Technology, Innovation and Disruption

Jack Sibley
Nuveen Real Estate

Filippo Rean
REED MIDEM

To an external observer, the commercial real estate industry might appear slow-moving and conservative. Many industries have experienced technological disruption since the millennium, however software and technology have not started 'eating the world' of real estate until relatively recently. So why has it taken until the last couple of years for the word 'innovation' to become a buzzword in real estate?

This report is a collaboration between Nuveen Real Estate and MIPIM. It includes our thoughts on the rise of digital disruption and innovation in the commercial real estate industry, and discusses whether real estate is ready to embrace innovation as the industry evolves. We also highlight our favorite 'MIPIM talk' topics from this year's conference. The 'Mapping World Urbanity' theme placed great emphasis on technology and innovation, sparking a number of insightful conversations, demonstrating that technology is front of mind for those in the industry. We hope this report gives you further insight, and will inspire you to turn ideas into actions. We welcome any feedback you may have and hope to see you at MIPIM 2019.

Ready for Change?

The structural characteristics of real estate as an asset class may not be naturally suited to certain models of innovation and disruption, which emphasize accelerated product iteration, scalability and a 'disruptive' mentality. The low velocity of turnover in assets and leases, the heterogeneous nature of properties, and the relatively high cost of experimentation, all present obstacles to successful, persistent innovation. However, obstacles can be overcome. Larger barriers for innovation have resulted from the industry's culture, which is more malleable. Obstructive

elements of this culture include being risk-averse, a lack of alignment between real estate stakeholders, and overall expectations in the industry that the future will be rigidly linear. Fundamentally, real estate is a relatively opaque industry, where connections matter and relationships involve building trust incrementally over time. There is a clear link between the characteristics of real estate as an asset class and the industry's culture, and to a degree this symmetry will undoubtedly prevail. However, some aspects are being challenged. Over the past few years, we have seen increasing expectations for industry players to engage with start-ups, disruptors and the emerging PropTech ecosystem.

Reasons for Change

Disruption in Adjacent Industries

The commercial real estate industry is being forced to acknowledge that disruption can happen to anyone. The retail sector has been shouting about e-commerce displacing traditional retailing models. Tesla and Uber are revolutionizing transport, leading the pack in producing electric, driverless and on-demand mobility. Elsewhere, over 80% of financial institutions believe their business is at risk of being overtaken by innovators, from FinTech start-ups to Bitcoin.

Emergence of PropTech Start-ups & Big Tech

The ecosystem of PropTech start-ups has been maturing fast and 'Big Tech' is creeping into the industry. Venture capital investment in PropTech has increased dramatically in recent years, and larger, later fundraising rounds are increasingly common. Real estate unicorns are starting to impact the industry and its fundamentals, for example, WeWork became the largest occupier in the Central London office market last year. Google has started to make moves through Sidewalk Labs by redeveloping an area of Toronto in Canada, Amazon has launched bricks-and-mortar

stores, and Alibaba is investing heavily in offline retail, recently spending $2.9bn for a stake in one of China's leading hypermarket operators.

Optimizing UX

Businesses have dedicated their time to improving the online user experience (UX), however consumers are now expecting them to raise the stakes offline. Furthermore, traditional real estate sectors are being challenged as the nature of demand for space changes: retail is embracing leisure and offices are focusing more on hospitality. We can see a slow moving supply side reaction to these trends, which will only accelerate.

On the Cusp of Technological Distruption?

Real estate is not yet on the cusp of technological disruption, but the seeds of innovation are now firmly planted and are starting to germinate. The relevant question is not if, but when and how will the industry reap the rewards. There is no single answer, however the potential consequences of technology, innovation and disruption is an ongoing, industry-wide conversation that spans from inward-looking digital transformation strategies, to outward-looking re-examination of investment theses, key value propositions and core business objectives. Many other industries have faced technological disruption and have successfully transitioned to become more dynamic, flexible and responsive. Now is the start of this transition for commercial real estate.

