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The impact of trade policy decisions on social Justice

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Australian administrative elites and the challenges of digital-era change

Patrick Dunleavy and Mark Evans

Abstract: Within long-lived public sector bureaucracies the organizational cultures developed by administrative elites have strong filtering and focusing effects on the kinds of technological changes adopted, especially in the modern era. Normally seen as very slow-moving and hard to alter, senior officials' attitudes towards digital changes have recently begun to change in more substantial ways in Australia. We review first a considerable reappraisal of the priority given to digital changes by top public services managers. This cultural shift has followed on from tech-lead disruptive societal changes affecting most areas of government now, and from the rise of global-scaled ICT corporations to become key management exemplars for officials. Second, we look at the chequered history of political leaders' interventions to speed up digital change, showing that in the period 2015-19 Australia witnessed both the initial power and later limits of such involvement. Finally, we consider Australia's recent experience with BDAI (big data/artificial intelligence), a key area of technological change for public service officials, but one that in a liberal democracy can also easily spark public resistance to their plans.

In the mid 2000s Dunleavy et al argued that

'it makes sense to characterize the broad sweep of current public management regime change in terms [of] new information-handling potentialities... The advent of the digital era is now the most general, pervasive, and structurally distinctive influence on how governance arrangements are changing in advanced industrial states' (Dunleavy et al. 2006, p. 478).

Yet Christopher Pollitt (2009, p. 31-2) observed that 'technological change is a powerful shaping influence on public administration... [yet] one which is seldom directly addressed.... [T]he majority of [PA] scholars proceed with their usual business, making few, if any, references to technological change'. The only exception Pollitt saw was a 'ghettoized'

discussion of e-government (p.32), more than a bit divorced from mainstream public administration. Nearly a decade later, Andrews (2018, pp.10-11) could still note that: ‘Technological change remains under-researched and under-theorized in the public administration literature...’. For a number of key reasons, however, this picture has now begun to change rapidly, albeit in a somewhat lagged fashion. A key reason for public administration scholars starting to ‘catch up’ with the importance of tech issues has been that the administrative elites (on whom most academics focus attention) have themselves recently re-prioritized IT systems and online transactions and information.

The first section of the paper explores multiple (and slightly miscellaneous) reasons why administrative cultures have changed in relatively short order, so as to assign a new priority to officials understanding and responding to digital change. Our key data sources come from systematic interviews in 2016 with senior civil servants from all branches of the Australian federal government (the Commonwealth level), plus near-continuous research engagements with a range of federal departments and different levels of officials (from senior staff to new trainees).¹ The core story here speaks to the rise of Silicon Valley companies creating disruptive digital changes even in areas of administration previously unaffected by them, and also changing the way that senior managers think about organizational issues. Within the public services, however, there clearly remain some distinctive barriers to the adoption of new organizational technologies.

In section II, we consider how Australia (as a ‘Westminster system’ country) creates a potential for political leaders to stimulate public service changes, and some of the limitations that surround their doing so in digital change areas. The final section explores some of the issues around the newest ‘state of the art’ governance approaches, which combine ‘big data and artificial intelligence’ (BDAI) to seek new levels of evidence-based interventions. We examine how the Australian civil service has responded to the early potential of ‘big data’ and some of the challenges illuminated by the first ambitious efforts to innovate with selection algorithms in this area.

I. Administrative elites ‘buy in’ to digital change

Strongly influenced by UK experience, the Australian civil service closely follows the lower-profile ‘professional’ bureaucracy path that Silberman (1993) argues characterizes the British and American types of civil service system. The Australian Public Service developed on a

‘generalist’ model, with substantial cross-departmental moves as part of a career promotion trajectory. The socialization of APS officials into ‘public interest’ values was mainly achieved via university education and some low-key, cross-departmental institutions that sustain a common APS organizational culture. Following the ‘Westminster system’ model the civil service also evolved as a generalist-dominated set-up - closely responsive to ministerial and political direction (Weller, 2001). Canberra too ran under the ‘Armstrong doctrine’ that the civil service has no constitutional standing or personality separate from the government of the day.

However, Australia’s post-war reliance on continuous immigration as a key motor of economic growth also vested all three tiers of government - federal, state and local authorities (in big cities at least) – with some ‘development bureaucracy’ features. For instance, professional and scientific agencies at various times assumed greater prominence in fostering agricultural and urban growth than in the UK model. These strands were easily incorporated into the ‘progressive public administration’ (PPA) quasi-paradigm current in the Keynesian heyday of the 1960s and ’70s (Hood, 1995), giving top federal officials greater respect of science, an attitude sometimes reflected in their more autonomous impacts on policy (Pusey, 1991, p.241; Bell, 1995). The APS also grew rapidly from just over 60,000 staff in 1941 to around 240,000 by the early 1970s (Halligan, 2004, p. 74)

