA from INSEAD in Fontainebleau, France.

**Jacob Bruun-Jensen** | jbruunjensen@deloitte.com

Jacob Bruun-Jensen is a principal with Deloitte Consulting LLP in the US Strategy service line, Monitor Deloitte, with a focus on strategy and innovation. He works with leading companies in the Consumer Product and Retail sectors to make sense of the converging forces of customer desires, technologies, and business ecosystems to rethink business models and innovation. Bruun-Jensen is currently completing his PhD in Business Model Innovation at Rotman School of Management in Toronto, and holds two master's degrees in management from Henley Business School and ESCP Europe Business School.

**Bruce Chew** | brchew@deloitte.com

Bruce Chew is a director with Deloitte Consulting LLP in the US Strategy service line Monitor Deloitte. For more than 20 years, his work has focused on strategy development, implementation, and the building of organizational capabilities. Chew has worked with the federal government, universities, and companies across a broad range of industries. He holds an MBA from Harvard Business School and a PhD from Harvard University after graduating from the University of Michigan.

**Don Derosby** | dderosby@deloitte.com

Don Derosby is a specialist master with Deloitte Consulting LLP in the US strategy service line Monitor Deloitte. Derosby has nearly 20 years of experience in strategy, scenario planning, risk assessment, problem framing, system dynamics, and in the creation of learning laboratories for executives. His work has been equally distributed between the corporate and public sectors with an emphasis on health and wellness, information security, globalization, innovation, and economic development.

**William D. Eggers** | weggers@deloitte.com

William D. Eggers is responsible for research and thought leadership for Deloitte's Public Sector industry practice and has advised governments around the world. He is an internationally recognized authority on government reform, a columnist, and author of eight books. His books have won numerous awards and his commentary has appeared in dozens of major media outlets including the *New York Times*, *Wall Street Journal*, *Washington Post*, *Guardian*, and the *Chicago Tribune*.

**William Engelbrecht** | wiengelbrecht@deloitte.com

Will Engelbrecht is a principal with Deloitte Consulting LLP and leads its M&A Strategy and Strategic Diligence practice. He has more than 15 years of experience serving clients, with a focus on creating value through M&A, and assists clients across the deal life cycle from strategy development to post-merger integration. Engelbrecht serves both strategic and private equity clients on the buy and sell side across a variety of deal structures including foreign inbound, MOEs, LBOs, carve-out, and multinational transactions.

**John Hagel** | jhagel@deloitte.com

John Hagel is co-chairman for Deloitte LLP's Center for the Edge and has nearly 30 years of experience as a management consultant, author, speaker, and entrepreneur. He has served as senior vice president of strategy at Atari, Inc., and is the founder of two Silicon Valley startups. Author of *The Power of Pull, Net Gain, Net Worth, Out of the Box*, and *The Only Sustainable Edge*, Hagel holds a BA from Wesleyan University, a B.Phil from Oxford University, and a JD and MBA from Harvard University.

**Larry Keeley** | lkeeley@deloitte.com

Larry Keeley has worked for over three decades to develop more effective innovation methods. He is co-founder of innovation firm Doblin, which is now a unit of Deloitte Consulting LLP, where he serves as a director. Keeley has been identified by *BusinessWeek* as one of seven leading global innovation gurus, and separately as one of 27 leading global designers. He teaches innovation at both IIT's Institute of Design, where he is also a board member, and at the Kellogg Graduate School of Management, where he has been recently appointed as a senior fellow.

**Eamonn Kelly** | eakelly@deloitte.com

Eamonn Kelly is a director with Deloitte Consulting LLP and chief marketing officer (CMO) of the Strategy and Operations practice. He has, for more than two decades, advised senior leadership at leading corporations across multiple industry sectors, key global and national public agencies, and major philanthropic foundations. Prior to joining Deloitte, Kelly held a wide range of leadership positions. He was a Monitor Group partner and, as CMO, a member of its global executive team responsible for marketing, thought leadership, network strategy, and client experience. He also served as CEO of Global Business Network (GBN), the pioneering scenario planning consultancy and futures think tank, where he led GBN's thought leadership about the future, writing two books and numerous articles and delivering insights and new methodologies for mastering change and uncertainty.

**Kelly Marchese** | kmarchese@deloitte.com

Kelly Marchese is a principal with Deloitte Consulting LLP and leader of the Supply Chain Strategy practice. She has over 20 years of experience leading projects in complex manufacturing industry sectors. Marchese also leads the Global Supply Chain Risk service offering. She is a master black belt in Lean/Six Sigma and is a thought leader in supply chain innovation and engineering effectiveness.

**Bill Miracky** | wmiracky@deloitte.com

Bill Miracky is a director with Deloitte Consulting LLP in the US strategy service line Monitor Deloitte. He advises senior government officials and corporate executives on a range of strategic and operational issues associated with institutional performance, competitiveness, economic development, and security. His client engagements have addressed a number of management issues, including corporate portfolio strategy, business unit strategy, cost management, and organization strategy and transformation. Prior to joining Deloitte, Bill was a partner at Monitor Group where he managed the firm's National Economic Development and Security practice and co-founded its High-Performance Bureaucracy practice. He began his career in government at the Federal Reserve Board in Washington, D.C.

**Anna Muoio** | amuoio@deloitte.com

Anna is a specialist leader with Monitor Institute, part of Deloitte Consulting LLP's Social Impact service line. Anna has worked at the intersection of business, innovation, and social change for the past 15 years. She believes deeply in the power of cross-sector collaborations to move the needle on tough social problems. She focuses her practice on how to drive large-scale social change through galvanizing networks around a shared agenda. She has led Aligned Action efforts for organizations such as New Profit, Skoll Foundation, and Venture Philanthropy Partners—designing network strategies and launching large-scale coalitions that work to drive new solutions to old problems.

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# The future of mobility

## How transportation technology and social trends are creating a new business ecosystem

Deloitte University Press

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# About the authors

**Scott Corwin** is a director in Deloitte Consulting LLP's Strategy and Business Transformation practices. He brings over 25 years of experience working closely with corporate leaders to develop and implement strategy-based transformations, specifically around globalization, advanced R&D/technology innovation, and new business models. Corwin works with clients across a wide range of industries, including automotive, technology, industrial, media, consumer products, retail, healthcare, telecommunications, public sector, and not-for-profits. He serves as the leader of Deloitte's Future of Mobility initiative and lead consulting partner for a number of the firm's key accounts, including a global leading automotive OEM.

**Joe Vitale** is the global automotive industry leader for Deloitte Touche Tomatsu Limited and serves as the global lead client service partner for one of the largest automotive OEMs. He is responsible for delivering Deloitte's multidisciplinary solutions, including consulting, enterprise risk management, tax, and financial advisory services to automotive companies worldwide. Vitale specializes in corporate strategy, mergers and acquisitions, supply chain optimization, and new product development.

**Eamonn Kelly** is a director with Deloitte Consulting LLP and chief marketing officer of the Strategy and Operations practice. He has, for more than two decades, advised senior leadership at leading corporations across multiple industry sectors, key global and national public agencies, and major philanthropic foundations. Prior to joining Deloitte, he was a Monitor Group partner and also served as CEO of the think tank Global Business Network, where he led thought leadership about the future, writing two books and numerous articles and delivering insights and new methodologies for mastering change and uncertainty.

**Elizabeth Cathles** is a manager in Deloitte Consulting LLP's Strategy & Operations practice. She has over 10 years of experience in strategy and innovation, specializing in growth strategy, marketing and customer strategy, organizational management, R&D, and product-launch strategy. Her experience includes building and implementing new processes and structure for product development, developing growth and launch strategies for products across multiple geographies, helping to design organizational training systems to challenge global leaders, and implementing innovative approaches to customer experience.

