

The future of real estate

How we will **work, play and live** on earth and on Mars...





Introduction

Innovation has had a profound impact on the world and investment markets. In just a century we've moved from horse-drawn ploughs to GPS guided tractors, steam powered trains to automated metro systems, and from telescopes to cars in space.

The next decade will dwarf the past century with advancements. Elon Musk is developing brain-machine interfaces to connect humans and computers (human cyborgs). The Gates Foundation has backed the Omni Processor which converts sewage into drinkable water. They're also backing a project to decarbonise the world by extracting carbon dioxide from the air and converting it to clean, carbon-neutral synthetic diesel and petrol. NASA has produced a cloud machine to induce rain in arid locations. Richard Branson has backed the Hyperloop One train project allowing travel on the ground at the speed of a jet airplane. Businesses must evolve and so too does the real estate sector. With so many advances, it's timely to look at what the future looks like for the real estate and infrastructure sectors, and to consider the benefit of an active approach in identifying which businesses stand to gain (or lose) from technological change.



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Will video games be the demise of casinos?

Online gaming is growing rapidly and is spreading beyond Silicon Valley, to the UK, Israel and Malta, where it accounts for 12% of their economy. The online gaming industry is estimated to be worth US\$100bn in 2017, with 360 million people viewing the 2017 League of Legends mid-season event (more than the Super Bowl and NBA Finals combined)¹. It is clear that organised, multiplayer video game competitions (known as eSports) are booming with no signs of slowing.

Land-based casinos tend to be quality assets, with accommodation, retail, nightclubs and restaurants all on the one site. The question is, how sustainable will these entertainment precincts be when casinos inevitably lose market share to online gaming? The casinos will argue that

you can't completely trust computers, that gamblers enjoy the physical stimulation and that bad beats (strong cards getting beaten) seem to be more common online. But some casino operators recognise the demand for eSports and are adapting their properties by hosting competitions, with weekend events attracting up to 20,000 people.

Casinos are often centrally located with good transport and could easily be adapted to become thriving neighbourhoods, with floor space re-purposed for offices, supermarkets, medical and childcare services where everything is within a 15 minute walk. Like retail, they'll have to evolve with changing consumer needs, but given the importance of land-based casinos with regards to taxation revenue, these threats are likely long dated issues.

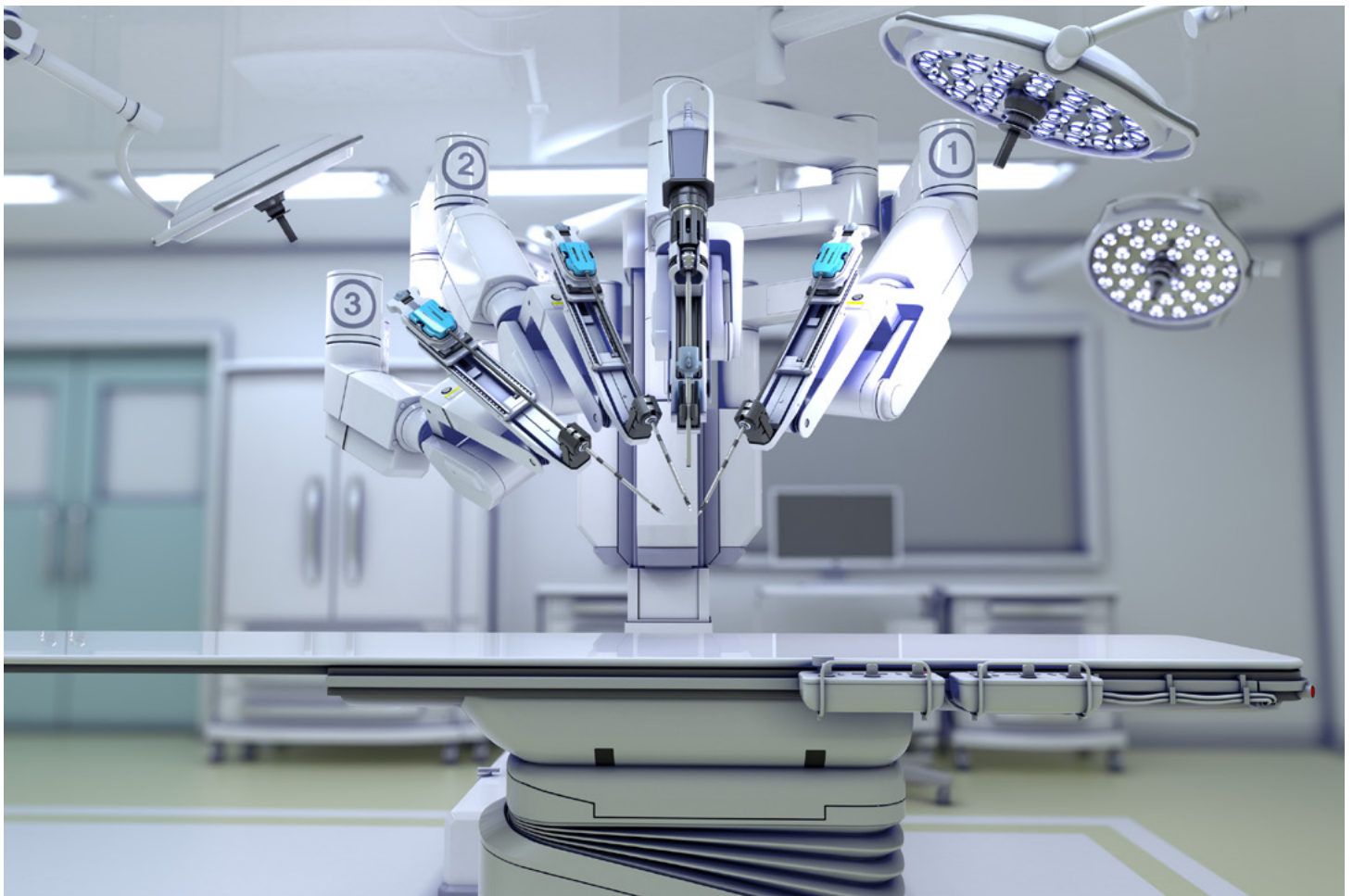
¹ Hester, B., *More than 360 million people watched this year's 'League of Legends' mid-season invitational*

