



RealTrends Real
INSIGHTS

September 5, 2019

ISSUE 31

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AltusGroup

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1. CANADIAN PROPTECH COMPANIES TAKING THE INDUSTRY BY STORM

As our tech ecosystem expands and matures, Canadian PropTech companies are making a significant impact on CRE.

As at January 2019, CB Insights reported that there were 361 Unicorns across the globe with a total cumulative value of US \$1,113 B. Most were companies out of China or the US. One Canadian company – Kik Interactive – made it onto the list.

A unicorn is a private company with a valuation over US \$1 billion.

The Toronto-based Impact Centre recently posted its 2019 Narwhal List which identifies nascent Canadian companies that may evolve into unicorns, as well as the financial avenues that can facilitate such transformations. The report found that the number of firms projected to become unicorns has nearly doubled.

Ranked second on the Narwhal list was Element AI. Based in Montreal, the company has raised US \$105.7 M since it was founded in 2016.

PropTech and FinTech companies represent a small portion of Unicorn and Narwhal companies. However, venture funds and accelerators that have been launched recently will likely change these numbers in the coming years.

A recent Altus Group survey found that 53% of commercial real estate firms with at least \$250 M in assets have made some form of investment into PropTech.

PropTech investment has grown from US \$20 M in 2008. CB Insights has calculated that in 2018 approximately US \$4 B was invested into PropTech – representing 5% of total VC funding.

Brookfield has created a fund that will invest \$200 M to \$300 M into disruptive real estate technology.

Brookfield Ventures' first deal was a \$15 M investment in BuildingConnected. The company is a networking and preconstruction management site for owners, general contractors and subcontractors.

JLL Spark, an independent division of JLL, launched in 2017. It operates a US \$100 M global venture fund to invest in PropTech companies transforming commercial real estate. Its first acquisition was Stessa in 2018. Stessa is a software-as-a-service real estate technology company that allows income property investors to track, manage and communicate portfolio performance.

Colliers launched a real estate accelerator with Techstars last year. The program intends to identify and mentor startups around the globe that are developing industry-disrupting technologies in the property and real estate industry.

RXR Realty partnered with CBRE Group Inc. and Cushman & Wakefield to back MetaProp Ventures II LP, a \$40 M venture capital fund that will invest in early-stage real estate technology firms alongside more traditional real estate companies. New technologies that the fund is reported to be investing in include augmented reality, 3D printing, co-working and blockchain.

At the end of 2018, Alate Partners has launched a \$40 M fund focused on the PropTech market backed by DREAM and Relay Ventures.

Founded in 2014 and based in Toronto, Lane is a SaaS software that creates a smart workplace, improves tenant engagement and reportedly reduces tenant turnover. Its technology is in 35 M sq. ft. of space across North America.


Lane was one of 10 companies chosen to participate in Colliers International's first PropTech accelerator and has also received funding from Alate Partners.

In May, Canadian PropTech company ParityGo raised \$5 M in Series A funding from ArcTern Ventures, a North American cleantech venture fund. ParityGo controls existing HVAC equipment with cloud-based artificial intelligence (AI) to deliver 30% - 40% energy savings. The system claims to be cash-flow positive from day one and requires no up-front capital.

Real estate tech company NestReady has raised \$5.7 M in VC. NestReady is a Montreal-based real estate technology company that partners with mortgage lenders to offer a seamless homebuying experience. Among investors include National Bank of Canada and former CEO of Tangerine and ING Direct, Peter Aceto.

1VALET is a company founded by Devcore president Jean-Pierre Poulin. It is a platform that synthesizes various building services into a single app for residents, managers and concierges. The firm says it raised an initial \$3.85 M in January 2018 and secured top-up financing of \$1.3 M in May.

Automated parcel locker firm Snaile is collaborating with 1VALET to simplify the process of receiving packages. This partnership between the two Canadian companies allows parcels to be safely deposited at recipients' multi-family building and delivery notifications integrated with the 1VALET platform.



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2. SPACE-AS-A-SERVICE GROWS BEYOND THE OFFICE SECTOR

Technology is revolutionizing the demand for space.

The demand for space is being revolutionized by technology and these five factors have been identified as the reasons for changing the demand for space:

- High-speed, high-band internet connectivity is almost everywhere;
- Software as a service and cloud computing reduces the importance of where work is done;
- Mobile devices such as laptops, tablets, and smartphones go where the worker goes;
- IoT sensors can connect almost anything to the internet;
- Rising use of AI and robotics.

Together, these technologies are re-shaping the way in which we as a society and workforce use and occupy space.

The common definition of space as a service is the change in the real estate model from asset ownership to monetization of access and services that include physical space.

Companies like Airbnb, Clutter, WeWork and Common do not own physical space but have found ways to monetize it.

Flexible office space has grown at an average annual rate of 23% since 2010, according to JLL.