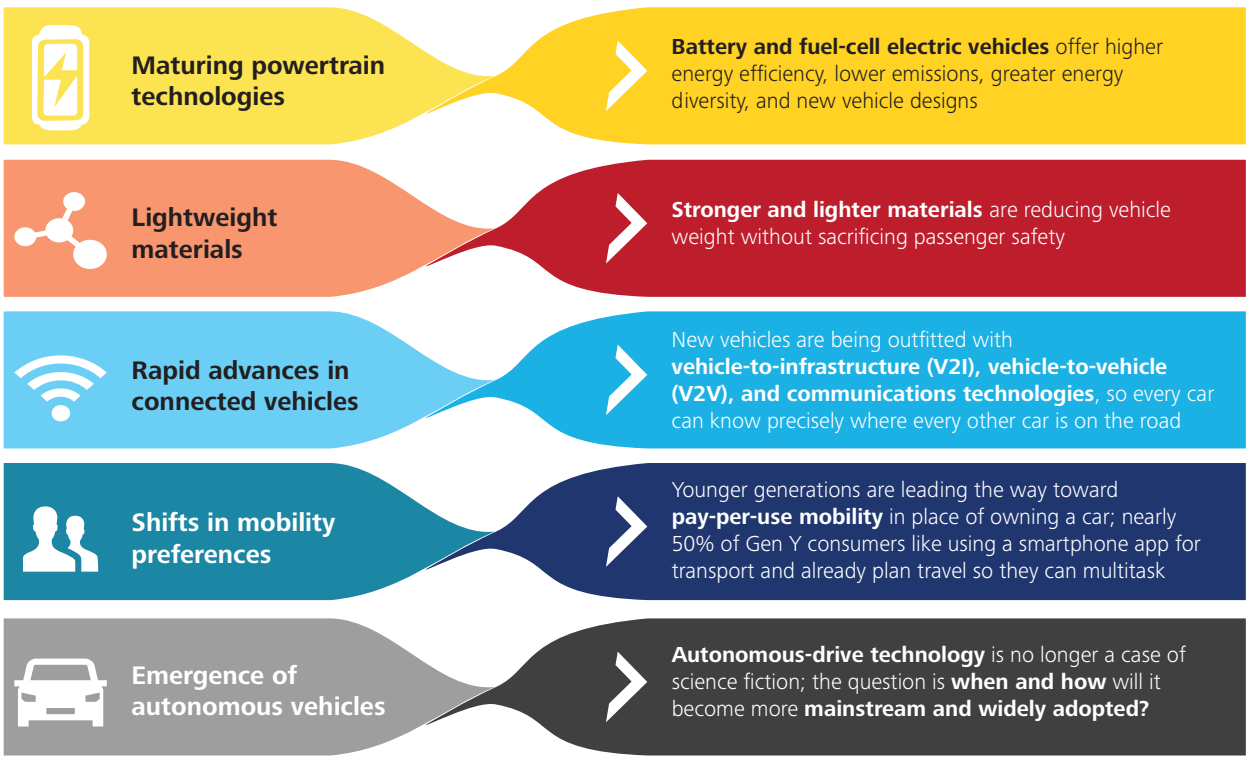
# Contents

# Introduction

THERE is a critically important dialogue going on across the extended global automotive industry about the future evolution of transportation and mobility. This debate is driven by the convergence of a series of industry-changing forces and mega-trends (see figure 1).

Innovative technologies are changing how companies develop and build vehicles. Electric and fuel-cell powertrains tend to offer greater propulsion for lower energy investment at lower emission levels.[1] New, lightweight materials enable automakers to reduce vehicle weight without sacrificing passenger safety.[2]

**Figure 1. Converging forces transforming the future evolution of automotive transportation and mobility**




Graphic: Deloitte University Press | DUPress.com

Further breakthroughs are advancing the introduction of autonomous vehicles; increasingly, daily news reports suggest that driverless cars will soon become a commercial reality.[3] We have already seen rapid advances in the "connected car"—innovations that integrate communications technologies and the Internet of Things to provide valuable services to drivers.[4] Vehicles outfitted with electronic control modules and sensors that enable vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications can proactively suggest re-routings to avoid road hazards and call for assistance in the event of an accident.[5] Soon, cars will routinely gain precise-enough awareness of where they are in relation to other vehicles and potential hazards to take preemptive action to avoid accidents.[6]

Simultaneously, young adults, along with urbanites, are gravitating toward a model of personal mobility consumption based on pay-per-use rather than upfront purchase of a capital asset, which fundamentally challenges today's consumption model centered on personal ownership of cars.[7]

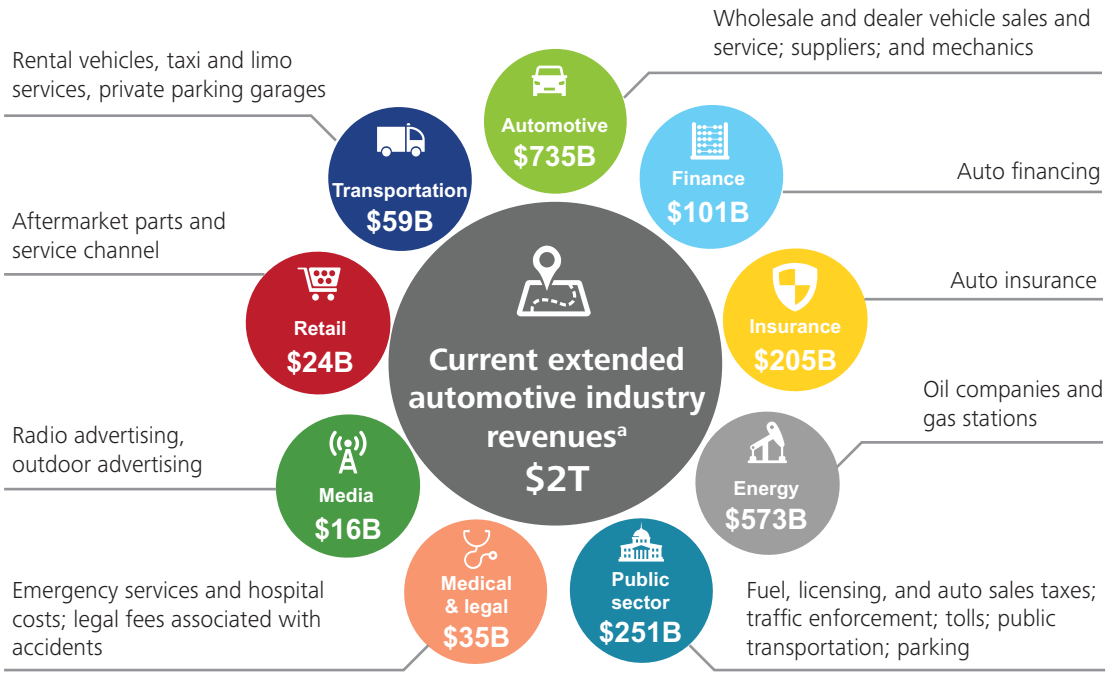
All told, a system that has been well established for a century is on the verge of a major transformation that could result in the emergence of a new ecosystem[8] of personal mobility.

Today's debate centers on whether the extended automotive industry will evolve incrementally toward some future mobility ecosystem or whether change will occur at a more radical pace and in a highly disruptive manner. No one knows the full scope and magnitude of the changes that are to come, what they entail, or how they will evolve, yet these forces have the potential to alter current industry structures, business models, competitive dynamics, value creation, and customer value propositions. We may be on the threshold of change as great as any the industry has ever seen.

# The importance of the automotive industry

THERE'S no mystery about why we pay such close attention to the ups and downs of the auto industry—its extended value chain is an essential engine of global economic growth. In the United States, the sector generated $2 trillion of annual revenue in 2014 (see figure 2)—11.5 percent of US GDP[9]—from auto manufacturers, suppliers, dealers, financial services companies, oil companies, fuel retailers, aftermarket services and parts, insurance, public and private parking, public-sector taxes, tolling and traffic enforcement, medical care, and others.

**Figure 2. 2014 extended automotive industry revenue**




Source: Deloitte analysis based on IBISWorld Industry Reports, IHS, DOT, US Census, EIA, Auto News, TechCrunch. Current revenue represents 2014 figures (or earlier if 2014 data not available) in the United States.
[a]Total revenue is $1.99T.

