GLOBAL INFRASTRUCTURE INITIATIVE
by McKinsey & Company

Voices on Infrastructure: The future of real estate

December 2016

Table of contents

Introduction: Rethinking real estate

Subbu Narayanswamy

Senior partner, Mumbai, Global real estate leader, McKinsey & Company

Welcome to the December issue of *Voices on Infrastructure*.

This, our fourth edition, focuses on real estate. One of the world's most interesting industries, real estate contributes significantly to global GDP; it is also the bedrock of urbanization and has created immense wealth. But it is difficult to understand. Real estate is local in character, extremely cyclical, and often characterized by information asymmetry and lack of transparency.

At the Global Infrastructure Initiative, we seek to improve understanding of this vital sector, and also to identify and share best practices. We regularly meet real-estate professionals from around the world and ask them to pick their top five trends. Here are their most common answers.

> Customer centricity will become more important. Rather than accept a sellers' mind-set, the best real-estate developers will put buyers at the center of everything they do.
>
> The real work will start after the buildings are finished. "After-sales service," in the form of curating and delivering the best living, working, and shopping experience, will become an essential capability.
>
> Design will become even more about function, including health, walkability, and environmental sustainability.
>
> Technology, both digital and otherwise, will disrupt many aspects of real estate, including marketing and construction.
>
> Many global real-estate investors will start building stronger in-house capabilities and buying operating platforms as they increase their focus on emerging markets.

Voices considers each of these themes and goes further, for example, by asking what it takes to build a new city from scratch. Our contributors take a global view, with articles dedicated to California, China, India, and the United Kingdom. I hope you find these ideas worth thinking about—and I look forward to working with you to help reimagine the future of real estate.

News from the Global Infrastructure Initiative

Tony Hansen

Director of the Global Infrastructure Initiative, McKinsey & Company

Thank you for the constructive feedback on the October edition of *Voices on Infrastructure*. We are encouraged that our readers are so willing to embrace innovative practices and technologies to tackle the many challenges facing the engineering and construction sectors.

This year, we have hosted more than 350 infrastructure leaders from 40-plus countries at 13 Global Infrastructure Initiative (GII) roundtables and site visits. Topics have included rethinking construction, the future of airports, digital strategies in infrastructure, optimizing real estate, financing sustainable infrastructure, congestion relief, megaproject delivery, and housing affordability. Reports from these events are on our website. We encourage you to look at this video featuring some of the greatest advances in infrastructure and capital projects from around the world.

Momentum is building for the fourth GII Summit, to take place in Singapore, May 24–26, 2017. A diverse and influential group of global leaders have confirmed their participation, and there are only 50 places left. In addition to addressing the most relevant and challenging issues, the summit will also feature sector-specific workshops, including one on real estate—the theme of this edition of *Voices*.

At GII events, we place a premium on dialogue and problem solving. Our goal is for participants to share the latest data, best practices, and innovative approaches that can be used to plan, finance, build, and operate infrastructure. *Voices*, the GII's quarterly digital publication, allows us to share these insights with a broader audience.

Our next edition of *Voices*, scheduled for March 2017, will focus on project development and financing. If you would like to let us know what you think of *Voices*, sign up for GII events, or receive more information, please contact us at info@giiconnect.com.

Building Asia's cities of the future

Lim Ming Yan

How one Asian developer is using planning and technology to make cities work for people.

The fundamental goal of city design must be to improve the lives of people. That means the creation of fulfilling, enriching, and sustainable ways for residents to live, work, and play.

Today, almost half of Asia's population lives in cities. By 2050, the United Nations projects almost two-thirds of the world's population will live in cities, as more rural dwellers migrate to urban areas. Rapid urbanization puts more pressure on land, making it important for each square meter to be used effectively. At the same time, quality-of-life issues, such as traffic congestion and air pollution, must be considered from the start.

The modern, efficient cities of the future, then, will connect transportation hubs with quality retail, hospitality, commercial, and residential spaces. Such integrated developments will enable populations to flourish both economically and socially. Think of them as new-age high-rise villages.

CapitaLand's Raffles City developments are an example of this thinking. Built around the concept of a "city within a city," they integrate shopping malls, offices, serviced residences and hotels, and homes. The first Raffles City development opened in Singapore 30 years ago; CapitaLand is now working on eight more in China. Each is located in a city center and connected to transport. Designed to high architectural standards, we believe that these developments will not only become symbols of economic transformation but also become important social spaces.

The role of technology

Advances in digital technology will play an important role in Asia's urban future. A new generation expects personalized and seamless experiences. Employing technology, such as artificial intelligence, sensors, the Internet of Things, social media, and data analytics, will be crucial to meet this demand.

CapitaLand recognizes this and was an early adopter of online-to-offline and offline-to-online strategies. It knows that consumers want to complement their digital activities with real-world shopping—and vice versa. By using technology to offer better retail experiences, its shopping malls are also becoming one-stop destinations for communities.

In Singapore, for example, CapitaLand is redeveloping the Funan shopping mall in the city center into an integrated environment where shoppers can live, work, and play. In addition to retail, the new Funan will feature working space for a mobile workforce, apartments for young professionals, the first multidimensional cinematic experience for moviegoers in Singapore, and a robot-enabled food court, among other technological innovations.

Another example of the use of advanced technologies is the way CapitaLand uses data. To engage with its shoppers and to help retailers increase their sales, it developed CapitaStar—a multimall, multistore, cardless rewards program that 3.3 million shoppers in China, India, Japan, Malaysia, and Singapore belong to. CapitaStar aggregates data from shoppers' purchases and optimizes the location of tenants to maximize their sales. And with Sparkle, Asia's first fully automated artificial-intelligence chatbot created by a developer, CapitaStar members in Singapore will be able to hail taxi rides, book restaurants, and browse and shop at the touch of an app.

Real-estate businesses such as CapitaLand must work hard to support people and their communities. CapitaLand is one of Asia's largest real-estate developers, with more than

500 properties in more than 130 cities in more than two dozen countries. It touches the lives of millions of people every year. It must therefore think beyond bricks and mortar: creating the cities of the future requires thinking in broader terms about the quality of urban life. That means keeping a close eye on consumer and industry trends.

And while technology will certainly be at the heart of Asia's urbanization, this is not a tech race. CapitaLand's work will be judged not by how many cutting-edge technologies its developments include but rather by how they are used to improve the lives of residents and by how they can build the character of a community.

Lim Ming Yan

President and group CEO,
CapitaLand

Learning as a strategic necessity: Entering a global property market during a domestic boom

Guangyu Li and Zhang Xu

China Vanke executive Zhang Xu describes how his real-estate company has met the challenges of overseas expansion.

Zhang Xu *is the executive vice president and chief operating officer of China Vanke. Founded in 1984 and based in Shenzhen, China, Vanke is one of China's biggest real-estate companies (2015 revenues: $29.3 billion). In addition to its operations in more than 60*

Chinese cities, Vanke also does business in Hong Kong, London, New York, San Francisco, and Singapore.

In this interview with Guangyu Li, a senior partner in McKinsey's Shanghai office, Zhang Xu explains Vanke's global strategy.

McKinsey: *Why did Vanke decide to enter the global real-estate market at a time when the residential market in China was in its "golden decade"?*

Zhang Xu: It all comes down to Vanke's DNA as a learning organization, though we didn't quite figure out what exactly we wanted to achieve until we had done much exploration and experimenting. I once tried to build a seven-person pilot team to take the first steps overseas, but as it turned out, none of them wanted to go. Of course, it's understandable. The Chinese market is so big and lucrative. Why would anyone want to go to a foreign land and build everything from the ground up?

McKinsey: *So how have you developed your overseas strategy and found the breakthrough point?*

Zhang Xu: We spent the whole of 2012 doing our homework. First, we interviewed the top ten US residential developers to understand how the market works. We thought about equity investment and buying shares of listed real-estate companies, and we considered the conventional Chinese approach of sending someone over to build the business. But these options were all vetoed as either against Vanke's values or beyond our capability.