IWG plc, which operates Spaces and Regus, have plans for coast to coast growth in 2019, with new deals, openings and expansions across eight Canadian cities. In total, IWG will add 375,000 sq. ft. in 2019, up by 300% from the space added in 2018. This expansion will bring IWG's total Canadian footprint up to approximately 3 M sq. ft. in over 35 cities.

Knight Frank surveyed senior executives at 120 global companies who collectively employ over 3.5 M people and who occupy a combined total of over 233 M sq. ft. of office space. The growing demand for flexible coworking space was one of the main themes. According to Lee Elliott, Knight Frank Global Head of Occupier Research:

"While coworking and serviced office operators have grown rapidly over the past five years, driven largely by startups and the freelance economy, this is only the tip of the iceberg with latent demand from global companies set to emerge over the next three years."

Sixty-nine per cent of global corporations plan on increasing their use of coworking and flexible workspace over the next three years. Nearly 45% believe flexible workspace will account for up to one-fifth of total corporate workspace, and 75% of those surveyed are focusing on the best ways to utilize business space to boost employee satisfaction and improve productivity.

In March 2018, MingTiandi, a research website based out of Hong Kong, wrote this:

"56% of Asia's top 200 occupiers are already using flexible workplaces in some capacity, and 91% are considering using them."

Clutter moves and stores your belonging as a service. Its storage facilities are located in remote areas, which means they can store items at a far lower rate than traditional storage facilities based in inner-city locations. And because they rent the buildings in which they store, they do not own any physical assets. They are a real estate platform with a service, but they don't own any real estate.

Meanwhile, co-living startups such as Common, Ollie and WeLive are making strong headway into multi-family residential markets, and investment in the sector has been increasing at a dramatic rate.

- Medici Living Group raised US \$300 M in January 2019 as part of a joint venture with investment firm W5 Group to develop 1,500 units across the US under its co-living brand, Quarters, according to The Real Deal.
- Ollie has raised US \$15 M in financing from Aviva Investors Real Estate Capital Global Co-Investment Fund, according to TechCrunch.
- Homeshare has raised US \$5.7 M led by Lightspeed Venture Partners in 2018, according to Axios.
- Roam, which has raised US \$3.4 M in seed funding, is poised to open more locations this year in New York City and London. It already has spaces operating in Miami, San Francisco and Tokyo.

PropTech startups Fourpost and BrandBox are transforming the traditional retail model by adapting the SPaaS model to retail through "brandboxing."

Brandboxing is a full-service approach that enables smaller online brands to open and operate stores in malls. Prefabricated spaces available for shorter lease terms and lower rents make it easier for online merchants to scale and test the success of the brick-and-mortar stores without having to obtain a permanent location.

Fourpost has already launched studio shops in the Mall of America and West Edmonton Mall. Macerich announced the launch of Brandbox in Tysons Corner Center in Virginia this last November.

To start, Tysons Corner housed six brands with space ranges from 550 to 2,500 sq. ft. at the property with six to 12-month lease agreements.

Propmodo estimates that SpaaS represents a trillion dollar opportunity and states that the most important factor in this model is user experience. Superior user experience is critical to achieving maximum revenue.

"You don't need to own real estate assets anymore to build huge real estate companies," according to Fifth Wall VC.

3. SMART BUILDINGS HELPING TO SHAPE THE FUTURE

Smart buildings leverage pervasive wireless connectivity, sensors and IoT technologies to communicate and analyze data that is used to control and optimize building management systems.

A combination of IoT solutions is used to automate access control, security systems, lighting, HVAC systems and more. They provide greater efficiency, safety and comfort, while delivering cost savings that are more closely aligned with the goals of property owners, managers and tenants.



Energy Management: on average, buildings consume about 30% of the world's energy and in 2017



Building construction and operations were responsible for nearly 40% of energy-related CO2 emissions, according to a report written by the Global Alliance for Buildings and Construction.

The implementation of smart building technology has the capacity to reduce global energy consumption as well as producing significant cost savings.

AT&T lowered lighting spending through a pilot program at 240 of their properties with an average size of about 83,000 sq. ft. Fluorescent lighting was replaced by LED lighting integrated with smart sensor systems that are enabled by scalable wireless networks. Sensors monitor such dynamics as real-time occupancy, light levels, temperature and energy usage. The retrofit has saved the company approximately US \$8 M a year.

Siemens announced this year that is carrying out a smart building pilot on the Isle of Wight. The company integrated the existing building control and energy infrastructure at a local community centre with a smart building management system. The new platform allowed building management to understand where and when energy is being used and what is happening in the Center's spaces helping to identify opportunities to reduce operating costs, increase energy efficiency and improve comfort for the centre's users.

Schneider Electric Canada has partnered with Ryerson University to build the Smart Building Analytics Living Lab, the first laboratory of its kind in Canada.