What do Apple's "Genius Bar" and hospitals have in common?

The medical sector is facing rapid changes due to revolutionary advancements in technology. It is inevitable that we will need more medical facilities as our population ages and more purpose built facilities catering for physical and mental illness, which often require large and expensive equipment. These facilities, similar to the office sector, will need to have an environment where a work/ life balance can be enjoyed in an attempt to attract the best medical staff. This will require onsite services such as childcare, gyms and restaurants.

In terms of retail operations, hospitals will be similar to airports in that they will benefit from a captured audience, albeit the mood of the customers is starkly different. Most visitors don't have the luxury to wander too far from their loved ones and are often "trapped" with relatively poor food and café offerings. Any improvement would be welcome, like the food and dining options offered in major shopping centres.

While the property side of the medical industry is fairly benign, the technological advancements within the sector are amazing. One such example is robot assisted surgeries which gives surgeons the ability to control robotic arms and its end-effectors, even remotely if required, with smoother motions than otherwise possible. Would you back a human to move 1mm or a robot? We've already got smart watches with integrated heart rate monitors and activity trackers, so it's not too far-fetched to have nanobots (tiny machines) monitor our health, even from within. Maybe hospitals could borrow from the Apple "Genius Bar" concept and make standard triaging more efficient by having patients send their symptoms to the hospital ahead of time and patients be allocated a specialist upon arrival.



Will the home office takeover?

We've had activity based working (ABW) and work from home concepts in place for many years now, yet there's still millions of people that commute to our CBDs each day. Around 85% of the office space in the Melbourne metropolitan area is located in the CBD and Southbank, with St Kilda's importance decreasing due to residential conversion. Sydney's metro office space is more spread out, with ~70% of space in the CBD and ~10% in each of North Sydney, Macquarie Park and Parramatta. Brisbane has ~65% in the CBD versus the fringe.² What's surprising is that the Sunshine Coast is one of the fastest growing areas in Australia, but has <5% of the office space offered in the Brisbane metro area. This indicates that Australia remains a centralised white collar workforce.

