

Smart Cities Success: Connecting people, proptech and real estate



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Foreword

What does it mean to live in a smart city? How many of us are benefitting from smart city innovations designed to make our lives more connected, efficient and sustainable? Are government and corporate investments in these technologies paying off? Has the 'smart city' concept finally evolved from buzzword to reality?

This report addresses each of these questions. At JLL, we understand cities and the ambitions and concerns of the people who live, work and invest in them. To make sense of the burgeoning smart city movement and how it's transforming urban spaces, we collaborated with proptech, smart cities and Internet of Things (IoT) expert Charles Reed Anderson, consulted governments, real estate investors, developers and technology experts, and combined their insights with our own deep knowledge.

What we discovered challenged our preconceptions, and also made us excited about the pivotal role real estate has to play in future cities. Just as real estate is at the heart of cities, real estate technology will be at the heart of smart cities. We believe proptech – the convergence of property and technology – will be key to powering the cities of tomorrow.

Our clients – real estate investors and corporate occupiers alike – have told us that they want to better understand smart cities and the opportunities on offer. As the ways we live and work change, there is an urgency to prepare for this fast approaching future where our experience of real estate is transformed by the use of sensors, the IoT, virtual reality (VR) and much more.

It's time to look beyond the hype to see the challenges and opportunities of delivering on the smart city promise.

We hope you enjoy the report and look forward to discussing it with you.

Dr Megan Walters

Head of Research, Asia Pacific, JLL





Findings in brief

Smart cities are not a new concept, yet their potential continues to excite and confound governments and businesses worldwide. The positive and negative aspects of smart cities have been explored extensively – in Alphabet’s Toronto-based Sidewalk Labs project, for example, and in Seoul’s efforts to tackle the challenges of high-density living. Some commentators are questioning whether the term ‘smart city’ is still meaningful or whether it has lost its currency. We consulted experts across the Asia Pacific region to better understand where we are in the development curve. These are our key findings:

People, not technologies, make a city smart. It’s people that enable smart cities to reach their potential.

Resourcing and implementation are key factors holding back the development of smart cities. City ecosystems must learn to collaborate or they will inevitably fail. Different city government agencies must work together, learn to engage with the technology that will support their smart city solutions, and look for ways to better serve the ultimate stakeholders: the citizens.

We need to ignore the hype and focus on what’s real today.

It’s easy to get caught up in the massive scale of the smart city market, but delivering tangible value – and soon – requires working with the present reality. We already have technologies, solutions and use cases that can deliver proven value in citizen engagement, streamlined operations and improved processes. While it’s important to plan for the future, the main effort should focus on delivering solutions in the near future that benefit existing cities, the businesses operating in them, and the people living, working and playing in them.

Real estate is at the heart of any smart city. It’s time for the industry to take a leading role.

The real estate industry has been viewed as a technology laggard for too long. Many of the best smart city solutions now sit within its domain, capable of delivering tangible business, financial, strategic, operational and community value.

The industry must lead by example. It should work closely with cities to create special interest groups and identify new use cases and technologies that will influence the built environment. It should also look to liaise between cities and the technology vendor ecosystem in all matters related to property. The real estate industry has the opportunity to become a true smart city solution provider. It’s time to rise to the challenge.

A world of cities

According to the United Nations, 55 per cent of the world's population currently lives in urban areas, and that number is expected to rise to 68 per cent by 2050.¹ This will have a significant impact in Asia, where India's urban population is expected to grow by 416 million and China's is expected to grow by 255 million during that period.

It's not just the region's mega-cities that will experience this urban expansion. Association of Southeast Asian Nations (ASEAN) expects that 90 million people will move into urban environments by 2030, 36 million (40 per cent) of them to middleweight cities – those with populations between 200,000 and 2 million residents.²

The number of governments declaring their intention to make their city 'smart' is staggering. More than 1,000 cities worldwide have begun deploying smart city initiatives, and half of those are in China alone.³ The Indian government has followed suit by launching its Smart Cities Mission, a five-year plan for its central and state governments to provide US\$14 billion of funding between 2017 and 2022, kickstarting the development of 100 smart cities.⁴

It's not just the number of smart city initiatives that's growing at a spectacular rate. According to market intelligence firm IDC, cities spent US\$81 billion in 2018 on their smart city initiatives, and this figure will nearly double to US\$158 billion by 2022.⁵ Frost & Sullivan, another leading market intelligence firm, predicts that smart city market opportunities will be worth US\$2 trillion by 2025.⁶

Confused yet? These statistics illustrate one of the key challenges for the sector: the diversity of smart cities and the ecosystems that support them. Because of this, what constitutes a smart city is different for different stakeholders. That makes it very challenging for the market intelligence firms working to forecast the opportunities for technology vendors, developers, solutions, businesses, citizens and the cities themselves.

Smart city initiatives that are struggling or have failed are often overly focused on the technology instead of providing practical solutions. In other words, they deployed an initiative because it was technically feasible, not because it delivered a tangible benefit back to the city, or the people and businesses that the city supports.

Despite some failures, governments, corporations and urban residents are realising that smart cities could help solve some of our most pressing issues, such as overcrowding, ageing populations and environmental degradation.

This brings us to an often-overlooked aspect of smart cities: real estate. The rise of proptech is allowing the real estate industry to take a technological leap forward. Spurred by the momentum of broader urban technology developments, proptech could finally bridge the gap between technologists and people, enabling smart cities to be a functioning, meaningful and successful reality.



What does ‘smart city’ mean to you?

Any internet search will turn up dozens, if not hundreds of different definitions for the term ‘smart city’. Why? For starters, cities are complex. Each has a variety of government agencies that operate as ‘businesses’ in the fields of transport, energy, public housing and tourism. Smart cities are even more complex, with a wide range of stakeholders involved in designing, deploying, supporting and using smart technology.

JLL defines a smart city as a set of policies and strategies using technology and data to deliver initiatives that:

- improve inclusiveness, services and quality of life for the people who live there
- drive efficiency, sustainability and improved decision making for government
- create a transparent, efficient and competitive environment for businesses.



How would you define a smart city?

“A smart city uses technology and data to enhance its liveability, workability and sustainability.”

Adam Beck – Executive Director, Smart Cities Council Australia New Zealand

“A city that utilises new technologies and innovations to promote productivity and efficiencies, reduces waste and costs, and enhances diversity and inclusion.”

Fiona Cho – Executive Director, Portfolio Management, Prudential Global Investment Management

“Smart cities put data and digital technology to work to make better decisions and improve the quality of urban life.”

Jonathan Woetzel – McKinsey & Company





The role of real estate in smart cities

Real estate is at the heart of every city. It includes the homes we live in, the offices we work in and the places where we spend our free time.