But by ruling out what was impossible, we figured out what we wanted to do. And put simply, it was to learn. That started with understanding how the industry will evolve. American cities are 100 years ahead of Chinese cities, and business models have progressed with urbanization. So we looked at how industries and cities have progressed with urbanization in the US, and that gives us an idea of what will become of China. We also picked the brains of leading companies on businesses and models that have enabled our peers to survive the economic cycles; this eventually translated into concrete plans for our overseas operations.

McKinsey: *Has overseas expansion led to any strategic gains?*

Zhang Xu: Staying close to overseas markets has helped us to identify future trends back at home. What we've seen and learned during the process is embedded in the transformation agendas outlined in our new ten-year strategy.

We've seen how urbanization and industrial upgrading can affect the real-estate industry in a mature market. That's the biggest strategic gain. New property needs have emerged as the industrial age gives way to the age of finance and services. That is why we've decided to move away from property development alone to become an urban facilities and services provider. We are also monitoring the many opportunities that come with urban planning

and investment in big-city renovation and the development of industry clusters. All will have a direct impact on Vanke's future strategy.

The second strategic gain is about business models. We are convinced that commercial property will remain the way to go, particularly from the perspective of asset management. What we've discovered about holding and operating real-estate investment trusts [REITs] is that real-estate finance can lead to another, broader world. In the United States, institutional investors take up half of the market, REITs 20 percent, and developers a mere 10 percent. Operating-asset managers take a much larger share than developers, and residential developers are by no means the ones with the highest market capitalization. In China, real-estate finance is still in its infancy, but the property industry will increasingly connect with capital and finance, and move toward asset management. The future size of China's asset-management market can be enormous.

McKinsey: *Was it difficult for Vanke to make this strategic shift?*

Zhang Xu: This has been a very difficult move. Some people may ask, "Why are you risking profit and asking for trouble with new business, when it is so easy to reap profit from land purchase and new construction?" But we must have the courage to step out of our comfort zone and walk a different path. We did have arguments over our ten-year strategy, and it was such a big fight that we extended the original plan of discussion from 4 months to 18 months. We finally reached consensus. In the future, Vanke will focus on two business pillars—real estate and urban facilities and services—rather than only focusing on residential developments.

McKinsey: *What kind of governance system does Vanke have for its overseas operations?*

Zhang Xu: Sometimes the best management is no management at all. Real estate is a very local business, and from the very beginning, we decided to build completely local teams, rather than sending a Chinese team from home as we did in the past. When I say "local," that does not mean that we simply recruit Americans in the United States. If we are selling houses in New York, we target New Yorkers, because the US real-estate industry is highly fragmented. There are 200 to 300 small developers in New York City alone, so our people must know everything about each block.

In terms of organizational structure, the US office is placed under Vanke's Department of Strategic Investment, and headquarters retains only strategic oversight of its direction. We offer partnerships to attract talent, so that staff can grow from professional managers to become partners of Vanke, and so act in accordance with the company's general interests.

McKinsey: *What can other Chinese real-estate companies learn from Vanke's experiences?*

Zhang Xu: There's no right or wrong way, but the key is to think twice before you leap and to figure out what you're trying to accomplish. It could be that you want to expand market share, export products and construction models, and diversify asset allocation. Or it could be that you want to learn and build new capabilities; that is our goal. Once you know where you're going with your strategy, you will have a clear idea of what means would be best to help you deploy overseas operations.

We have a step-by-step approach for our overseas expansion. First, we learn from mature markets' business model and management experience. Second, we find the best partners to leverage the best resources and capabilities for Vanke. Third, we scale up the Western business model to turn the overseas office into a profit center.

McKinsey: *In broad terms, what are Vanke's future plans?*

Zhang Xu: We believe our overseas business will account for at least 20 percent of our total assets, compared with less than 5 percent now, so there is much room to develop. Our business will also be more diversified. In the future, the income of China's middle class will outrun that of Europe and the United States, driving consumption and opportunity. For example, the number of skiers and divers in China is growing by 40 percent a year, creating great opportunities to develop new customer experiences and commercial property to support these pastimes. Learning best practices from abroad can help Vanke to enter more specialized areas and thus broaden our prospects in different ways.

Zhang Xu

Executive vice president and chief operating officer, China Vanke

Guangyu Li

Senior partner, Shanghai, McKinsey & Company

Understanding real estate as an investment class

Samvit Kanoria and Hasan Muzaffar

When it comes to real estate, institutional investors are changing the terms of engagement.

The portfolios of pension and mutual funds often include real-estate assets. Target allocations ranged from 9 to 10 percent for institutional investors between 2011 and 2015. Over that period, actual allocations rose steadily, from 6.7 percent to 8.5 percent.

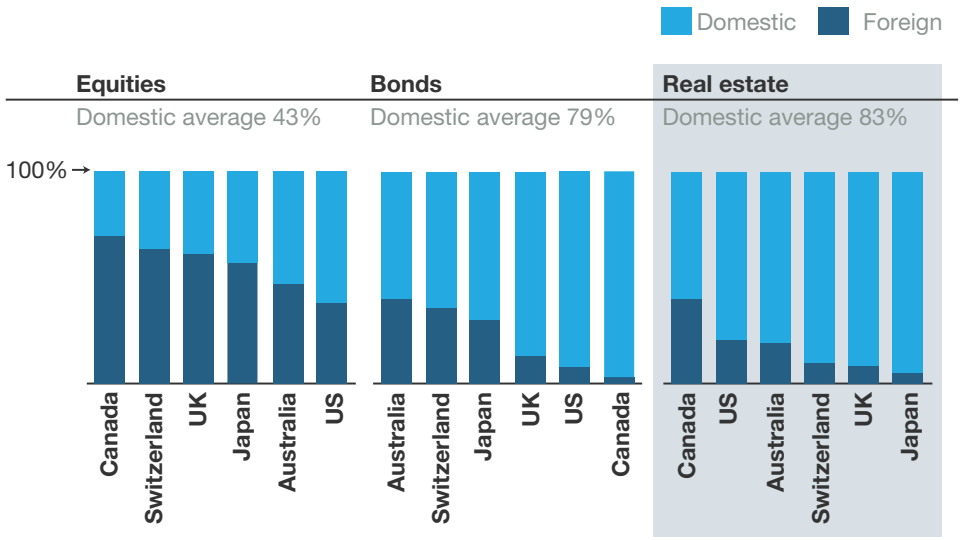
Real estate can yield high returns, and it's useful for diversification and as a hedge against inflation, but many see it as a high-risk play, particularly in developing countries. Barriers to

investing include a lack of transparency, low liquidity, and undeveloped capital markets. That's in sharp contrast with the rationale behind investors' equity-investment strategies. For pension investors, 83 percent of real-estate allocations are in domestic markets; the figure for equities is 43 percent (Exhibit 1).

In this article, we consider two risk-mitigated trends in real-estate investment: nontraditional real-estate asset classes and building a direct-investment capability.

Exhibit 1

Foreign and domestic exposure for pension investors in equities, bonds, and real estate.



Source: BlackRock, February 2015; IPD asset-owner survey, Dec 31, 2014; Willis Towers Watson global asset survey

McKinsey&Company

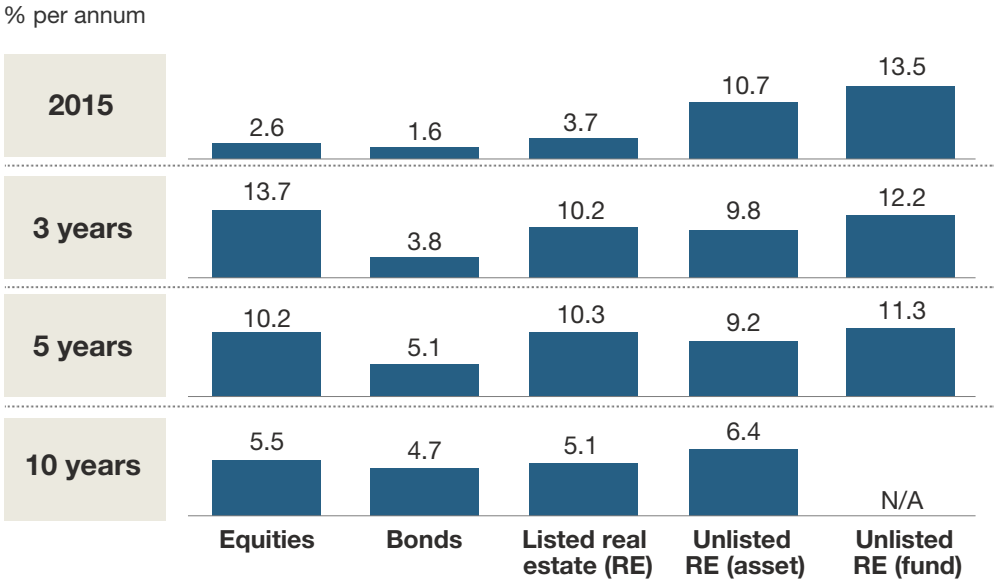
Real estate: Happy returns?