The new lab will provide Ryerson students with access to tools to develop technologies in building management. It will be used to demonstrate savings in energy consumption capital and operating expenses for buildings of all sizes.

"The Smart Building Analytics Living Lab will be used as a direct connection into real-world applications of building management systems and energy management. From the laboratory, the Ryerson team will connect to building control systems using Schneider Electric's EcoStruxure Building software platform, which includes access control, lighting control, security, energy and HVAC systems."

There are 28,000 sensors at the Edge building in Amsterdam, one of the world's smartest buildings. Via an app, workers are directed to a parking spot, to an open desk adjusted for their environmental preferences and their schedules are updated.

Smart building technology is only as effective as the building's own internet connectivity. In Informa's May RealTrends newsletter, over 61% said that there were connectivity issues in their workplace when asked the question, "How is your mobile device reception in your building and space?" Over 7% said that they were unable to connect to the network.

New York-based WiredScore, certifies office buildings for internet connectivity. Founder and CEO Arie Barendrecht said "Technology has never been more important to office tenants than it is today and by providing invaluable insights into how to optimally design for reliable connectivity, mobile enhancement planning, electrical resiliency and flexibility to adopt new building technologies, we are helping Canadian developers design future-proofed office assets."

Fourteen Canadian property owners and developers with 75 office assets are either Wired Certified or undergoing the certification process in Toronto, Montreal and Vancouver. Notable developments include Ivanhoé Cambridge and Manulife's Maison Manuvie and Broccolini's 700 Saint-Jacques St. in Montreal; Menkes Development's One York St. and Caterra's 65 King East in Toronto; and GWL Realty Advisors' Vancouver Centre II in Vancouver.

BlueSky Properties recently opened a 9-storey building at 988 West Broadway. The AAA-class, 102,000 sq. ft. development is the first office building in Canada fully equipped with View Dynamic Glass technology.

The smart window system controls the amount of light entering the building by automatically tinting to block glare using nanotechnology. It can also be manually controlled down to the level of individual window panes via a tablet or other electronic device. The system can reduce incoming visible sunlight by up to 99.5%, representing a 20% savings on the operation of the building.

988 Broadway is the first building in Vancouver and the first office tower in Canada to use the system for all its windows. The glass is also utilized on the Humber River Hospital in Toronto, the first building in Canada to fully utilize the product.

The company has completed roughly 22 projects in Canada, with another 30 locations underway.

Smart glass market is expected to reach US \$8.35 B by 2023 from US \$3.32 B by 2017, at a compound annual growth rate (CAGR) of 16.61% between 2017 and 2023.

Innovative companies and organizations such as Deloitte (The Edge), IBM (Munich HQ for Watson IoT), WeWork, Googleplex, Apple Park, Microsoft Redmond Campus have made the realization that making decisions with data and learning hard lessons from occupants is the quickest path to improvement.

"The better we leverage building data, the better we can plan, design, construct and operate space," said WeWork.

4. INDUSTRIAL VACANCY RATES THE LOWEST ON RECORD

Double-digit growth in e-commerce sales continues to drive demand for industrial real estate.

National availability rate for industrial real estate dropped even further to 2.9% at the end of Q2 2019, Altus Group reports.

Toronto, Vancouver and Montreal are all at historic low availability rates of 1.5%, 1.7%, and 4.1%, respectively.

Across the country, asking rental rates increased by 10.1% in 2018 and average rates surpassed \$8.00 per sq. ft. Toronto saw asking rental rates rise by 17.6%, the fastest growth in the country.

"This is the most dramatic and long-lasting transformation cycle in decades, and it's far from over," said Stuart Barron, National Director of Research at Cushman & Wakefield.

From 2019 to 2023, Deloitte predicts the demand for an additional 850 M sq. ft. of industrial real estate in the United States, led by e-commerce.

An e-commerce supply chain requires up to three times more warehouse and logistics space than a traditional brick-and-mortar supply chain. This increase in the need for space, along with faster delivery expectations and developments in urban centers, has some developers moving to vertical warehouse design to increase the efficiency of the building footprint.

"As a population, we have increasingly high expectations of almost immediate delivery of e-commerce items," CBRE Seattle Senior Vice President Andrew Hitchcock said in a statement. "Densely populated cities with high land values will continue to see a fundamental shift towards multistory warehouses in an effort to develop modern facilities as close to the population as possible."

E-commerce has been one of the driving forces for the increase in height and floor plate of industrial facilities. In 2005, the average clear height for an industrial distribution facility was 28 feet. Clear heights are now reaching 36 feet and above to accommodate taller racking for increased capacity and storage of products.

As industrial buildings become more advanced with automatic storage retrieval systems, clear heights will continue to increase, and aisle width will decrease, resulting in denser racking and storage capacity. Floor level will also become increasingly more critical as e-commerce users rely on robots for inventory management within facilities.