Although it's been viewed as a technology laggard, the real estate industry is catching up fast, and it has the potential to revolutionise smart city ecosystems.

We are witnessing the increasing prominence of proptech: technology hardware, software and services focused on the investment, construction, management and sale or lease phases of a building's life cycle.

Venture capital (VC) firms have helped drive this market globally. In 2018, the proptech industry received VC funding anywhere between US\$4 billion and US\$20 billion.⁷ This fast-paced growth has continued into 2019, with proptech firms raising US\$4.5 billion in the first quarter of 2019 alone.⁸ CB Insights, which has tracked proptech funding since 2012, first reported annual proptech funding at US\$221 million only seven years ago.⁹

Clicks and Mortar: The Growing Influence of Proptech, a collaborative report by JLL and technology news website Tech in Asia, revealed that 179 proptech start-ups in the Asia Pacific region raised more than half (US\$4.8 billion) of the US\$7.8 billion invested globally from 2013 to 2017.¹⁰

Proptech innovations have a material impact on cities, driving efficiency, sustainability and improved decision making, and creating more transparent and competitive business environments. The discussions we held in preparing this report found these impacts are being felt throughout eight key stages in the urban life cycle.

1. Enhancing build and construction

The construction phase presents many opportunities to use technology in ways that drive productivity and increase worker safety. We learned from many industry leaders that they are focused on using cloud-based collaboration platforms to share construction plans, track project delivery and determine cost benchmarks. Sharing data and progress drives operational efficiency and leads to financial benefits for real estate firms and, in turn, for their clients.

The industry is increasing its use of VR to streamline the design process, enhance the customer experience and identify design flaws early in the process, limiting expensive change orders. It has used 3D modelling for years, but combining building information modelling (BIM) technology with VR headsets means architects and clients can now completely enter the virtual environment, experiencing a truly immersive scene.

Another solution that has gained much interest is the use of ‘wearables’ for construction site workers. These devices can give workers updates on safety and compliance issues; geofence areas to alert workers they are entering a restricted or dangerous area; and track workers’ movements.



2. Managing and optimising spaces

Unsurprisingly, nearly everyone interviewed for this report listed predictive maintenance, energy management and environmental sensors as the smart building solutions they have deployed to date. These proven solutions help facility managers drive operational efficiency by intelligently monitoring assets, equipment and environments. Results are tangible: managers use captured data to reduce energy costs, minimise asset downtime, increase the life of assets, and ensure a healthy and comfortable workplace. These benefits also enhance business performance and employee productivity.

Smart technology is key to workplace transformation for many developed economies and countries that have smart city ambitions. Every year, building managers are deploying more sensors in the workplace, generating ‘heat maps’ that support occupancy planning, lease negotiations or workspace redesigns, optimising usage and productivity.

However, there’s no point deploying sensors just for the sake of it. Where sensors are used, it’s vital that the data they produce are used to improve operations and worker.

“Smart technology has made its way into many of our homes. It is inevitable that people now expect workplaces to have the same standard and infrastructure. With this in mind, we created our “Smart Building Strategy” to enhance our employee workplace experience and help us achieve our sustainability goals. By leveraging big data, we’re able to make informed decisions that meet our employee’s needs while being prudent in the use of resources. It’s not simply about deploying sensors, connectors and automation systems, it’s about knowing how to build a better workplace for our employees.”

Erwin Chong – Head of Corporate Real Estate, DBS Bank



A man's silhouette is shown in profile, facing right. The interior of the silhouette is filled with a vibrant, abstract image of a city at night. Tall buildings are visible, with light trails from cars and possibly drones creating streaks of red, orange, and white light across the scene. The overall effect is a blend of human presence and urban technology.

3. Merging different tools

Innovative technologies can help deliver value to a city's real estate portfolio. Drones, for instance, can be used to conduct building inspections during the build and management phases.

“Drones can be used to enhance safety, increase accessibility and expedite data collection for difficult and challenging locations.”

Bernard Leong – Vice President, Airbus Aerial Asia

Many building owners and facility managers use artificial intelligence (AI) to analyse captured data from existing and new sensors and cameras, and then develop actionable insights. This data would previously be captured by multiple platforms and analysed in silos, but now can be aggregated by integrated systems, helping us create more self-managing and self-healing buildings in the future.

Adopting more AI can also alter the organisational structure of a city's facility management teams and other business owners. For example, more human resources will be required to create, operate and customise these technologies for most effective use within their organisations.

“You need to train new people to understand the technology and I suspect most organisational charts still haven't got a data scientist as part of the building management team. In five years, they all will.”

Jack FitzGerald – Senior Development Manager, Lendlease

4. Enabling greater investment

Smart building solutions exist, but what value do real estate investors and developers see in them?

Some solutions can deliver ‘hard’ benefits, such as reduced costs by better managing smart lighting and heating, ventilation and air conditioning (HVAC) solutions, or using office space more effectively. However, many other benefits are less tangible and considered ‘soft’ benefits – such as delivering a better working environment or driving long-term sustainability. These solutions deliver value, but aren’t always immediately measurable.

“Much of Asia is behind Europe and North America in terms of these smart building considerations but quickly catching up. Landlords, tenants and investors are increasingly valuing not only the economic benefits of smart buildings solutions, but also the environmental and social merits in their underwriting of deals.”

Fiona Cho – Executive Director, Portfolio Management, Prudential Global Investment Management

“Smart building features do contribute to a price premium in the market, albeit indirectly. The savings generated from lower utility consumption will indirectly translate to a higher price for the building as compared to a similar building which has no savings from smart features.”

Thomas Kong – Deputy Chairman, APM Property Management (ARA Group)

It’s vital that the real estate industry learns how to understand the value of deploying smart building solutions. Without smart buildings, there can be no smart cities. We need smart cities to drive our economies.

A more efficient and sustainable city – where buildings are smart and connected – will attract entrepreneurs and companies, create jobs and generate business opportunities. Governments have realised this – it’s a major reason why so many are investing in smart cities and technology. Consider the Indonesian city of Bandung. Its smart city efforts are spearheaded by its former mayor – and now governor of West Java – Ridwan Kamil. Under his charge, the city is greener and more connected, and boasts innovations such as an IBM-enabled command centre for monitoring traffic.¹¹

5. Improving transparency

Proptech offers tools to better track, collect and analyse data, improving quality, consistency and reliability. As highlighted by JLL's 2018 Global Real Estate Transparency Index, these new platforms and services will enable more manageable data sets and boost transparency. This in turn creates conditions for better decision making by investors, tenants and property managers, who demand access to trustworthy information.¹²

Data transparency – coupled with clear, fair practices and high professional standards – also allows businesses and investors to proceed with confidence when deciding what types of space to build and when.

With the rise of proptech, emerging cities may be able to leapfrog the traditional timelines for improving transparency, accelerating towards being smarter, more transparent urban centres.

