Between a Rock and a Hard Place: Land-Use Planning in the Second Machine Age

Abstract: The imminent arrival of the Second Machine Age (2MA) will usher in an era of unprecedented economic and social turmoil which is likely to rewrite, over the next quarter century, the structure and function of cities at up to 4 times the pace of the industrial revolution, which itself transformed cities in the two centuries or so following 1750. Events will be driven not just by a raft of impending technologies and the fluidity with which they can be blended, integrated or fused into new products, services and lifestyles. As the recent intergenerational report and others like it have concluded, turmoil will be further exacerbated by changing demographic structures and migration patterns, global economic engagement – including both trade and finance, government budgetary crises, the increasingly fluid nature of work and social networking, and shifting home-work relationships and travel patterns, among many other things.

Alas, such dynamism appears likely to hit a wall of urban inflexibility. Our sclerotic cities appear ill-suited to a world of rapid change for all manner of reasons, many planning related. For example, most planning systems arguably privilege the preferences of fearful incumbent residents over the preferences of outsiders. Excessive reverence for urban heritage stultifies imaginative proposals for badly needed higher density living spaces. Stretched public finances delay contemporary infrastructure provision. Our state and federal fiscal settings further ossify urban form in a variety of ways. Moreover, how can we conduct worthwhile long-term strategic planning when we can hardly conceive the configuration of fast-moving economy and society as little as 5 years from now? In short, many of our urban management procedures appear as an increasingly bureaucratic and conservative bulwark against imminent change at the same time as we need them to become imaginatively flexible and adaptive. How, then, can urban planning recapture the glory days of a century or so ago when it was in the vanguard of reimagining cities for the first machine age?

Introduction

> "Tomorrow, and tomorrow, and tomorrow, creeps in this petty pace from day to day, to the last syllable of recorded time; and all our yesterdays have lighted fools the way to dusty death. Out, out, brief candle! Life's but a walking shadow, a poor player that struts and frets his hour upon the stage, and then is heard no more. It is a tale told by an idiot, full of sound and fury, signifying nothing." William Shakespeare (1564-1616), Macbeth - 1606.
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> "If the rate of change on the outside exceeds the rate of change on the inside, the end is near." Jack Welch (1935 -), former CEO of General Electric.

These powerful quotations admirably summarise the main themes of my argument. Over four centuries ago, Shakespeare noted in one of the great soliloquies of all times that the past is a poor guide to the future. And Welch, something of an orator and word-smith himself, crucially noticed that businesses or, for our purposes, public administration frequently beach themselves when they fail to keep pace with changes externally imposed by technology and the market. Urban planning, for me, is beginning to resemble a beached whale for it seems to be blissfully unaware that a huge and accelerating raft of technologies will rewrite all dimensions of urban life in a few short decades, while those charged with managing the evolution of cities progressively lose sovereignty over their domain. In a kind of pincer movement, both technology and looming governance difficulties will likely combine to ravage our ideas of both long-range strategic planning and the minutiae of development control. In short, we are heading into an environment of extreme uncertainty. The antidotes, painful as they may seem be to those used to shaping urban form and function, appear to lie in the burgeoning fields of behavioural economics, community networking, and the crash-through culture of Silicon Valley[1]. Let me explain.

A Technological and Societal Tsunami

[1] This manuscript was compiled while listening to the end of Richard Wagner's Götterdämmerung, whose finale of fire and destruction also fits my theme.

Over the short to medium term, say 10 to 20 years, we are likely to witness the intersection of a large range of burgeoning and massively transformative technologies impacting economy, society, and environment (see Table 1). Brynjolfsson and McAfee (2014) and Rifkin (2011) variously term the future as the Second Machine Age (2MA) and Third Industrial Revolution, though I prefer the former designation. They and such authors as Brockman (2014), Hammersley (2012), Rawlings (2013), Stephenson (2013), Wood (2014) and de Waele (2015) also note (a) the dramatic decline in the lapse time between pure research and development of commercial products, (b) the ever faster adaptation of existing products to new & unimagined uses, and (c) the rising power of integrating, fusing and blending multiple technologies. All comment expansively on the dramatic shock society is likely to face in the short term. Indeed, the pervasive interaction of different technological innovations could help transform the application of Moore's Law, which correctly anticipated the doubling of semiconductor power every 18 months to two years, to many more facets of urban life. No aspect of urban living is likely to avoid serious disturbance, however often city residents try to cling to their conservative traditions and expectations. Moreover, these impending technologies appear largely uncontrollable, especially by local and state governments which nominally attempt to plan urban evolution. In the getting on for three centuries since the start of the industrial revolution, the capacity of governments to control technological evolution and its uses has proved to be vanishingly small and nothing on the horizon suggests that this is about to change.