The imminent rollout of the 5G mobile communications network and the significant increase in data that will need to be processed, stored and distributed is likely to have a significant impact on the data centre sector.

With the onset of 5G, a massive boom in edge computing is expected to take place, transforming the way enterprises manage their networks. According to experts, the edge data center market is expected to exceed US \$16 B by 2024, growing at a compound annual growth rate of more than 20% in the next five years.

Edge computing is defined as data processing power at the edge of a network instead of in a cloud or a central data warehouse. Edge computing enables data processing as close to the source as possible and allows for faster processing of data and enhanced customer experiences.

Vapor IO, a provider of edge computing and edge data centers, and cloud provider Packet are offering 5G-as-a-Service (5GaaS) built on pay as you go capable infrastructure and connectivity solution for edge locations.

The company recently launched its first two edge data centers in Chicago near Wrigley Field and O'Hare Airport in collaboration with Packet.

On-demand warehousing startups, such as Flexe and FlowSpace, are aggregating underutilized industrial real estate spaces to fulfill seasonal warehousing needs. Some owners are repurposing vacant or near-vacant nonindustrial real estate spaces to provide more options for renters seeking warehouses in closer proximity to consumers. Owners of some older office buildings are also converting vacant spaces into industrial real estate. The adaptive reuse extends to underutilized parking lots and garages and even former churches.

5. CONTINUED RETAIL EVOLUTION

E-commerce growth provides new opportunities in the retail sector.

Digitally native brands are making their mark on the brick-and-mortar landscape. Collectively they are set to open 850 stores in the next five years, according to an Online Retailers Report by JLL.

JLL cites plans for mattress retailer Casper to open 200 stores in North America within three years, lingerie startup Adore Me for up to 300 in five years, and footwear company Allbirds for stores in four cities in the next year. "The clicks-to-bricks retailers' expansion plans demonstrate the value these brands place on having a physical presence with which to engage shoppers," JLL said.

Between 2017 and 2018, almost 200 M sq. ft. of retail space closed in the US. There are a number of creative ways landlords are repurposing empty stores.

When it was built in the 1820s, the Arcade Providence was America's first shopping mall, hosting boutiques on three floors. Now those shops have been transformed into 48 tiny apartments and a mix of businesses, including restaurants, a coffee shop and hair salon.

The renovation converted the top two floors of stores into micro-apartments, ranging from 225 to 775 sq. ft. (and priced from \$800 to \$1,800 a month). Most measure 300 sq. ft. or less.

A three-storey Life Time fitness centre has taken over an empty Sears Auto Center in Chicago and features a rooftop pool.

According to Jim Sud, EVP of Growth and Business Development for Whole Foods, "We're looking for the best locations we can find. So if that's an existing center— second-generation space— that meets all of our criteria... we'll jump all over it".

Medical centers are also filling up vacant box stores. In Gainesville, the UF Medical Centre will inhabit one of these properties following a full-scale retrofit. These new medical centers will feature everything from traditional health care to popular techniques including acupuncture, massage, and hydrotherapy.

The food hall concept has been floating around for a few years but the untapped potential of this idea was one of the themes at the ICSC conference in May.

Over the past three years, the US has experienced robust growth of food halls. Cushman & Wakefield has estimated that the number will have nearly quadrupled to 450 by the end of 2020.

Experts on a RECon session titled 'The Future of Food Halls,' noted that there's room for growth in the food hall sector. Cushman & Wakefield's Colicchio Consulting division notes the sector is far from saturated. Phil Colicchio said, "About 20% of the food hall footprint is in New York State alone, so there is considerable room for growth elsewhere."

Food halls are not necessarily replacing food courts in malls but they are being integrated in office complexes and into mixed-use developments.

In Canada, food halls are popping up in the country's largest cities.

The Queen St. Fare, which opened in December is a 10,000 sq. ft. licensed food hall with a stage for live events, in Ottawa at the Sun Life Financial Centre.

Eataly, which started in Turin, Italy in 2007 and has expanded to about 30 locations around the globe, will open a 50,000 sq. ft. location in the Manulife Centre in Toronto this year.

The 8,000 sq. ft. Marché des Artisans inside the Queen Elizabeth Fairmont Hotel in Montreal features takeaway foods and ready-made meals, as well as a specialty grocery store.

Toronto Chef Rob Bragagnolo has launched Campo Food Hall, a 3,500 sq. ft. Spanish-style food emporium at King Street West and Spadina Avenue.

Assembly Chef's Hall, a new 18,000 sq. ft. food emporium at 111 Richmond St. W, features food from 17 of Toronto's top chefs.

There are also food halls slated for The Well and the Waterworks developments.

Developers around the country have a big appetite for food halls to anchor their office parks or luxury condos, said Warren Solochek, a food industry analyst at The NP Group. The brick-and-mortar retail downturn is fueling the trend. "You have large retail and office space that has become open," Solochek said. "And the owners of the buildings are looking to fill in those large spaces."