This proved a peak in numbers, however, with staff falling back to 150,000 by the 1990s, and then to around 120,000 by the 2000s, half its peak size, (Halligan, 2004, p. 74). A large part of this latter change reflected first the arrival of cross-party ‘economic rationalism’ approaches in Canberra (Pusey, 2001), and later the evolution of fully fledged new public management (NPM) doctrines, albeit in somewhat humanistic form (MacDemott, 2008). This change reflected a greater political scepticism about bureaucratic expertise and greater policy assertiveness by Labour and Liberal/National governments. With continuous economic growth still maintained (albeit at lower levels), and recent decades’ tax receipts boosted by mining exports, the federal APS has never really faced strong austerity or cutback pressures – but longer-term staff- and resource-capping succeeded the previous decades of personnel growth. These pressures were at various times associated with the contracting out of IT services, greater use of e-government, and early forms of administrative automation.

In 2013 the outgoing Australian Public Service Commissioner, Stephen Sedgwick commented (2014, p. 3):

‘Today there is no doubt that the elected government sets the agenda and defines the national interest. And looking back over 30 years, it is clear the APS culture has

changed to afford primacy to that reality. But, having successfully created a responsive, action-oriented culture, concerns emerged that the APS may have become too reactive, too focused on the short term and the delivery of tasks, and unable to generate the range of new ideas that it might have liked. . . .

[A]mendments to the Public Service Act introduced in 2013 were intended to clarify the leadership responsibilities of APS leaders. These leaders remain responsible for delivering the government's immediate agenda. In addition, APS leaders are required to develop the capability to provide forward-looking, creative contributions to government about what that agenda should be, and to be *stewards of an enduring institution who scan the horizon and build capability within their agency ahead of predictable need*. [Our italics]

A key area of such stewardship is, of course, the operating technology and organization of departments and agencies, and their appropriateness for future tasks and eras.

When we examine how a given civil service culture adapts (or not) to digital changes pressures, it is important to take account of multiple other pressures. Governments have long been 'technology takers' in how IT and digital changes are incorporated in their own administrative processes. In their uses of digital technologies and systems, departments and agencies have generally followed along behind the corporate sector, and in some respects even behind consumers and citizens at large. In many new public management (NPM) countries, including the UK and Australia, extensive outsourcing of IT and digital tech to system integrator corporations left government officials struggling to maintain even 'intelligent customer' capability to critically assess the services (and prices) that they received from contractors (Dunleavy et al, 2006; 2008). They also lead to successive IT project cancellations and under-performances – such as that of Queensland health care system (Chisnall, 2018; Chesterman, 2013). There are often popularly mis-construed as government 'blunders' occurring at elite level (King and Crewe, 2013). Such incidents, along with the increased risks surrounding privacy losses of data and cyber-security problems over time, all tended to increase Australian civil servants' (and even contractors') aversion to undertaking large-scale IT projects – an attitude still visible in some agencies in our 2016 interviews. Not surprisingly, even recent analyses by public management scholars close to top officials accord little attention to tech-related issues:

'Every time an era is identified, the inadequacies are quickly found, the dissatisfaction, the problems. That is unsurprising. Each generation has its challenges. Technology is obviously one; we do not want or need administrative arrangements from a century ago...' (Weller and Haddon, 2016, p. 489).

One consequence of IT and digital issues receiving little priority in top officials' value systems has been a 'stop-go' pattern of digital change inside Canberra's federal government,

with periods of rapid change (as from 1990 to 2002) succeeded by periods of relative stagnation in digital progress (as in the 2003-13 period). PM John Howard promised in 1997 that ‘all appropriate services would be delivered electronically’ by 2001. And Australia was an early leader in e-Government (Accenture 2003; Chen et al., 2007), developing an international reputation that peaked in the early noughties (Clift 2002). In the mid-2000s Australia still seemed close to NPM-leader countries like the UK and New Zealand in terms of its adoption of NPM, weak IT-industrial policies and restrictive Westminster system executive predominance (Dunleavy et al, 2008). The country’s ‘e-government’ policy outcomes and IT systems implementation were still more effective than elsewhere, partly due to citizens’ and enterprises’ strong early adoption of internet technologies, and the legacies of a relatively coherent e-government strategy in the late 1990s.

From then on, however, progress slowed and became rather mixed across departments. Australia missed the original Howard e-government target for services to be up online by 16 years, despite it being a low risk digital change (Goggin, 2005). At state level interviews showed that: ‘IT is not considered a core activity in many government departments’ (Graham and Scarborough, 1997, p. 35). Halligan and Moore (2004) noted the absence of a unifying vision to inform Commonwealth level change. Some arms-length implementation agencies emerged to handle ‘blended’ or more IT-intensive solutions for delivering public services, especially Centrelink (Halligan, 2011). But although large, these bodies were seen by top officials as inherently specialist, necessarily located at several removes from the APS mainstream. In the mid-2010s Australia still fared well in the plethora of consultancy ratings of e-government, for instance, ranking second to South Korea in a UN ranking (United Nations, 2014, p. 15). But the frontiers of digital change had in fact substantially moved on from the kinds of things featuring as components in dated e-gov indices.