6. Driving sustainability

Sustainability and environmental impact measures play an increasingly important role in investment and corporate strategies, but also in measuring the success of smart cities. This is especially important to cities in the Asia Pacific region, many of which are grappling with the effects of overcrowding. These cities need solutions to pressing everyday issues, from real-time traffic control to waste management and water systems.

Cities manage large real estate portfolios, including government buildings and offices, industrial parks, public housing and public spaces. This scale presents a massive opportunity to cut costs through potential energy savings; more efficient use of resources to support building and site operations; and the increased lifespan of better maintained assets. The good news for cities is that most solutions on the table are not cost prohibitive.

“Some smart building technology is well tested and relatively inexpensive, and can be retrofitted into existing buildings. In many cities, the built environment is responsible for a large share of the overall carbon emissions, and wide adoption of smart building technology can help cities reduce energy consumption and achieve their sustainability targets.”

Jeremy Kelly – Director, Global Research Programmes, JLL

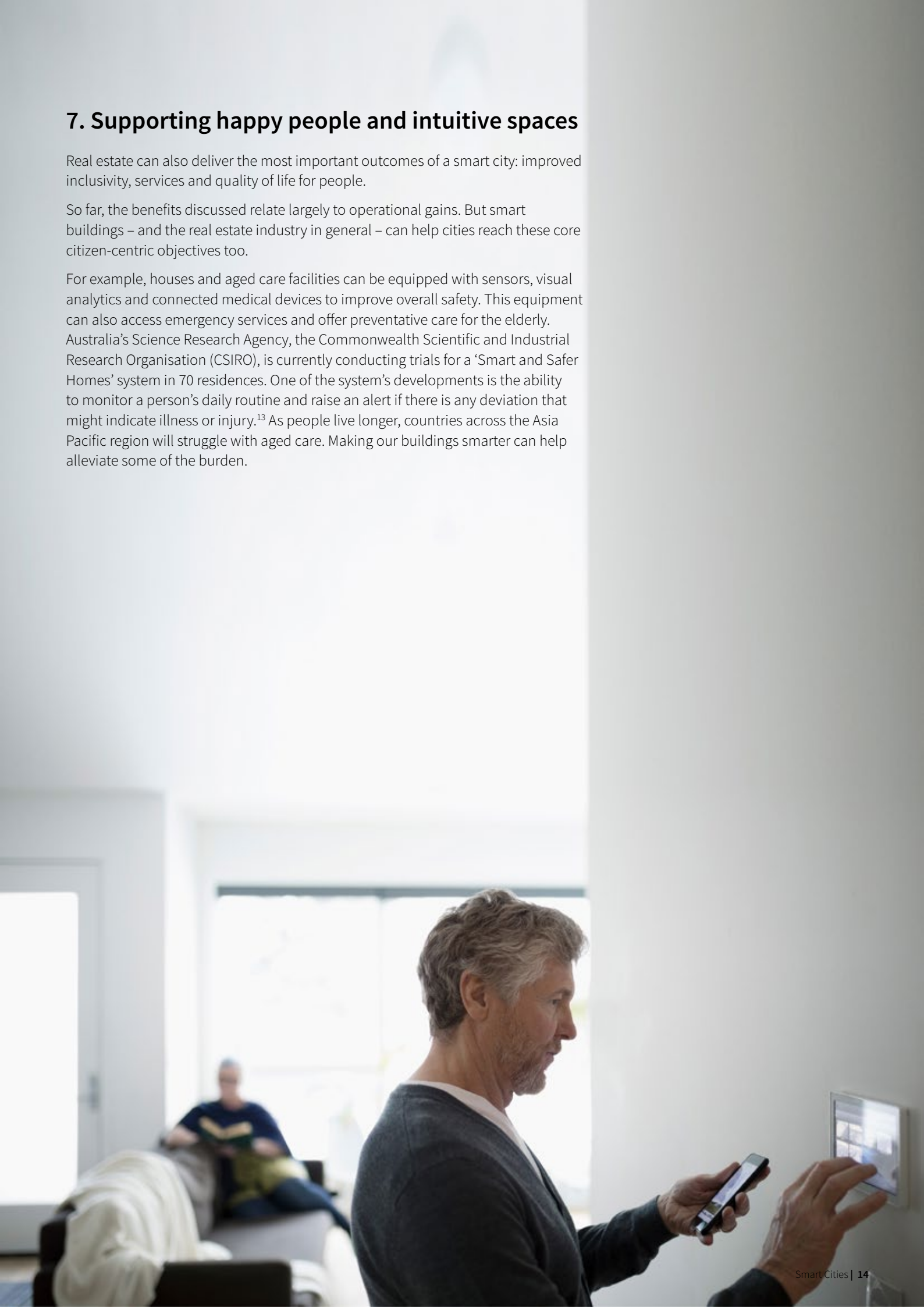


7. Supporting happy people and intuitive spaces

Real estate can also deliver the most important outcomes of a smart city: improved inclusivity, services and quality of life for people.

So far, the benefits discussed relate largely to operational gains. But smart buildings – and the real estate industry in general – can help cities reach these core citizen-centric objectives too.

For example, houses and aged care facilities can be equipped with sensors, visual analytics and connected medical devices to improve overall safety. This equipment can also access emergency services and offer preventative care for the elderly. Australia's Science Research Agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), is currently conducting trials for a 'Smart and Safer Homes' system in 70 residences. One of the system's developments is the ability to monitor a person's daily routine and raise an alert if there is any deviation that might indicate illness or injury.¹³ As people live longer, countries across the Asia Pacific region will struggle with aged care. Making our buildings smarter can help alleviate some of the burden.



8. Redefining cities

Finally, we must remember that real estate's contribution to smart cities isn't limited to buildings. It's also about the development and redevelopment of a city's districts, in a way that can reignite economic growth and offer fresh community spaces.

Research from JLL's City Momentum Index 2019 shows that real estate can set a city's future development path through urban transformation, regeneration and placemaking. For instance, neighbourhoods and mixed-use developments can seed new businesses and improve lives, while large-scale infrastructure projects can combat problems such as congestion.¹⁴

Lendlease's urban regeneration project for Singapore's Paya Lebar area is one example. The multibillion-dollar project includes building three office towers (with close to a million square feet of office space), residential towers and a stand-alone retail shopping centre. With the support of Singapore's Urban Redevelopment Authority (URA), Paya Lebar may be a key catalyst in achieving some of Singapore's long-term goals, such as providing jobs closer to homes, cutting congestion and reducing commute times. The URA's masterplan is to turn the suburb into a "new city precinct and a dynamic sub-regional business hub".¹⁵

Public-private partnerships (PPPs) like this are redefining cities across the region. For example, a Singapore-Sichuan partnership is developing the high-end industrial and residential Hi-Tech Innovation Park in Chengdu.¹⁶ The Mitsubishi Estate is redeveloping the 120-hectare Marunouchi, Otemachi and Yurakucho districts in Tokyo to create a globally competitive urban area.¹⁷ In Australia, Western Sydney's Aerotropolis will feature a new airport, and the surrounding area will form a 'second city' in Sydney, projected to generate 200,000 new jobs.¹⁸

The real estate industry goes beyond constructing and managing buildings and facilities. It helps cities redefine themselves and creates sustainable urban environments for future generations.