6. TECH IN LEASING TRANSACTIONS GROWS IN IMPORTANCE

Technology is seeping into all of the facets of residential and commercial lease transactions.

AR/VR

By 2021, the market for virtual reality (VR) and augmented reality (AR) technologies is expected to reach US \$108 B. According to Goldman Sachs, VR alone will be a US \$80 B dollar market by 2025— with US \$2.6 B of that coming directly from real estate.

One of the major benefits of VR is the ability to showcase a property during all stages of development— including the pre-construction phase. Brokers are able to showcase the property down to every last detail, including amenities and location.

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Building Information Modelling (BIM) becomes a particularly powerful tool when it is used with AR. AR's ability to present the data in a clear and straightforward manner makes for an ideal visualization platform for BIM.

Briefly described, BIM is a way to visualize, manage and coordinate data about a building or other kind of construction project. It is like having a scale model of a building, but with the ability to identify every component, every material and every foot of wiring.

Evidence highlights that combining **BIM and AR** will drive the digital transformation of this sector.

This combination has many advantages: being able to verify in advance space usage and coordination, and minimize design errors before moving to the practical project implementation.

Further advantages of the interaction between BIM and AR are:

- Faster project approvals;
- Better customer relations and higher levels of customer satisfaction;
- Time saving and cost reduction.

As Peter Marchese of Microdesk stated to Forbes, "I do believe that as [augmented reality] becomes more available, it will shape how the BIM data and information is used and consumed, especially on the construction and manufacturing side of things. I feel the real power of AR will be a boost to facilities and construction, especially when connected to real-time data from a connected IoT. It has the capability to make jobs safer, more efficient and productive, and the pilots that have used AR in manufacturing have proved these claims."

AI

Machine learning algorithms, trained on an abundance of market data, are able to generate hyper-accurate predictions, improving real-time investment decisions with analytical capabilities far beyond the limited scope of human analysis. These data points include rent, occupancy, cap rates, broker listing data, schools, crime, census figures, mobility scores and key economic indicators, alongside new types of data to which AI enables access, such as web clickstream data, cellular and geolocation data, satellite image data and more writes Guy Zipori, the Co-Founder and CEO at Skyline AI.

For deal sourcing, the most advanced AI systems can efficiently pinpoint trends and direct investors toward the most promising area, providing a significantly broader market picture than human analysts could.

The rapid pace with which AI can analyze huge amounts of data means that AI-equipped investors can beat the competition to bid with quick underwriting that takes mere minutes, versus traditional methods which take days and even weeks.

Through constantly analyzing key market indicators— including loan maturity, aggressive attempts to market vacancies, sudden increases in occupancy, rent anomalies and concessions and operational strategies on other assets— AI can detect and notify about soon-to-market opportunities, so investors can score deals even before an asset reaches the market.

Mobile Leasing Applications

Mobile leasing applications provide leasing managers data they need to interact with prospective tenants and residents using tablets or smartphones. The tools enable more effective problem-solving, better customer service, and facilitate a multitude of tasks with increased efficiency. For instance, staff can match available rental units to prospective tenants' preferences, secure a signed a lease (using an electronic signature to complete the process), and help tenants with moving-related paperwork, remotely, saving them time and money.

Property management software provider Appfolio offers a helpful app that gives users quick and easy mobile access to their property database, enabling them to inspect properties; create, edit, and view work orders from the field; upload photos; and more. The tool optimizes their business potential and their efficiency, promising to boost profitability.

With real estate firms holding record high levels of dry powder— US \$278 B as of June 2018— the industry is in a good position to explore the role advanced technology can play in spurring new investments and generating profit.

7. CONTINUED HOUSING AFFORDABILITY CRISIS SPURS INNOVATION & POLICY

Government Initiatives and innovations provide hope for improved housing affordability.

A third of urban dwellers— 1.6 billion people— could struggle to secure decent housing by 2025, Mckinsey estimates.

In November 2017, the federal government unveiled its 10-year, \$40 B National Housing Strategy (NHS). Its goals include reducing homelessness by half, removing about 530,000 families from housing need, renovating and modernizing about 300,000 existing homes, and building more than 125,000 new units over the next decade. Two years in, the budget for the NHS has climbed to \$55 B and consists of the following four components:

The Rental Construction Financing Initiative

provides low-interest, 10-year fixed loans, which can be amortized up to 50 years for up to 100% of total construction costs. At least 20% of the project's units must be affordable to be eligible. \$3.75 B was originally given to the initiative and was topped up by \$10 B over 9 years in the 2019 Budget.