Graphic: Deloitte University Press | DUPress.com

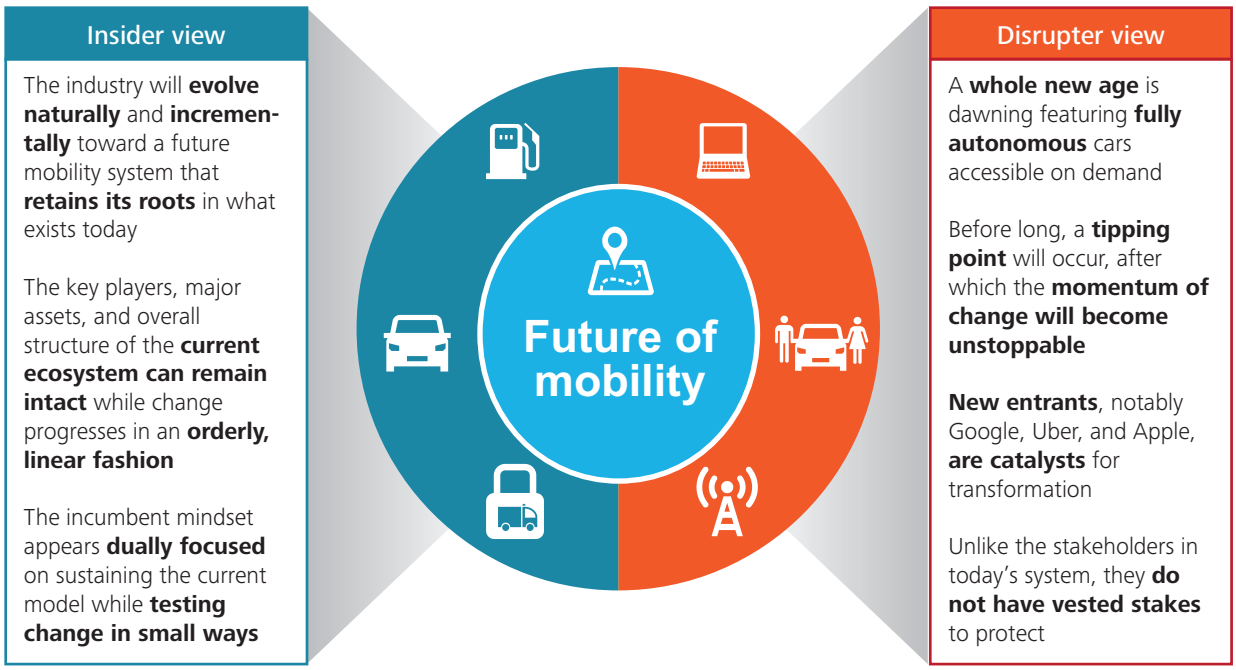
At Deloitte, we've been engaged in a deep and broadly ranging study of the extended auto industry, the economics of alternative future states, and the potential impact of each on related industries.[10] We have concluded that change will happen systematically—a rising tide, not a tsunami. At no point will the world be presented with a Manichean choice and collectively decide to plunge all-in to a system of driverless, pay-per-use travel—or else to change nothing at all. Rather, the new personal mobility ecosystem will likely emerge unevenly across geographic, demographic, and other dimensions, and evolve in phases over time.

# Two divergent visions

THERE are two profoundly different visions of the future of mobility. Fundamental differences center around whether today's system of private ownership of driver-controlled vehicles remains relatively unchanged or whether we eventually migrate to a driverless system of predominantly shared mobility. There is also a critical difference about the pathway forward.

The "insider" view believes that today's system can progress in an orderly, linear fashion, in which the current industry assets and fundamental structure remain essentially intact. The "disrupter" view envisions a tipping-point approach to a very different future, one that offers great promise and potential societal benefits (see figure 3).

**Figure 3. "Insider" and "disrupter" views of the future of mobility**




Source: Deloitte analysis, based on publicly available information and company websites.

Graphic: Deloitte University Press | DUPress.com

Within the high-tech community, companies are working to arrive at something radically different than today's system of personally owned driver-driven passenger automobiles. According to this perspective, which we label the disrupter view, a new age is dawning, featuring fully autonomous cars accessible on demand. Progress toward it might be measured at first, but before long, a tipping point will occur, after which the momentum of change could gather speed. Imagine a world where the following statements are all true:

- Vehicles hardly ever crash. Autonomous operation removes the cause of almost all accidents: human error.[11]
- Traffic jams are rarities, thanks to sensors allowing for less space between vehicles and guidance systems with real-time awareness of congestion.
- Energy demand drops, since smaller mass and weight allow cars to be propelled by more compact, efficient, and environmentally friendly powertrains.
- Trip costs plummet, with average cost per passenger mile dipping from today's ~$1 per mile to approximately 30¢ per mile, thanks to dramatically higher rates of asset utilization.
- Infrastructure is funded by charges for actual usage, since connected-car technology allows systems to precisely calculate personal road use.
- Parking lots disappear, as the rise of autonomous-drive and carsharing models diminish need.
- Law enforcement ceases to concern itself with traffic, since autonomous vehicles are programmed not to exceed speed limits or otherwise violate traffic laws.
- Speed of deliveries quickens and costs decrease through the rise of fully autonomous networks of long-haul trucks that can operate for more extended time periods and cover longer distances with lower labor costs.
- Seamless multimodal transportation becomes the new norm, as greater system interoperability enables consumers to get from point A to point B via multiple, connected modes of transportation on a single fixed price charged on a single payment system.

Much of the technology already exists to turn this vision into reality, and disrupters are working toward implementing it, catalyzing the transformation. Google's driverless cars have already driven more than 1 million miles in autonomous mode, and the company is running pilot and testing programs with small fleets of fully autonomous vehicles in Mountain View, CA, and Austin, TX.[12] Less technologically dazzling but equally disruptive—and far more mature—are carsharing and ridesharing: The movement that started with Zipcar has more recently spawned the ridesharing concepts of Uber and Lyft; Uber alone delivers 1 million trips per day worldwide[13] and is growing rapidly.

Still, these industry-changing technologies may fail to reach transformational scale—or at least fail to do so within a strategically relevant time frame. Insiders, heavily invested in the current auto industry, see change evolving slowly toward a future that retains its roots in what exists today.

We see the major auto companies pursuing strategies that address the converging forces incrementally, creating future option value while preserving flexibility. These industry players' efforts and investments are yielding a steady stream of benefits for customers. For example, in introducing connected-car technology, manufacturers offer drivers many of the benefits associated with autonomous drive

without fundamentally altering how humans currently interact with vehicles.

Automakers are experimenting and inventing, and have passionate voices within their ranks describing much-altered futures. Most have set up offices in Silicon Valley to gain greater proximity to technology development and early-stage funding. Among the noteworthy examples of forward-thinking initiatives are Ford's 25 mobility projects,[14] BMW iVentures,[15] Daimler's engineering advances in intelligent driving,[16] and Cadillac's "super cruise" functionality.[17] In addition, public-private partnerships such as the recently opened Mcity in Ann Arbor, MI, provide a platform to enable more efficient and effective automated vehicle (and feature) testing.[18]

This approach is consistent with historic norms, in which automakers invest in new technologies—e.g., antilock brakes, electronic stability control, backup cameras, and telematics—across higher-end vehicle lines and then move down market as scale economics take hold.[19] In our ongoing conversations with auto-industry leaders, they repeatedly and collectively argue that outsiders simply do not appreciate the sheer complexity of developing a vehicle today, the challenge of introducing new advanced technologies into a vehicle's architecture, or the rigor and inertia of the regulatory environment. All of this encourages incumbents to believe that they can be at the center of actively managing the timing and pace of these converging forces.

But the interplay of the converging forces of change may be less predictable and lead to faster upheaval than they think. Automakers might be overestimating how much power they have to manage the course of future events.