By contrast, in our 2016 interviews senior APS officials clearly recognized that digital changes in civil society had both accelerated in tempo and broadened out in scope, so that it was now hard all aspects of domestic governance to keep up. The ‘move fast and break things’ style of Silicon Valley corporations (Taplin, 2017; Ganesh, 2018) has often meant that officials are caught by surprise. Previous ‘backwater’ areas of public management have been transformed by the sudden arrival of radical disruptors – as with taxi administration and Uber, or property regulation and Air BnB. In some cases, regulatory officials have been forced to change within two years from operating in an early twentieth century, paper-based

regulation fashion to trying to regulate brand new digital marketplaces. Similarly, previously labour-intensive regulatory bureaucracies, such as customs and immigration systems, have been telescoped by digital IT changes since the late 1990s into becoming some of the most high tech, ‘zero touch technology’ (and even robotic) areas of government.

In the mid-2000s also, government officials in large countries (like the USA) or medium countries (like Australia and the UK) still took pride in the greater scale of their datasets compared with those of their domestic private sector counterparts, in the unrivalled quality and depth of government information and statistics, and in the enhanced security and privacy protection of government data compared with firms’ provision. By 2016 top Canberra officials recognized that that era has long since passed, perhaps especially in Australia with its relatively small national population (26 million people). All the big American GAFAM companies (Google, Amazon, Facebook, Apple, Microsoft) now run cloud datasets in real time for hundreds of millions (or even billions) of customers. And their scale, updating time, and quality of security and privacy protection all dwarf or match those of government-run systems.

Thanks to social scientists, governments also used to have access to official data, statistics and analyses that clearly out-performed corporate sector information sources. But now corporate data holdings are beginning to dwarf official datasets, in their speed of renewal, in the intimacy and sensitivity of the data handled, and in the quality of detailing about individuals, households and enterprises that they can give (Savage and Burrows, 2007; Bastow et al, 2014, p. 133). Officials in business-facing Australian departments were the most aware of this important shift.

The concept of government as the sole or prime regulator of economic and social life has also taken a knock on many fronts. The key Silicon Valley platform companies, whom Tusikov (2016) terms ‘macro-intermediaries’, have emerged as the predominant global regulators of content and user behaviours on their indispensable sites. They are also often key controllers of payments, e-identities and other matters. Beyond the USA and China, and the collective weight of the EU, no national government of Australia’s scale now has much individual leverage with the internet giants on how their internal processes operate across multiple national markets simultaneously. In many key respects (such as the visibility of a business to its potential customers) the internal, ‘private law’ regulation of content users’ behaviour by platform providers, and the detailed ways that the giant companies run their

operations, have already rivalled or even displaced public law in importance. Perhaps this is because of long lags in governments adjusting their regulatory set up, that may be rectified in time. But it also undeniably reflects the salience of GAFAM companies' services to citizens and firms in Australia, who have (as elsewhere) come to depend on them.

Officials also recognized the importance and pervasive effects of firms and consumers switching over to smartphone and cloud-based services. There were approximately 13.5 million internet subscribers in Australia at the end of December 2016, and only a small minority of people were without some level of access (ABS, 2017). Although it might have seemed a natural progression for a development state with major infrastructure experience, the huge scale of Australian distances has meant that only low progress was made in implementing the National Broadband Network (NBN). By 2016 Australia only ranked 50th in the world on some connection speeds (*Guardian*, 2016).

Most top officials repeatedly stressed in our interviews that citizens now fully expect the same quality of transactions with government that they experience with private firms and other service providers through their Ipad or smart phone. All new services would have to be digitally based, and designed from the outset for citizens who are 'digital natives'. Not to keep up, risked government becoming less nodal in society, and hence getting pushed more and more to the fringes of networks and conversations that mattered to citizens, and many firms. The Mygov.au portal site, with its strong links to different services like taxation, welfare and immigration was seen as reflecting this pressure. Only a few officials still held to the previous elite conventional wisdom, that government websites and online services only need to be 'plain cooking' without frills, because citizens by and large visit them only when they are forced to do so.

The extent to which this implies changes in the way that the APS operates can be gauged from official targets. It was not until comparatively late on that the Department of Finance (2013) partly followed the UK's lead in using digital changes to foster large expenditure reductions. In June 2013 they introduced quite a loose 'digital first', requiring that 'by December 2017 Australians will be able to complete the vast majority of their business with government online'. In 2016 the Turnbull government converted this rather vague goal into more of a 'digital by default' policy on UK lines. All departments or agencies having more than 50,000 transactions with firms or citizens per year needing to achieve 80% transactions online - but by 2025, a very long time-frame indeed. Many medium and small agencies remained outside the target's reach though.