The Federal Lands Initiative

allows federal departments with surplus land to offer these assets for new affordable housing projects that are sustainable, accessible and socially inclusive. This \$200 M fund supports the transfer of these lands at a discount, or even at no cost, to eligible proponents who will then turn them into affordable housing. So far, six federal properties have been listed for sale, located in Ottawa, St. John's, Montreal, Sherbrooke, Que., and Yellowknife, the Globe & Mail reports.

1.6 billion people

A third of urban dwellers could struggle to secure decent housing by 2025, McKinsey estimates.

The Co-Investment Fund

provides financing to create new affordable shelter, transitional and supportive housing, providing more than \$13 B in low-interest loans and grants. WoodGreen's 35-unit seniors complex on Danforth Avenue received about half of the \$16 M required to construct the project from this fund.

The Affordable Housing Innovation Fund

provides \$200 M to create up to 4,000 affordable housing units. The goal of the Innovation Fund is to encourage new and creative approaches to affordable housing, from innovative funding models to new building techniques.

The HPC Housing Investment Corporation (HIC) is one such innovative funding model. This financing vehicle helps affordable housing providers access low-cost, long-term financing available in the capital markets.

In February, HIC announced that it had secured \$33 M in private placement funding for two affordable housing projects: a 15-storey, 135-home building in Vancouver's former Olympic Village and 136 homes for low-to-moderate income families, seniors and individuals in Edmonton.

Edmonton is tackling the affordability by launching a 'missing middle' infill design competition. The 'missing middle' refers to low rise multi-unit housing which is the type of housing the city says is essential to creating complete communities with a variety of housing options for people at every stage of life and income level.

The city is soliciting proposals to design a multi-unit, medium-density, or 'missing middle', housing development on five City of Edmonton owned parcels of land at the northeast corner of 112 Avenue and 106 Street in the Spruce Avenue neighbourhood. The winning team will be given the opportunity to purchase the site and build their winning design.

Vancouver's **Making Room** initiative, which was launched in 2018, focuses on adding a greater variety of housing types in single-family neighbourhoods, ranging from laneway houses and infill to townhouses, rowhouses to low-rise apartment buildings.

It added in a statement, "This directly supports the Housing Vancouver strategy, which targets the delivery of 10,000 units of 'missing middle' housing over the next 10 years, specifically 1,000 coach houses, 5,000 townhouses and 4,000 laneway houses."

A rise in modular housing is providing a new affordable way of building homes.

Modular construction is defined as the offsite manufacturing of prefabricated units that are later assembled on-site. Boxes are built, transported, and put together. The process and material used from one company to the next vary.

Projects are digitally designed and streamlined with exacting precision before assembly begins. Factories can cut construction time in half and reduce costs by 10 to 20%. A multifamily apartment building that would take 14 to 16 months to build using traditional methods goes up in seven to nine months using modular construction.

Google recently spent upwards of US \$30 million on 300 modular housing units built by the Bay Area-based Factory OS for its Silicon Valley employees. Microsoft is spending half a billion dollars for new housing in the Seattle area. There is a growing list of modular startups— such as Blokable in Seattle and RAD Urban in Oakland set to disrupt the construction industry.

Up to 80% of modular-construction processes can occur off-site using leaner work forces of moderately skilled, less-expensive labour. Work once done on-site by specialized labour can now be done at a fraction of the cost. Those in the building trades are still in demand, but now there is a larger pool of labour. Labourers work in a climate-controlled factory so there are no delays because of inclement weather.

FullStack Modular's constructed a 32-storey modular tower— the world's tallest modular building— in Brooklyn. Another off-site construction company, Kattera, has been projected to be worth US \$4 B by the end of the year. "If you're not increasing the productivity of the built environment, you're not getting anywhere," FullStack Modular CEO Roger Krulak told National Review.

8. CITIES OF THE FUTURE

A smart city is defined as one that uses data and technology to enhance operational efficiency and deliver sustainable solutions to enable economic growth and enhance the quality of life for its community.

By deploying sensors within city infrastructure— from roads and transit vehicles to traffic lights and sewage lines— local governments collect data to monitor and manage city resources for optimal efficiency, energy conservation and cost savings.

A new forecast from the International Data shows global spending on smart cities initiatives will reach US \$189.5 B in 2023. The top priorities for these initiatives will be resilient energy and infrastructure projects, followed by data-driven public safety and intelligent transportation. Together, these priority areas will account for more than half of all smart cities spending throughout the 2019-2023 forecast.

According to Energy Manager Today, the number of smart cities throughout the world is expected to grow, driven in part by population trends that show more people leaving rural areas for urban ones. Europe and North America are expected to account for about half of the world's smart cities in the next 10 years.

Sidewalk Labs

This past June, Google's sister company Sidewalk Labs unveiled its updated plan for Toronto's waterfront. Originally a 12-acre community called 'Quayside' at the bottom of Parliament, the new plan is for a 190-acre master-planned community that extends east of the Don River.