The performance of the real-estate market can be hard to gauge in markets where information is scarce and many transactions are private. To get a better understanding, McKinsey looked at the returns from more than 10,000 real-estate investments across asset classes in 14 major cities over a 19-year period through 2012. The study found that real-estate returns tended to be inversely correlated with those of conventional assets and thereby serve as a good diversification play for the portfolios of most institutional investors (Exhibit 2).

Emerging economies will account for a large proportion of the growth in the global real-estate market because of the scale of new building in rapidly urbanizing countries

Exhibit 2

Comparative global performance across asset classes.



[1]Using conversion rate of 1 € = 1.113 $ as of June 30, 2015

Source: Institutional Real Estate; IPE Real Estate; Property Funds Research

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with high GDP growth. As the scale of real-estate development in emerging markets rises, so too does the proportion of it available for private investment. In the past two decades, in developed markets, the share of investable real estate as a percentage of GDP has been stable, at 40 to 50 percent. In emerging ones, however, the percentage is growing (Exhibit 3), so investors may need to invest in emerging economies just to retain current allocations.

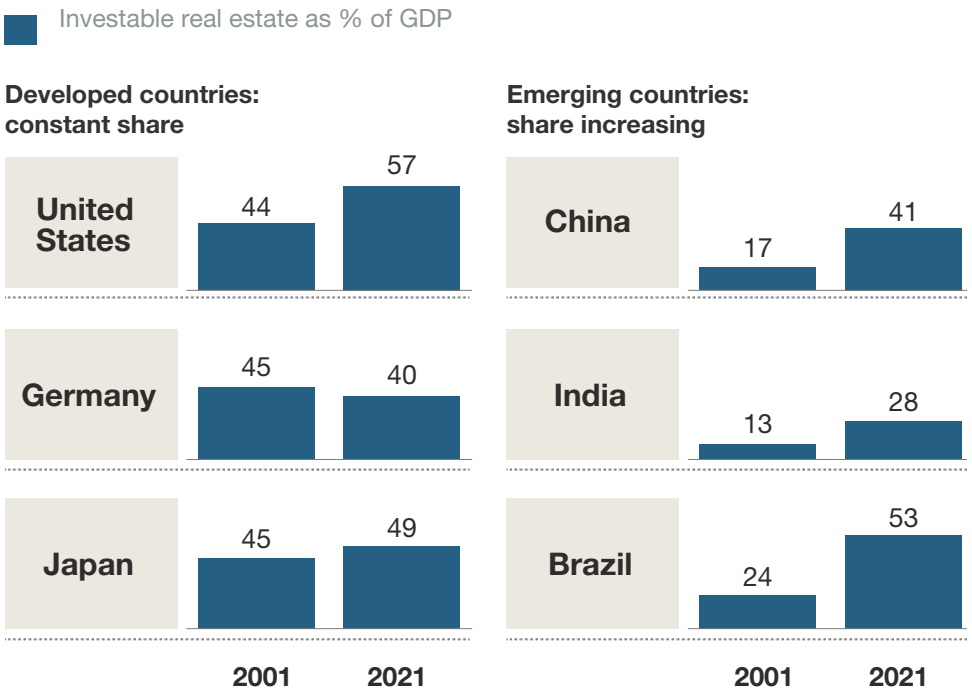
Emerging trends

Two interesting trends characterize institutional investment in real estate. First, there is momentum toward nontraditional asset classes, such as student housing, data centers, healthcare offices, medical facilities, and assisted-living communities. Many of these are reaching investment grade, both by the size of deals and the number of transactions.

Global investment in student housing has more than doubled, for example—from $3 billion in 2007 to about $7 billion in 2015. In the United Kingdom alone, investor spending on student accommodations increased from £460 million in 2014 to £1.92 billion in 2015. In the United States, Wayne State University (in Michigan) recently closed a 40-year deal valued at $1.4 billion. In 2014, the University System of Georgia completed a $520 million deal to develop and manage student accommodations on nine campuses for 65 years.

Exhibit 3

Growth of real-estate investment opportunities.



Source: Prudential Real Estate Investors report, February 2012

McKinsey&Company

Data centers, aided by advances in cloud computing, are another asset class gaining interest from institutional investors. In 2015, for example, Equinix, which provides carrier-neutral data centers and Internet exchanges to enable interconnection with data centers, was converted into a real-estate investment trust (REIT). As the volume and size of such deals increase, they become more attractive to institutional investors looking for scale.

Second, some investors, citing high costs and a perceived lack of control, are beginning to develop a direct-investment capability by building small teams of specialized investment practitioners. In a 2016 McKinsey survey of global institutional investors, 74 percent indicated that they were “likely” or “very likely” to build direct-investing capabilities. Moreover, direct investing could expand the sources of value creation to include operational improvements of assets. In the same survey, 51 percent of investors indicated that they were “likely” or “very likely” to acquire an operating platform to source deals and operate assets for the whole portfolio.

The traditional approach to real-estate investment is still very much alive. But with growth shifting to emerging markets, and with new business models in a range of nontraditional real-estate asset classes beginning to prove themselves, investors are more willing to consider new ways to find the returns they need. As always, though, the buyer must beware.

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Creating a “smart city” from the ground up in India

Abhishek Lodha and Subbu Narayanswamy

Palava shows a future that may work.

Abhishek Lodha *is managing director of the privately held Lodha Group, one of India’s largest real-estate developers. It is currently building Palava, a 4,500-acre greenfield city near Mumbai. Construction started in 2010, and the first residents arrived in 2014. In an interview with Subbu Narayanswamy, a Mumbai-based McKinsey senior partner who leads the firm’s work in real estate globally, Lodha spoke about India’s rapidly evolving real-estate sector and what it takes to build a city of the future.*

McKinsey: *How you see India's real-estate market evolving? Where is the greatest potential for growth?*

Abhishek Lodha: India is among the fastest-growing major economies in the world, but organized real estate has a small base. Any projections on India's population and likely GDP growth over the next 10 to 15 years automatically imply growth for real estate. No major economy has grown without this happening. Real estate is a feeder to the consumption cycle because it allows wealth to grow on the asset side. As people become affluent, one of the most important things they want to upgrade is where they live and work. If India grows, real estate will do well. The big question is: how fast and sustainably can India grow?

Though residential and commercial are the largest segments now, I see growth across sectors because we lack good supply everywhere. Retail, hospitality, education, and healthcare are all growing fast. Over the next ten years, India is projected to move from a $2.2 trillion economy to twice that; all the growth sectors will need space to do business.

McKinsey: *What is your vision for Palava, the city you are building from scratch?*

Abhishek Lodha: For a greenfield city, you need to have a multigenerational, multiyear view.

Today we have about 34,000 residents (8,500 families); 70 percent of them work in a ten-kilometer radius. The typical family income for new buyers is in the $18,000 to $30,000 range. Palava caters largely to the middle class, although we will have people from all economic segments.

We want Palava to rank among the top 50 most liveable cities in the world by 2025; this is ambitious, because at the moment, no Indian city is ranked in the top 100. We will have half a million people living in Palava in 2025, with 100,000 jobs in and around the city.