Can we deliver on the smart city promise?

While the promise of a smart city is attractive, delivering it is not so easy.

More than 1,000 smart city initiatives have been announced worldwide, but a March 2019 report from global consulting firm, Roland Berger, found that only 153 have an official smart city strategy. Of the roughly 500 initiatives for cities with populations over 1 million, only 49 had a strategy.¹⁹ Only 15 of these cities, or 10 per cent, have what the report refers to as a comprehensive strategy including detailed targets and activities. Only eight cities, or 5 per cent, went as far as including a means of implementation.²⁰

There are myriad overlapping reasons why smart cities are still underdeveloped or struggling to take off. To deliver true value, the smart cities ecosystem needs to address six key challenges.

1. Cities are complicated

The size and scale of cities create many organisational challenges. Shanghai, for instance, is home to more than 24 million people and is divided into 16 districts, three counties, 205 towns and 99 subdistrict committees, with 33 city government agencies.²¹ Creating a unified smart city strategy to incorporate all those stakeholders would be a logistical nightmare. Although Shanghai may be larger than most cities, its complex structure is far from unique.

“Cities have a multitude of needs to satisfy multiple areas such as mobility, energy, buildings and public locations, safety and security, as well as administration and population engagement. We have found that even within one city, different authorities often have significantly different requirements and preferences regarding IoT projects. Hence, smart city projects are complex.”

Thomas Jakob – Asia Pacific Regional President, Bosch Software Innovations

One city that has taken great steps to simplify its structure is Singapore. In 2017, it created the Smart Nation and Digital Government Office, which plans and prioritises key Smart Nation initiatives, drives the government’s digital transformation, and engages with citizens and businesses to drive adoption and participation.²²

This centralised project management office structure presents a single point of contact for 16 relevant government ministries to engage with, from which their initiatives are incorporated into the wider Smart Nation strategy. This structure also benefits the technology vendor ecosystem that supports the delivery of Smart Nation projects.



2. Cultural change is difficult

Dealing with cities involves bureaucracy. Many government agencies have not adapted their business and operating models in years, which can make them risk-averse and resistant to new ideas, even when presented with innovative ways to improve existing services.

Changing this bureaucratic mindset is a significant challenge. It's vital that cultural shifts be driven from the top, and that cities have a strong executive champion to combat resistance to change.

“Culture is the first thing you need to deal with when you want to implement something different in the public sector. Technology is not the most difficult part.

Chen-Yu Lee – Director, Taipei Smart City Project Management Office and Secretary General, GO SMART Secretariat

For example, Taipei City's Mayor Ko Wen-je spearheaded the Smart Taipei initiative. To overcome the government's risk-averse mindset, he created an environment where failures are accepted and professional knowledge is respected. This involved a 'living lab' concept where start-ups, small businesses and large enterprises could use government platforms to trial new smart city solutions.²³ Mayor Ko Wen-je also focused on citizen-centric solutions to increase engagement.

“Technologies and industry solutions play only a small ‘enabling’ portion of realising smart city outcomes. At least 99 per cent of the transformation work comes from disrupting traditional mindsets and bridging silos across organisational cultures, processes, governance structures, policies, regulations and expectations.”

Gerald Wang – Head of Government & Health Insights, IDC Asia Pacific

3. Governance is essential

Smart city governance uses technology to facilitate better decision making; plan, deliver and support smart city implementations; and share real-time data among governments, businesses and citizens. Without these platforms, cities will struggle to effectively manage their operations, break down departmental and agency silos, and engage with their citizens.

“Smart cities and the process to evolve governance directly with technology is reshaping how we all live, do business and connect as humans,”

Josh Sattler, General Manager of Innovation, Growth and Development Services, City of Darwin, Australia

Critical to this is applying transparency in what has been traditionally siloed. The more we are open and connected, the better the efficiencies we can gain. One key action that cities need to manage effectively is tracking policies and initiatives through their life cycle. In 2016, Tokyo set 360 policy targets with four-year work schedules as part of its ‘New Tokyo. New Tomorrow. The Action Plan for 2020’ initiative.²⁴ To track progress against these targets, Tokyo implemented a plan-do-check-act cycle to formulate plans (plan), implement policies and programs (do), manage progress and evaluate programs (check), and improve and review programs (act).²⁵ This cycle makes complex policy targets manageable and has led to Tokyo being viewed as a world leader in smart city governance.²⁶

“There are national and international standards that clearly articulate processes and methodologies to advance smart city action. There is no need to have to ‘guess it’ and create your own methodology.

Adam Beck – Executive Director, Smart Cities Council Australia New Zealand



4. Solutions are complex

After overcoming the organisational challenges, cities are left with their biggest challenge yet: identifying and deploying a solution that can be scaled successfully.

Although smart city concepts have been around for years, cities still struggle to identify and deploy use cases, or to have the means to scale them. Many proven use cases deliver tangible value back to the city and its people, including mobility (bike sharing and congestion pricing), security (disaster early warning systems and smart surveillance) and energy (smart meter and water quality monitoring) solutions. However, we are still in the early stages. Many more use cases will be needed to help cities confidently implement effective, smart city initiatives.

Further complicating this is the rapidly changing technology and solution landscape. Cities are rightly concerned about backing a solution that may be out of date in years or months due to the advent of new technology.

The good news is that technology is not holding the industry back. There are technologies to develop and secure any solution. What holds us back is stakeholder collaboration among government agencies, technology vendors, and users.

“Define the problem that you’re trying to solve and have a clear ambition with measurable targets. The roadmaps and strategies can follow after that.”

Joelle Chen – Director, Global Partnerships & Marketing, Mann+Hummel

“The rapidly evolving and changing solutions landscape creates too many choices and options for decision makers. Before they can make a call on a major commitment to an initiative, something else gets proposed and it’s back to the drawing board for the team.”