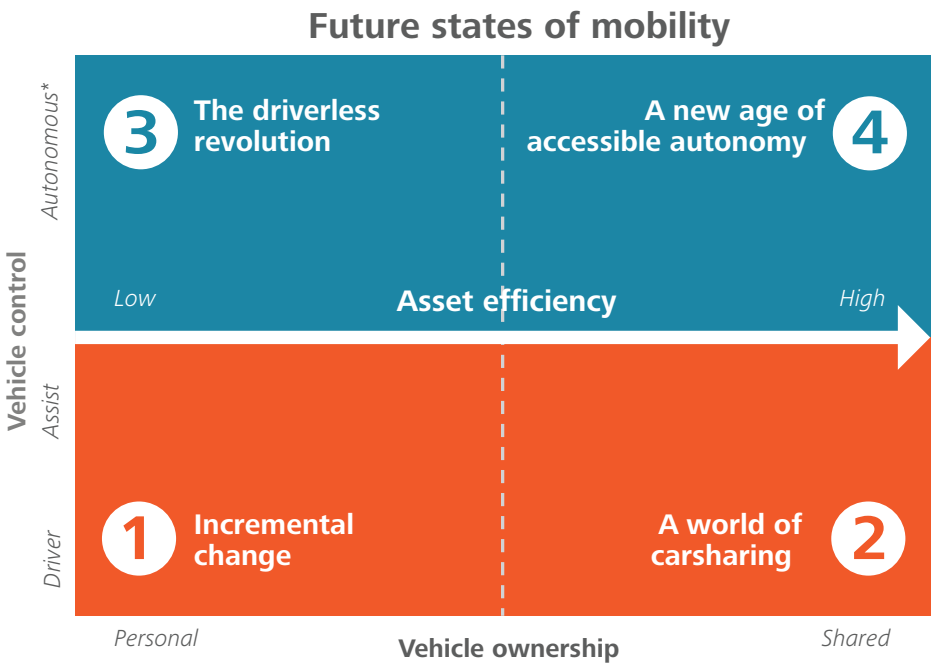
# Four futures will coexist

GIVEN the disparate forces shaping the landscape, we envision four different personal mobility futures emerging from the intersection of two critical trends (see figure 4):

- Vehicle control (driver versus autonomous)
- Vehicle ownership (private versus shared)

Our analysis concludes that change will happen unevenly around the world, with different populations requiring different modes of transportation—which means that the four future states may well exist *simultaneously*. In

**Figure 4. Four potential future states**




Note: Fully autonomous drive means that the vehicle's central processing unit has full responsibility for controlling its operation and is inherently different from the most advanced form of driver assist. It is demarcated in the figure above with a clear dividing line (an "equator").

Graphic: Deloitte University Press | DUPress.com

other words, business leaders will need to prepare their organizations to be capable of operating in four different futures, with distinct sets of customers—beginning in as little as 5–15 years. Here we offer a high-level description of each future state and the conditions that promote its eventual emergence.

## Future state 1: Incremental change

This most conservative vision of the future puts heavy weight on the massive assets tied up in today's system, assuming that these assets' owners will neither willingly abandon them nor eagerly transfer capital into new enterprises with uncertain returns. It sees private ownership remaining the norm, with consumers opting for the particular forms of privacy, flexibility, security, and convenience that come with owning vehicles. Importantly, while incorporating driver-assist technologies, this vision assumes that fully autonomous drive won't become widely available anytime soon.

With so little change envisioned, this future state reinforces automakers' reliance on a business model that emphasizes unit sales. They continue to invest in the development and introduction of new vehicle lines with advanced technologies, and dealers retain responsibility for the customer experience. Other industry players are similarly incented to rely on the practices and structures that have been well established for decades.

## Future state 2: A world of carsharing

The second future state anticipates continued growth of shared access to vehicles.[20] In this state, economic scale and increased competition drive the expansion of shared vehicle services into new geographic territories and more specialized customer segments. Here, passengers more heavily value the convenience of point-to-point transportation created through ridesharing and carsharing, saving them the hassle of navigating traffic and finding parking spaces. Plus, the system offers options for non-drivers such as seniors, low-income families, and minors without licenses.

In this future state, as the cost per mile decreases, some come to view ridesharing as a more economical, convenient, and sustainable way to get around, particularly for short point-to-point movements (see below for our analysis of the economics of mobility). As shared mobility serves a greater proportion of local transportation needs, multivehicle households can begin reducing the number of cars they own while others may abandon ownership altogether, reducing future demand.

## Future state 3: The driverless revolution

The third state is one in which autonomous-drive technology proves to be viable, safe, convenient, and economical, yet private ownership continues to prevail. Collaboration between leading academics, regulatory agencies, and businesses accelerates progress toward this future.[21] Both technology and automotive firms continue investing heavily to increase "V2X" (V2V and V2I) capabilities; in parallel, driverless technology matures, with the success of early pilots fostering quick adoption.

Given that this future state assumes most drivers still prefer owning their own vehicles, individuals seek the driverless functionality for its safety and other potential benefits but continue to own cars for many of the same reasons they did before the advent of autonomous drive. They might even invest more in their vehicles as a new era of customization dawns and it becomes appealing to use vehicles tailored for specific occasions and circumstances.[22] That said, the features in which owners are willing to invest, and the design of the vehicles themselves, may change; this new segment of the market may offer lighter, more technically advanced vehicles that embrace design principles counter to today's four-door, driver-in-front-on-left, gripping-the-steering-wheel reality.

## Future state 4: A new age of accessible autonomy

The fourth future state anticipates a convergence of both the autonomous and vehicle-sharing trends. In this future, mobility management companies offer a range of passenger experiences to meet widely varied needs at differentiated price points.[23] The earliest, most avid adopters seem likely to be urban commuters, given the potential for faster trips thanks to reduced distances between highly automated vehicles, and routes enhanced by real-time awareness of conditions. Over time, as smart infrastructure expands and driver usage nears a tipping point, fleets of autonomous shared vehicles could spread from urban centers to densely populated suburbs and beyond.

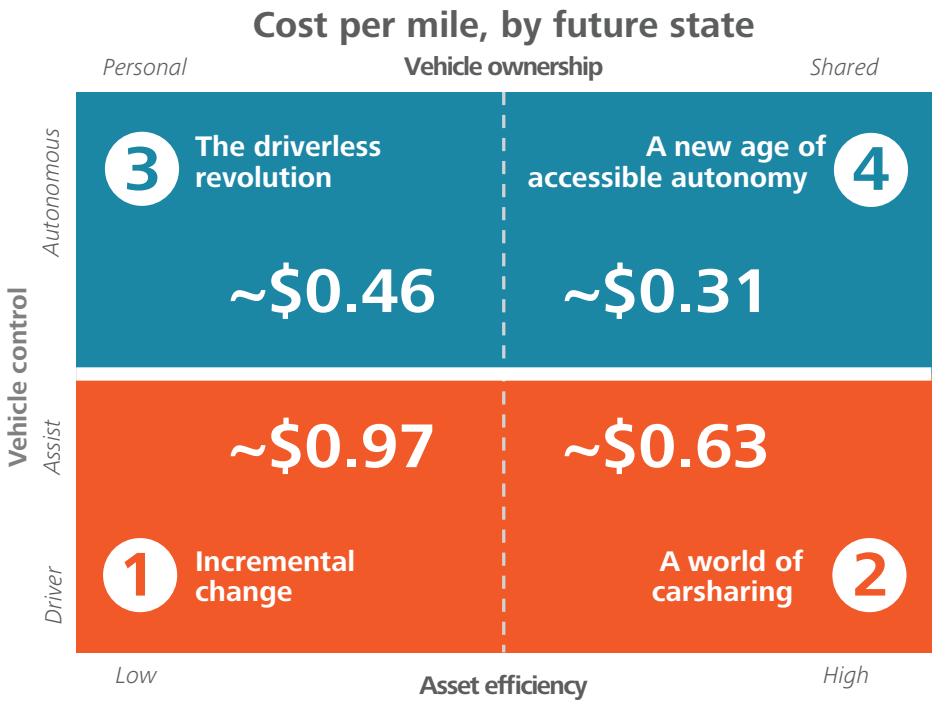
Advanced communications technologies coordinate the customer's point-to-point mobility experience: Intuitive interfaces enable users to order a vehicle pickup within minutes and travel from point A to point B efficiently, safely, and cost-effectively. Vehicle and traffic network systems operators, in-vehicle content-experience providers (e.g., software and infotainment firms), and data owners (e.g., telecoms) could have further opportunities to monetize the value of passengers' attention in transit as well as additional metadata pertaining to system use.