A report compiled by Deloitte (2015) assumed that the target would be met and then projected what else would need to change so as to attain it. The results are shown in Table 1 below. Online transactions in 2015 were estimated at three fifths of the total, and the scenario for boosting that to 80% target assumed an even-handed halving of postal and face-to-face transactions as a result. However, this was not an independent analysis either of likely trends in government's 'channel mix', nor a prediction of whether the 80% target will in fact be under- or over-achieved.

Table 1: Forecast trends in Australian federal government transactions volumes

<i>Type of transaction</i>	<i>Forecast % of 2025 transactions</i>	<i>Actual % of 2015 transactions</i>	<i>% total costs 2015</i>
Online	79.9	60.4	5.2
Phone	8.7	17.1	24.3
Postal	6.1	12.0	33.0
Face to face	5.3	10.4	37.6
Total	100.0	100.0	100.0
Transactions volume (Millions)	810.2	810.5	

Source: Deloitte (2015, Table 3.2).

A more subtle influence on top officials' views concerns how far the rise of the GAFAM companies has altered the wider management models that administrative leaders have in mind when orientating their careers and their organizations' development paths towards future trends. In business management (and in academic business schools' management theory) the priority assigned to the digital capabilities of companies and industries has greatly increased compared to previous decades. Digital technologies have come to dominate and disrupt many private business sectors, changing the whole organization of industries and firms (Bloom et al, 2009), instead of being confined to IT areas. So, for all corporate managements now their ability to anticipate and adapt to a constant stream of fast-moving digital changes has become the acid test of success. Australia's top civil servants once stood aloof from such tech-driven management thinking, but now they no longer do so. Where once their chosen comparators were Australian banks, insurance or resources companies, by 2016 officials' primary sources of inspiration and examples of good management practices were digitally-based and innovation-orientated companies, especially the key Silicon Valley platform corporations.

Towards the end of our interviews we asked all of our interviewees if digital changes had now plateaued, or were they likely to continue in the next decade at or above the pace of recent years. They unanimously chose the latter. No one in government now expects a ‘quiet life’ on the technology and organizational fronts – a significant change from senior leaders’ attitudes in earlier periods.

There are multiple ways in which administrative macro-cultures can change an earlier conventional wisdom so as to try out alternative approaches. Public managers operate (by and large) with only ‘quasi-paradigms’ competing for plausibility, so there is no Kuhnian death-match where a successor doctrine must completely drive out its predecessor via rigorous proof or experimentation (Margetts and Dunleavy, 2013, pp.1-2). Instead different management philosophies may be layered on top of one another (as NPM was with the earlier PPA culture in Australia). Or they may be segmented, with older views holding sway over part of the terrain, but new ones influencing a defined area (as with DEG in the older, segmented ‘e-government’ area). Or across a broader area of concerns the old and new approaches may blur and inter-penetrate each other, producing some form of synthesis. Our interviews yielded evidence of all four super-cession processes operating in different types of organizations. DEG ideas extensively replacing NPM were most evident in the largest transactions handling departments, while segmentation remained strongest in small policy departments. Other agencies showed a layering of NPM and DEG processes in some cases, or a blurring together of NPM and DEG ideas driven by multiple processes.

II. Political leadership on digital change

Australian officials can generally look forward to rising government spending with some equanimity – for instance, even the global financial crisis of 2008 left the economy relatively unruffled. However, it did produce an emergency savings whip-round by the then Labour government, who cut federal IT funding by 20% in the crisis’s onset year, in order to raise resources for a precautionary increase in bank liquidity. That ‘political’ interference with long term IT spending was accepted at the time, but was still frequently cited by officials in our 2016 interviews as disruptive of planned IT and digital development. It was also seen as of a piece with longer term political imperatives to limit the size and cost of government, a stance now recognized as unlikely to shift much with changes of partisan control in Canberra.

Looking forward, a minority of officials (often in smaller departments) were pessimistic about what tight political controls meant for their ability to develop a thriving culture of digital change, or even just keeping their IT systems and business-critical software up to date in some smaller agencies. The majority recognized a paradox, however. In the long term, caps on spending provided conditions that incentivized their organizations towards adopting more digital change. But in the short term, funding constraints and under-funding also complicated or obstructed the investments needed to achieve medium- to long-term efficiency gains.

Top officials recognize that pressures from voters on politicians to keep down government costs will also shape digital changes in their relatively ‘immortal’ (or at least very long-lasting) organizations (Kaufman, 1976). They recognize and have internalized the proposition of ‘Baumol’s law’, that the relative price of low productivity services will ineluctably rise compared to those in high productivity sectors of the economy (Dunleavy and Carrera, 2013; New Zealand Productivity Commission, 2018). But now officials also generally see Moore’s Law (that the processing power of microchips will double every two years) as a possible countervailing development, offering a route out for improving public services fast, perhaps even faster than in some private industries.