There have been numerous studies to assess why we continue to congregate, despite working from home being a viable alternative. Deloitte's research found that when employees collaborate, they work 15% faster on average and are 60% more innovative. Businesses with a collaborative strategy are twice as likely to outgrow their competitors.³ Furthermore, corporate culture and goals are better identified in a collaborative environment. Coming together in an office environment helps satisfies the human need for social interaction and provides networking opportunities. The growth of WeWork is a testament to this collaborative culture. The US start-up has rented more space in the centre of London since 2012 than any other company, leasing 2.6m ft² of space, according to estate agency group Cushman and Wakefield.

Driverless cars could become an extension of the office, employees can start work with no wasted time on commuting.

The key for office owners is to create an environment where firms can attract the best talent to collaborate. The best "collaborative factories" will be those offering flexibility, vibrancy and wellness. This could take the shape of onsite childcare and gyms (with priority given to tenants), or shorter leases to cater for start-up firms. Most office developments already include ground floor retail and designated places that support cyclists, joggers and walkers (known as end-of-trip facilities). There's no longer

an excuse to work back in the office when we can access information anywhere, plus with biometrics taking over, remote workers will be able to ditch the security swipe card. Buildings will ultimately be alerted to our impending arrival and activate the relevant devices and systems. The future should be a mixture of office accommodation solutions; from home offices, convenient suburban locations and CBDs.

The bigger question is what type of employees we will become, with 35% of the US workforce being freelance. The growth in freelance and outsourced work is projected to reach 50% in the next few years.⁴ Repetitive jobs will be replaced by software, greater outsourcing will occur and big firms will push for creative, relationship, "ideas" people.

Driverless cars will impact property usage as they effectively become an extension of the office. Given the use of traffic flow algorithms that can tell you the optimum time to travel to and from work, and without the need for traffic lights, employees will be able to enter a driverless vehicle and start working with no wasted time on travel and commuting. People in regional locations can use their commute time productively and live where they want rather than feel pressured to move to the city to be closer to the office. This could then support more satellite cities (decentralisation), with the advancement of smaller capitals and regional cities such as the Sunshine Coast. The home office concept is also gathering pace with Mirvac offering three level town houses, with the family home concentrated on the upper levels and the ground floor offering a formal work environment.

Conserving energy will be a must for new developments, but creating "off grid" buildings appears to be a challenge. Most office roofs are not large enough to house the required number of solar panels to power the entire building, so other, smarter energy conservation methods will need to be utilised. New developments are already using water recycling systems that treat wastewater for toilet flushing, garden irrigation and cooling towers. There's also a trend towards building in wood, for example, Lend Lease are developing Australia's tallest timber office tower in Brisbane. Timber offers a better sustainability rating, faster construction time (panels arrive and join like Lego blocks), and less noise and waste during construction. Lend Lease have already successfully completed one project in Sydney using cross laminated timber (CLT) and glue laminated (glulam) timber.

2 Property Council of Australia, *Australia Office Market Report*

3 Dexus Research, *What will be the role of office buildings in the future?*

4 UpWork and Freelancers Union, *Freelancing in America*



Customer experience will be vital for retail

The retail sector has been impacted by a combination of cyclical and anticipated structural issues. Cyclically, retail sales have been under pressure as living expenses (higher debt costs and utilities) have risen faster than wages. Structurally, the market is anticipating growth in the e-commerce channels via Amazon and other disruptors.

Short to medium term issues will be the ability to re-lease space left by struggling retailers, particularly department stores that occupy a lot of space. This could see the addition of more community services such as medical, educational and childcare, or it could make room for traditional bulky good tenants such as Freedom, Bunnings,

or even IKEA. Given that department stores pay minimal rent (relative to other users) and occupy large areas, this could actually benefit landlords over time. Retail could follow in the footsteps of Uber and Airbnb by capitalising on underutilised assets (known as the collaborative economy), and result in a more efficient use of space. For example, community or educational groups (such as TAFE students) could use cinemas during quiet periods. TwoSpace is another example which turns restaurants that are closed during the day into a network of co-working spaces for start-ups.

This evolution has always occurred in retail but the future will see a faster rate of change. Westfield disclosed that they had introduced 120 new tenants and brands into three of their recent redevelopments. Over the past ten years, Westfield's sales in the food and dining category has more than doubled, while the technology and auto category has almost tripled, with continued growth anticipated.

In the longer term, shopping malls in secondary locations are at risk of closure as retailers are more ambivalent about their presence. The consequences of this have been seen in the US where the number of "dead malls" is so high that a YouTube page has been devoted to them. However, conversion of this dead space is occurring with the Ford Motor Company converting the Fairlane Town Centre in Michigan into office space, housing 1,800 workers across 240,000 ft².