Table 1. 16 Technology Arenas Likely to Transform the Structure, Aesthetics and Functions of Cities

1. Enhanced ICT (the internet of things)
2. Quantum computing (ever faster information processing)
3. Big data / information storage / expert systems
4. Robotics / Artificial General Intelligence (AGI)
5. New materials (light weight, high strength, anti-corrosive, good malleability, etc. – graphene and stanene)
6. Automated construction techniques (look up DIRTT in Calgary)
7. Human augmentation (wearable ICT, plus surgical implants as foreseen by Kurzweil (2005)
8. Smart everything: cities, homes, vehicles, leisure, work
9. New Foods (e.g. synthetic meat printed on 3-D printers; chemical cuisine (or Note-by-Note cooking); synthetic milk (developed in Boston by muufri); protein from harvesting insects) and their production in cities
10. Bio-medical (drugs or cures for many common diseases; GM advances; pharmaceuticals)
11. Transport (e.g. drones, driverless cars and trucks, Elon Musk's vacuum tubes, and aerospace)
12. Renewable energy generation and especially storage using new battery technologies
13. E-tailing and e-governance
14. Rapidly changing demographics (ageing, length of working lives, family structures, lifestyle preferences, working arrangements, work-social balances, social networking)
15. New financial technologies (FinTech) and business management protocols (Pixar example, Catmull, (2014))
16. Improved social networking platforms

Source: the author

Urban management, then, faces in particular the uncertain and rapidly changing mutual interaction of massively transforming construction techniques; transport modes; and ICT technologies with the power to enable smart homes, businesses, or daily urban routines. Simultaneously, there seems to be widespread recognition that the Table's list of technologies could destroy or radically modify perhaps 40% of all existing jobs over the next 20 years, while creating many new positions, albeit not

necessarily co-located with jobs lost. In short, it seems that current patterns of work and residential choice are also in for massive transformation about which we can estimate little at this stage. Alongside these events, many aspects of society itself will also be revised. It requires little imagination to realise that family and household structures could change dramatically with the complex mutual intersection of:

- the onset of much longer working lives;
- more flexible working hours and locations;
- declining birth-rates;
- ever expanding lifestyle choices;
- the dissolution of existing structure class structures: two to three for most of the nineteenth and twentieth centuries becoming perhaps eight to ten in the twenty-first (see Savage et al. 2013 for a British take on this theme);
- the need for almost constant skills retraining and life-long learning, coupled with the dissolution of current patterns of education across all five tiers from pre-school to life-long learning;
- ever more sophisticated and less spatially bound social networking;
- widening spatial mobility and increasingly flexible, if also often overloaded time budgets;
- the reworking of many the fiscal settings that have major impacts on urban form – including tax breaks to home ownership like negative gearing and capital gains tax exemptions for owner occupied housing, which collectively fuel over-consumption of housing goods and stifle venture capital for high-tech start-ups; and
- the emergence of a plethora of robots with artificial general intelligence (AGI), with whom we will have to live peacefully. Of crucial importance to city evolution, the advent of driverless cars could, according to discussions I have had in Silicon Valley, reduce the number of vehicles on urban roads by two-thirds when allied to the impact of car-pooling regimes and the likes of Uber ot Lyft. Since driverless cars are expected to crash a lot less often than ones driven by humans, that is not good news for employees in the smash repair and ambulance industries.

In short, technology and the whole functioning of society are likely to be hugely interconnected, with the former dominant in the changes taking place.