McKinsey: *In India, there are debates about whether to build new satellite cities or to fix existing ones. You have done both. What has been your experience?*

Abhishek Lodha: The important question to ask is: where will people choose to live? The answer is often driven by economic activity and proximity to jobs. Developments within existing cities do not need to create their own economic activity. The disadvantage is that old cities have limited potential to rewrite the rules. They cannot significantly change people's living and working experience.

We cannot just go wherever we can find land and start building a new city. The economic nucleus needed to sustain growth would be missing, and that is too expensive for the private sector to create. Palava is a new city development, but only about 25 miles from India's economic capital, Mumbai.

Palava has been built with private money and without a rupee of government aid. Problems of many big cities can be solved if we can figure out a model where the private sector can address urbanization issues by building satellite cities.

McKinsey: *What have you learned over the course of the Palava project?*

Abhishek Lodha: One of our most fulfilling experiences is that residents have truly started caring about their public/common spaces and how the city is run. The quality of public spaces and city governance make a place liveable or an economy productive. So, for instance, even if Mumbai's infrastructure was fixed and we had smoothly flowing traffic, it still would not make the city the best place to live.

Common spaces are not valued in India. This is often because they are not well governed, or the legal framework makes it difficult for people to uphold their value. We see a difference in Palava, and this is probably explained by classical economics. Residents know that if their locality is well-governed and looked after, the value of the property goes up. Two things can help to get people to value the commons. One is if they receive a benefit or a payoff; the other is confidence that their efforts will not be sabotaged. When these conditions are satisfied, people make an effort to protect their public spaces.

You have to govern with citizen engagement, transparency, and cost efficiency. To get people to pay maintenance for the commons is not easy, and many are not used to it. We learned that you have to communicate the advantages continuously. What matters most for residents is everyday engagement through sport, art, culture, or at schools, and in community areas. This soft infrastructure element is often missing in India's urbanization.

McKinsey: *What is a "smart city"?*

Abhishek Lodha: A smart city is not just about technology. This misinterpretation has often led cities to make investments that are doomed to fail. Cities can be governed using technology but have to be designed with vision. I like to say that to make a place good to live, you need "CCTV" to work—citizens, community, technology, and vision. Probably because technology is more tangible than "community" or "vision," people tend to grab it when they define a smart city.

When we started building Palava, we began with the classical definition. We used the notion of 5-10-15, which means everything you require daily should be within 5 minutes of walking, what you need every three to four days should be within a 10-minute walk, and things you use within a week to a month should be within a 15- to 20-minute walk.

When you start designing an entire city with this in mind, there are multiple benefits. Given our population, India can never build enough roads to solve our traffic problems. What we can do is design cities so you don't need so many cars. It is also much healthier for people to walk more.

McKinsey: *What has been the government's reaction to Palava?*

Abhishek Lodha: Palava would not have been possible without government policies enabling it. These include the special township policy, which allows developers to take land, zone it properly, and put in the infrastructure in a time-bound manner.

Palava has truly come to life over the past 18 to 24 months. I think the government has started thinking about what it means, but it has not fully grasped the impact in terms of what private entrepreneurship in greenfield city development can achieve. Also, how this will influence expectations of citizens in terms of how they should live, and how they should be governed. I think the government will take note of it over time, but at this stage, I do not think that it is a significant item on the agenda.

McKinsey: *What are the most important things you have learned about developing a city from scratch?*

Abhishek Lodha: The demand for real estate among India's middle class is enormous. We need to figure out business models to cater to this demand. Consumer-product companies do this all the time, by being innovative, making sure costs are kept under control, and delivering good service. We are thinking in similar terms. Building Palava is like building a very high-value consumer product. Everything that applies to consumer-product companies in terms of innovation, quality control, and after-sales service also applies to this city.

One lesson is that we have to do even more to build facilities in common spaces. We have to deliver these faster and earlier, because expectations are going up. They may not be so expensive to build, but they are a product of thoughtfulness. Citizens want to belong to a city, and they can only belong if they have something to attach themselves to.

Last, if you do not have the city governance/administrative layer, there will be chaos. The Palava City Management Association, which is tasked with handling all of the city's operations, needs to keep getting even better. This layer is critical for success.

Abhishek Lodha

Managing director,
Lodha Group

Subbu Narayanswamy

Senior partner, Mumbai,
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High Speed Two: Britain's $65 billion rebalancing bet

Improved rail connectivity could transform development opportunities—and the entire economy—in the United Kingdom.

Sir David Higgins

For businesses in today's digitally transforming, global world, success comes from having access to a critical mass of skills, products, and professional services. Get these things right, and collaboration and serendipity will likely do the rest.

Achieving this vital access may be relatively straightforward in a global center such as London, where commuters can travel by rail the full 360 degrees around the city, like the spokes of a wheel. The same cannot be said of other regional and nonmetropolitan areas.

That is one reason why the United Kingdom has a "two speed" economy, in which a few regions, such as London and the southeast, have healthy growth and globally competitive industries, while many others are lagging behind. As the Brexit vote indicated, there is a sharp political divide between those areas where globalization is seen as a positive and those where it is perceived as a threat.

The prospect of High Speed Two (HS2) in Britain, therefore, is well timed. The first phase of the $65 billion (£55.7 billion) project will link London to Birmingham in the West Midlands, with construction of new dedicated track expected to start next year. The second phase, which will follow some five years later, forms a Y-shaped track from the West Midlands toward Manchester and Leeds in the north, where the trains leave the high-speed network and continue to the northeast and Scotland.

When completed, the project will improve capacity and journey times to and from London. More important, it will transform connectivity among the cities and towns of the Midlands and the north, halving journey times and boosting reliability on trips between Birmingham and cities such as Leeds, Manchester, Wigan, and York. It will also substantially reduce journey times to destinations farther north, to cities including Edinburgh, Glasgow, and Newcastle.

That will improve the prospects for these regions by making it much easier for them to access the skills, products, and services they need. Add in the substantial cost savings that firms can achieve by locating in these newly connected cities, and the project will open up new areas for development.

HS2 represents the greatest upgrade to the United Kingdom's domestic rail network in living memory. But it is much more than that. It is an opportunity to drive development and to rebalance the UK economy from south to north, fusing the towns and cities of the Midlands and the north into a powerful economic unit and reducing pressure on an overheating London economy.

In Leeds, the South Bank regeneration zone has attracted more than $650 million of investment in the past two years on the back of HS2's arrival. In Crewe, HS2 services will help support the region's ambition to double the size of its economy to more than $65 billion and create 70,000 new jobs.

Then there is Birmingham, the country's second-largest city, where the first high-speed trains are scheduled to arrive in 2026. The transformation has already begun as companies recognize the huge potential of being at the heart of a fast and reliable nationwide service. Estimates are that the £1.7 billion Curzon development sited next

to the new HS2 station will create 36,000 jobs and 4,000 new homes. Improved connectivity is one important reason that a major global bank is moving its retail headquarters from London to Birmingham, and why Birmingham Airport is looking at ways to harness HS2 to improve connectivity and boost its business.

The same is true in the East Midlands, home to Leicester and Nottingham. The rail service to Birmingham now is infrequent and takes almost an hour; after HS2, it will be a reliable 20-minute trip. New opportunities are opening up along the line as local authorities and businesses put HS2 at the heart of their strategies. The East Midlands expects 74,000 jobs to be created on the back of HS2, with significant housing and commercial development planned. Such projects, and others, are proof that businesses value fast, regular, and reliable links to suppliers, employees, and customers.

HS2 will help to meet the United Kingdom's ever-increasing demand for travel. But it will have other, more indirect benefits, too. Shifting long-distance services onto HS2 will create new capacity for commuter trains and freight on the existing main lines and suburban routes. That should, in turn, ease chronic congestion on some motorways. The positive impact is not limited to the major metropolitan areas through which the new line passes. HS2 trains will also use existing rail lines to provide faster services to towns and cities beyond the new track, such as Carlisle, Darlington, Durham, Edinburgh, Glasgow, Liverpool, Newcastle, Preston, Stafford, Warrington, Wigan, and York.