Carparks and loading docks will be revamped, with ticketless parking now common and parking guidance systems alerting customers where to park (VIPs could have spaces reserved). There's smart-parking-robots being developed, where you drive onto a metal board and it takes the car to a space, or the robot lifts the car and stacks it. Loading bays could become drive through facilities, with customers picking up goods on the way home from work.

Retail could follow in the footsteps of Uber and Airbnb...

Changing demographics such as age, disposable incomes and ethnicity will see each centre tweaked to match its catchment. This means each landlord needs to differentiate their consumer offering.⁵ This will see the inclusion of drawcards such as day spas, gyms, farmers' markets, ice-rinks, ski slopes, go karts (Xanadu in Madrid), aquariums (the Mall of America in Minnesota), theme parks, bowling alleys, museums, medical facilities and basically anything else that helps increase foot-traffic to the centre. Shopping malls can't compete with the commoditised products available online so food and experience will be vital for their survival. The consumer experience will be the key driver of success.

Pleasingly in Australia, the REITs generally own trophy centres with strong demographics (high incomes, asset rich, growing population). Nevertheless, the future is leading towards more mixed use developments, with landlords open to developing apartments on-site ("retail-dential"). With large expanses of land used for parking,

it is inevitable that they will be converted for other uses with some councils already pushing for mixed use. The downside to this is that future developments could be compromised if residential is not planned correctly. For instance, Westfield identified that developing freehold apartments above Westfield Sydney would limit future retail expansion. Scentre have just submitted plans to overhaul its retail mall in Hurstville, proposing five new residential / mixed use buildings and new levels above the existing complex. The plan is their first significant move into the apartment sector, with the group also seeking to build an office tower above its Parramatta centre.

In terms of the consumer, virtual reality (VR) and augmented reality (AR) will make shopping easier. VR uses technology to simulate an environment, for example, virtual dressing rooms; while AR creates an enhanced version of reality by adding information onto an image, such as the IKEA app which integrates virtual furniture items into your environment. When we visit a centre, biometric devices will identify us and highlight areas of interest all guided by voice recognition / natural language technology that will be our main means of communication (no more typing).

Technology will provide consumers with a physical and emotional feel of the products without ever needing to leave their home. There are already numerous apps on the market showcasing products including Audi, Target, Sephora, IKEA, Pepsi, and Cadbury amongst others.

We cover the impacts of robotics on supply chains in the industrial segment, but robots will also see more efficient stocking of goods in the retail sector, with "airborne fulfilment centres" (think blimps) deploying drones to cover the last mile. With more efficient supply chains, delivery space can be converted to leisure and public space.

Centres are well placed to utilise sustainable measures, with massive rooftop space to support solar, natural ventilation and economy air conditioning, plus rainwater collection technologies to service landscaping and toilets. The end game is to be off the grid.

Longer term, centres will become the meeting place to socialise, with retail, co-working, residential, leisure and public spaces linked. Offices, apartments, childcare, medical, outdoor spaces and other drawcards will make the retail experience more community based rather than a destination.

⁵ Fantoni, F., Hoefel, F., and Mazzarolo, M., *The future of the shopping mall*



Retirement villages – not just for the elderly

The vision for the ageing population is exciting, with a number of unique concepts scattered globally. Some are based upon philosophy's of anthroposophy (using natural means to optimise health and wellness), like Ytterjarna in Sweden. Germany's multigenerational centres (mehrgenerationenhäuser) combine seniors, health, preschool and youth groups in the same premises, with the UK and US to follow the same approach.⁶ Austria's Miss Sargfabrik village is dedicated to communal living for families and senior citizens. These apartments are connected by communal-access balconies which

promote socialisation amongst the residents. Mado, a multigenerational village in Georgia (United States), utilises a combination of everything, featuring medicinal gardens, community activities and multiple housing options. The site features a 25-acre organic farm, seasonal farmers' markets, art galleries, and a range of public events.⁷

The future is multi-generational towns with a focus on health and wellness. A range of housing options will cater for changing needs, from independent living to shared common areas to aged care. High density sites will become prevalent, with thoughts that such accommodation would be best served next to, or on top of shopping centres, providing easy access to retail, community and medical services. Residents will be monitored via wearable devices, GPS, sensors and eventually nanobots.