# How much per mile?

WE conducted an analysis to calculate the average cost per mile under each of these future states; this analysis shows that consumers could benefit from lower per-mile travel costs in future states 2, 3, and 4 (see figure 5 for a summary of these costs by future state, and figure 6 for a more detailed breakdown of associated costs).

According to our calculations, personally owned vehicles today impose costs of approximately $0.97 per mile. This includes vehicle depreciation, financing, insurance, and fuel, as well as the value of the individual driver's time. By adjusting these key variables for each future state, we have developed high-level directional

**Figure 5. Per-mile summary cost calculations for each future state**




Source: Deloitte analysis, based on publicly available information (US DOT, AAA, etc.).
Note: Fully autonomous drive means that the vehicle's central processing unit has full responsibility for controlling its operation and is inherently different from the most advanced form of driver assist. It is demarcated in the figure above with a clear dividing line (an "equator").

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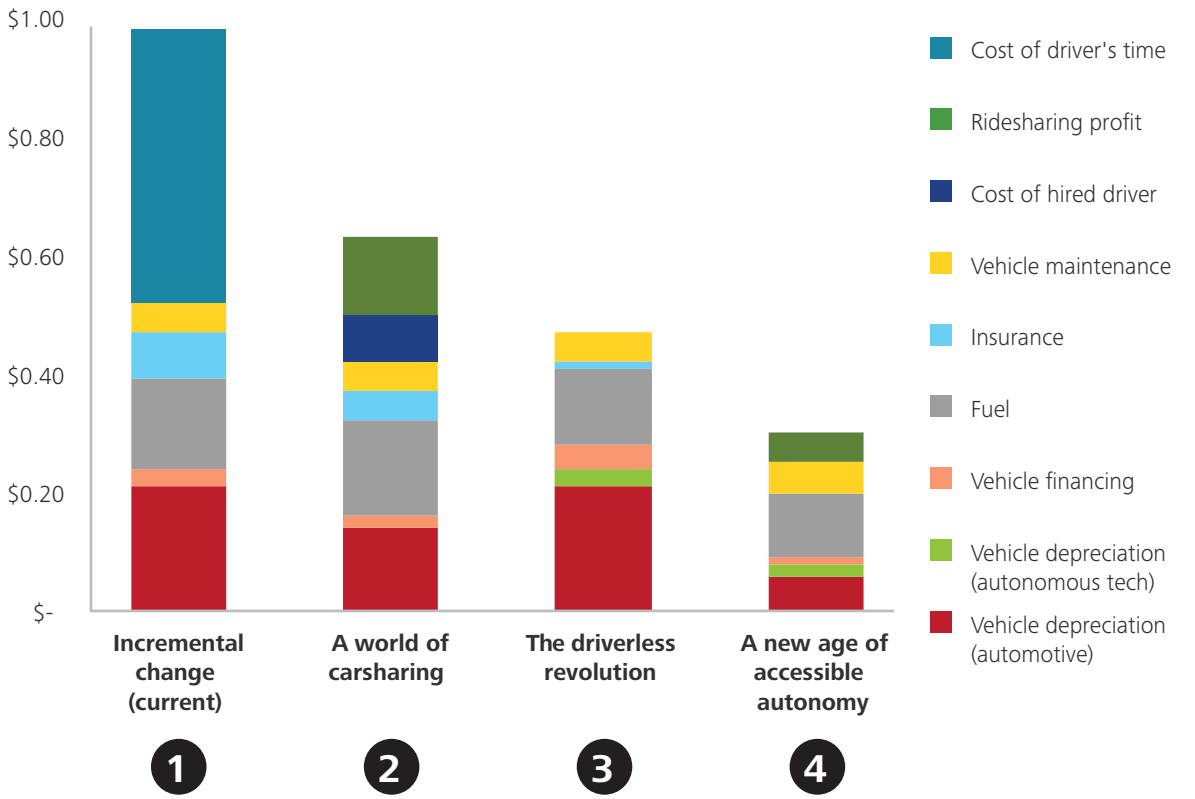
**Figure 6. Cost per mile breakdown for each future state**




Graphic: Deloitte University Press | DUPress.com

estimates of per-mile costs for each future state at maturity.

Our projections indicate that in future state 2 of shared mobility, the economics become more favorable compared to private vehicle ownership, due to greater asset utilization and reduced consumer time spent driving. Over time, the efficiencies of greater asset utilization offset the higher costs associated with employing a driver. Our analysis suggests that a fully scaled shared-service model would cost approximately $0.63 per mile.

If personally owned autonomous-drive vehicles become widely adopted (future state 3), projecting the cost per mile becomes trickier, since calculations depend on the assumptions made for the value of reallocating the driver's time and productivity. Based on conservative estimates of this time value, future state 3 would cost approximately $0.46 per mile.[24]

And in a world of autonomous shared vehicles (future state 4), our analysis finds the economics to be highly favorable: Cost per mile could drop as low as $0.31 for single-person trips—in other words, lower by roughly two-thirds than the cost of driving today. Savings partly result from key assumptions around the availability of lighter-weight vehicles (for example, two-person pods for as little as $10,000) reducing capital costs, high rates of asset utilization (*much* higher than today's 4 percent), and the value placed on freeing up driver time for more productive purposes.

# The course of change

IN our view, moves from the current state of mobility will likely occur fastest in the direction of shared access, in turn catalyzing the (upward) adoption of autonomous drive. We see this progression occurring in a number of steps, as illustrated in figure 7.

## Step 1: Gradual adoption of shared access

The move from pure personal ownership of vehicles to a system more reliant on shared access (i.e., from quadrant 1 to quadrant 2 of

**Figure 7. The course of change**

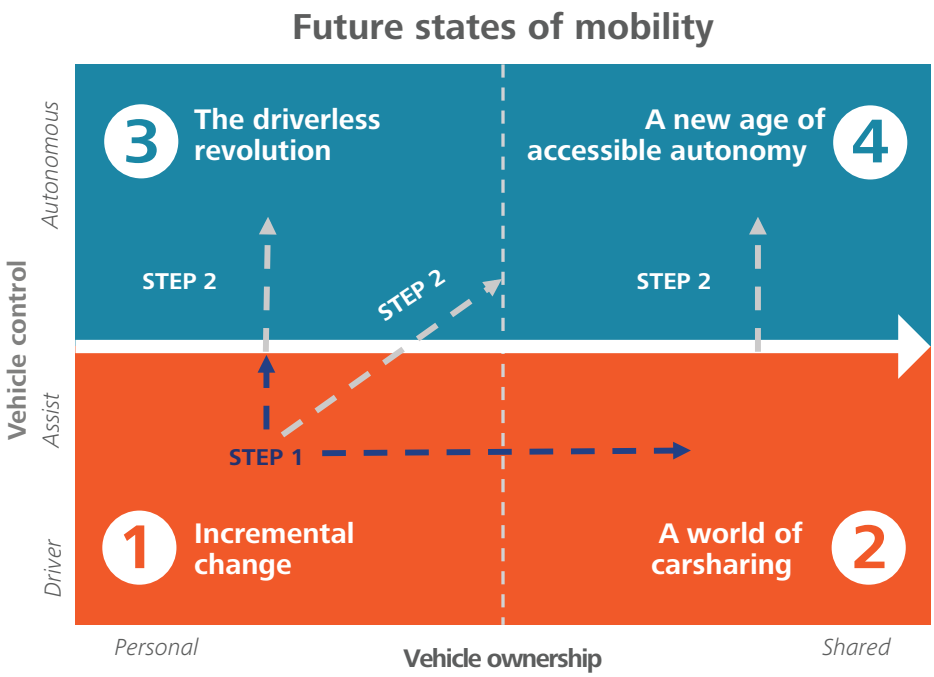



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figure 7), is already under way in some parts of the United States. For example, carsharing services, such as Zipcar, have roughly doubled their customer base in the last six years,[25] while ridesharing services, such as Uber, have been adding 50,000 drivers per month and completed 140 million rides worldwide in 2014 alone.[26] The software and hardware systems these services employ to match drivers with riders are evolving rapidly, incorporating information about observed behaviors to improve rider and driver experiences.[27] Furthermore, intense competition offers the prospect of reducing market prices as improved economics related to increased asset utilization take hold.