Challenges for the Industry

In reacting to technology, innovation and disruption, there are two main challenges that real estate must overcome. The first is navigating the short-term, technology-driven shift in the purpose of real estate, the second is adapting to a heightened pace of obsolescence. These challenges shaped the debate at MIPIM and were reflected across many conversations. Embracing these

January 2017
Sears announces closure of 150 stores, setting the scene as 2017 becomes the year of the 'Retail Apocalypse' for the US

April 2017
Tesla surpasses GM and Ford to become most valuable car company in the US

August 2017
$4.4bn SoftBank investment values WeWork at $20bn

November 2017
Chinese shoppers spend $38bn on Singles' Day, Alibaba accounts for $25bn of this alone*

October 2017
Sidewalk Labs (an affiliat of Google) announces they will lead largest urban redevelopment in North America

August 2017
Amazon buys Whole Foods, and begins to integrate Prime and other Amazone Services

December 2017
Annual Venture Capital investment in PropTech triples to $12.6bn (year-on-year)**

December 2017
Cryptocurrency mania prevails as Bitcoin hits $20,000

March 2018
MIPIM PropTech competition attracts 400 attendees

* CECRC, 2017
** RE:Tech, 2017 (includes residential PropTech)

Exhibit 1

challenges means embarking on the transition to becoming a future-proof industry that is equipped to disrupt itself before it is disrupted, and an endogenous driver of technology and innovation. None of this is easy, as it means changing the mindset and culture of the industry and, ultimately, will likely alter the structural characteristics of real estate as we know it.

Navigating the Technology-Driven Shift

A major challenge will be understanding what people want from real estate, particularly in the two largest sectors: retail and office. The digital world has become a cornerstone in people's lives – the average adult in the UK spends more time online than sleeping – and this will increase. The reality is that people can work and shop remotely if they choose to. Real estate must differentiate itself by providing an experience, or align with the same trends driving its success by prioritizing efficiency. In the case of the former, this means navigating the transition of real estate from passive to active, from delivering a product to intermediaries towards providing an experience to end-users.

In retail, gone are the days when 'being a place to buy things' was a good enough reason for an asset to attract consumers. Some retail assets will increasingly align with e-commerce through initiatives like click-and-collect, a focus on efficiency and convenience, and a weighting towards more 'defensive' areas of retail, such as groceries. This model is driven by the same forces as logistics, and, if executed successfully, will retain a distinct purpose in Tomorrow's World. Conversely, other retail assets will move towards 'experiential' retail. In practice, this will likely be driven by successful 'activation' of the asset, an unrelenting focus on UX, and hosting 'service providers', be it food and beverage, leisure (e.g. cinemas), or retailers who understand that their customers are more than 'shoppers', and to an extent embrace showrooming.

Offices are not yet facing the same scale of potential disruption, but we have reason to believe that difficult questions will also be asked in this sector in the foreseeable future. Constant connectivity has led to the death of the traditional 'work-life' balance. Work is now considered a key part of people's lifestyle, rather than a '9-to-5' duty. Add to this the overall rise of the knowledge economy, and the result is that the quality and experience of the office is increasingly important, from attracting and retaining talent, influencing productivity, boosting collaboration, and acting as the bedrock of a company's culture. Faced with this almost meteoric rise in expectations, offices are quickly shifting towards hospitality, with many of the same attributes seen in retail's move towards leisure, such as an increase in animation, intensive asset management, and more focus on the end-user.