The plan calls for a \$1.2 B Waterfront East light-rail transit line for which Sidewalk Labs would offer up to \$400 M in 'optional financing' to help build it. The company considers the 6.5-kilometer rail line "critical" to the development.

Sidewalk says tens of thousands of people could live and work in the new area, and that it could generate billions of dollars for the economy. Cameras and sensors could capture data that Sidewalk and companies could use to get a better understanding of how people move around cities, and possibly develop new technology to improve city life.

The neighbourhood would have 30-storey buildings made from timber with ground-floor spaces shielded from the elements to let residents spend more time outside year-round. Sensors at traffic lights would detect when slower pedestrians are approaching and adjust timing to give them more time to cross; curbside parking spaces could be monitored and pre-booked.

Sidewalk proposes it should also be the lead developer for a larger area, the 19-acre Villiers West, up to three-fifths of which would become the new home of Google's Canadian campus.

Sidewalk also proposes numerous regulatory changes at the municipal and provincial level to accommodate its plans for traffic, technology and tall timber buildings. These changes would require amendments to the City of Toronto Act and the Ontario Highway Traffic Act as well.

Pending approvals the Quayside development would have shovels in the ground in 2021 and occupancy by 2026. Construction for Villiers West would begin in 2023, with an initial move-in date of 2027.

UofT professor Richard Florida argued in an opinion piece in *The Globe & Mail* in June that Sidewalk “can be the catalytic anchor company that can propel Toronto to the top of the heap in what is arguably the biggest new high-tech sector to emerge in decades.”

Jim Balsillie, former co-CEO of BlackBerry Ltd. and founder and chair of the Centre for International Governance Innovation, says that it would be better for Canada’s innovation economy if local companies that have developed smart city technologies had been brought in instead.

If Canada doesn’t adequately protect its innovators, foreign companies can appropriate their ideas, their talent and their potential clients, according to Balsillie.

LA

Adam Rogers writes in *Wired* that Los Angeles is retrofitting 4,500 miles of streetlights with a moonlight-hued matrix of light-emitting diodes. Roads will look brighter, but they’ll also be more connected. Every energy-efficient lamp will link wirelessly to the Bureau of Street Lighting, letting headquarters know if it is on, off, broken, etc. In the future, the city hopes to program lights that change in response to what’s going on around them. They might blink if a police car or ambulance is on its way or brighten for pedestrians after a ball game. While other cities around the world use LEDs to save money and add splashes of color and emphasis, LA plans to build a network that does more than show what’s happening right in front of you. It tells you something about the entire city.

The city has an open-data platform with more than 1,100 datasets, and has launched mobile apps like ShakeAlertLA, which attempts to give users early warnings about earthquakes in seismically active Southern California.

The increased collection and sharing of data is also helping officials make street-sweeping and trash collection more routine in neglected parts of Los Angeles. By placing environmental sensors on streets known to be cleaned less frequently, the city was able to program the sanitation department to make its cleaning services more even.

Singapore

In 2014, Singapore launched a landmark Smart Nation program through which it is gathering unprecedented amounts of data about all aspects of city life. That information may be used as predictive data for disease outbreak preparedness or disaster management, as well as more personalized quality of life and safety initiatives.

The city came up with an initiative called the ‘Parking Guidance System’. This initiative enables the drivers to get access to the real-time parking availability in a particular area without having to move around in search of parking spaces – which may contribute towards the reduction of traffic congestion in the city. The program pays attention to using the already existing parking lots in a more efficient and smart way.

Singapore has deployed a mobile app developed by the local utility company ‘Singapore Power’ that enables the people to analyze their bills, payment updates and offers to submit the meter readings. The app also provides an option to audit home water consumption usage that helps in managing the usage of water wisely. Singapore’s Intelligent Energy System facilitated the citizens by providing smart meters that allow people to communicate directly with electricity operators.

9.AS DATA VOLUMES GROW SO DOES CYBER SECURITY RISK

Blockchain is being employed to protect data from being hacked.

The data volumes are exploding— more data has been created in the past two years than in the entire previous history of the human race.

By the year 2020, about 1.7 megabytes of new information will be created every second for every human being on the planet.

Big data increases the risk of data breaches. The more information a company has, the more likely it is that it includes personal or sensitive information. Sources of information vary greatly, allowing multiple opportunities for infiltration. Distributed computing, which is the only way to process the massive quantity of “big data”, opens up additional opportunities for data breaches.

A report by the Identity Theft Resource Center found that 1.7 million Americans’ banking, credit or financial records were compromised at some point in the first six months of 2018.

Travellers have been particularly hard hit. In the last five years, there have been security breaches at the following hotel chains: Marriott, Hyatt, Hilton and InterContinental Hotel Group; airlines such as Cathay Pacific Airways, Delta Airlines, British Airways and Air Canada; restaurant chains like Wendy’s and Chili’s as well as Uber.