Governments that we enable to regulate and enable all of the above are also increasingly embedded in endemic uncertainties of the kinds identified by Taleb (2007) and Sorensen (2011), which collectively amount to a policy fog. At a theoretical level, these involve:

1. Economic and social complexity (multitudes of intersecting variables with extensive feedback loops), all made worse by globalization and rapid shifts in spatial patterns of production resulting from dynamic changes of comparative and competitive advantages among nations and regions;
2. Huge information deficiencies about each of the above variables and their impacts. In a fast moving and complex world, the information at our disposal is often patchy and soon hopelessly dated. Note that many of our current analytical models, which often use rapidly dating information, will have little application in the emerging world sketched here;
3. Extreme leveraging of both economic growth and decline in the spirit of chaos theory – witness (a) the growth of the BRIC nations, (b) the collapse of some American cities like Detroit, (c) the seemingly inexorable rise of futures hubs like Silicon Valley and Tel Aviv, or (d) the sudden collapse of governments and their attached ideologies in many parts of the world;
4. The existence of environmental and economic tipping points, typically leading to the sudden wrecking of some manufacturing or service industries. The demise of Australia's automobile industry is likely to be repeated many times in other industry sectors, including interestingly most of such professions as law, accountancy and medicine. Diamond's (2005) treatise on collapse captures nicely the dynamics of such events;
5. Asynchronous cycles (analogous with quantum mechanics); most economic processes take wave forms such as the business, product, technology, and fashion life-cycles (Sorensen, 2011). The chance intersection of these wave cycles across industries and nations as a whole poses nightmares for governors of reserve banks. They have grudgingly acknowledged two speed economies, but the reality might be closer to eight or ten;
6. Prevalent non-linearities between cause and effect among nearly all system variables (Taleb 2007, 2012);
7. The prevalence of such destabilizing psychologies like fear & greed, well described by Prechter's (2003) socionomics; and
8. Rising loss of domestic sovereignty to a slew of international regulatory or political agencies.

Gigerenzer (2014) ably discusses how to take decisions in complex and fast changing environments, alongside Taleb (2012), but neither in the end sufficiently captures the difficulties faced in managing cities, with myriad of complexly linked interests and preferences.

The acceleration of technological advances, coupled with the kinds of societal impacts just noted must then be connected with another dystopic element: the nightmare of massive government and governance incompetence. Governments are increasingly constrained by what one might term a democratic deficit. Simply put, the task of having to win elections and retain office against a background of endemic social fragmentation and an economic roller coaster ride is likely to impede seriously the task of effective policy formation and management in many policy arenas. The British study (Savage et al. 2013), noted above, reported the existence of seven 'social classes' in that country, not the two or three presumed for most of the 20th century, each determined to defend its perceived interests. By the way, my own back-of-the-envelope calculations suggest that Australia may have even more such classes once we dice and splice our population by age, stage in the life-cycle, income, wealth, life-style preferences, ethnicity, risk-taking profile, adherence to tradition and other dimensions. Such interests are often defensive and have little to do with adjusting to the inevitable economic and social realities of the emerging world order. In short, many future Australian governments are likely to represent unstable coalitions of diverse interests in which policy deliberations will be time consuming at the precise time that fast action is needed or demanded. Resulting policies are therefore likely to be belated, defensive and second-best compromises. Worse still, the politicians we elect mostly lack the knowledge and skills bases necessary to navigate the hazards of guiding society towards credible and desirable urban futures in a fog of almost complete uncertainty.

We should also recognise a spatial dimension: that some parts of the urban economy, society and landscape will likely be affected much more severely than others in terms of (a) the form and extent of damage to existing conditions, (b) opportunities for beneficial adaptation, (c) the scale and types of investment needed in new infrastructure, or (d) the need for sympathetic strategies to ameliorate harm or maximise adaptive capacity. Consequently, necessary responses will also likely be highly varied from one city or suburb to another – and even within some suburbs. Enduring one-size-fits-all planning strategies, whether focusing on development control or longer range strategic vision, seem largely irrelevant in the face of such difficulties. One can readily imagine that neither professional urban management bureaucrats nor even more especially their political masters can come close to understanding the processes at work, the direction of events and their effect on present or aspiring city residents, and prospective opportunities for change. Sorensen (2002) previously reached similar conclusions with respect to regional development policy, which faces similar complexities and dynamics. How, then, can we hope to **plan** the evolution of urban space over both short and medium terms when we do not and cannot know where we're going? Perhaps urban planning as we know it is becoming impossible and should be replaced by the term **urban management**, but where management is conceived along the somewhat revolutionary lines described below.