Australia’s early e-government phase through the 1990s was extensively shaped first by Labour ministers looking for NPM modernizations, and later by the Howard governments’ insistence on outsourcing ICT services to major system integrators and achieving spending reductions. The long ‘stop’ period in the pace of ICT development from 2003 to 2013 was only hesitantly modified by the Labour governments of 2007-13, with renewed ministerial interest in digital change surfacing only at the end of the period. The return of Liberal-National government under Abbott put the federal civil service on the defensive again, with the PM widely seen as unsympathetic to long-term planning for public sector modernization – as opposed to shrinking.

When Malcom Turnbull became PM in September 2015 (following an internal Liberal party ‘spill’ deposing Abbott) he struck a far more emollient note, urging the Australian Public Service to embrace digital changes: ‘One of the pillars of our innovation agenda is government as an exemplar. I want you to be bold in your thinking. I want you to lead by example’ (Turnbull, 2016). To pioneer cultural change Turnbull closely followed the template of the UK’s successful Government Digital Service (GDS) (National Audit Office, 2017). He created a Digital Transformation Office (DTO) to undertake hands-on IT

modernization projects jointly with staff in federal departments. On GDS lines, the aim was to ‘seed’ a greater understanding of modern online and digital potentials across a wider swathe of public managers. A leading figure from the IT efforts in the UK’s Ministry of Justice, Paul Shetler, was imported to run DTO, and given a wide brief and a lot of freedom.

Shetler succeeded in hiring creative staff and getting six or seven digital change projects under way with departments per year. DTO also held conferences, ran training sessions and created a blog designed to ‘spread the culture’ of bottom-up digital transformation amongst ICT and sympathetic policy staff throughout the APS. Almost immediately Shetler met some frictional resistance and scepticism from many department Secretaries. Even in the DOT’s early days, at the time of our 2016 interviews, some Secretaries clearly felt that its philosophy of grass-roots-change via pilot projects run jointly with departments threatened their integrated control over strategy and staffing. A minority of our senior respondents gave clear sceptical signals about the ‘transformative’ and delivery emphasis of the DTO, and tagged its head Shetler as a Canberra outsider who would have to learn the ropes to succeed. And despite Shetler’s radical evangelism about ‘transforming Australian government’, others saw DTO’s few, modest interventions as too unambitious in scale to make much impact on APS culture in any reasonable timeframe.

These cautious voices also argued that maintaining any Prime Ministerial momentum behind digital transformation would become progressively more difficult, unless it was successfully institutionalized early on. The focus that Turnbull could give digital change issues as PM would be likely to diminish, as other issues piled up demanding his urgent attention. And so it proved to be. In a 2016 reorganization pressed through by a junior minister in the Prime Minister’s and Cabinet Office (PMCO), the DTO ceased to be an independent agency reporting to the PM. Instead it was moved within the line management of the PMCO department, renamed the Digital Transformation Agency and given a new and additional parcel of service-wide digital/IT regulation functions (*GovInsider*, 2016). Now reporting to a generalist civil servant, Shetler was effectively demoted from being Chief Executive to becoming just the Chief Information Officer of the new Digital Transformation Agency. He soon resigned, citing ‘philosophical differences’ with the minister (Nott, 2017a). Having left for Singapore, a few months later Shetler gave a series of interviews that were unusually critical of the federal civil service, and that lifted the lid on some of the internal conflicts around digital change policies. He argued that ‘the Australian Public Service must wean itself off the "eye-watering" expense of hiring contractors and temps to undertake its IT

projects' (Towell, 2017a). In *The Mandarin* (a house blog for upper level APS officials)

Shetler

'said [that] under his leadership the DTA had only made "a start" on exemplar projects, whole-of-government platforms and delivery hubs but still had a lot of work left to do, pointing to over 1524 federal government websites, lots of "broken customer journeys" and "repeated IT failures" over recent years as the proof' (Easton, 2017).

At the least then, the chequered fortunes of DTO (now DTA) point up some of the acute difficulties in political, ministerial or Prime Ministerial initiatives acting as agents of long-run, sustainable digital change in the APS as whole. In an era of rapid turnover of 'disposable' political leaders (Tiffen, 2017, Ch.3), and marked by the political short-termism induced by Australia's three year electoral cycle and 24/7 media pressures, the support of the Australian PM powerfully generalized the recognition of digital modernization's salience amongst administrative elites – but only for a relatively short time.

Even in the toned-down and more conventional-looking form of the Digital Transformation Agency, the political push for digital era governance was vulnerable. In August 2018 Turnbull too was voted out as PM by his party, and replaced by the Treasurer, Scott Morrison. DTA continued under the new premier, but by early 2019 speculation grew that it might soon be downgraded further in importance, by being moved from PMCO to become just another (primarily regulatory) part of the budget agency, the Ministry of Finance.