In 2018, the average cost of a data breach was US \$3.86 M, according to a study by IBM Security and Ponemon Institute. The cost was up 6.4% from their 2017 report.

The study found that hidden costs in data breaches— such as lost business, negative impact on reputation and employee time spent on recovery— are difficult and expensive to manage. One-third of the cost of “mega breaches” (over 1 million lost records) were derived from lost business.

Average total costs of a data breach also varied heavily between countries with the United States the hardest hit. In 2018, an average incident cost U.S. firms \$7.91 M, while in Canada and Germany the impact is lower at less than \$5 M. Indian and Brazilian companies have the lowest average cost of a data breach at \$1.77 M and \$1.24 M respectively.

Blockchain technology is being applied to data security systems. With blockchain technology, there’s no middleman that could potentially serve as a source of leaks or compromised data. Digital certificates keep every transactional participant completely anonymous, and a private-public key mechanism coupled with powerful cryptographic algorithms keep everything secure.

A hindrance to the growth of IoT is the threat of device security. According to research by Gemalto, 96% of companies and 90% of consumers believe that their IoT devices aren’t secure. Their main concern is that a hacker will take control of their device, or that their personal data will be stolen.

The IBM Watson IoT Platform is allowing IoT devices to transmit data to blockchain ledgers. This data is then included in shared transactions and records that are tamper-resistant and validated through secure, smart contracts.

Australian telecommunications giant Telstra is also seeing success using blockchain to secure their “smart home” IoT ecosystems, by verifying people’s identity through stored biometric authentication data.

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10. THE RISE OF TEX

Providing superior tenant experience is emerging as a requirement for leading owners of commercial real estate to stay competitive.

Landlords are becoming increasingly aware that it is essential for their tenants to create workplaces that will enable them to attract and retain talent.

According to JLL, the combination of demographic shifts, changing tastes, competition for talent, and today's latest technology have inspired the reinvention of life in the office.

Simply providing space is no longer sufficient. "In the age of on-demand everything, flexible workspaces, and work-from-anywhere freedom, occupants expect an exemplary tenant experience," Michael Hoban in Promodo writes.

Chris Kelly, co-founder and former president of Convene, writes, "What talent wants, landlords need, and developers must build." By partnering with landlords, Convene offers companies and building tenants access to a shared network of best-in-class workspaces, premium amenities, and five-star hospitality services— all enabled by their technology platform.

Tenant experience is a trend that is expected to continue because it is the growth of coworking that has changed tenant expectation of their workspace. Coworking spaces provide creatively designed environments that provide a variety of amenities and programming.

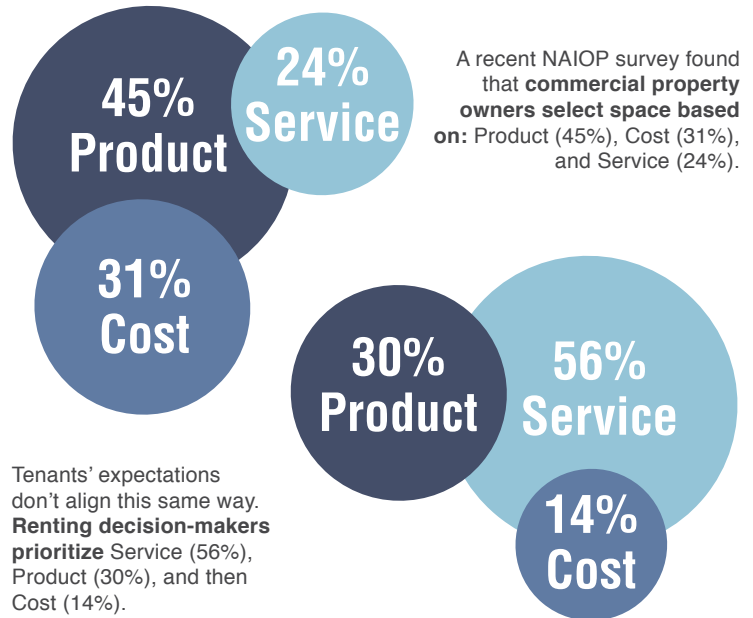
A recent NAIOP survey found that commercial property owners select space based on: Product (45%), Cost (31%), and Service (24%).

Tenants' expectations don't align this same way. Renting decision-makers prioritize Service (56%), Product (30%), and then Cost (14%).

In an effort to differentiate themselves from their competitors, landlords are adopting tenant experience platforms like HqO, Workwell and Lane.

HqO, a tenant experience platform for commercial real estate, announced in May that it raised US \$6M in funding. So far, it has secured funding from Accomplice, JLL Spark, Navitas Capital, Pritzker Group Venture Capital, MetaProp, and Jamestown.

In less than two years, HqO has launched its software in 20 M sq. ft. of office buildings, doing deals with owners including Blackstone's EQ Office, Jamestown, DivcoWest, and National Development.



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