Technology will monitor residents' via wearable devices, GPS, sensors and eventually nanobots.

⁶ Oltermann, P., *Germany's 'multigenerational houses' could solve two problems for Britain*

⁷ Bluestein, A., *Is this sustainable village the future of retirement*

Smart warehouses to be the norm

With rising land values it is inevitable that industrial premises will follow the lead of office, residential and shopping centres and become multi-storey. This is already occurring in other parts of the world, with the Goodman Group (GMG) owning a 24 level facility in Hong Kong called Interlink. Australian building codes, construction techniques and compliance issues will need to be resolved but this transition makes sense, particularly in port and airport locations such as South Sydney, NSW.

Higher clearance facilities are also being developed, allowing firms to store more vertically – the higher you can go the better. Current development is restricted by Australian Standards, but we are fast approaching the day when tenants are charged a rate per cubic metre, not square metre. The real advancements however, will occur inside the warehouse.

An example of this is IKEA's 70,000m² purpose built distribution centre at Marsden Park, NSW. The centre includes a 35m high bay section that houses a fully

automated storage and retrieval system consisting of nine automatic cranes and an extensive conveyor system which sorts, shelves and retrieves 66,000 pallets 24 hours a day.⁸

Smart warehouses will be the future norm, with robots already leading 70% of the work in Alibaba's facilities. Putting solar panels on the roofs could generate all the power required, but if robots handle everything who needs lights anyway? 4D printing will impact the manufacturing sector and could also impact some retail outlets. As these printers become more accessible, consumers can download 4D plans online and print their goods at home, removing the need to go to a store to buy an item – great for last minute birthday gifts!

The industrial sector will continue to play a pivotal role in the medium term, with one vision being that super warehouses such as the Interlink facility could be scattered around major population areas, with smaller warehouses closer to home.



8 FDC Building, IKEA multi-function logistics unit, Marsden Park

Gas to batteries – what will happen to service stations?

Sceptics are worried about the impact of driverless cars on service stations. In the short term there's no need for concern with estimated total electric vehicle sales since 2010 being 8,000 (including Tesla) out of a total passenger fleet of 14 million. That's equivalent to one in every 1,750 cars or <0.1%.⁹ The transition to driverless cars appears some way off given we need electric cars first, so that driverless cars can self-dock and charge. The first step will be to extend the "swap and go" gas bottle service to a "swap and go" battery service.

When driverless cars do become mainstream, service stations will simply adapt to higher and better usage. They should be keenly sought after because of their great locations (largely inner city and major roads) that suit residential uses, or they could be used for last mile distribution. As an example, Amazon could buy the Caltex or Shell branded stations and distribute goods from there. However, they would have to overcome long lease commitments, for example, with the Shell branded

stations (owned by Viva REIT) having leases to Viva Energy for between 10 to 18 years, with seven 10 year options, contractual income is theoretically flowing until 2100!

That's not to say that there isn't progress. For instance, Rio Tinto is using driverless trucks and unmanned drilling rigs and trains in the Pilbara, remotely overseeing them from Perth. Rio Tinto started deploying autonomous technology in the Pilbara in 2008, with 80 trucks operating at their iron ore mines and looking to make it 130 by 2019. In the farming community, GPS guidance systems for tractors are a must-have for modern farmers who want to work professionally and more efficiently. This technology allows the farmer to instruct a tractor to plough, sow, or spray crops automatically. Automated trains have been in use for decades, and chances are that you've ridden on an automated metro system like the Docklands Light Railway in London (since 1987), the AirTrain at JFK Airport and San Francisco, and Singapore's MRT, with Sydney to offer a fleet of driverless trains on the new Northwest Metro train line.



9 Electric Vehicle Council; *The State of Electric Vehicles in Australia*.



Airport retail will fly to new heights

Given the move to a new generation of quieter, cleaner and more fuel efficient aircrafts, airports will likely have shorter curfews. Subsequently, the extended operating hours will create greater demand for services such as child minding, hotels and gyms and if they're not housed on-site they'll have to be provided within close proximity.

Passengers will benefit from biometric check-in solutions, which are already in operation in some parts of the world, with Sydney set to begin trials soon. Advancements in baggage handling are also underway with bag drop-off stations in the carpark, saving travellers from having to carry their bags to check in. There are also thoughts to have bags delivered to different parts of the airport once you disembark, as opposed to everyone standing around at the carousel.

