

**SYMPOSIUM ARTICLE**

# Public administration, public leadership and the construction of public value in the age of the algorithm and 'big data'

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Public administration scholarship has to a significant degree neglected technological change. The age of the algorithm and 'big data' is throwing up new challenges for public leadership, which are already being confronted by public leaders in different jurisdictions. Algorithms may be perceived as presenting new kinds of 'wicked problems' for public authorities. The article offers a tentative overview of the kind of algorithmic challenges facing public leaders in an environment where the discursive context is shaped by corporate technology companies. Public value theory is assessed as an analytical framework to examine how public leaders are seeking to address the ethical and public value issues affecting governance and regulation, drawing on recent UK experience in particular. The article suggests that this is a fruitful area for future research.

## 1 | INTRODUCTION

In one week in May 2018 the UK Health Secretary blamed a computer algorithm for errors in cancer screening, South Wales Police admitted that the facial technology system they had used had thrown up thousands of 'false positives', Amnesty International attacked the Metropolitan Police's Gang Violence Matrix database as being racially discriminatory, and the data profiling company Cambridge Analytica, under legislative scrutiny in the UK and other jurisdictions over Facebook data harvesting, closed for business (BBC 2018; Burgess 2018; Hansard 2018; Solon and Laughland 2018). The challenges of algorithmic and data governance to public authorities could scarcely have been more dramatically revealed.

Yet technological change has largely been neglected by public administration (Dunleavy 2009; Pollitt 2010, 2012). Some researchers have articulated a new paradigm of 'digital-era governance', holding out 'the promise of a potential transition to a more genuinely integrated, agile and holistic government' visible in all its aspects to citizens and employees alike (Dunleavy et al. 2005). This has been developed further as 'Essentially Digital Governance' idealized as a 'hypothetical new state' with 'a small intelligent core, informed by big data, its activities restricted mainly to

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policy design, while citizens using a range of internet-based platforms would play a major role in devolved delivery, leading government (at last) to a truly post-bureaucratic, "Information State" (Dunleavy and Margetts 2015). More cautiously, others see digital technology as an enabler of 'more efficient, transparent and effective government', drawing on 'mobile applications, open data, social media, technical and organizational networks, the Internet of things, sensors, data analytics'. These may demand 'new styles of leadership, new decision-making processes, different ways of organizing and delivering services, and new concepts of citizenship' (Gil-Garcia et al. 2018). Others (Fountain 2001; Borins et al. 2007) recognize the growing role of political leadership in shaping digital government. While Dunleavy et al. (2006) addressed the power of large IT corporations with long-term outsourcing contracts over government bodies, concerns about the dominance of the corporate technology sector over government remain largely at the margins of these accounts.

Technology deployed in the public sector is becoming more and more sophisticated, with many examples of 'machine learning' systems:

These models, often colloquially simply referred to as algorithms, are commonly accused of being inscrutable to the public and even their designers, slipping through processes of democracy and accountability by being misleadingly cloaked in the neutral language of technology. (Veale et al. 2018)

These are also accused, the authors note, of 'replicating problematic biases inherent in the historical datasets used to train them'.

This article explores a number of research questions. Are there algorithmic risks to the public? Are these algorithmic risks a form of 'wicked problem' requiring new and transformative solutions? What is the discursive context for determining policy options? How are public bodies ensuring the 'governance readiness' (Lodge and Wegrich 2014) of their organizations in the age of the algorithm and big data? The article explicitly examines public value theory (Moore 1995) as an analytical framework to diagnose the actions taken by the UK to be 'governance ready' for these new challenges. The benefit of Moore's theory, modified from his original work, is that it provides a dynamic legitimizing framework for the development of public value objectives, the gaining of support from the authorizing environment of the public sphere, and the development of the necessary capacity to act.

## 2 | DATA, METHODS, THEORY

The article draws on an 18-month qualitative review of academic papers and articles, documentary materials such as governmental and legislative papers, media content, surveys and reports from consultancies and corporate organizations. Inductive analysis of this material has been used to develop an overview of algorithmic risks, asking whether the challenges they pose for public administrators can be considered to be 'wicked problems' (Rittel and Webber 1973). Drawing on the qualitative analysis, the discussion section then examines the ways in which public leaders are attempting to make sense of the challenges of algorithmic regulation, including some of the policy proposals now being advanced in the UK in particular. These are live issues and this is a fast-moving field.