III. Big data and artificial intelligence – early experiences

Big data can be defined in multiple ways, but its most distinctive features include having very large volumes of data (e.g. petabytes), that is frequently updated (ideally in real time) and offers a comprehensive picture of the population of cases (so it is a census and not a sample) (Kitchin, 2014). 'Big data' analysis has widespread application in the government sector (Dunleavy, 2016), especially when allied with the algorithmic methods of artificial intelligence considered below. Yet there is also considerable public resistance to automatic and impersonal systems being used that might erode citizens' privacy in new ways. An immediate impact has been to rule out government agencies themselves being able to analyse citizens' or enterprises' digital footprints or social media data, except in the special fields of

national security, counter-terrorism or counteracting organized crime. Fears of a ‘big brother’ or omni-surveillance state inhibit any direct learning from around half of all contemporary ‘big data’, despite their huge potential and immediate (real time) relevance for much government work. As in other countries, Australian citizens are far more willing to trust GAFAM companies and other service suppliers with immensely detailed real-time information about their behaviours than they are government agencies. However, academic research using social media data in anonymized ways (and perhaps some kinds of consultancy work) undertaken for government agencies is still feasible.

As a result, ‘big data’ analyses within government still focus almost exclusively on ‘administrative data’, that is information owned by the agencies concerned, and primarily generated through transactions like paying taxes, claiming welfare payments, seeking licenses and looking for or giving information on government websites. ‘Big data’ from such sources has already opened up a potential for government agencies to develop genuinely ‘free’ (not just taxpayer-funded) services, where scalable information provision allows marginal consumers to be added at zero (or near-zero) marginal cost (Anderson, 2009). For instance, data on house prices recorded by the UK Land Registry are analysed to generate for any interested citizen free, comprehensive and real time information on house prices in their area, at different spatial levels. Such applications of ‘big data’ are crucial in helping government to retain what Hood and Margetts (2007) term ‘nodality’, that is, a central place in society’s information and communication systems where the state receives information for free and can broadcast messages to which civil society gives special attention or credence. Public sector bodies must continuously compete in information and attention terms with the major social and economic interests that they are seeking to regulate or influence.

Other key big data uses are in improving the comprehensiveness and timeliness of agency information, as with a border control agency upgrading its ability to scan immigrants using biometric passports; using existing information more intelligently, for instance to achieve a better targeting of welfare payments or grants to industry; and improving regulatory capabilities so as to speed up the detection of problems and to better monitor the implementation of corrective measures. In all these uses data collected for transactional purposes requires skill to analyse, since it is set up with administrative rationales in mind, rather than being designed for research analyses or use in carefully constructed national statistics measures.

Machine learning forms the middle part of the big data/ artificial intelligence (BDAI) combination. It is ‘concerned primarily with prediction’ (Varian, 2014, p. 5), but may also involve data-mining, which primarily focuses on summarizing data and extracting interesting findings. The emphasis here is on the capacity of very large-scale (and tireless, frequently repeated) iterations of analysis to uncover emergent effects and connections within big databases (Armstrong, 2015). There is a contrast with previous forms of programmed analyses here, because the computers involved operate inductively or ‘learn in the wild’, connecting up information autonomously so as to build a mosaic potentially showing a new picture, without the pre-conceptions, mental biases or limits that human analysts can impose. Finally, the Artificial Intelligence component of BDAI involves the development of algorithms, that is a process of making decisions according to rules that is capable of making selections in complex contexts. These are sophisticated choice and detection processes that can be deployed so as to produce (hopefully) improved administrative actions from analyses of ‘big data’ sources. Algorithmic selection is strongly advanced in the operations of all the GAFAM companies, but much less practiced inside state agencies. The first column of Table 2 shows a typology of AI selection applications (initially formulated by Latzer and colleagues). The second column shows some government applications already in use by public agencies in advanced industrial countries. Some of the Australian examples here are long-standing but unspectacular. For instance, internal search engines in government online sites are usually (in most countries) much less effective in finding relevant webpages or information than are general Google or Bing searches. Other developments are still new, potentially very promising, but limited until recently. The last two rows in Table 2 are areas not yet developed in the Australian public sector. Currently no agency is producing government documentation using robot writing systems (akin to algorithmic journalism, although that is developing fast). Similarly, there is a lot of potential for using tireless and impeccably neutral talking (ro)bots to manage service marketing or consultation conversations (which can then be text-analysed for emerging themes). In future bots may even be able to facilitate focus groups or larger discussion meetings.