Adapting to a Heightened Pace of Obsolescence

Keeping up with, and responding to a heightened pace of obsolescence, driven by technology and new business models, is a major challenge to real estate that threatens assets, business processes and the industry itself. With high transaction costs and private market illiquidity, real estate has one of the longest typical hold periods of any asset class, often around 8-10 years. If an asset is bought today, the disposal can sometimes be expected as late as 2030 and beyond. If sold earlier, the buyer will still be underwriting the asset on a similar hold period. It makes sense to consider the structural trends that will impact real estate over medium- and long-term horizons – historically these have been large infrastructure projects and demographic changes, which evolve at a 5-10-15 year pace. When it comes to technology, 2030 feels like a long time away for a lot of change to happen. Accordingly, there are several large-scale technological changes that are expected to impact real estate within this timeframe. One of these will be autonomous vehicles, which will spearhead a transportation revolution as the sector moves towards new forms of personal and shared mobility. Another is 5G, which will herald a connectivity revolution. Although the impact of trends like these on real estate is sometimes difficult to conceive, to ignore them when making investment and asset management decisions is to implicitly assume they will have no impact, or worse, will mean that we miss opportunities. The industry will have to get better at dealing with technological trends whose knock-on impact on real estate is high probability but low predictability.

In addition to these exogenous technological impacts, the rapid changes in the nature of consumer demand should not be considered a one-off shift, rather they will continue to evolve at an accelerated pace. E-commerce is still in its infancy even over a medium-time horizon, and its influence on consumer behaviour will continue to evolve. Moreover, the preferences of millennials – currently described as self-centered, requiring instant gratification and addicted to the internet – are still in the process of being deciphered. In five years' time, the young talent coming into businesses will be from Generation Z, not Y. Although many of this new generation's traits are likely to be accentuations of the previous generation's, it is very possible they will be considered as different from Y, in the way that Y are from X.

Finally, we can no longer predict all of what will come to influence the nature of real estate in the next decade. We should acknowledge that unknown disruptive business models, new technological breakthroughs or consumer-led shifts, will likely materialize and require a reaction.

Technological disruption is not just an isolated event to which defensive action has to be taken, but a realignment of the industry to a new plateau, where real estate will have to adapt to a faster pace of obsolescence, with innovation, change and disruption as constant threats. One worry is that the cost of keeping assets ahead of this wave of obsolescence will require an increased level of capital expenditure, which may dilute returns.

However, evidence from other industries, such as computing, advertising, and media, suggests that as the pace of obsolescence accelerates, the reward for innovation increases proportionately, with those that can keep up being generously compensated for doing so.

The impact on returns may seem an obvious threat. However, the failure to react to this structural realignment may prove costly, given the industry is often considered slow-moving, backward-looking and resistant to change. Successful adaption will require a significant change in mentality, culture and even skill-sets across the board. The ability to react at speed, scale and with conviction will also become important. The real estate industry has a lot of work to do.

How do We Keep Up?

As an industry, we can do more to encourage and reward creativity, forward-thinking and innovation. Having a designated 'innovation lead' within real estate firms is increasingly common. Larger organizations may benefit from a dedicated resource – a Chief Innovation or Chief Technology Officer – which helps the business to keep up and drive the top-down strategy.

Thinking more strategically and applying research around both the nature of demand for real estate and the potential impact of key technological trends over five and ten year horizons is needed to help identify, understand and react to potential sources of disruption.

To comprehensively address this structural shift, the industry will need to proactively embrace and leverage the latest technology to their advantage. In other words, the real estate industry will have to digitize. This is a broad area and the major themes of digitization today will be explored next.

Digitizing the Industry

If we are going to digitise the industry, we must change the way we do things across the entire lifecycle of property investment, from research and transaction, to management and development. There are many areas of interest here, however three themes represent the most immediate opportunities: data, smart buildings and digital platforms.

Opportunity: Data

The value of data has long been neglected by the real estate industry. Some argue that the industry has thrived because of its lack of transparency, which has maintained the illiquidity premium of the asset class. Aggregated data initiatives have existed at scale to provide performance benchmarks, however collecting and sharing granular data on real estate and the built environment has not been a priority. Valuable information is often hoarded, usually in the brains of market participants rather than in formal databases. Despite this, data (both big and small) is slowly but surely making its way to real estate's center stage.