## Step 2: Tipping-point shift to driverless

Currently, wide acceptance of autonomous operation seems much further away than a broad carsharing/ridesharing culture.[28] Sources of delay include the need to address existing technological limitations, such as sensor functioning in all weather and the wide availability of 3D mapping, as well as concerns over cyber security and liability.[29] How quickly these and other issues are addressed will be a key determinant of the pace of adoption for autonomous drive.

Automakers—both in partnership and competition with tech firms—are sequentially and systematically pursuing a shift of control from *driver-only* to *driver-assist* to *autonomous drive*. If driverless technology were the only vector of change, uptake might gradually gain steam, following the pattern of adoption that has become classic to the automotive industry. In our view, this is the pathway from quadrant 1 to quadrant 3, *incremental change* to *driverless revolution*, which is well under way.

However, we also see change progressing along a second, parallel northward vector—from a *world of carsharing* toward a *new age of accessible autonomy*. Along this path, a powerful, additional boost toward driverless adoption is also under way. Uber recently partnered with both Carnegie Mellon University and the University of Arizona to open an Advanced Technologies Center in Pittsburgh and test driverless cars and optics for mapping technologies.[30] Ridesharing services have economic incentives to accelerate the adoption of autonomous vehicles, since it could reduce one of the biggest operational costs in this system: the driver. These companies could capture a significant share of the consumer surplus value generated by reducing this cost. If autonomous drive becomes viable for ridesharing services, it could dramatically accelerate broad adoption, as consumers have greater opportunity to experience the technology while simultaneously realizing significant reductions in the cost of personal mobility.

Finally, other high-tech players are forging a third path to autonomous drive. For example, Google's self-driving car program is testing cars that do not rely on driver-assist progression but, rather, immediately jump to fully autonomous; Google has stated publicly that "taking the driver out of the loop" is the safest path.[31] And in the long term, it is still unclear whether Google intends to choose between supporting shared autonomous mobility, personal ownership, or both.

Rather than following the historical pattern for technological innovation, autonomous driving, when it arrives, could constitute a step-change. And the ensuing changes to the personal mobility ecosystem could unfold much more quickly than many companies can imagine. (See "Forces of delay—or acceleration.")

## FORCES OF DELAY—OR ACCELERATION

The inertial forces slowing down the process that Joseph Schumpeter called "creative destruction"[32] in the realm of personal mobility are not to be underestimated. The table below summarizes the key drivers that could either significantly delay or accelerate the adoption of new technologies.

| Forces of delay or acceleration | Changes in and/or impacts |
|---|---|
| Regulation and government | • Global, federal, state, and local—legislation and regulation<br>• Taxation and revenue<br>• Laws governing capture, usage, storage, and transfer of data |
| Social attitudes | • Perceptions about role of human and machine interface, longstanding notions around vehicle ownership and usage, etc.<br>• Safety<br>• Continued growth of shared economy |
| Technology development | • Results from early experiments and pilot programs<br>• Emergence of innovation or technology breakthroughs |
| Privacy and security | • Cyber-security and communication standards and protocols<br>• Protection of personal identification information |
| Wall Street | • Corporate valuations<br>• Investment capital availability<br>• Level of investment (technology, market introduction, etc.) |
| Impacts to key stakeholders | • Potential changes to current employment models, including dislocation effects, costs, and change management<br>• Future employment growth opportunities (nature and size)<br>• Stakeholder reactions and next steps (e.g., workers, unions, dealers, employers, government, etc.) |

# The future for the extended automotive industry

DELOITTE'S recent *Business Trends* report "Business ecosystems come of age"[33] describes a broad pattern by which many of the industries that make up the global economy are undergoing a kind of metamorphosis. What we inherited from the 20th century, the paper states, were "narrowly defined industries built around large, vertically integrated and mainly 'self-contained' corporations"—but in recent years, thanks largely to digital technologies, those monoliths have been fracturing into independent, tightly focused, highly interconnected businesses, many of which perform their specialized functions across former industry lines. We argue, "The fundamental boundaries that have specified the relationships, interactions, and possibilities of most businesses are rapidly blurring and dissolving."[34] The basic human needs that industries were built to serve remain, but serving them is now the work of much more fluid ecosystems. In the future mobility system, the mobility needs that today's industries were built to serve remain, but much more fluid ecosystems will likely emerge to serve them. And this portends significant change to current business models—and partnerships (e.g., between insiders and disrupters) will be critical to deliver new mobility.

Complementary analysis from Deloitte's Center for the Edge argues that a new mobility ecosystem could spark a "virtual" value chain in which the ability to capture, aggregate, and analyze mobility-related data becomes a tremendous source of value. In this vision, value will accrete to those who:

1. Provide end-to-end seamless mobility
2. Manage the mobility network operating system
3. Holistically create and manage the in-vehicle experience

Rewards could be great for players that are able to capture, analyze, and (securely) monetize the awareness of where people travel to, the routes they take to get there, and what they do along the way. While third parties will no doubt pay for access to this information, perhaps the greatest value will be realized by new entrants who emerge as "trusted advisers" to help all of us navigate the new ecosystem and increase our "return on mobility." These companies may also enable the ecosystem to monetize new services and ownership models.

The future mobility system will also need firms to develop and manage the vehicle-operating and traffic network information system that helps direct and control the movement of autonomous vehicles and shared mobility fleets. Technology companies already have access to passenger data and seek to capture this value, but they will likely face challenges from entrants with new business models.[35] Vehicle manufacturers could design and develop vehicles not to accommodate drivers but, rather, to emphasize passenger experience, potentially giving rise to new vehicle structures and forms.

In the meantime, it is reasonable to anticipate a healthy tension between automakers, heavily invested in today's product-centered system, and technological innovators looking to realize a more virtually dependent world of mobility options.[36] And in this case, since shared driverless cars could decrease total auto sales, it's no wonder why carmakers might be reluctant to embrace such a vision.

But there's little question that some version, perhaps multiple versions, of a new ecosystem—one based on shared access and

autonomous driving—will indeed eventually emerge. Where and when it does, the change could be profound: lower cost per mile, improved safety, reduced need for parking lots and traffic enforcement, dramatically lower overall environmental impact, and more. Questions revolve around what will happen to today's automotive sector and how these will affect auto OEMs, suppliers, dealers, oil companies, fuel retailers, aftermarket service and parts companies, insurance companies, public and private parking, public-sector traffic enforcement, and others. However the forces of change unfold, every company may need to determine, in Roger Martin's succinct phrasing, "where to play and how to win."[37]

What follows is an initial overview of the enormous scope of change that could affect the key stakeholders in the current system as well as in the new mobility ecosystem.

**Global automotive manufacturers (OEMs)** face momentous and difficult decisions. The auto industry currently struggles with the fundamental economics of an intensely competitive business with enormous capital requirements; operating margins and return on invested capital remain low.[38] The industry operates with sizeable excess production capacity: Globally, it is possible to produce 113 million vehicles annually, while sales hover around 70 million.[39] In addition, regulatory requirements (such as CAFE, zero-emission vehicles, and safety standards) are becoming ever more stringent and costly.[40] And consumers relentlessly demand that automakers integrate the latest technologies.

OEMs will need to determine if they should evolve from a (relatively) fixed capital production, first-transaction, product-sale business into one centered on being an end-to-end mobility services provider. This would represent a profound business-model change and the development of entirely new capabilities to be competitively and sustainably viable.