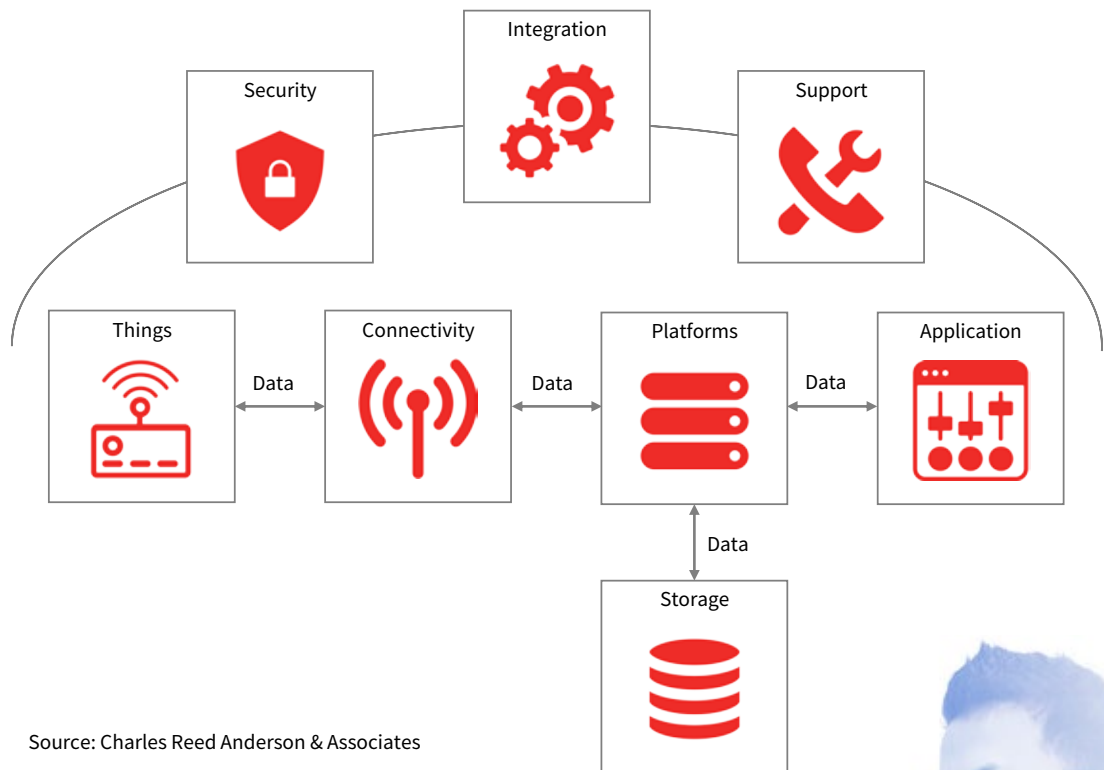
Alex Tan – Chief Innovation Officer, M1 Limited



5. The vendor ecosystem needs to be re-examined

Finding the perfect technology vendor to partner with can be like finding a needle in a haystack. To put it in perspective, there are more than 340 industrial IoT vendors in China alone²⁷ – not including enterprise- or consumer-focused IoT vendors. Globally, there are at least 450 IoT platform vendors.²⁸

The Smart City Solution Ecosystem



Source: Charles Reed Anderson & Associates

This fragmented vendor ecosystem is also immature, which is not ideal for smart city teams looking to roll out effective new solutions. To start, cities must identify products or solutions that deliver their promised value. They then face the interoperability challenge – each vendor’s product must be able to ‘communicate’ with the other vendor products as part of an integrated solution. Finally, they must be able to support the solution – and all the vendors that compose it – once it goes live.

“No one entity is capable of doing everything that is needed in smart cities – so consortiums are key. Cities should consider owning the role of the “Master System Integrator” and work with multiple partners to enable smart cities.”

Ani Bhalekar – McKinsey & Company



6. Funding is limited

While smart city market opportunities are very attractive to technology vendors, their complexities and high levels of risk can inhibit further development.

“Building up a smart city is really a continuous exercise at finding the right balance between investment, time and benefits.”

Shin We Yeow – Business Director, G Element

Few – if any – cities can write blank cheques to support the full cost of technology proofs of concept. They face a dilemma: either scale back the project, meaning it will have less impact, or find partners to help jointly fund these initiatives via PPP.

In recent years, PPPs have become the preferred model for funding large-scale initiatives. As of September 2018, China alone had 14,220 PPP projects with a total value of US\$2.7 trillion.²⁹ Asia is also home to one of the largest smart city PPP initiatives, the US\$35 billion Songdo development. Billed as the world’s ‘smartest city’, the 1,500-square-acre city was developed through a partnership between the South Korean government and private developers.³⁰

However, PPPs do not guarantee success. Many miss deadlines and have unclear ownership structures, inflexible contracts and cost overruns.

“In many cases, we don’t need to focus on ‘emerging’ technologies. I believe that as a general trend, technology adoption and processes around its use have been slower than the technology itself. Mobile payments, smart metering, video analytics, and air quality sensors are all examples of technology products that are already working and well-validated, but in many parts of Asia, they are waiting for adopters to design a plan to use them.”

Anthony Liu – New Ventures Lead, Swire Properties



Smart city opportunities in Asia Pacific

Drawing direct comparisons of smart cities across the Asia Pacific region is difficult due to the diverse demographics, political systems and economic fundamentals of its countries. We interviewed 30 regional smart city leaders to assess the unique sets of challenges and opportunities in some of Asia Pacific's leading smart city markets.



Australia

Opportunities

- There is strong interest in smart city initiatives within city sub-sectors, such as Western Sydney's Aerotropolis initiative.
- Strong competition between cities is driving innovation as they compete for the next wave of urban dwellers.
- A government-run AU\$50 million Smart Cities and Suburbs Program is supporting projects that apply innovative technology-based solutions to urban challenges.

Challenges

- Local governments are highly fragmented, which complicates private sector engagement.
- Public trust is at an all-time low; only 31% of the population trust the federal government.³¹
- Smart city initiatives could be at risk whenever a new party wins an election.



China

Opportunities

- Proptech is about to skyrocket in China. The joint efforts from traditional stakeholders and start-ups are expected to drive and speed up the development of smart cities.
- The government's 'Five-Year Plan' sets clear targets for technological advancement.
- The large number and scale of in-country smart city initiatives has produced a vibrant technology vendor ecosystem.
- There is a strong start-up and entrepreneurial environment. Chinese firms receive large amounts of venture capital funding, at similar levels to American companies.

Challenges

- Increased PPP governance and transparency is needed to overcome issues that led to the 2,400 PPPs put on hold in 2018.
- The government needs to create a forward-thinking regulatory environment that promotes responsible use of AI applications (for example in the country's social credit system).
- China's data protection and cybersecurity regulations have lagged, despite the country being at the forefront of data collection.