In our 2016 interviews senior officials in most departments, and especially organizations with heavy transaction loads, were enthusiastic about the capabilities that ‘big data’ advances had for improving their information about and detection of policy problems. For instance, analyses in the Department of Human Services showed that children who had to look after a severely ill or disabled parent on social security benefits were themselves

Table 2: How different types of algorithmic selection applications are or might be used in the government sector

Functional type of algorithms	Government sector uses
Search	Internal government search engines
Observations/surveillance	Security and intelligence surveillance via linguistic clues Facial recognition programmes in CTV systems Monitoring employees
Prognosis/forecasting	Predictive policing Predicting terrorism Predictive modelling of developments (e.g. flu waves, or animal diseases) Detection of stressful answers in phone transaction systems (e.g. may indicate a taxpayer or benefit claimant having difficulty in answering questions, or lying)
Aggregating data	Data matching across main government IT systems
Filtering	Automatic 'triage' systems for prioritizing correspondence
Recommendations/ influencing people's choices	Online behavioural public policy or nudge systems
Scoring performance	Reputation systems (going beyond league tables)
Allocating resources	Algorithmic placement of government advertising Algorithmic evaluations of resource priorities Algorithmic direction of government/emergency service messaging in crises
Producing content	Algorithmic production of documentation (i.e. robot writers)
Facilitating personal interactions	Online or phone-based consultation bots or deliberative process bots (i.e. robot consultation-conversation managers or facilitators of discussions)

Source: For all but one rows in column 1, Just and Latzer (2014, p. 250). Column 2 and the last row are added here.

Notes: Orange shaded rows show potential applications, not yet implemented.

disproportionately likely to end up as long-term recipients of social security. Hence pre-emptive interventions to give extra help to such children (and their parents) at an early stage could offer long-term gains for them as adults, and also potential savings in terms of reducing benefits dependency.

Yet administrative elites also saw some key barriers in developing BDAI capabilities. A first group involved privacy constraints on using data only for the original purpose for which it was gathered. Constraints of this kind have tended to be quite onerous and also variable and

legislation-specific in Australian federal government. However, long-term work has been done to try to make data-sharing for legitimate purposes easier to do across departments and policy sectors. The second most frequent concern was about data quality. Machine learning and AI can only be as good as the datasets used to find connections or train algorithms. If data contains inaccuracies, or is limited in what it covers, then analyses or predictions made from it can potentially be deeply flawed. Apparent government agency mistakes may create reputational damage for ministers and public agencies, invite opposition criticism and attacks, and often prove costly in terms of retro-fitting patches or correcting mistakes in online processes that are already rolled out. Again, improving data quality in main datasets is a long-term APS effort.

A third set of barriers concern linking BDAI processes to the often-coercive powers of government, which implies that mistakes in data analysis or prediction can impose substantial costs on citizens to whom administrative actions should not be applied. If they occur on any large scale, such mistakes may risk collapsing the normal interactions between citizens or enterprises and government agencies. Phone lines clog up with complainants, many phone calls never get through, and those that do entail long and frustrating waits for citizens or firms. Recognizing that an agency has made a mistake takes time, so that an initial period of denying or dismissing complaints is succeeded by administrative confusion, and only belatedly by acknowledgement of the mistake and systematic efforts to rectify it. Especially in large transaction services, the potential for a public and electoral backlash here can be considerable.

Some of the sensitivities involved in developing BDAI were aptly illustrated by the ‘robodebt’ crisis of 2016-17, which followed a major data-matching effort by the Department for Human Services and its transactions/ welfare payments agency Centrelink. Originally a set of processes for detecting possible benefits overpayments were trialled in 100,000 cases using human staff in 2015-16. By comparing records of income received and time worked in a given year from the Australian Tax Office with means-tested unemployment payments and time-specific benefits made to claimants, Centrelink staff sought to eliminate fraud and recoup benefit payments that seemed unjustified. The same processes were then automated to use only AI detection and with online notification of demands for repayments. These started operating in 2016 as the Online Compliance Intervention (OCI). In the initial implementation OCI messages often concerned periods stretching back over several years. Early estimates claimed that OCI would raise \$2.1 billion by 2020.

In practice, the OCI generated thousands of debt-looking notices. Citizens were notified electronically on MyGov.au (the federal government's portal). If they failed to respond online, they were then sent a letter to their last known address. Initially they had only 21 days to respond (later raised to 28 days) before their case was passed to private debt collection agencies. The rolling out of the initiative led to a storm of public protests as people and households were pursued for alleged debts, many of which proved to be incorrect or were revised down. Critical lawyers observed that the Department of Human Services passed over to claimants 'an inconvenient burden of proof' (Hanks, 2017) that they were not over-paid, whereas in Australian private law it is up to someone owed a debt to prove its existence and scale. The political damage increased when the media and critics came up with the evocative label 'robo-debt' to stigmatize the AI-led and online operations. Centrelink contact centre phone lines were flooded and became very hard to access. And a succession of disturbing individual cases of citizens' being asked for impossible information, or their information not being given credence, created damaging press and TV headlines, fuelling left criticisms of a government drive against poor people (Forgione, 2017). The Department of Human Services and Centrelink were widely criticized by welfare NGOs and activists and legal academics for what they claimed were multiple OCI design flaws, and for the 'aggressive' manner adopted by officials to collect alleged debts (ACOSS 2017). A Parliamentary committee concluded that OCI 'lacked procedural fairness at every stage and had put thousands of innocent Australians through the trauma of having to prove they do not owe the money the welfare agency demanded' (Towell, 2017b).