At a minimum, they will need to weigh how to meet the needs of a changing landscape as consumers increasingly use shared mobility and become interested in highly tailored, customized, personally owned autonomous-drive vehicles.[41] This could require transforming product-development and innovation capabilities and reconfiguring supply chains and production operating systems to be even more lean, flexible, and "smart customization"-enabled. At the same time, consumers could begin demanding *shared* autonomous vehicles for different kinds of trips, which could spur the creation of more varied vehicle forms. This could drive the development of high-speed, low-cost vehicle assembly operations to create and produce vehicles with lightweight frames, custom experience-focused software, and highly customized, design-focused interiors. Light autonomous-drive vehicles can be made to be highly energy-efficient and, with a longer driving range, might make electric vehicles more viable and help automakers meet stringent regulatory standards.

**Automotive suppliers** will have to adjust as OEMs transform. As sales of autonomous-drive vehicles grow, suppliers will need lean, agile operations to serve the highly varying needs of the personally owned segment. While most of the core powertrain, chassis, brake systems, and electronic wiring components on such vehicles may be standard, giving suppliers some benefits of operational scale, the packaging for personally owned vehicles will likely be tailored and customized. Building the more standardized vehicles needed for shared mobility solutions could offer large volumes, and the demand will likely be for less complex and lower-value-added products; therefore, the economics in this new marketplace will strongly favor the lowest-cost producers.

**Technology firms** are driving much of the change under way. Earlier we referred to these firms as the disrupters; their strategic vision is that toppling longstanding institutional structures and frameworks can generate massive value. Unlike the manufacturers and asset holders in today's system, they have few vested stakes in the current automotive ecosystem, and they view the market for mobility as a

new frontier. They share a conviction that the system's dominant source of value could be in creating and managing the operating system and in-transit experience as well as mining the data generated.

These companies have shown to be adept at building large, complex information networks and operating systems, introducing artificial intelligence to help minimize human error and randomness, creating compelling environments that drive consumer behavior, and creating digital communities. They view the vehicle as another platform in a multidevice world. Vehicle sensors and personal devices could generate ever-greater amounts of data, with insights producing personalized customer experiences and delivering targeted advertising and services.[42] Integrated information systems can enable effective intermodal transportation. And mobile, wireless, location-based systems can create new opportunities for dynamic-pricing, single-payment, and consumption-based models to become much more prevalent. Technology leaders in general, relative to traditional auto-industry leaders, are in highly advantaged positions to capture this information and virtual-based value.

**Cargo delivery and long-haul trucking** currently face significant challenges that the future mobility ecosystem could alleviate. In the most ambitious version of the future, cargo transportation and delivery systems could become predominantly driverless through daisy chains or remote operation—an appealing scenario, considering the US trucking industry's growing labor shortages, with as many as 30,000 driver positions unfilled and an annual turnover rate of 92 percent.[43] Autonomous vehicles offer a way to overcome restrictions on hours driven and increase capital utilization. Given long-haul cargo transportation's $700 billion in annual revenues,[44] major fleets such as UPS and USPS have a sizeable economic incentive to actively explore how to operate for more extended time periods, cover longer distances without stops, and reduce the cost of drivers (accounting for 26 percent of operating costs).[45] With such compelling economics, this sector could become an early test bed for driverless technologies.

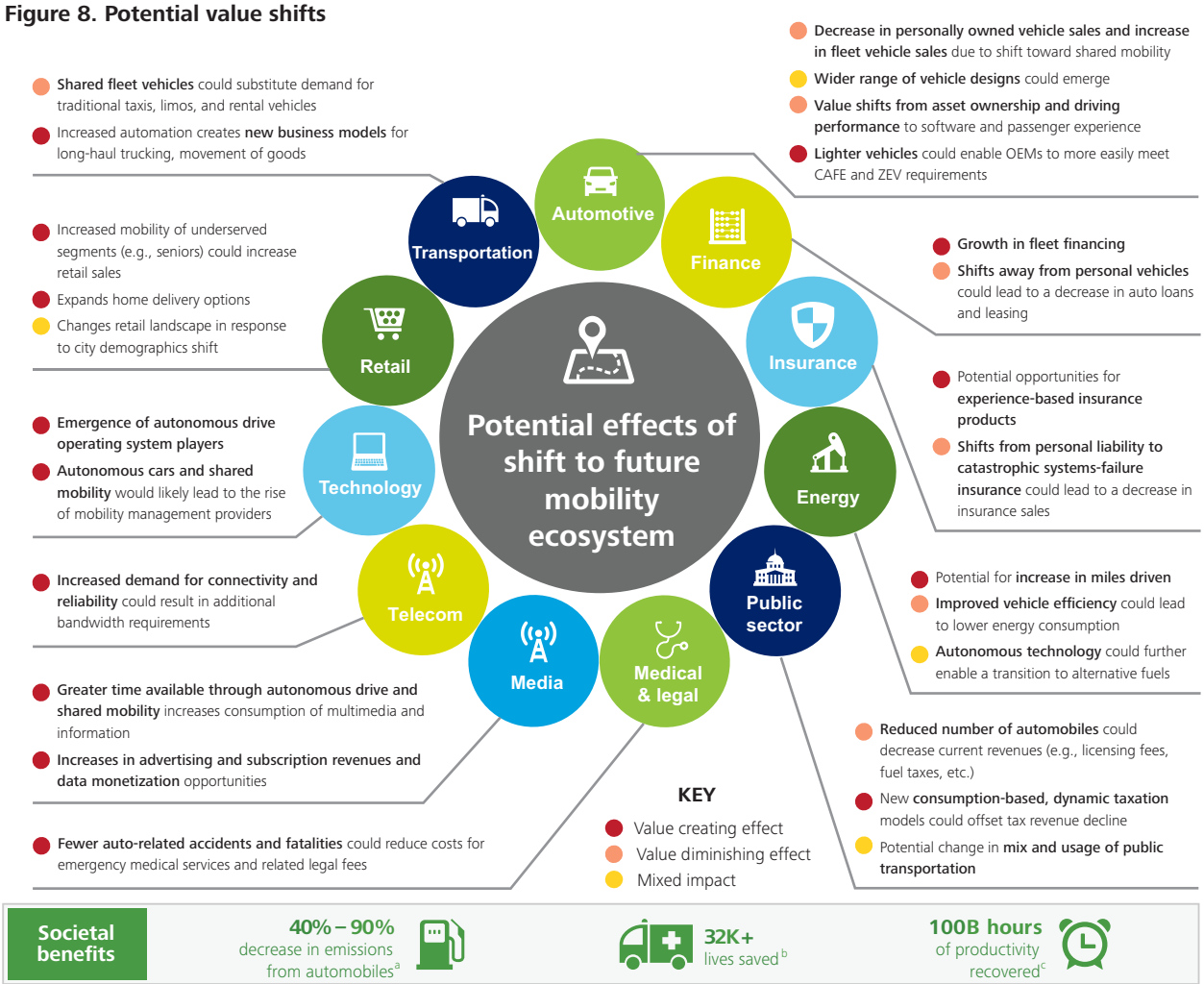
**Insurers** face a complex set of strategic questions in how they will continue to grow their business and serve various segments, geographies, and demographic groups depending on which future states of mobility take hold. With $205 billion in premiums for personal liability, collision, and umbrella insurance in play, the stakes are high. Insurers today largely insure the vehicle and not the individual driver; they are currently unable to accurately assess risk associated with new forms of mobility and safety—ridesharing in the short term, and driverless cars and inter-modal transportation in the long term. Insurers need an operating model that fosters innovation and allows them to adapt to a rapidly changing market: As shared mobility continues to become more popular, insurers will need to evolve their business model to be more driver-centric, as there will be fewer vehicles to insure and more drivers using each one. With the emergence of autonomous drive, insurers will have to continue supporting vehicle and driver-centric models while developing new forms of transportation for the more technical, systemic failure risk associated with a driverless vehicle. This new system faces clearly significant issues associated with assigning liabilities: Risk pools morphing will likely force dramatic changes in insurers' cost structure. The flood of new information provided by greater connectivity provides ways to offset these costs through more accurate ways to assign risk.