Seeking to improve 'hard' real estate market data (rents, yields, and vacancies), several initiatives have launched to improve the sharing and democratisation of market data. So far they have failed to gain the critical mass and momentum needed to change the industry. It is possible that blockchain could be part of shifting this tide, but it will likely be more of an enabler rather than a driver of change – historically the main obstacle has been culture and incentives to sharing data, rather than the technology infrastructure. However, within the real estate industry, larger organizations have got serious about managing their own data, having realized they are sitting on commodity which, if correctly leveraged, could be highly valuable.

The potentially bigger story, however, is 'soft' data becoming 'better' in every sense – volume, velocity, variety and veracity. The public sector is a leading driver of improving the quality of soft data, as cities, local authorities and land registries adopt open data initiatives and allow third parties to gain access to publically-collected data that was previously not leveraged to create value. Data points including taxi trips, air quality, local population

characteristics and more, can now be freely accessed across cities globally, as well as detailed property-specific information about ownership and even leases in many countries.

With mobile phones now ubiquitous, it is also possible to gauge a better understanding of city dynamics through online activity and location trackers, be it the number of Instagram photos posted across different locations, Yelp restaurant ratings in the local area, Airbnb pricing trends, or anonymized geolocation data from mobile GPS. These create a digital tapestry through which to view the evolution of a city and its spaces. In Europe, the development of GDPR has positively encouraged innovation in these areas by providing certainty around the regulatory environment.

This soft data is usually complementary to conventional approaches and can help build a more three-dimensional picture of an investment by providing greater context and more comprehensively describing the built environment. Although hard real estate market data will always form the backbone of real estate research and underwriting, those that have the bandwidth and ability are taking the opportunity to broaden their view, to absorb a wider range of data points, and better inform investment and asset management decisions.

Opportunity: Smart Buildings

Smart buildings have been around in many different forms over the years. Historically, it has sometimes been a descriptive term that has somewhat overpromised and under-delivered. However, especially as the value of data has become recognized in real estate and data analysis tools have evolved, this area is maturing fast. Two major areas of development have been the 'Internet of Things' (IoT), where the falling costs of sensors is leading to more useful data being generated, and energy efficiency, where both software and hardware are making significant progress.

The rise of IoT has been largely driven by the long-heralded miniaturization and cost-effectiveness of sensors. After some minor false starts, small and cheap sensors have now arrived in commercial real estate, with some sensors shrinking to the size of postage stamps and prices falling across the board. Although it is now possible to generate millions of data points per second from any building, at relatively low cost, it is crucial to link back these initiatives directly to enhancing user experience.

An obvious example of this is the increasingly common deployment of sensors that measure environmental factors such as temperature, humidity, light and air quality. These show how the decisions taken at the business management system (BMS) level are cascading through the space itself and affecting end-users. The data from these sensors then provide the basis upon which to make dynamic adjustments to optimize the environment – enhancing the overall user experience of the space. In practice, this means improving the health and wellbeing of users, including reducing exposure to pollutants, maximizing natural light and reducing stress. It also means realizing that productivity is directly linked to the experience of the space itself, and recognizing that if productivity can be boosted by just a few percent, the cost of these improvements is more than validated.

Space utilization is another example of an IoT application. Using combinations of sensors and cameras, it is now possible to understand in granular detail how a space is being used.

Leveraging its advantages of scale, WeWork has been leading the wider movement in applying Artificial Intelligence (AI) to these data sets to understand how space is used, and see how it can be made more architecturally efficient. In practice, this means providing data-backed answers to questions like how many meeting rooms of what size are needed, what impact the layout and design of a shop or shopping centre has on dwell times in certain areas, and so forth. Again, the focus is on enhancing UX.