The regional voice of Britain—so strong in the Victorian era, when the original railways were born—is making itself heard again. Just as that original railway helped translate the concept of Britain into economic reality, so too will HS2 help break down today's economic barriers.

Sir David Higgins

Chairman,
High Speed Two Ltd.

Meeting millennials where they shop: Shaping the future of shopping malls

Sangeeth Ram

The traditional shopping mall is under threat. Here is how to meet the needs of digital customers.

Digital technology is transforming global lifestyles and changing the way we live, work, shop, eat, play, and learn. Real-estate developers therefore must provide new ways to meet these needs.

One example is the shopping mall. These sit at the heart of communities in many cities in both the developed and developing worlds. But as consumers embrace digital technologies, developers must redefine the traditional shopping mall to adapt to this behavior.

In this article, we explore five consumer trends that will shape the future of the shopping mall.

Entertainment

Many millennials—adults born from the early 1980s on—prioritize spending on multisensory experiences and events over product ownership. They prefer instant gratification from entertainment and are attracted to media, gaming, and experiences that are shared socially. Half of millennials regularly go online for video games (versus 30 percent for Generation X); four in ten use social media to record their experience after using a product. Meanwhile, Gen X consumers—those born from the mid-1960s to early 1980s—are embracing digital from a different angle. For example, this segment increasingly views digital entertainment as an education tool, underpinned by smart technology and an expanding, globally connected Internet.

Meeting the needs of these groups while responding to rapidly developing technologies, such as virtual reality and participative experiences, will be the key to providing successful entertainment.

This disruption in traditional entertainment offerings has serious implications for the real-estate industry. Here are some ways that they may react:

- Reimagining public spaces as a canvas for entertainment. This can mean integrating the community experience into the public realm via live social-media feeds and new display formats that share user-generated content. Technology will enable public events and spectacles to become participatory experiences with multisensory appeal, increasing visitor numbers and tying the physical space with the virtual world. Being part of such experiences and sharing them becomes a social currency for millennials, thus encouraging repeat visits.

- Working with educators to create new learning opportunities via “edutainment.” Likely venues include museums and theaters, which could be redesigned to combine learning, discovery, and entertainment. Some destination malls are already considering designing entire districts as “hackable and playable.”

- Redesigning entertainment hubs, such as movie theaters, theme parks, and gaming parlors as interactive experiences with virtual-reality content and immersive experiences where the customer becomes part of the story.

Food and drink

"Food is the new fashion" is the mantra that increasingly guides development. The expression reflects the idea that food has usurped fashion as a force in retail and travel. One example is the fast-growing trend toward healthy eating, driven by millennials' preferences and government policies to curb obesity. Food-focused digital platforms that see consumers routinely reading online reviews before choosing restaurants or ordering through food-delivery platforms are on the rise.

Quick-service restaurants are upscaling through furniture and technology changes. At the same time, casual-dining restaurants are transitioning to two established formats—fast casual and casual premium. On the other hand, fine dining is embracing new and niche concepts, such as multisensory experiences. The sector is also adapting itself to provide more accessible dining formats.

In response, real-estate developers are positioning more restaurants within retail areas; the idea is to create gastronomic "stop spots" to attract shoppers. Real-estate experts suggest that the gross leasable area devoted to food and beverage outlets in malls could rise to some 25 percent by 2020 from 10 percent today. Among the possible strategies are the following:

- Using technology, such as self-ordering, and providing healthier eating options to redefine traditional fast-food outlets and casual dining.

- Creating new "experiential dining" options that offer more entertainment for consumers. Examples include farm-to-table courtyards, gourmet food halls, and "cook your own food" facilities.

- Seeing food as theater, using reconfigurable spaces and rotational chef concepts in restaurants to offer customer encounters with, for example, celebrity chefs.

Retail

Millennial consumers want to shop for experiences as well as products. Rising demand for cooking classes, health-and-wellness sessions, and makeup tutorials means that retailers, athletic-apparel makers, and electronics companies are changing what they offer and how. Specifically, traditional department stores and shopping malls are wondering whether and how to embrace online shopping.

The traditional department-store format is driving less traffic to shopping malls as consumers move their retail activity online. With online retail creating choice overload,

consumers are beginning to appreciate curated retail concepts. “Pop up” stores that provide distinctive products for a short period are one significant response. These are on the rise in a variety of markets. In the United Kingdom, for example, pop-ups accounted for £2.3 billion in sales in 2015, up 12 percent compared with the previous year.

To meet this changing environment, real-estate developers should consider the following:

- Creating retail centers, that are also learning zones to bring together consumers, retailers, and entertainment. One example is a sporting-goods store that includes a fitness studio to enable the consumer to experience the product.

- Experimenting with niche retail concepts such as revolving storefronts, pop-up stores, dedicated space for “glocal” brands, and offline showrooms of online players. Doing so creates a more interesting mix of tenants. It may not maximize leasing yields per square foot, but it will generate buzz and traffic.

- Converting anchor retail spaces into coworking areas that are flexible and reconfigurable for other retailers and more appealing to start-ups and to millennial customers. For example, one San Francisco mall created a coworking space that provided direct access to more than 20 million mall shoppers.

- Allocating reconfigurable spaces in mall corridors and piazzas to host pop-up stores for product launches and seasonal offerings.

Transportation

Getting into and out of the mall is an important part of the shopping experience—and often a frustrating one, when it comes to parking, safety, and convenience. Here are some approaches that real-estate developers might consider to improve this part of the experience:

- Technology-enabled parking, including use of robot parking valets to perform the last-mile parking service and maximize the available parking space. Integrating parking apps and sensors can help shoppers spot spaces and then get to them.

- Redesigning car parking to include dedicated e-hailing pick up zones, shared economy parking, and fast-charging stations for electric vehicles.

- Preparing underground parking space for possible future conversion to retail or commercial space as autonomous vehicles gradually reduce the need for private-car parking.

Technology

By 2017, the millennial generation will comprise the largest online audience, and they will have more buying power than any generation ever. Almost seven in ten say they are influenced by friends' social-media posts; 83 percent say they trust recommendations by friends and family. They rely on peer recommendations, and increasingly discover products online before going out to shop. But they still want to touch, feel, and explore products before purchasing them. The need, then, is to create a seamless chain between online and on-site shopping. There are several technology-enabled innovations to consider:

- Creating "virtu-real" formats to provide consumers with a more interactive retail experience, for example, through the use of touchscreen navigation panels, virtual fitting rooms, magic mirrors, and augmented-reality zones.

- Merging online and offline retail using "social shopping" technology with digital screens in transport-arrival zones, piazzas, shop windows, and major junctions of the shopping district. These can help consumers find products, access reviews, and then direct them where to buy.

- Using smartphones for e-checkouts and click-and-collect services, to help blend the offline and online shopping experience. Some of the largest mall operators in the United States are already working with partners to give shoppers same-day delivery service.

Digital technologies and changing shopping habits are a clear threat to traditional retail business models. But there are positive ways to respond to these trends. To embrace these opportunities, real-estate developers must get closer to consumers and figure out how to meet their evolving wants and needs. That means rethinking the role of the shopping mall, and adapting its strengths to those of the virtual world.

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California's housing sector: Five ways to accelerate home-building

Jan Mischke, Shannon Peloquin, Daniel Weisfield, and Jonathan Woetzel

America's biggest state needs to build 3.5 million homes by 2025. Here are some approaches that can help.

California is America's largest state by population (38.5 million). If it were a country, it would have the world's sixth-biggest economy (almost $2.5 trillion). But it faces a $50 billion to $60 billion housing-affordability gap each year. Half the state's households cannot afford the cost of housing. An undersupply of housing units costs $140 billion per year in lost economic output.