**The US public sector** will likely have to figure out how to offset anticipated declines in the $251 billion annually generated from fuel taxes, public-transportation fees, tolls, vehicle sales taxes, municipal parking, and registration and licensing fees. All these revenues are tied to today's reality of individually owned and operated vehicles—for instance, the need for parking diminishes with the rise of autonomous-drive shared mobility. Agencies

may need to evaluate alternatives—e.g., taxing "movement" versus ownership. Monetization for road usage in the future could transition to a much more dynamic model based on time of day, market demand, routes traveled, distance, and vehicle form, aligning the use of public assets more directly to usage than today's system. On the other hand, as vehicle volumes decline, municipalities might experience reduced wear and tear on infrastructure and have the opportunity to reallocate parking and other space to more value-adding purposes. Government costs (such as the DMV) could decline significantly and potentially offset some of the public-sector revenue decline.

The value shifts for these and other industries could have a tremendous impact on revenues across the ecosystem. Figure 8 summarizes some of the potential effects of the shift to the future mobility ecosystem. The graphic also includes potential societal benefits expected as a result of autonomous drive and shared mobility technological advances. The analysis does not yet account for new business models that could evolve within the future ecosystem; it is meant to illustrate the potential effects/directional impact that autonomous cars and shared mobility may have on *today's* ecosystem.

**Figure 8. Potential value shifts**




[a]Deloitte analysis; annual percentage decrease is calculated prior to any changes in fuel mix and is equivalent to a decrease of 10% to 25% of overall US emissions.
[b]2013 figure for US only; global figure is 1.24 million annually (WHO)
[c]Deloitte analysis based on miles driven in the US in 2014 (DOT) and average travel speed in miles per hour (Columbia University)
Source: Deloitte analysis

Graphic: Deloitte University Press | DUPress.com

# Conclusions

IN the four futures of the mobility ecosystem, sources of value shift profoundly. With this evolution toward a new ecosystem still taking shape, we want to share some reflections on the strategic and operational implications for legacy incumbents, extended industry participants, and disrupters as they weigh their future direction. Specifically:

1. **Industries rise and fall.** Cycles take long periods to play out, but eventually change occurs.

2. **The potential system benefits and fundamental economics of the disrupter vision are compelling.**

3. **There is a pathway for the existing extended auto industry to lead the transition to the future of personal mobility, but it will require fundamental and expeditious business-model change.** Competing effectively in the future mobility ecosystem requires building new and different capabilities. Everyone in today's extended automotive sector needs to reassess how they will operate and create value while the four states coexist and in the longer term, when autonomous and shared mobility become more mainstream.

4. **The insiders and disrupters need each other.** Unquestionably, fierce competition will characterize the commercial environment around personal mobility. Yet, despite their wariness and differing outlooks and perspectives, automotive incumbents and challenging new entrants will together make up a new ecosystem with high levels of interdependency, mutualism, and symbiosis.

5. **Profound disruption will extend far past the automotive industry.** Every aspect of the modern economy based on the assumption of human-driven, personally owned vehicles will be challenged. Each company in this new ecosystem will have to determine where to play and how to win. As in any time of large-scale transformation, we can expect to see new players, with differentiated capabilities, emerge and change the fundamental dynamics of where and how value is created. Ultimately, the market, in its relentless quest for higher performance at lower cost, will decide who wins and who loses.

*Deloitte will continue to periodically share insights about this evolution as part of an ongoing series. We aim to contribute to the dialogue as we all collectively wrestle with the impact and implications of the future of mobility. Our objective is to help to build a bridge between a highly uncertain futuristic vision, the realities of today's industries, and potential pathways to alternative future realities.*

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    Since the cost-per-mile calculation does not capture all of the changes' implications for each industry affected by the transformation to the future mobility ecosystem, we developed a baseline of the revenue generated by each sector in today's extended US auto industry. We then analyzed the impact of the future mobility ecosystem based on industry-specific hypotheses and macroeconomic analysis. We estimated the change in value from the current industry baseline across the four future states by understanding changes to components of cost per mile today and mapping each cost to the industry that collects the corresponding revenue. We conducted further analysis to estimate a future "steady state" that incorporates adoption rates across all future states. The value shifts are summarized at a sector level to illustrate the potential directional impact that autonomous cars and shared mobility could have on today's extended auto industry. Factoring in availability of data and the scope of the analysis, all data and figures used are from the United States as of 2015 (using 2014 dollars). The analysis does not assume a specific timeline or adoption curve. Rather, it is a blended model of four potential future states intended to provide directional insights about the future at maturity. Forthcoming installments of the Future of Mobility series will include a more detailed explanation of the analysis Deloitte conducted as well as the results.
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# Contacts

**Scott Corwin**
Senior director
Deloitte Consulting LLP
+1 212 653 4075
scottcorwin@deloitte.com

**Joe Vitale**
Global automotive industry leader
Deloitte Touche Tomatsu Limited
+1 313 324 1120
jvitale@deloitte.com

**Eamonn Kelly**
CMO, Strategy & Operations
Director
Deloitte Consulting LLP
+1 415 932 5358
eakelly@deloitte.com

**Elizabeth Cathles**
Manager
Deloitte Consulting LLP
+1 510 914 0612
ecathles@deloitte.com

**Henna Verburg**
Senior marketing manager
Deloitte Services LP
+1 703 885 6168
heverburg@deloitte.com

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ULI Urban Land Institute

# Gen Y and Housing

## WHAT THEY WANT AND WHERE THEY WANT IT

**M. Leanne Lachman and Deborah L. Brett**

Urban Land Institute

UDR

# AMERICA IN **2015**

## A ULI Survey of Views on Housing, Transportation, and Community


Urban Land Institute
Building Healthy Places Initiative

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Terwilliger Center for Housing

# Infrastructure 2014

## SHAPING THE COMPETITIVE CITY


*Hong Kong's investment in high-quality transit has allowed the city to achieve remarkable densities, a superior quality of life, and protection of environmentally sensitive land areas.*

HOW DO REAL ESTATE DEVELOPERS AND INVESTORS—who could pursue opportunities regionally, nationally, or internationally—think about infrastructure? How do city leaders use infrastructure investments to position their cities for real estate investment and economic development? What role does infrastructure play relative to other economic development strategies? And are public and private perceptions and priorities aligned—or do they diverge, and in what ways?

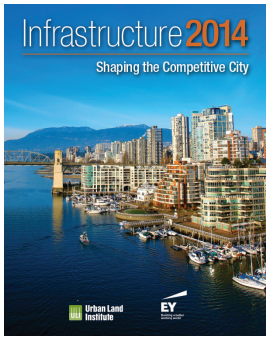
These were the central questions for *Infrastructure 2014: Shaping the Competitive City*, the eighth in an annual series of reports examining infrastructure trends and issues by ULI and EY.

To provide answers, researchers for *Infrastructure 2014* crafted a series of survey questions and asked high-level public officials and private real estate leaders to weigh in. Nearly 250 public sector leaders in local and regional government and over 200 senior-level private developers, investors, and real estate advisers responded to the survey. About 86 percent of survey respondents were based in the United States, with the balance located in countries across the globe.

Nearly every city aspires to grow, and high-quality infrastructure—infrastructure that is well maintained, reliable, safe, resilient, and customer friendly—contributes to well-functioning, growth-primed cities—cities that attract new residents and retain existing ones.

Infrastructure—the physical facilities and systems that support economic activity—is often seen as a driver of real estate and development, especially by those who are in the business of providing it. But do the people actually building and investing in real estate agree? The *Infrastructure 2014* survey tells us "yes"—and a number of other interesting things as well.

On many of the questions asked, there was strong convergence between the public and private sector respondents, and between U.S. and global ones. The survey provides a means for mutual learning and dialogue that can help advance the conversation about the role that infrastructure plays in shaping and promoting growth, infrastructure priorities, and opportunities to improve current practice.




This is a summary of key findings. We invite you to learn more about the *Infrastructure 2014* survey online and read the full report at www.uli.org/infrastructurereport and www.ey.com/realestate.

# 10 Principles for Liveable High-Density Cities

*Lessons from Singapore*

Urban Land Institute Singapore

CENTRE for LiveableCities SINGAPORE