The article adopts a multi-theoretical approach to the research questions identified. It makes use of Alford and Head's recent (2017) assessments of 'wicked problems'. Were the article to focus on domain-specific policy challenges, for example in respect of social media, Kingdon's multiple streams analysis and Sabatier's advocacy coalition framework might have been utilized to examine developments. As the article addresses broader questions of governance of a new technology, the article draws on Spar's (2001) four-phase cycle of technological regulation to illustrate how the discourse on technological regulation is shaped. The article uses public value theory (PVT) as an analytical framework to identify how issues of value and ethics have been addressed in public policy, noting that PVT has rarely been used to underpin regulatory action. In terms of a theoretical contribution it seeks to suggest the need

for greater research into the role of PVT as an analytic framework for deliberative development of governance and regulatory approaches in new areas where public value is contested.

### 3 | ALGORITHMS, BIG DATA AND THE SEARCH FOR PUBLIC VALUE

The dictionary definition of an algorithm is 'a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer'. Mergel et al. (2016) define big data as: 'high-volume data that frequently combines highly structured administrative data actively collected by public sector organizations with continuously and automatically collected structured and unstructured real-time data that are often passively created by public and private entities through their Internet interactions'. The problem arises in the age of machine learning and big data, with algorithms which are designed for self-learning and adjustment, but are based, of course, on inbuilt human judgements or biases at their creation (Diakopoulos 2015; Turing 2017).

Pasquale (2015) says 'authority is increasingly expressed algorithmically'. Yeung (2017) speaks of 'algorithmic power'. This is not, of course, to say that all algorithms require governance or regulatory intervention. Gillespie (2014) has called certain kinds of algorithms 'public relevance algorithms' which have 'political valence'. In this article I will examine some of the potential harms or risks which have already been identified as challenges for governance, since it is the identification of risks which is the likely catalyst for political or governmental action (Beck 1992).

The relevance of PVT is underpinned by two principal research observations. First, values are at the heart of discussions on algorithms and big data (Mittelstadt et al. 2016). Ethical dilemmas require resolution if big data is to contribute to public value (Mergel et al. 2016, following boyd and Crawford 2012). These include who can use data and for what purpose; how can privacy be protected when data can be collected in a variety of ways which collectively allow the identification of individuals; how can security issues be managed; how much data can be effectively managed by public bodies and how might 'digital exhaust'—data captured for other purposes—be legitimately used for public decision-making? Since algorithms are being trained on big data, the issues that they identify have a bearing on the regulation of algorithms too. Second, as Veale et al. (2018) point out, practitioners are already deploying these systems in the public sector and 'are facing immediate, value laden challenges'. They suggest that researchers should not assume that public sector practitioners are naive about 'challenges such as fairness and accountability', and urge greater engagement, based on trust, between public bodies and researchers.

PVT was originally conceived as a way of assessing quality public management (Jorgensen and Bozeman 2007). Public value can be thought of both as what the public values and as what adds value to the public sphere, defined as 'a democratic space which includes, but is not coterminous with the state' (Benington 2011). The notion of the public sphere as conceived by Habermas (1962) is of course itself contested (Lunt and Livingstone 2013), but 'its normative value remains considerable' (Sparks 2004).

As Bryson et al. (2017) note, PVT's normative focus was developed via Moore's strategic triangle, which urges public managers to be clear about their purpose in creating public value, engage publicly to respond to and shape the wider authorizing environment of the public sphere, and focus on ensuring that their organization has the necessary operational capacity to deliver public value. They say this is 'an easily understandable and useful heuristic guide to practical reasoning' for public managers, but argue that there has been little empirical research on the framework in operation. The authors of the original 2002 UK Cabinet Office paper on the potential role of public value theory in UK governance argued that PVT's uses might include 'government regulation' (Kelly et al. 2002). Moore (2013) looks at some cases of the creation of public value by regulatory bodies. PVT has been used to underpin governance of the BBC, 'probably the most fully developed set of reflections on public value and the implementation of a public value-based regime of any UK public body' (Collins 2007). PVT has had a significant impact as an operational tool across a variety of EU member states (Donders and Moe 2011). In the public administration literature the application of PVT in the regulation of the BBC is only briefly referenced (Alford and O'Flynn 2009; Benington and Moore 2011; Williams and Shearer 2011; Dahl and Soss 2012).

Alford and O'Flynn (2009) argue that PVT is both an empirical and a normative approach, which is capable of being read as paradigm, rhetoric, narrative and performance measure. Some (Rhodes and Wanna 2007) have argued that PVT is in danger of eliding the different roles of public managers and political leaders and may have less relevance in systems following the Westminster Model where there are clear demarcations. However, there are many examples of regulation in Westminster Model polities where broad principles are established by politicians and the detail is left to the regulators (Majone 1997), such as OFCOM in the field of UK communications technology policy (Lunt and Livingstone 2012). It is also possible for democratic polities to lay down principles for ensuring clarity between public managers and elected political leaders (Public Governance 2005). Moore (2014) acknowledges that there were weaknesses in his original formulation, and demonstrates his awareness of the importance of political leadership in setting goals. Meanwhile Hartley et al. (2015) identify political astuteness as a necessary skill for public managers. Bryson et al. (2017) emphasize Moore's commitment to 'the important role of politicians, political leadership and politics in public value production in a democratic society'.