The Secretary of DHS later admitted in Senate questioning that 20% of people sent debt recovery notices in fact had no debts at all, and in a further unspecified quota of cases the sums initially asked for were radically reduced. The Commonwealth Ombudsman (2017) accepted the 20% level as legitimate administrative querying, given the existing law, plus the large scale of Centrelink's annual benefits payments and accompanying anti-fraud responsibilities. But critics saw the stress imposed on families by non-working agency phone lines and repeated referring back of citizens to the online system when they did get through to a contact centre (amply documented in the Ombudsman's report) as imposing unacceptable stress on families. The Ombudsman called for significant changes in operational policies before new tranches of more vulnerable 'customers' were brought into the system. The Audit Office (ANAO, 2018) concluded more favourably that the DHS fraud prevention systems were effective.

From his exile in Singapore, Paul Shetler the former head of the DTO, publicly criticized the two agencies involved, noting that: ‘The problem with this one [OCI] was quite simply you had an algorithm, which frankly wasn’t working properly, that was trying to match really disparate data sets... You’re trying to match fortnightly [unemployment benefit] data with yearly [tax] data; you’re trying to extrapolate on the results. And it fails’ (quoted in Nott, 2017). ‘If they were a commercial company, you would go out of business, with a 20% failure rate, a known 20% failure rate, you would go out of business, any other kind of [data] matching service would’.

The gains projected for OCI were initially large but later scaled down, partly due to the swamping of Centrelink phone lines and the public controversy creating a need for changes. ‘Human services minister, Alan Tudge, told *the Guardian* [in late 2016] that the new system had lead to a huge increase in the number of “compliance interventions”, from 20,000 per year to 20,000 per week’ (Nott, 2017). In fact, the Australia National Audit Office (2018, Table 1.2) later found that the number of Centrelink anti-fraud ‘activities’ increased, but only from 0.99 million in 2015-16, to 1.08 million the following year, and 1.10 million in 2017-18 – that is less than a 12% increase. In terms of recouping overpayments in practice, the OCI reputedly raised less than a quarter of the projected revenue during its first year of operation. The Audit Office gave no quantified evidence of net savings achieved over any longer period, despite endorsing DHS’s anti-fraud efforts. However, defenders of the system argue that it has increased benefit claimants’ awareness of the legal requirement on them to promptly file changes of their employment circumstances online with Centrelink (every two weeks), and OCI has probably made other savings through deterring fraud or lax compliance with benefit regulations. However, it may also have deterred some legitimate welfare benefit claims, so that no clear view of OCI’s wider effects currently seems feasible.

The end result then was that an ambitious and large-scale transition to AI-only modes of operating was introduced perhaps too simply, and perhaps with insufficient testing and development for its full-scale roll-out. As in other service delivery crises, the likelihood of initial costs savings projections being met can decrease sharply when there is a public reaction against changes seen as reducing service quality.

Conclusions

Is there now any area of modern public administration where digital changes of many diverse kinds are not amongst the most pervasive and potentially disruptive challenges that officials confront? The trends reviewed in our first section suggest not. As a result, digital roles have quite recently become far more central in top Australian officials' views of what public management is and where it is going in future. Shifts in private sector management theory towards 'Silicon Valley' models have helped top officials to re-value and upgrade their previous mid-to low estimates of the importance of digital change. Despite other constraints, changes in achieving appropriate organizational cultures in APS departments and agencies are still seen by officials as one of the key barriers to thorough-going digital modernization. The support of one Australian PM for a time powerfully generalized the recognition of digital modernization's salience amongst administrative elites. But its petering out also highlighted the limits of a political impetus for achieving sustainable modernization. The early Australian experiences of trying to implement new BDAI techniques in public management contexts have also brought out some key limits operating in liberal democratic countries, probably necessitating a slower implementation and a longer learning process than ambitious officials and ministers at first planned for.

Notes

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1. Our key interviews took place in spring 2016 and involved talking at length with 20 Departmental Secretaries, Agency Heads and National Managers, eight Deputy Secretaries, eight Chief Information Officers of departments, and six senior advisors to government on digital/innovation programmes. In most cases interviewees also provided detailed written responses to our core questions, explaining how digital changes affected their organizations and programmes. For further details, see Evans et al (2019).

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