India

Opportunities

- Nodal special-purpose vehicles (SPVs) set up by the Indian government create a centralised body that studies citizen needs, allocates budgets and streamlines the decision-making process.
- There is a strong information and communications technology ecosystem – including systems integrators and start-ups – to support smart city initiatives.
- Largely in-country manufacturing and delivery of smart city solutions means solutions are priced at a point that meets local market requirements.
- There is a uniform process of bidding for smart city projects, managed by each city's SPV.
- More than 5,000 smart cities projects with investments valued at over INR₹2 trillion were in various stages of implementation as of January 2019.³²
- Efforts have been made to invite foreign partnership in developing smart cities. Deals have been signed to build eight cities — three with Germany, three with the United States and one each with Spain and Singapore.

Challenges

- Engaging with SPVs involves long sales and monetisation cycles.
- SPV requirements are open-ended, fragmenting definitions of a smart city and what solutions are required.
- There is limited availability and sharing of government data to support smart city solutions.
- Capacity building remains a big hurdle due to change-averse mindsets, a dearth of technical training and a lack of skill building.
- The increasing use of technology in various aspects of smart city programs is challenging data security.
- Co-ordination is hindered by the presence of multiple government bodies that have overlapping jurisdictions, programmes and resources.



Japan

Opportunities

- The 2020 Summer Olympic Games in Tokyo is driving experimentation and innovation in smart city solutions, especially in areas such as security and tourism.
- Tier 2 cities such as Fukuoka and Toyama City are leveraging smart city initiatives in an effort to attract talent from megacities like Tokyo and Osaka.
- Japan's 'Society 5.0' initiative to create a new social contract and economic model by leveraging technology and innovation across infrastructure, fintech, healthcare, logistics and AI.

Challenges

- Urbanisation trends are leaving some cities with underutilised buildings and declining populations.
- Japan is struggling to overcome the ageing and shrinking population, as well as deflationary risks.
- The country is lagging behind other developed economies in cybersecurity and adoption of IoT solutions.



Singapore

Opportunities

- Political stability allows for a long-term smart city strategy with minimal risk of the project being abandoned by a change in political leadership.
- The business-friendly environment attracts leading technology vendors and talent.
- Singapore is one of the global leaders for smart mobility, healthcare, safety and digital citizen services.

Challenges

- A conservative approach to smart city trials could benefit from an appetite for calculated risk and the acceptance of failed projects.
- Recent data breaches have increased citizen awareness of cybersecurity risks to their personal data.
- There are skills shortages in emerging technologies, including AI, big data and robotics.





Moving towards a collaborative future

Innovation through collaboration

Innovation in smart cities is about more than technology. Cities are increasingly embracing collaboration with other cities and the technology vendor ecosystem to help drive innovation.

Surveys regularly show that diverse teams lead to better decision making. Responding to the complexity and number of decisions that cities have to make, diverse teams use collaborative initiatives to engage wider stakeholder audiences and help ensure that decisions minimise the risk of failure.

“Governments and private partners should work together to ensure adequate infrastructure is laid, data sources are regulated and properly exposed to partners, and most importantly, problem statements are validated through public dialogue. Only then can the work of creative start-ups, service designers and engineers begin.”

Sangwon Park – CEO, Favorite Medium

ASEAN Smart Cities Network

One example of collaboration comes from the Association of Southeast Asian Nations (ASEAN), a group of 10 member countries that encourages political, economic and social co-operation across the region. While the individual ASEAN member states may not be as large as India or China, combined they have a population of over 630 million people and represent the sixth largest economy in the world.³³


In 2018, they launched the ASEAN Smart Cities Network (ASCN), which brings together 26 pilot cities working towards the common goal of smart and sustainable urban development.³⁴ The initiative's primary goal is to improve the lives of its citizens using technology.

This platform provides guidelines for smart city governance and strategies at a regional level, and can also be implemented at the city level. Best practice sharing will allow the cities in the network to set up their initiatives efficiently, share learnings, and identify new and innovative use cases. This in turn will deliver a higher quality of life for citizens, a competitive economy and a sustainable environment.

Global Organisation of Smart Cities

Another example of collaboration is the Global Organisation of Smart Cities (GO SMART) led by Taipei City. It is a global network of smart cities working to accelerate sustainable city development by building a city-centred online platform for sharing information and resources. More importantly, the network encourages international co-operation between cities in developing inter-city proof of concept projects.³⁵

This collaborative initiative also benefits technology vendors – from multinational companies to start-ups – that support smart city programmes, by showcasing the solutions they have already delivered, exposing the company and its solutions to a much wider audience.



“Cities globally have their own successful, and sometimes less successful, approaches to developing smart city solutions. We believe there is a lot of potential for cities to share the lessons learned, to facilitate the exchange of smart city solutions between cities, and to accelerate smart city innovations.”

Chen-Yu Lee – Director, Taipei Smart City Project Management Office and Secretary General, GO SMART Secretariat

China's PATH Initiative

It's not just governments that are getting on board with these collaborative efforts. In August 2018, the PATH initiative launched in China. Backed by leading Chinese corporations Ping An, Alibaba, Tencent and Huawei, its objective is to work with 500 cities across China to create the world's largest smart city testing ground.³⁶

Each of these vendors will provide a specific set of technologies and solutions:

Ping An

the '1 + N' smart city platform, based on smart recognition, AI, blockchain and cloud computing

Alibaba

the mobile and online payment platform Alipay, to support businesses and consumers

Tencent

a communications platform

Huawei

the core hardware, smartphones and networking equipment.

These companies will work together to help identified cities address 10 smart city solution profiles: smart administration, insurance, security, transportation, ports, financial trade, finance, education, healthcare, real estate, environmental protection and elderly care.

As these co-operative groups all demonstrate, smart cities are complex, and no city or vendor should attempt the challenge alone. Multi-city and multi-vendor collaboration is the only way forward.



Where next for smart cities?

Smart cities are already upon us. Technology is being adopted rapidly in real estate. We need to take stock of what this means for our buildings and spaces, and how cities can be smarter and better for the people who live in them.

It's easy to get caught up by the hype – the incredible scale and variation in market forecasts; the bleeding-edge technology that will someday transform our cities; and the constant barrage of new initiatives.

But as we think about what the development of smart cities means for individuals, companies and governments, we must ask ourselves the following questions: Do the benefits of smart city living outweigh the drawbacks? Can technology make a city more sustainable, equitable and competitive? Is the city putting human experience at the core of its plan for the future?

We firmly believe the answers to these questions should be a resounding 'yes'. Real estate has a crucial role to play in realising the potential of smart cities in Asia Pacific and beyond. Many of the most valuable urban innovations sit within our industry's domain, capable of delivering tangible business, financial, strategic, operational and community value.

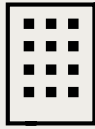
It's time for real estate to take its place at the heart of smart cities. We look forward to working with you to help make this a reality.



APPENDIX 1: Applying smart city solutions

A smart city has hundreds of solutions deployed across a diverse range of government agencies, making it difficult to grasp where and which solutions are applicable. To simplify this complex solution landscape, we have grouped applications into seven categories.