In summary, the imminent arrival of the 2MA will usher in an era of unprecedented economic and social turmoil which is likely to rewrite, over the next quarter century, the structure and function of cities at up to 4 times the pace of the industrial revolution, which itself transformed cities in the two centuries or so following 1750. Events will be driven not just by a raft of impending technologies and the fluidity with which they can be blended, integrated or fused into new products, services and lifestyles. As Treasury's 2015 intergenerational report and others like it have concluded, turmoil will be further exacerbated by changing demographic structures and migration patterns, global economic engagement – including both trade and finance arenas, government budgetary crises, the increasingly fluid nature of work and social networking, and shifting home-work relationships and travel patterns, among many other things (Treasury, 2015).

Alas, such dynamism appears likely to hit a wall of urban inflexibility. Our sclerotic cities appear ill-suited to a world of rapid change for all manner of reasons, many planning related. For example, most planning systems arguably privilege the preferences of fearful incumbent residents over the preferences of energetic outsiders bristling with ideas. Excessive reverence for urban heritage stultifies imaginative proposals for badly needed higher density living spaces (Productivity Commission, 2006). Stretched public finances delay contemporary infrastructure provision and preclude toying with imaginative new alternatives. Our state and federal fiscal settings further ossify urban form in a variety of ways, especially through their fierce favouring of home ownership over forms of investment – buttressed by capital gains tax exemption for owner occupied housing and negative gearing. Moreover, how can we conduct worthwhile long-term strategic planning when we can hardly conceive the configuration of our fast-moving economy and society as little as 5 years from now? Not even Hall's (1989) suggestion of placing the task of strategic planning in the hands of 12 great and good committee members is likely to deliver improved outcomes compared with present approaches because of their limited visions and capacities to understand the future. In short, many of our urban

management procedures appear as an increasingly bureaucratic and conservative bulwark against imminent change at the same time as we need them to become imaginatively flexible and adaptive. How, then, can urban planning (or management) recapture the glory days of a century or more ago when it was in the vanguard of reimagining cities for the first machine age? This was the world of imaginative industrialists like Robert Owen (New Lanark), George Cadbury (Bourneville), Titus Salt (Saltaire), or Lord Leverhulme (Port Sunlight), or imaginative thinkers and architects like Ebenezer Howard (of Garden Cities fame), Frank Lloyd Wright and Le Corbusier - all exponents of experimental action and effective polemicists for change (Hall, 1988). All these protagonists came from the private sector and were largely unaffected by the dead hands of politicians and bureaucracy.

Redesigning Urban Management

There is a raft of literature in economics, social relations, governance and psychology dealing with the task of accelerating the pace of change in particular facets of society. Economic theory has come in for a hiding not just from the likes of Taleb, but also for example from Thaler (2015) and Prechter (2003). Building on the work of Nobel prize-winners Kahneman and Tversky, they demolish the idea that people make rational economic decisions a lot of the time. Planners need to take their strictures to task and realise that most decision-making in urban space, whether that of businesses, residents or regulators, is psychological in one way or another and driven by base instincts like fear, greed, hopes, expectations, gut preferences and so on of the kinds brilliantly portrayed in Kahneman's (2011) epic work 'Thinking Fast and Slow'. Sorensen (2010) also noted that regional development policy – like planning – is a massively psychological or behavioural endeavour. This is a huge liability for the task of redesign the structure and functioning of cities to, as Jack Welch said in his introductory quote, at least match or even exceed the pace of externally induced change. And, in periods of impending turmoil the task appears to be well beyond the limited knowledge, imagination and leadership capacity of governments. Rather it is a whole-of-society learning process in which myriads of often conflicting ideas and visions are promoted and debated vigorously, but courteously, in an atmosphere imbued with a high level of risk acceptance and future orientation. A culture of trial and error will generate a large array of experiences from which we can select apparently favourable urban design features that would have struggled to see the light of day in earlier generations of top-down urban planning. This culture owes much to the philosophy of Michel de Montaigne (1580), the guru of *experience* and perhaps the sage of the 21st century – an era of complexity and rapid change. Suffice to say that Montaigne's ideas have crucially influenced the work of Nassim Taleb (2013) on how to handle uncertain environments, a conclusion that this writer also reached independently.