One valid criticism has been that of Dahl and Soss (2014) that PVT has largely eschewed 'foundational questions of power and conflict' and devotes little attention 'to the state's traditional role as a "countervailing power"' (Galbraith 1952). Jacobs (2014) has argued that PVT can too easily be incorporated into neo-liberal rationality. However, Moore (2014) has argued that the word 'value implicitly rejected neoliberal ideas that sought to limit government's concerns to technical efforts to counter various forms of market failure', reasserting the role of government in promoting equity and justice, using state authority.

The potential application of public value theory (PVT) to wicked problems has been addressed by Moore himself (2013). He joins with co-authors (Geuijen et al. 2017) to add further dimensions: separate institutional platforms (government, civil society, commercial) and multiple 'spheres' of action (international, national, state or federal, local government, grass roots level). With adjustment they suggest that Moore's strategic triangle is directly relevant to 'global wicked issues'. They also call attention to the way in which specific political discourses speak only to those elements of public value which fit their narrative. Morse, meanwhile, identifies 'integrative' public leadership as a process in which numerous actors from different spheres work together to create public value: public value, therefore, is 'a social construct' (Morse 2010).

I will now consider the findings of the empirical research under the headings of algorithmic risks, wicked problems and the discursive context before turning to a discussion of the relevance of public value theory to governance readiness for algorithmic problems.

## 4 | ALGORITHMIC RISKS

Below I develop six broad examples of algorithmic challenges for public policy. My intention is illustrative: it indicates the broad algorithmic challenges facing public leaders at local, federal, national and international levels, in order to demonstrate the multi-governmental levels at which administrative and regulatory capacity is having to be built.

The first issue is what I call algorithmic selection error, as witnessed in the UK cancer screening and police facial recognition algorithms. However, there are also examples of algorithms whose selection mechanisms have been found to operate in discriminatory ways. These include algorithms designed for checking credit-worthiness, or eligibility for driving licences, or job applications, for predictive policing, in education or for advertising or other services. Google's voice recognition system has been found to have significant issues in recognizing women's voices (Tatman 2016). Google advertising was more likely to show men high-paying CEO jobs than women (Datta et al. 2015). Advertising search brought up ads featuring 'arrest' more frequently for black-identifying first names than white-identifying first names (Sweeney 2013). Facial recognition technology was found to be biased to recognition of white people (Buolamwini 2017). A predictive policing algorithm resulted in racial targeting of black neighbourhoods (Lum and Isaac 2016). Algorithmic judgements on individuals' risks of reoffending were found to be racially biased (Angwin 2016). Meanwhile, teachers were unfairly sacked on the basis of algorithms (O'Neil 2016, 2017a, 2017b).

Second, we are seeing a growing number of cases of algorithmic law-breaking. The car manufacturer Volkswagen used a 'defeat device' to evade emissions limitation legislation. This algorithm recognized when the car was in a compliance test situation rather than a real-time road situation, and activated pollution-controlling software to reduce exhaust emissions when the car was being tested. When the car was on the road, the pollution controlling devices were switched off, meaning that higher levels of air pollutants were emitted than under testing. Switching off these devices resulted in higher on-road performance and more economic fuel usage than would happen with the fully active emission control system (Congressional Research Service 2016). Civil and criminal cases were taken forward in the United States (Environmental Protection Agency 2017). Actions or threats of action have followed in other jurisdictions. Meanwhile, Uber has not been allowed to operate in some cities, and public officials have put in place measures to seek to track its attempts to operate where it has been banned. These have included 'sting' operations whereby city officials seek to use the Uber app to hail rides to demonstrate that the company is operating in breach of local laws, regulations or agreements. In retaliation, it is said that Uber employees have taken steps to seek to identify public officials who may be seeking to catch them out, identifying the hailing of rides around civic buildings as likely attempts at 'stings', or seeking to profile public officials from social media and tagging them with a piece of code that said 'Greyball' and a string of numbers. If someone tagged called a car, Uber could mobilize 'ghost' cars in a fake version of their app, or show that no cars were available to be summoned. If drivers picked up anyone flagged as a 'Greyball', Uber might call the driver, instructing them to end the ride (Isaac 2017).