Airport retail should be the least impacted by e-commerce. In fact, they'll continue to benefit from a captured, high-quality audience, with customers wealthier than the average, and in the case of international passengers, with hours of spare time before their flight. Where else can some of these brands get their target audience in one spot, with time?

Parking has always been a bug-bear for airport management, but with demand management algorithms, airports can de-risk their carpark income by pre-selling

spaces, allowing them to benefit from higher fees if the planes are late or delayed. In the longer term, when driverless cars become the norm, airport carparks are likely to move towards a toll road model where access charges to the airport will apply based on time, with carparks converted to other uses such as hotels.

The race is on, who will be the first REIT on Mars?

Despite existing autopilot technology being an accepted feature, a 2017 UBS survey showed that 54% of respondents would be unlikely to take a pilotless flight.¹⁰ This suggests that pilotless planes will be carrying cargo in the medium term, rather than passengers. But, in the (distant) future, according to Elon Musk, commercial airlines will be replaced with next-generation spacecraft that will travel commercially to the Moon, Mars, or even around the Earth, cutting most long-distance Earth flights to just half an hour. When we're flying to Mars we'll need something at the other end, so expect to see docking stations with retail and other uses there. Who will be the first landlord on Mars? Will there be Westfield Mars?

¹⁰ UBS Evidence Lab: *Pilotless planes – further findings*.

I'm just popping up to the roof for some fresh food...

Agriculture is facing a number of challenges, including water scarcity, climate change, global population growth, pesticide use, ageing farming populations, the timing of harvests, food waste, and price fluctuations.¹¹ With a growing population versus finite resources, the question is whether we will be able to feed a population projected to reach ~10bn by 2050 in an efficient and sustainable manner? It is a people vs the planet debate.

Vertical gardens are quite a common sight, but could the next step be vertical farming? Growing produce vertically is not a new concept, with the Hanging Gardens of Babylon one of the first examples. Could we see produce walls rather than green walls? Could shopping centres take the fresh concept all the way with produce grown on their roofspace? Industrial facilities could have farmers' markets inside or at the very least, be used as urban farms. A Japanese firm called Spread have developed a farming system called "Techno Farm". Using hydroponics their facility produces ~21,000 heads of lettuce a day using floor-to-ceiling shelves where the produce is grown. Seed planting is done by people, but the rest of the process, including harvesting, is done by industrial robots. This has reduced personnel costs by about half and reduced energy expenses by nearly one third. The pesticide-free lettuce also has more beta carotene than other farm-grown lettuce which our body converts this to Vitamin A.

Another possible solution is re-claim parts of waterways near major cities. The concept is based upon the Aztecs who created "Chinampas", creating new land to farm and live on. They weaved webs of sticks and piled reeds and mud on top to form narrow fields surrounded by navigational channels. Their crop production rates were much higher than other techniques. Back to the future perhaps?

In terms of livestock and traditional crops, the University of WA has initiated the "Future Farm 2050 project", using a 1,600-hectare farm near Pingelly, WA. They are using crop science, livestock science, resource economics, architecture and landscape architecture, electronic engineering, solar energy, water management, animal and plant ecology to deliver more sustainable outcomes. The first concept is clean, green and ethical animal production systems for sheep (meat and wool). The second is no-till cropping production, primarily for the production of wheat and canola to alleviate problems of soil erosion and water loss. Finally, the farm manager's home uses sustainable design and materials to deliver energy and water efficient outcomes.¹²

Ag-tech is developing devices to monitor vegetable growth, as well as robotic pickers, and for livestock farmers there's sensing technologies to manage the health and welfare of their animals (tracking devices). There's work underway to monitor and maintain soil quality and eliminate disease without the use of agrichemicals.

Artificial environments could also be produced. In China, a state-owned defence company is testing a system that involves lofting particles of silver iodide into the atmosphere. When the water-laden air of the monsoon hits the particles, ice crystals are supposed to form and later fall as rain or snow. The hope is to increase rainfall by up to 10bn cubic metres a year in an area the size of Iran which feeds the Yangzi and Yellow rivers as well as others upon which China's neighbours depend.¹³



11 Spread Co, *Techno Farm*

12 University of Western Australia, *Future Farm 2050 Project*

13 The Economist, *Could Tibetan clouds save China from drought?*



Innovation will help us live off-the-grid

At the most basic level, affordability constraints will require more medium density housing around key infrastructure nodes. These dwellings will incorporate wellness measures such as gyms, crèches, and green designs, as seen at the Vertical Forests in Milan and One Central Park in Sydney.