Our task of urban management therefore requires attention to the following themes:

1. The generation of large numbers of new and emergent ideas for many aspects of urban living: building design; residential densities; mixtures of competing or complementary land-uses; social complexions of neighbourhoods; transport and accessibility; home-work balances; delivery of essential infrastructure and services – including health-care and education; lifestyle preferences of different age segments or family structures; desirable environmental improvements – green spaces, urban gardens, renewable energy generation; the space and accessibility needs of businesses employing new technologies; and so on. Pentland (2014) sees what he terms social physics as crucial to both the generation and debate of such ideas – large numbers of informed, knowledgeable, open-minded and imaginative people coming together, possibly in virtual space, to toss around, meld and refine ideas – in this case for urban living. Such a culture lies at the hearts of such successful technological hubs as Silicon Valley and Tel Aviv (Saxenian, 1996). In a way it also resembles Taleb's (2013) strategies of optionality for individual businesses – a process by which entrepreneurs comb their operating environment creatively and imaginatively for a wide range of development options from which they select those with a combination of the greatest estimated future pay-offs and lowest downside risk. In the case of urban imagination, we need the energetic participation of architects, developers, civic leaders, community groups, imaginative individuals, existing residents, would-be future residents (who are almost entirely frozen out of current planning processes), infrastructure supply engineers, and futurists among others. Such a sprawling constituency requires exemplary and powerful leadership to galvanise and focus debate while maintaining high visibility in key media. Alas, professional institutes working in the urban domain have little public recognition and exhibit few of the required leadership qualities. Even the late Sir Peter Hall found it difficult to gain widespread public traction on such themes. So maybe this key dimension in urban imagination will struggle to get to first base.

2. Perhaps one trigger for more intense and considered public engagement in debates about our urban future would be to give much greater room for experimentation in urban living by key activists. Developers and architects are likely to have much greater appreciation of new design, construction and infrastructure technologies than the public at large or professional planners / regulators. Likewise, the businessmen who employ both developers and architects will often be acutely aware of market trends, opportunities, or threats and options for handling them. Thus the private sector, as with the seers who experimented with new urban designs in the 19th century, might be well placed to demonstrate paths to future through direct action. In this way they could also gain Montaigne-style experience about what works or doesn't work. Such crash through or crash approaches are the dynamo of the likes of Silicon Valley, where about 85% of start-up businesses fail. Who cares? Failure carries little shame, and start-up entrepreneurs frequently look for the next big thing, find more venture capital backers, and take to the air again. Alas Australia's urban residents are highly conservative, and planning systems here are designed to ludicrously over-protect them from anything imaginatively new (see Sorensen and Auster, 1990 for an early development of this theme). So, to trigger much greater urban design experimentation we will simultaneously have to reduce the power of existing residents to protest against development applications, and better empower prospective residents or businesses to argue the case for developments to proceed. Amendments to planning procedures and controls are only the beginning of this story. It might be a good thing to de-throne real estate from its iconic role in household wealth accumulation. That's easy in theory. Impose capital gains taxes on owner-occupied housing; abolish negative gearing for rental properties; wind back heritage protection provisions that stultify urban redevelopment (Productivity Commission, 2006); amend strata-title laws to enable faster redevelopment of apartment blocks; help developers assemble larger redevelopment sites at critical locations; and abolish stamp duties on property transactions. The last-named probably prevent many people from leaving their existing homes or business premises for places with greater amenity because of the heavy financial losses they'd incur. In short, our cities are a stultifying web of taxes and prohibitions preventing their swifter reconfiguration to simultaneously meet new technological demands and opportunities, enhance the community's wealth, and bestow more modern amenity.
3. One of the greatest blockages to ushering in the future, whether urban design or adoption of latest technologies, is the broad lack of an innovative culture among the population at large. Studies of such innovative nodes as Silicon Valley find them more risk accepting, educated and knowledgeable about emerging technologies, future oriented, less defensive, more networked, strong on mutual assistance and adoption of sharing lifestyles, private sector oriented – and with the concomitant of a strong sense of personal responsibility. In some ways this culture is quite inclusive – we're all in this task of inventing the future together. Greater adherence to such a slate of cultural attitudes could undoubtedly ease the path to more widespread acceptance of experiments in new or modified urban lifestyles. Government hectoring seems an unlikely path to preference for modernity and responsibility for advancing an experimental and can-do preference seems to lie in strengthening the institutions of civil society given over to sharing, mutual assistance, social equity, civic engagement, and the promotion of social diversity. This is not an easy task unless promoted actively by the leaders of change, but essential for what Sorensen and Epps (2005) have called Stable Adaptation.
4. Another blockage in the path or rapid urban evolution lies in the expense of retro-fitting urban infrastructure. And once again Taleb (2013) rides to the rescue with a seemingly improbable, but ultimately reasonable-sounding suggestion. He advocates building redundancy into much of our urban infrastructure to allow for fast construction responses to demand shifts for housing, factories, offices, logistics hubs and so on, thereby easing a little the pain of undertaking fast changes where additional infrastructure is needed.
5. Urban management operates, of course, on at least two parallel time frames: (i) the present and the short-term; and (ii) the medium to longer term, typically 5 to 20 years into the future. Both development control and strategic dimensions require attention to the first three themes raised above. And they together require enormous networking, drive and authority on the part of key participants, especially those with technological knowledge and future imagination to navigate increasingly complex and fast-moving economy and society. We need developers, infrastructure agencies, service providers of various kinds, technologists, forecasters and futurists to engage in vigorous, civil, and constructive debate about all aspects of urban living – a task that the seers performed in relative isolation in earlier and less complex or fast moving epochs. Perhaps such professional organisations as the Urban Development Institute of Australia, the PIA, and the Australian Institute of Architects, not forget associations in professional engineering and environmental management could host regular public forums to grapple with these issues. That's just the start, for such debates have to inform, and mould opinion in, the community at large.