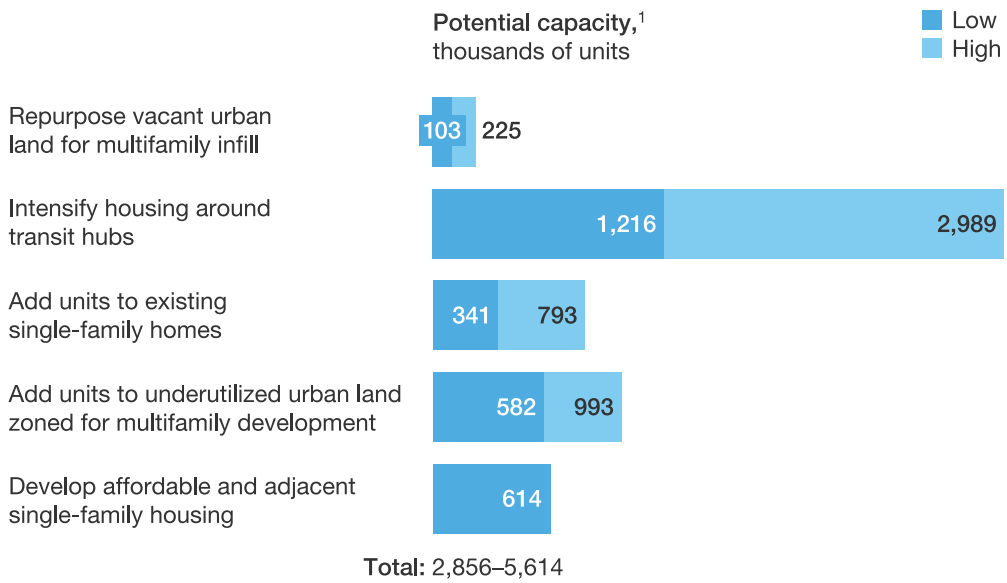
Housing is critical to human health and well-being. But in many places around the world, in both developing and advanced economies, access to affordable housing falls short. In October

2014, the McKinsey Global Institute published *A blueprint for addressing the global affordable housing challenge*. In October 2016, MGI released a new report that focuses specifically on California, *A tool kit to close California's housing gap: 3.5 million homes by 2025*. This article summarizes the main findings of that report. We have also written an op-ed on the subject for the *Los Angeles Times*.

To understand the nature of the problem, we built a quantitative model to identify California's housing-affordability gap by household and location. Among our findings: 50 percent of California's households cannot afford the cost of housing in their local market. This problem is most acute among the poor and near-poor, but it also squeezes the middle class. In Anaheim, Long Beach, and Los Angeles, households earning up to 115 percent of area median income, or $69,800 per year, are unable to afford local housing costs. Nor is it just an urban problem. In rural communities such as Watsonville and Salinas, up to 60 percent of households are stressed. Of America's 50 states, California ranks 49th in housing units per capita. From 2009 to 2014, the state added 544,000 households but only 467,000 net housing units; that helped drive up housing costs. To satisfy pent-up demand and meet the needs of a growing population, California must build 3.5 million homes by 2025 (exhibit).

Exhibit

California has room to build more than five million new units in 'housing hot spots.'



[1]Highly conservative estimate, based on only 3 counties: Contra Costa, Sacramento, and San Bernadino.

McKinsey&Company | Source: McKinsey Global Institute analysis

After quantifying California's affordability gap, we analyzed land across the state, parcel by parcel, to identify "housing hot spots" where large amounts of housing could be developed with attractive returns. We identified physical capacity to add more than five million units in these hot spots—more than enough to close the state's housing gap. Up to three million units could be built within a half-mile of high-frequency public-transit stations. More than 600,000 could be added by homeowners to existing single-family homes.

The challenges will vary from place to place, so solutions must be tailored to local needs. Here are five promising approaches:

Build on vacant urban land that cities have already zoned for multifamily development.

California could prioritize infill development on vacant urban land that cities have already zoned for multifamily development. Multifamily infill projects can enliven cities, reduce the number of cars on the road, and raise economic productivity. Focusing on cities rather than "building outward" also preserves agricultural land and open space. In California cities with populations of more than 100,000 people, we conservatively estimate that there is capacity to build 103,000 to 225,000 housing units on vacant land that has already cleared the multifamily-zoning hurdle.

Intensify the supply of housing around transit hubs.

Given current land prices and allowable densities, cities such as Los Angeles, Sacramento, San Diego, and San Francisco cannot create enough housing within city limits. Transit-oriented development, which creates compact, mixed-use communities clustered around public transit hubs, is a solution. Locating housing on public-transit lines increases connectivity and convenience while reducing sprawl, highway gridlock, and greenhouse-gas emissions. State legislation from 2008 prioritized housing development within a half-mile radius of high-frequency public-transit terminals. San Jose has embraced these principles in its 2040 general plan, which channels housing growth into 70 mixed-use "urban villages" clustered around transit stations. By increasing housing density around transit, California could build 1.2 million to 3 million units within a half-mile radius of transit stations.

Add units to existing single-family homes.

In Los Angeles and San Francisco, 93 percent of the residential land area is dedicated to single-family housing. Many homeowners would like to create an additional unit on their property, such as a garage apartment, basement apartment, or backyard cottage. Through such "accessory dwelling units," we estimate that California could add up to 790,000 housing units. Cities such as Berkeley, San Diego, and Santa Monica have a dearth of vacant parcels, but they have an abundant supply of private spaces that are fertile ground for microscale housing. Adding units inside existing units creates "invisible density."

"Co-living" is another option. A co-living developer might obtain a 3,500-square-foot house previously occupied by a family of four and rent it to eight unrelated individuals who commit to a culture of shared use. Co-living results in high-density, energy-efficient, and affordable housing without government subsidies. For owners, the business model in California yields cash-on-cash returns of 8 to 9 percent.

Add units to underutilized urban land zoned for multifamily development.

In Los Angeles, a single-story apartment building built in the 1930s might have four units, with most of the lot area dedicated to parking. But the lot may be zoned for ten units. To get a sense of the scale of the opportunity, we mapped every land parcel in two counties: San Francisco and Los Angeles. This geospatial analysis revealed that 31 percent of San Francisco's multifamily parcels are underutilized, which means the city could add 70,500 units under current zoning. In Los Angeles, the potential is for 306,000 more. Statewide, we conservatively estimate that there is capacity to build 580,000 to 990,000 units on underutilized multifamily parcels in the state's major cities over the next 30 years, and 200,000 in the next decade.

Develop affordable and adjacent single-family housing.

To meet market demand, a share of California's new housing supply must be built on land dedicated to nonresidential uses such as agriculture. To increase access to housing and reduce urban sprawl, greenfield development of single-family homes should be optimized for affordability and adjacency to existing development. We quantified the opportunity to build single-family homes in California in accordance with "smart growth" principles, such as small lot sizes and proximity to existing development, jobs, and transit. In three counties that fit these parameters—Contra Costa, Sacramento, and San Bernardino—our ground-level analysis identified more than 600,000 potential units.

Turning ideas into homes

Capturing this opportunity requires leadership from government, engagement from citizens, and action from the private sector—including policy innovation, bringing new voices into local land-use decisions, and attracting social-impact investment. There is no single policy prescription to close the state's housing gap. California's statewide housing gap will only be closed at the local level.

Cities, towns and developers have the tools to act. For example, shortening the land-use approval process alone could reduce the cost of housing by more than $12 billion through 2025. Reducing construction permitting times could cut another $1.6 billion. Raising construction productivity and deploying modular construction techniques would improve efficiency substantially. Governments could reallocate $10 billion a year in developer-impact fees to other forms of revenue generation in order to lower housing costs.

Attracting new sources of capital is also important. Policy tools such as inclusionary zoning, linkage fees, and tax-increment financing can capture some of the value created through market-driven real-estate development and channel it into subsidized affordable housing.

There are opportunities to build. Based on rigorous and fact-based analysis, our report has identified how and where more than five million new housing units could be built. Our hope is that this research can help California to close its housing gap—a matter that is critical for improving social equality, enhancing quality of life, and boosting competitiveness.

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Learning from experience: How hosting the Olympics can leave a positive legacy

Bill Hanway

Careful planning and an eye on the future can help the cities that host them.

Deciding to host the Olympic Games can no longer be about national ego. In democratic countries, there has to be a clear social and economic rationale that goes beyond simply staging a global sports event.