Improving energy efficiency has increasingly become a point of focus for landlords and tenants alike, especially since the Paris Agreement. In the last 12-18 months, smart building software has made significant strides in solving the problem that the BMS running buildings are designed to control the systems themselves, not provide visibility on how the building is performing. There are now options to resolve this pain point, as software can plug into the building (often through the BMS itself), extract the relevant data and turn it into actionable recommendations – sometimes adding in relevant external data (e.g. weather) into the analysis. These tools lean on sophisticated data analysis including AI and, although most of the last step is still manual (hence 'recommendations') it is also possible to instruct the BMS directly. In essence, this could be one of the first instances of almost complete automation of an entire function, from data collection to interpretation, to action

Smart building hardware targeted at energy efficiency is also evolving fast. The price of solar panels continues to fall and in certain cases can now be accretive to property-level performance. Smart glass that can generate electricity is also becoming a more attractive option, especially if installed from construction. Aside from generating energy, new buildings seeking to minimize their environmental footprint can leverage new materials, modular construction, and more sophisticated insulation and cooling systems, all of which have seen significant progress in recent years. Although the most cutting-edge technology is easiest to apply to new builds, solutions adapted specifically for retrofitting are also gaining traction and are becoming easier to integrate.

Previously, the adoption of these solutions would sometimes be driven by broader sustainability concerns. It is increasingly easy to make the case for energy efficiency solutions (both hardware and software) purely on the basis of the financial return-on-investment (ROI). This means that the pay-back period for implementing these initiatives, based on energy costs saved, is getting progressively shorter, if not immediate in some cases.

Opportunity: Digital Platforms

Digital platforms are a diverse category, with different applications targeting a variety of end-users, asset managers and real estate investors.

Starting with end-users, a key theme that has been topical recently is how to provide the best blend of online and offline experience. In practice, this encompasses efforts to improve the online presence of retail locations (often through simple strategies like revamping websites), improving the shopping experience through downloadable apps (e.g. introducing elements of artificial reality into the experience), or providing tenants with access to a digital platform that aims to create a sense of community and digital place. Following a flurry of development, there is now what might feel like an abundance of apps and digital platforms that seem to

fit the mould, with some areas even beginning to feel congested. Although many of these solutions are still immature and certainly require critical piloting and evaluation, this is good news for real estate as a whole.

Some of these solutions go a step further than enhancing end-user experience. When asset-specific data becomes collated onto one digital platform – rather than simply serving several individual use cases – there is the potential to create a 'digital twin' of a physical building. This requires collating a broad range of data on a building, ranging from BMS data to ownership and tenant information, and real-time data on temperature, to space utilisation. Although the standard for what a digital twin looks like has not yet been established, many buildings now have enough data points and information to build one. As more data is generated from buildings, these digital twins will become more comprehensive, insightful and useful for all stakeholders in real estate, including owners, asset managers, tenants and end-users alike, who can each gain access to the information they need, when they need it.

There are also more comprehensive and value-adding platforms being built for commercial real estate asset managers and investors. Many of these reflect the current default of the real estate industry to work primarily on Outlook and Excel as the day-to-day dashboard, something which many other industries have long since left behind. Many of these platforms are effectively cloud-based, workflow management tools that aggregate the relevant sources of data into one place and allow all relevant parties to input as and when required. Although sometimes described as a prettier way to look at the same data you would in Excel, when applied at scale these can yield tangible efficiency benefits and will continue to build out their functionality and value-add.

Finally, several platforms have launched which aim to create digital marketplaces, and simultaneously engage both buyers and sellers onto one platform. Some of these have integrated payment functionality (sometimes using Blockchain to do so), others do not and concentrate simply on matching buyers and sellers. A large part of their current value proposition offers access to fractional direct real estate investment for retail and high net-worth segments, although as platforms mature they will move towards encompassing smaller institutions. Those that are currently making the most progress usually focus on those areas of real estate which tend to be more homogenous and commoditized, namely commercial real estate debt. Promisingly, several emerging players in this area have found the necessary backing and momentum to become genuine forces within the market, while others are clearly at much earlier stages.

Conclusion

The industry faces many challenges, both internal and external, some of which go to the very heart of what real estate is today. However, the industry will not suffer from deep disruption overnight – we do have time to process, react, and reposition ourselves. This means shedding some elements of real estate and improving others. Those that can align themselves with this structural shift will succeed in Tomorrow's World, and those that can't or choose not to, will struggle. A warning – if you don't like change, you'll like irrelevance even less!