Informed culture shifting of this kind would probably gain Kahneman's seal of approval, and raises the thought that we perhaps need planning's equivalent of Kahneman to impart psychological insight into urban management and rewrite existing theory. Irrespective of whether these kinds of debate are applied nationally, regionally or locally, they have to be ongoing given the fast arrival of new economies and lifestyles. In some respects, however, the task of long-range strategic thinking will be much more fraught because of the huge uncertainties and risks inevitably involved, not to forget the theme of how best we can retro-fit urban landscapes.

In Conclusion

These five dimensions taken together are complexly interrelated and their numerous strands are often difficult to implement individually, yet alone in a concerted and comprehensive way. In my view we must at least start immediately to debate their implementation earnestly and creatively, for time is short and the pressures for change are great. And, as noted earlier, discussion must be based broadly among all sections of society and presided over by top class leaders who can motivate participants, generate ideas, synthesise responses, and gauge optimal paths to follow. Does Australia have such leaders? Don't look to our political leaders for guidance. Where, then, are contemporary versions of Ebenezer Howard? Planning or urban management cannot any longer be about creating certainty. Rather it has become about minimising dysfunctionality in a society where the large bulk of the population – citizens, politicians, bureaucrats, and business-people are often pretty clueless about where we are headed. Instead we need plenty of imaginative ideas, implemented on a trial and error basis – from which we will gain experience of what works where and when in particular geographical environments. Perhaps urban management needs to adopt a strategy similar to that advocated by Ed Morrison (2010) in the context of regional development, an equally fraught and complex policy environment. He calls it strategic doing, which follows my earlier arguments about simply doing and learning from mistakes made, but also ensuring vigorous debate and discussion at a community level.. One last thought! Perhaps, even, literature might be a source of inspiration about planning in chaotic environments! For instance, Stanislav Lem's "Futurological Congress" might provide a few clues (Lem, 1985). The hero of this novel, which was written decades ago, awakes from a 50 year induced coma in 2039 to a world that no-one has seen before and one of the first things he sees is a deviant robot cornered by a robot cop. Just like us, he needs a fast learning curve to cope with his predicament.

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