In 1992, Barcelona marked the beginning of this new approach. City and national officials explicitly sought to use the Games as a way to accelerate the transformation of the city from its postindustrial languor into a hub for tourism and services. Those very successful Games helped to do just that.

Learning from Barcelona's achievement, when London won the right to host the 2012 Olympics, creating a post-Games legacy was at the heart of its thinking. Instead of hosting the event as an end in itself, London organizers conceived of it as a way to regenerate the historically challenged East End. "The Olympics will bring the biggest single transformation of the city since the Victorian age," London Mayor Ken Livingstone said in 2003. As is often the case, these Games went well over budget, but there are positive early indicators of lasting impact, with new housing, schools, and the 100-hectare Queen Elizabeth Olympic Park, as well as economic activity, cleaned-up canals, and significant infrastructure improvements.

What about Rio de Janeiro? When Rio won the right to host the Olympics in 2009, Mayor Eduardo Paes noted that Rio was not London or Beijing; it would do things its own way, including using a high degree of private financing. And he was right. Yes, there were some operational frustrations. But there was also the beauty of the city, the hospitality of the Cariocas (Rio's residents), the smiling spectators, the exceptional athletic performances—and finally, the enormous sense of national pride (and relief).

It's worth remembering, though, that Rio had the London example in mind from the start; indeed, one of Rio's key advisers had played an important role in the London bid. In effect, Brazil's leaders—and the bid had strong and deep political support—were thinking not so much about what the city could do for the Olympics, but what the Olympics could do for the city. The bid emphasized that two of the four Olympic zones were in fast-growing areas of the city, ones that needed the infrastructure and housing that development associated with the Games could accelerate. In another zone, Maracaña, there were plans for revitalizing the port and surrounding areas. The evaluators praised the "excellent legacy plan," with its emphasis on social integration.

Between 2009, when Brazil won the Games, and the 2016 Olympics, when it hosted them, Brazil faced many difficulties. It will be years, perhaps decades, before we know whether the legacies described in the bid come to pass. But it is clear that hosting the Games provided momentum for the country to start—and finish—projects that had been thought about for years, including a new subway line, almost 100 miles of rapid-bus lanes, and a 17-mile light-rail system, plus new schools and health clinics. "No one ever said the Olympics were going to solve all of the city's problems," Mayor Paes told the *New York Times*. "But we used the Games as a good excuse to get a lot of things done, things that have been the dream of mayors for 50 years."

Whether it was enough or could have been done better matters enormously to Brazil. In the narrower world of the Olympics, though, what can be said is that the way London and Brazil developed their bids will be the way that all other democratic countries do so in the future—with post-Games legacies front and center.

That is necessary, because there does appear to be something of a backlash against the Olympics. A number of cities have pulled out of consideration for the 2022 and 2024 Games, due to public opposition. Without a conviction that there will be benefits beyond hosting a ripping two-week party, voters these days will not support the Olympics.

AECOM has worked on Olympics for more than 30 years, including delivering the master plans for both London and Rio. Our work is no longer simply about practical concerns, such as venue design, transportation, and crowd flow. The process now has to encompass social and economic analysis to derive appropriate targets for success. A successful effort must work simultaneously at multiple levels—the Games, the post-Olympics transition, and the long-term legacy.

One thing London did well was to ensure that the infrastructure of the main Olympic Park was designed and located with future housing and commercial development in mind. Nothing had to be ripped up after the Games concluded; later analysis estimated that at least 75 percent of every British pound spent on the park had a legacy use.

Four years on, it is becoming possible to measure the success of the planning efforts and the impact on real-estate values in the neighborhoods near the Games. Recent analysis indicates that these hubs have outperformed surrounding areas by an average of 29 percent, suggesting a substantial Olympics-related benefit. Property values in Wembley, for example, where badminton, football, and rhythmic gymnastics took place, have almost doubled, compared with less than 30 percent for Wembley's near neighbors.

On the western edge of Queen Elizabeth Park, the £2.4 billion International Quarter in the east London area of Stratford is developing 4 million square feet of offices, more than 300 new homes, and could bring in as many as 25,000 jobs. A new cultural hub is also being developed with the new Sadler's Wells Theatre, a Victoria and Albert Museum extension, along with academic anchors, such as the London College of Fashion and University College London. In addition, the 2,818 apartments built for the Athletes' Village are now a mix of market and affordable rentals, with 2,000 more to come. All are well served by transit links built for the Games, with central London less than 15 minutes away. The East Village may or may not be "London's hippest postcode," as the developer says, but the combined investments suggest that this will become a lively and prosperous neighborhood, even though it has not seen the leap in real-estate values other Olympic-related areas have.

Brazil has already created one legacy that future bid cities might emulate: the way it designed the financing. The city of Rio owned the 120 hectares that were the center of

the Games. Developers then built the venues and other structures in exchange for the land. Even more than Atlanta, Brazil relied on private-sector resources (which accounted for 57 percent of the total). There has been criticism of this model because of concerns that the private sector and richer Brazilians got too much of the economic benefit. All this will take time to determine. Even in the short term, though, this method reduced public-sector capital outlays and created an economic foundation for future maintenance. In effect, it flipped the risk from the public to the private sector. And as with all modern Olympics, Rio got billions of dollars in revenue from sponsorships and broadcast rights that helped pay for Games-related improvements.

For Tokyo 2020, AECOM is working as an adviser, although to a more limited extent than in London or Rio. What we are seeing is that Tokyo, driven by the new governor, Yuriko Koike (elected in 2016), is making changes with financial sustainability in mind. That is one of the priorities of the International Olympic Committee's Agenda 2020, an effort to cut the costs of producing the Games while addressing "sporting, economic, social, and environmental long-term planning needs." Instead of building a new cycling venue, for example, Tokyo is locating this event in an existing facility 120 kilometers away; basketball will also take place outside the city center. The explicit aim is to improve the legacy outcomes by improving the underlying economics.

These experiences have influenced AECOM's work on the Los Angeles 2024 bid. The city's bid takes many of the lessons of the recent past as far as possible. For instance, Los Angeles will not be building any new venues—all events will take place in existing or temporary sites. In addition, the city will not build a new Olympic Village, historically a big expense; instead, athletes will stay in the dorms at University of California, Los Angeles. Financing will be entirely private. The bid committee even projects a surplus of $161 million.

Hosting an Olympics will never be cheap, but the idea of this $4.1 billion bid is to use private money, Games-generated revenues, and venue owners' commitments to upgrade facilities while emphasizing the athlete and spectator experience. Compared with many recent Games, Los Angeles envisions a modest, even frugal, Olympics. And it is telling that, at least in part, on this basis, the public appears to be solidly in favor of it—88 percent of Los Angeles respondents approved of the bid in a poll earlier this year. Los Angeles wants to demonstrate that it is possible to host a relatively low-risk, low-cost, high-quality Olympics. The Paris bid is similar, relying heavily on existing or temporary venues; officials are promising that every venue will have a post-Games purpose.

As a veteran of four Olympics, I understand and share the concerns about whether they are worth the cost and disruption. Like laws and sausage, seeing how the Games are put together is not always edifying. Even so, I believe that city and sports

officials who take the time to learn the lessons of the past can develop future Games that are a positive force for their societies.

Bill Hanway

Executive vice president and global sports leader, AECOM

Industrialized delivery systems and the future of real estate

Mukund Sridhar

Real-estate developers should accept that business as they have known it is changing. By adopting new construction technologies, they can improve delivery and affordability.

Imagine if people could design and develop their dream homes simply by going online to find the solution that best suits their means and lifestyle. Imagine being able to pick from a menu of standard base designs and being able to customize fittings, furnishings, and smart

equipment. Then imagine being able to use a digital interface to obtain quotes from vetted contractors for everything from surveying the plot to assembling the house. And the pieces of the house itself arrive in the form of prebuilt panels and modules in a container from a centralized robotic factory. This is what is meant by "industrialized delivery systems"—and these will play a crucial role in the future of the real-estate and construction sectors.