In the suburbs, there's a push for 20 minute neighbourhoods, where residents have access to shops, childcare, schools, parks, doctors and public transport, all within a 20-minute walking radius. The Victorian government has started a program to deliver this at three locations across Melbourne.¹⁴

Off-grid neighbourhoods will be the norm, with energy innovators looking at carbon-neutral liquid fuels, and tackling new generation methods, storage, and transmission. Rather than adding solar panels to roofs, Tesla has invented roof tiles that double as individual solar panels. On the water front, it's envisaged that all forms of water will be recycled, even human waste. The Gates Foundation has backed a firm to build a sewage treatment machine that can turn human waste into drinkable water, originally built to provide drinkable water for those in need.¹⁵

The ultimate aim is a zero-carbon city. One prototype is Masdar City in the UAE. It relies on solar energy and other renewable sources and was designed to be a hub for clean-tech companies. Its smart design means that the temperature on the street is generally 15 to 20°C cooler than the surrounding desert. Build-to-rent also looks to be gaining traction, with developers investing in apartment blocks that are exclusively for rent. Changing attitudes towards home ownership and apartment living in Australia are fuelling occupancy demand, while investment demand is strong from offshore funds who already invest in this space in the US, Europe and Japan. The ultimate aim will be to gain scale and build brand loyalty that could be extended to sub-sectors such as student accommodation. At present the business case for this approach doesn't stack up given nuances in taxation (GST and withholding tax). Furthermore, design issues will need to be sorted, where build-to-sell models traditionally have penthouses at the top, build-to-rent would arguably need to use the higher levels for common spaces such as pools and meeting places, and require more concierge services and maintenance rooms.

¹⁴ Victoria State Government Department of Environment, Land, Water and Planning, *Plan Melbourne – 20-minute neighbourhoods*

¹⁵ Chowdhry, A., *Watch Bill Gates sip water made from sewer sludge*

How automated can car parks really become?

With driverless cars becoming a reality we must think of where we will house them. Above ground or below? Or will there be a pool of vehicles that move around like taxi fleets stored in high-rise stacks outside the major ring roads?

Volkswagen has developed a novel solution; fully automated high-rise stacks which house up to 400 cars. At Volkswagen's Autostadt in Germany, cars are rolled over to two glass towers from the nearby plant using a robotic-pallet system mounted on rails, then loaded into the towers using two lifts.¹⁶ At a speed of two metres per

second, new vehicles are transported in one minute and 44 seconds from the entrance of the towers to the highest parking space.

Existing multi-level car parks are largely situated in densely populated areas so it seems logical that most car parks will be converted to higher and better uses. Dexus' development in Melbourne is a good adaptive example, with an existing multi-level carpark at 180 Flinders Street being incorporated into an office and retail development.



¹⁶ Autostadt, Car towers



Tollways are here to stay

Tollways derive revenue from usage charges, with consumers benefiting from reduced travel times. Congestion growth and market acceptance have seen these revenues expand. Express lanes or HOT lanes (high occupancy toll) have become popular, with variable pricing dependent on the level of congestion. Should vehicles in congested general purpose lanes wish to save time (and carrying less than a certain number of passengers), they can move into the express lanes and are charged at a higher rate for the benefit.

The future for tollways appears solid, given that driverless cars make no difference to tolls as vehicles are charged for using the road, regardless of whether they're driving the car themselves or not. Express lanes however, could be impacted as traffic flow algorithms smooth congestion, albeit there will always be a desire to get to places quicker.

However, what happens to driverless cars once they drop you off? Do they form part of a pool ready to aid other consumers (like a taxi fleet) or do they dock nearby in multi-level stacks?

Testing is underway for self-parking stations, with the theory being that once you exit the car at your desired destination, it drives itself to geo-fenced parking lots, with sensors finding vacant spaces. Jaguar Land Rover is testing self-driving valet in Milton Keynes, UK. This technology could free up congestion in downtown areas caused by people looking for parking. Should transport shift underground, like Elon Musk's vision with The Boring Company (underground road systems), tollway operators seem the natural owners.