Property

Cities own and manage various types of property, such as residential and commercial buildings, and recreational and agricultural land.

- Wearables for construction site safety
- AR/VR for site and office build-outs
- Predictive maintenance for building management systems
- Drones for site inspections
- Sensors and visual analytics for spatial mapping and workspace utilisation
- Transparent property ownership systems
- Wayfinding services for sites or offices
- Fingerprint or facial biometric access



Environmental

Tracking air quality, waste water and noise pollution, combined with green initiatives, can help cities secure a smarter, livable and sustainable future.

- Real-time air and water quality monitoring
- Smart recycling initiatives
- Smart streetlights
- Sustainability measuring
- Sharing economy initiatives to reduce unnecessary asset ownership
- AI to create ambient intelligence platforms
- Disaster monitoring
- Tracking urbanisation impact on city wildlife (e.g. bees)



Utilities

It will be necessary to transform the method of operation and support for major utilities, including energy, gas and water.

- Water, electricity and gas smart meters
- Leakage detection
- Smart refuse containers
- Optimised refuse collection services
- Dynamic utilities pricing
- Smart irrigation
- Real-time demand-based energy production
- Predictive maintenance on assets

“Mobility is the most commonly adopted smart city application globally. With the rising middle class in India and China, strains on mobility systems are likely to become acute, increasing the opportunity to deliver cleaner, safer and cheaper transport through digital technologies. Sharing, predictive and additive technologies will transform the transport and mobility value chains, and in doing so deliver on the promise of 20-minute access to all needed services for all urban residents.”

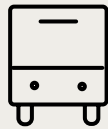
Jonathan Woetzel – McKinsey & Company



Healthcare

New technologies can improve patient care through in- and out-patient diagnostics and treatment.

- Telemedicine
- Wearables for remote patient diagnostics
- Elderly care management solutions
- Electronic health records
- General health and fitness wearables
- Body sensors to monitor chronic conditions
- Digital patient flow management systems
- Infectious disease surveillance



Mobility

Smart technologies can enhance public transportation, vehicle sharing and uptake of autonomous vehicles.

- Real-time information on public transportation and traffic
- Digital payments for public transport
- Shared vehicle services (e.g. cars, bikes, scooters)
- Intelligent traffic signals
- Congestion charging
- Smart parking service (e.g. availability, booking)
- Smart navigation services
- Autonomous vehicles for public transportation



Safety & Security

Using surveillance and analytics to monitor the safety of government sites can help ensure public safety and reduce crime.

- Smart surveillance
- Predictive policing
- Crime mapping
- Gunshot detection
- Emergency services bodycams
- Emergency response optimisation
- Disaster detection systems
- Citizen disaster alerting systems



Citizen Services

Digital platforms can increase inclusiveness by better engaging citizens in politics, society and government.

- Citizen engagement through social media channels
- Digital services (e.g. tax filing, retirement planning)
- AR/VR sightseeing applications
- Open data initiatives
- AI-driven tailored education programmes
- eCareer centers
- Digital training and education
- Blockchain linked universal identity card

Cities will continue to implement many new innovation-enabling technologies, and they must keep an eye on the emerging technologies that will drive innovation in the future. But it is important they also focus on delivering value in the near term. Here are some ways new technologies can be – or already are being – used.

These and other innovation enablers will drive the next wave of smart city solutions, including autonomous vehicles and enhanced digital services. While they will create exciting opportunities, they will also generate significant risks due to the level of data they capture, analyse and act on. Because of this, it is vital that cities underpin their solution deployments with end-to-end security.

Augmented Reality (AR)

“Augmented reality is a visualisation tool that bridges the imagination gap. It has the potential to significantly improve the communication of ideas and co-ordination of information between smart city stakeholders, and thereby contribute to productivity gains.”

Matthias Krampe – Managing Director, auggd

Artificial Intelligence (AI)

“AI and image recognition technologies have the opportunity to kickstart smart cities. As advancements take place, city infrastructure will be able to self-manage and self-correct in real time.”

Anuj Nangpal – Asia Pacific Lead, JLL Spark

Blockchain

“Blockchain can streamline the land registry process, secure payments between people and organisations, and provide citizen identity management for elections.”

Jeremy Kelly – Director, Global Research Programmes, JLL

5G

“5G will play a pivotal role in the progress of smart cities, as it forms the technological backbone for industries such as intelligent transportation and public safety, along with resilient energy solutions for communities.”

Danial Mausoo – Global Head, Enterprise Services, Nokia

APPENDIX 2: Viewpoints

Japan

Mitsubishi Estate is committed to resolving social issues relating to energy, the environment and disaster prevention by promoting joint urban development projects. One such project, with landlords and the government, is in the urban area spanning close to 120 hectares across Otemachi, Marunouchi and Yurakucho district (OMY Area).

The world has experienced significant changes in recent years, with greater work-life integration against a backdrop of sweeping technological innovations. To realise a smart city that addresses diverse urban issues, we must consider how to introduce the advanced technologies we currently have to urban planning, and prepare for their implementation. As such, we are aiming to turn the OMY Area into an “open innovation field”, a place where different people and enterprises can gather, interact and collaborate to create solutions.

We are providing the OMY Area for demos of leading-edge technologies and their applications in urban planning.

For example, we tested our “omotenashi service” in collaboration with several companies in January 2018. (“Omotenashi” refers to the Japanese value of providing heartfelt reception and services.) The test involved automatically detecting people needing help (for example, they looked lost or ill) and sending notifications to the mobile phones of security staff in the area, who would respond according to the situation.

In addition to enhancing customer service, the trial is expected to improve security in the area and reduce labour costs for building management resources.

We hope to see greater government support for realising functional and sophisticated smart cities through deregulation and establishing new rules and safety standards to demo and pilot new technologies.

At the same time, raising awareness of the shared vision for urban landscapes, and increasing collaboration between the public and private sectors will be essential for citizens to truly understand and embrace smart cities.

Jun Imai

Associate, Urban Planning Office,
Urban Development Promotion Department
Mitsubishi Estate Co., LTD.

Singapore

As smart access providers, it is imperative that cities operate in environments that are efficient and effective for their communities. These are smart cities.

Smart cities are urban organisms – similar to biological systems where each part affects another, performing functions successfully. This interoperability between various systems allows cities to be agile, flexible and sustainable.

Managing and monitoring different aspects of cities, from air and water quality to transportation and waste management, and ensuring efficient running, is not an easy feat. The complexities of the different systems and scales needed present a challenge to integration, which may take years.