In reality, early versions of this future already exist, with several venture-funded home builders in the United States aspiring to channel the customer-experience revolution pioneered by consumer-goods companies into the residential-property space. We are likely to see the creation of standardized home-building platforms, with developers working with an ecosystem of companies providing an array of fittings, furnishings, and equipment solutions. The result is a seamless customer experience and a more sustainable end product.

Skeptics may argue that such industrialized delivery innovations will focus on the lower-priced segments of the market, while the construction of high-end real estate will remain unchanged. Early evidence suggests, however, that this will not be the case. Industrialized delivery systems are poised to disrupt the real-estate sector across all asset classes and price points.

There is little doubt that the construction process adopted today badly needs innovation, mainly to improve the speed of delivery and reduce the dependence on manual interventions. A key enabler for this transformation is modular design, geared for production and assembly rather than field-based on-site work.

We are already seeing progress toward this future. Three technologies that already exist are of particular interest.

Virtual design and construction (VDC). Digital platforms, such as 5-D building-information modeling (BIM), enable the creation of a "virtual twin" of physical projects. This not only allows design optimization—in the form of more precise estimates, value engineering, constructability, and interface checks—but also provides transparency and project-management oversight over the life cycle of the project. Coupled with emerging industry trends, such as integrated project-delivery contracts, VDC is a powerful tool to help finish projects on budget, on time, and on spec.

To realize the full benefit of using 5-D BIM for projects, developers and contractors must fundamentally rewire their design, estimation, and project-management processes. That means contractors and clients must work closely together, backed up by clear contracts, to share both risks and gains.

Prefabricated, prefinished volumetric construction (PPVC). PPVC involves the factory construction of interlocking building modules, each equipped with internal finishes, fixtures, and fittings. These elements are then transported to the site for assembly and installation.

PPVC is slowly but steadily gaining popularity because it accelerates the construction process, with productivity gains of as much as 30 to 50 percent, according to case examples in Singapore. PPVC works particularly well for less-complicated and standardized designs. Other benefits include higher, more consistent quality; less waste; and better health, safety, and environmental performance because of the shift from chaotic field sites to a more controlled factory environment.

Singapore is one of the leaders in the use of PPVC. The city-state's Building and Construction Authority encourages deployment of this approach—not just for hotels, hostels, dormitories, and industrial facilities but also for middle- to high-end residential developments. The technique can accommodate both concrete and dry walls. It is also corrosion free and fire safe. So far, it has been used in buildings as high as 25 stories.

Deploying PPVC implies changing design standards, assumptions, and processes to adopt the Design for Manufacturing and Assembly approach. It also requires better production-planning, supply-chain, and logistics-management capabilities, given that modules need to be produced remotely and regularly shipped from factories to sites. These are areas in which many contractors are lacking. Few in the sector have anticipated this shift from construction to production, let alone budgeted and provided resources for it.

3-D printing. While 3-D printing has not yet been widely applied in construction, developers and contractors should keep an eye out for innovations here. 3-D printing will likely be an important part of the shift from the field to the factory. Experts believe that one core application of 3-D printing could be in realizing complex, iconic facades and architectural features previously thought too expensive or time consuming to produce.

3-D innovators are scaling up this technology, by developing printers and design methodologies to create building units up to 200 square meters in size in less than a day. Significant R&D efforts are also under way in universities to print individual structural components and architectural features.

Prepare for change

The construction industry is poised for big cultural and technological shifts as it embraces digitization across design and delivery processes. The real-estate industry is set to gain from these developments, not just as the result of efficiency and productivity gains but also by providing a richer and more satisfactory customer experience.

The larger benefits could be profound. By cutting costs, speeding up construction, and improving quality, industrialized delivery systems can also help provide the decent, affordable homes that families around the world need.

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Creating real-estate brands in emerging markets that excel in customer-centricity

Ankit Gupta, Bruce Xia, and Haimeng Zhang

As the global real-estate market changes, developers need to focus more on the customer experience.

The real-estate sector in emerging markets has been slow to focus on customers. In the past, economic cycles have largely determined whether it is a buyer's or seller's market. Customers have concentrated on location, property prices, payment plans, and product specifications. By contrast, most industries, including automotive, luxury goods, and

financial services, have identifiable market leaders that excel in customer service. In real estate, most businesses are family run, and owners often think with their gut on product design, pricing, and marketing. The best sales and marketing talent is unlikely to be found in the sector. All this looks set to change.

During the "golden era" of global real estate in the early 2000s, property developers in many markets, emerging and developed, prospered because they were able to sell almost everything they built. Inevitably, there was a correction, starting in 2008. Since then, large developing markets such as China and India have been subdued. Many property developers face pressure from oversupply in the residential market, a lengthy destocking cycle caused by limited investor demand, policy volatility, and funding shortages.

No wonder, then, that the way customers approach property purchases is changing. So, then, must the real-estate market. For a start, members of the millennial generation (adults born after the early 1980s) are comfortable with technology; they expect information and transparency. Modern families are also increasingly demanding. They want easy access to schools and colleges, well-developed parking and landscaping amenities, reliable property management, and high-quality infrastructure. And as the global population ages, demand is rising for senior-friendly facilities and healthcare services.

To meet these social, economic, and sectoral trends, within the next five years truly customer-focused real-estate brands need to emerge. To reach this goal, companies need to get six factors right. Some of these are already common in mature markets, but there is considerable room for improvement elsewhere.

Product design. While property developments will always involve vision and art—designing things that people have not even imagined—the industry needs more science. That starts with deep engagement to find out what consumers want and need, what their aspirations are, what they value, and what they don't want to pay for. Mining these insights brings an opportunity to offer differentiated products and can provide end-users and long-term investors with developments tailored to their needs.

Pricing and payment plans. Other industries use fact-based pricing models; the global real-estate industry needs them, too. Particularly in markets such as India and China, where such practices are not standard, this means analyzing the competition and measuring customer sensitivity to pricing, and payment plans. It means identifying the right approach to set more precise base prices and any add-ons, such as for higher floors or different views. This is equally relevant to leasing business models. For example, it's important to determine the theoretical rent each shop in a mall should generate, based on past footfall and sales data, store location, and the type of tenant. In many emerging markets, though, mall developers do not use scientific pricing tools that mine past data.

After-sales service. Customers don't just buy a residence, they buy a dream of what their life will be after they move in. Particularly for apartments and gated communities, the best real-estate brands will be built on excellence in after-sales service and property management that deliver value after occupation. Ways of doing this can range from ensuring that the basics of quality, security, and cleanliness are right to providing value-added services such as cooking classes, sports coaching, and apps for online concierge services.

Digital connectivity. Today's customers want digital options. Marketing of properties that are yet to be constructed will change with the use of augmented- or virtual-reality tools. Other tools already in use include daylight simulation to help customers see the natural light that will be visible in apartments and the use of drones to give a "real view" from a proposed high-rise property. The use of digital apps will also transform the customer experience, from arranging initial bank loans or tracking property-construction progress to choosing interior fit-out and selecting furniture. Finally, digital interfaces will be at the heart of property management, providing services to customers while offering customer information to real-estate companies.

Improving sales talent. Developers and real-estate professionals may want to consider hiring from other industries where customer focus has been the norm for longer. They will need to place more emphasis on training and on creating stronger links between compensation and sales performance. While project-level sales teams will continue to be important, centralized teams might be a better fit for international and institutional sales and to service high-net-worth investors. Finally, because the real-estate industry often relies on third-party property brokers, companies need to invest in upgrading their skills through training sessions and online aids.

Changing mind-sets. To embed customer-led thinking into the corporate vision and strategy, staff and senior management must work to get a firsthand feel for what customers want. Non-sales-related employees, too, should be offered customer-related performance assessments to spread this mind-set widely. Real-estate companies can learn from other industries where senior managers and board members interact with customers directly.

As the global real-estate sector bids farewell to the seller's market, it faces a host of new challenges. To succeed, companies need to identify innovative products and services that will serve customers well. This will be a difficult transformation—but a crucial one that will decide the winners of tomorrow.

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