Less of the Same

1. Silos: Real estate has been guilty of not evolving in parallel with mass instant communication. Valuable information has been known to not travel beyond silos within businesses, and there's a resistance to trying new ways of collaboration with a sense of 'if it isn't broken don't fix it'. Those that continue to adhere to convention for the sake of convention are increasingly likely to be left out in the cold.

2. Treating real estate like a bond: A traditional real estate investment strategy might be described as being contractually secured, and having inflation-linked income, with a focus on mitigating downside risks and any upside generated through the evolution of market rents and yields. Although this will not change overnight, these characteristics are becoming more closely linked to the operation of the asset and the end-user's experience, and less dependent on the surrounding market fundamentals.

3. Excel: Although Excel will continue to be a cornerstone software for real estate investors and other stakeholders, the industry's reliance on it is likely to wane as more sophisticated tools for storing, viewing and analyzing information develop.

4. Exclusivity: Real estate can be quite an insular industry, based on relationships built up over time, suspicious of outsiders and resistant to promises of positive change. Although the culture of real estate is entrenched, the most successful models will find ways to keep the best of the old while embracing new opportunities for innovation and technology. Encouraging diversity of thought will be key.

5. Focus on cycles: Although property and business cycles will always remain close to the top of the agenda, their relative importance will diminish as investors grapple with something more fundamental, as the ultimate purpose of real estate itself evolves and the pace of obsolescence accelerates.

More of the New

1. Focus on UX: An unrelenting focus on the end-user and how UX is crucial to maintaining relevance in Tomorrow's World.

2. Data: Now referred to as 'the oil of the 21st century', the importance and value of data (both market and proprietary) has been historically overlooked in the industry. As a result, real estate's sophistication around data management is currently far behind other industries. This is changing, fast.

3. Asset management expertise: As real estate undergoes a structural shift, expertise at all scales – asset, portfolio and strategic – will be needed across the risk spectrum, with each asset needing more specialist attention and continuous evaluation.

4. Collaboration: In order to keep up with the pace of change, more proactive collaboration is needed between all stakeholders across the industry, including incumbents and start-ups, investors and operators, occupiers and property managers, and more; as well as more conversations with adjacent industries like transport and finance which are a few years ahead of real estate in adapting to technological disruption.

5. Strategic thinking: At a time when the next 15 years look to be more transformative for real estate than perhaps the last 50, maintaining a long-term, strategic perspective, and concentrating on the fundamental drivers of real estate demand is even more important for successful investment strategies.

Authors' Bio

Jack Sibley
Nuveen Real Estate

Jack leads Nuveen Real Estate's initiative to embrace technological innovation, change and disruption within its tomorrow's world philosophy. His focus includes analysis and solutions for how technology is changing what end-users want from real estate, proactive engagement with PropTech start-ups and disruptors, and efforts seeking to leverage emerging technologies such as Big Data and AI. These efforts are integrated into Nuveen Real Estate's investment process, driving asset selection, asset management and portfolio resilience.

Prior to his current role, Jack worked in the business' R&D team, which he joined in 2016. Jack graduated with a B.A., honors, in Land Economy from the University of Cambridge and is a member of the Cambridge University Land Society.

Filippo Rean
REED MIDEM

Filippo Rean joined Reed MIDEM in October 2010 as Director of MIPIM and MIPIM Asia, the leading international real estate tradeshows and conferences. Since September 2014, he has become Director of Reed MIDEM's Real Estate Division, hence is in charge of supervising all MIPIM & MAPIC markets.

He started his career in the marketing department of Procter & Gamble in Italy and then joined Bain & Company where he focused his activity on the financial sector and real estate. He joined the European headquarters of GE Capital Real Estate in Paris in 2005 and held various roles in strategic marketing and product development.

Filippo Rean has an engineering degree from the Politecnico di Torino, holds an MBA in Business Administration from Harvard and is fluent in Italian – his mother tongue – English and French.