Yet integration is increasingly urgent, particularly for the information and technology sector. This is due to the need for connectivity and data transfer as data-driven strategies are the new bedrock of successful businesses and cities. Smart access is the first touchpoint. It opens up a host of opportunities. Whether it's about shared spaces for commercial entities or tracking logistics for businesses, there are plenty of ways that smart access supports the ambitions of smart cities.

On a small scale, it is useful for reducing costs and streamlining processes. But its real value becomes more evident with dramatically increased scale. When large numbers of people rapidly access different areas of a city at any given time, it's important to trace who's been where, when and for how long. Such data could help complete audit trails, trace movements, ease congestion and improve productivity. Of course, where necessary, surveillance can also contribute to higher levels of security and greater peace of mind.

We are already making the vision of a more efficient city into reality. In Singapore, igloohome has teamed up with Singtel, a leading Asian communications technology group, to launch connected perimeter access solutions. Using our technology,

the solution provides real-time, scalable remote management and monitoring of perimeter access for distributed infrastructure. We adopt carrier-grade Internet of Things (IoT) technologies and rely on Singtel's narrowband IoT cellular network to deploy our locks to manage cell towers around the city. We plan to expand to base stations and network infrastructure management.

The opportunities don't stop there. If needed, data could be extracted to spot trends and patterns over specific periods, to identify bottlenecks and improve processes. For example, maintenance personnel who enter monthly could be identified and granted access in advance.

Smart access goes beyond opening doors. It's also about analytics and insights into everything from gateways (for items as small as lockers and safes) to whole industries such as real estate and utilities management.

Of course, these ambitions are expected to bring challenges. Emerging technologies and protocols may face teething issues that require further testing and user trust before becoming reliable, viable platforms of choice.

With long lead times for integrating and stabilising systems, we sometimes encounter the issue of redundancy as new technologies emerge. We need to continuously keep up to speed with research and development, to ensure that we are ahead of the game.

This innovation and the continual search for better and more effective solutions to urban issues across multiple industries drive the evolution of smart cities. In this rapidly changing landscape, cities will be better able to adapt and build on competitive advantages to be true smart cities.

Anthony Chow

Founder and CEO, igloohome



China

Alibaba Cloud's ET City Brain was developed to make cities more intelligent and intuitive. Using Alibaba Cloud's proprietary AI platform and its big data processing and analytic capabilities, the City Brain provides urban planners and city officials with tools and information to upgrade their public services with cloud technology and AI.

Alibaba first implemented City Brain in Hangzhou in September 2016. Since then, it has become an indispensable traffic management solution for the city. It covers a total area of 420 square kilometres, including more than 1,300 traffic lights. In addition, 200 traffic officers are connected via mobile phones, enabling them to receive real-time alerts for traffic-related emergencies.

City Brain analyses data in real time to co-ordinate traffic, prevent gridlock and ease congestion. The technology is also able to predict traffic flow, detect accidents and give instant feedback. The results are impressive. In two years, Hangzhou dropped from fifth to 57th on the list of China's worst congested cities. The initiative has increased traffic speed by 15 per cent and achieved an average time saving of three minutes per vehicle.

City Brain has halved the average travel time for ambulances and fire trucks. The system can also optimise the city's firefighting efforts by providing crucial information to firefighters, such as water pressure, the number and position of fire hydrants in a given area, the location of gas pipes and other details.

City Brain is more than just about traffic management – it's also about empowering cities to think with data-driven governance to make a city more liveable, such as by tracking water supply quality, or the level of air pollution. In fact, City Brain has been used in Beijing's Tongzhou district to provide real-time air pollution monitoring. Companies have also worked with Alibaba Cloud to use City Brain for sewage management and environmental evaluation.

In the past two years, Alibaba rolled out City Brain in Macau and Kuala Lumpur. We believe cloud technology will serve citizens and businesses, providing more efficient urban public services and demonstrating better use of public resources.

Derek Wang

General Manager, Alibaba Cloud Singapore



Australia

What I learnt that has been challenging about fulfilling Darwin's journey – or really any city's journey – in becoming a smart city is the false perception that it's a race or competition.

It's not about being the smartest or fastest; I believe it is about having the most trusted community and a belief that there is an open and honest system that provides the best outcomes possible for the cities we operate. Upfront smart city architecture is infrastructure-driven and costly, but what comes next is very community-driven, and return on investment is implied through efficiencies.

However, our community has a deep-seeded mistrust in all levels of government. We face a huge challenge in educating our community, and in many cases we question the viability of doing so in the early stages of smart city development until the verifiable outcomes are completed.

Josh Sattler

General Manager, Innovation, Growth and Development Services, City of Darwin



India

With a young and rapidly growing population, India is headed towards mass urbanisation. The challenge for the Indian Government is to manage this rapid urban growth by providing improved infrastructure and ensuring sustainable economic performance.

Today, India has one of the world's most recognised smart city programmes, which will drive technological innovation to usher in economic development and citizen engagement. Core to the smart cities is a network of solution providers that are not just looking at new market opportunities but are committed to building smart solutions to improve the quality of citizens' lives.

This is no easy task. Each city is unique in terms of its geography, sociology, culture and political environment. These are critical factors that warrant studies to better understand citizens' requirements and inform the government's engagement level against these components. We believe in a framework where efficient public and commercial services are delivered to individuals through connected devices, to make services more accessible, reduce environmental impact and empower communities. Hence, having a technology base that is secure, scalable and future-ready is crucial to the success of any smart city initiative.

In India, we're seeing faster adoption of new technologies, and an increasing number of system integration companies, start-ups and technological companies with innovative products entering the market. This bodes well for the overall growth and use cases.

The success of these cities lies in building an ecosystem through public-private partnerships, and in the private sector, to provide services that will improve the quality of life for citizens.

Anthony Bartolo

Executive Vice President, Chief Product Officer
Tata Communications



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About Charles Reed Anderson & Associates

CHARLES REED ANDERSON is a globally-recognised IoT, smart cities and proptech industry thought leader who has presented at over 200 industry events. His company, CRA & Associates, provides technology- and vendor-agnostic advice to governments, enterprises and technology vendors on how to successfully navigate the increasingly complex technology solution ecosystem.

With over 25 years of experience, Charles' in-depth knowledge of emerging technologies and solution vendors, combined with his understanding of the market demand, allows him to separate industry hype from reality.

He has helped technology vendors navigate their role in the ecosystem, develop go-to-market strategies and partnerships, understand the customer buying decision criteria, and engage their employees, partners and customers.

He also works with customers and governments to identify use cases that deliver tangible business value, evaluate which technologies and vendors best meet their requirements, and engage their internal and external stakeholders.

Charles sits on the Advisory Boards of technology start-ups and the GO SMART (Global Organisation of Smart Cities) initiative. In addition, he has served as a Mentor since 2015 with one of the world's leading accelerator programmes – SparkLabs (Korea & Taiwan).

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