Prisons without bars: there's still no escape

Future prisons could be part of a mixed-asset solution, with this source of labour sitting next to industrial facilities or farms, which would help with the rehabilitation process. Other ideas include ocean platforms, vertical cities using old open pit mines (Mad Max esq) or even establishing them in Mars. In Norway, some prisons have no bars (open

prisons) with staff trained in philosophy, psychology, law and social work. They are connected to communities and families via work-release, home-release or educational-release programs. The real estate solution is not easy, given the large sums of government spending required to establish such facilities.

What is the technology driving operational change?

Linear change in technology is occurring given greater processing power, bandwidth and storage. This has led to disruptive technologies that are impacting every facet of life. For instance, phones have evolved from the analogue 1G "brick phones" in the early 1980's to the 5G rollout today. In terms of real estate it is impacting the way that we design and build property, lease, manage and maintain them, and acquire and sell them. There are numerous applications being developed, broadly covering three main areas:

- Smart buildings – smart phones will shortly provide us access to the workplace (prior to biometrics), there'll be sensors monitoring utilization and monitoring building service (building health checks). Smart cities are the ultimate goal.
- The marketplace – shared economy concept, exemplified by Airbnb and WeWork. This will enable a more efficient usage of space.
- Real Estate fin-tech – automation of buying, selling, leasing, financial processes and property management. We'll use VR to look at fitouts, developments and essentially bring property to life.

The ultimate aim is to make space more adaptive and to derive more money from real estate assets, either by offering additional services or by reducing business costs. The future could see landlords charge a rate for space and a rate for services like data usage.

Rather than a shopping centre having all of their tenants with individual supply chains, could the landlord be in control of the logistics and charge for it?

Westfield have been involved with an innovation lab for many years with "Onemarket" aiming to create better experiences in retail through the power of data, technology and collaboration. Rather than brands, retailers and venues all investing in technology independently, Onemarket is attempting to establish a united industry to deliver customer centric solutions. Elsewhere, Charter Hall teamed up with Collective Campus to offer Australia's first accelerator program for PropTech players. Some participants include:

- Bricks & Agent: have developed a smart, cloud-based platform focused on streamlining property management and maintenance. Whilst the first iteration of the software has focused on residential, B&A will utilise the accelerator program to further develop their commercial property product.
- Estate Baron: a blockchain-enabled software and services company enabling firms to efficiently engage in online capital formation, communicate with investors, distribute investment documents and centralize ongoing investor relations.
- InSpaceXR: leaders in applying immersive VR technology to real estate, with potential to help visualise, communicate and market assets to tenants and investors.
- Snaploader: visual tech company that have developed an innovative new web-viewer that enables potential tenants and investors to access interactive 3D model's of properties (including fit-out) without the need to download an app.

Will robots teach our kids?

It is difficult to see "AI" robots replacing childcare workers due to the educational, socialisation and safety aspects of the service. However, technology will allow better monitoring, safety and benchmarking of learning progress. More flexible work hours will require flexible childcare and we should see 24 hour childcare services to cater for the shift worker (similar to 24 hour gyms). The childcare workforce will arguably get older, given the aging population and more leisure time. There'll be simplified interactions in terms of managing bookings, staffing, payments, monitoring the child and transparency of the learning outcomes. The quality of educators will improve and be more consistent through AR and it is possible that

VR will also have a role to play given it is a more interactive experience and learning absorption is at a much higher rate. Improved technologies may help better identify child abuse or physical/health issues that can then be managed. From a real estate perspective, densification will see multi-level centres, with different age groups exposed to different activities on each level. Most sites tend to be in well located suburban locations so could be adapted back to residential or community uses readily, albeit we expect to see more facilities in shopping centres and office buildings in the medium term. Looking to 2050, if good social skills/manners and an education can be simply downloaded then the days for good educators are indeed limited.

Conclusion

It's an exciting time for real estate as it continues to evolve to meet the needs of its customers. Exploring the topic has opened a Pandora's box of opportunities and questions. Will we evolve to be cyborgs as per Elon Musk's vision, or will we be inferior to robots, sparking a Luddite revolution? Whatever happens, real estate will continue to play a vital role in the global rollout of technology and an active approach is the best way to ensure you are exposed to future opportunities. On earth and on Mars...



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