The third issue is algorithmic manipulation or gaming. There has been considerable focus recently on the phenomenon of 'fake news' and its political influence. Fake news is sustained by advertising revenues derived from online platforms. More likes, more shares, and more clicks lead to more money for advertisers and platforms (Tambini 2017). Facebook's vast range makes the platform particularly attractive to advertisers—and its ability to micro-target audiences, based on the data accumulated about users, and bought from elsewhere (Halpern 2016) is at the heart of this. The algorithm behind Facebook's Newsfeed organizes information according to its learned understanding of personal likes and interests, in order to maintain their attention and keep people on its site (Luckerson 2015; Wu 2016). Fake news creators target users with emotive news stories designed to appeal to their interests and increase the likelihood of these being shared with like-minded partisans. To illustrate, 140 pro-Trump fake news websites were being run for profit from the single Macedonian town of Veles. Engagement with fake news stories exceeded engagement with real news stories on Facebook in the months preceding the US Presidential election (Silverman 2016a, 2016b).

Research has shown that 'that by mining a person's Facebook "likes", a computer was able to predict a person's personality more accurately than most of their friends and family' (Youyou et al. 2015). The micro-targeting of Facebook advertising during the UK Brexit campaign and US Presidential election by commercial organizations with experience in psychological warfare or 'psy-ops' has been the subject of a series of news and now regulatory and legislative investigations in respect of their involvement in the UK Brexit vote (Cadwalladr 2017), the US Presidential election (Grassegger and Krogerus 2017) and other jurisdictions (Keter 2017). The UK's Information Commissioner (2018a) is investigating the political use of private data. The UK Electoral Commission (2018) is examining allegedly coordinated efforts by the different Brexit 'Leave' campaigns. In the United States, the Federal Trade Commission (FTC) has an open investigation into Facebook's privacy practices (FTC 2018). Tambini et al. (2017) say that these private companies: 'were not designed to play such a significant role in the public sphere. Their codes of practice are insufficient, they do not make their data transparent, and their proprietary algorithms lack independent oversight.' These issues are now under scrutiny in legislatures in the USA, the UK and Canada in particular (Senate 2018; House of Commons 2018a; Parliament of Canada 2018).

The fourth example is what I call algorithmic propaganda. The US Intelligence community—the CIA, FBI and National Security Agency—stated that Russian propaganda activities in the 2016 US Presidential election campaign had relied on both covert intelligence operations, such as cyber activity, along with more overt efforts by Russian government agencies, state-funded media, third-party intermediaries, and paid social media users or trolls, and bots orchestrated from the Internet Research Agency, a 'troll farm' backed by Russia. This was a deliberate attempt to 'undermine the US-led liberal democratic order ... undermine public faith in the US democratic process, denigrate Secretary Clinton, and harm her electability and potential presidency'. The agencies said they had high confidence in

these judgements (Office of the Director of National Intelligence 2017). Facebook has conceded that Russia-backed posts reached 126 million Americans; Twitter has suspended 50,000 fake accounts (Solon and Siddiqui 2017; Swaine 2018).

The fifth risk is algorithmic brand contamination. According to the Interactive Advertising Bureau (IAB), 'in the last few years programmatic trading has enjoyed a meteoric rise in the digital ad serving space'. Programmatic advertising is defined by the IAB as 'the use of automated systems and processes to buy and sell inventory. This includes, but is not limited to, trading that uses real time bidding auctions' (IAB 2014). Programmatic advertising is personalized and designed to deliver to consumers in real-time advertising thought to be of interest to them as they surf websites or social media platforms or search engines. It therefore requires information on the things that are of interest to them or likely to trigger buying decisions by them. During 2017, a series of newspaper exposés have provoked advertisers to look more closely at where their advertising was being placed. This has resulted in pressure on internet intermediaries such as Google (particularly in relation to its subsidiary, Youtube) and Facebook, the removal of material, calls for regulation, and boycotts by advertisers. (Mostrous and Dean 2017; Solon 2017; Vizard 2017).

The sixth area is what we might term algorithmic unknowns. This raises the question of whether machine learning means that algorithms are becoming too complicated for humans to understand or unpick. The notion of technology 'out of control' has been a theme in political thought for centuries (Winner 1977, 1986). Chollet (2018) identifies the commonly expressed fear 'that AI will gain an agency of its own, become superhuman, and choose to destroy us'—the notion of 'General AI'—as one of the challenges facing AI researchers. Floridi (2017) warns that information societies are being built without any kind of plan, and that we are surrounded by misinformation about the future, scaremongering warnings about technological sci-fi scenarios, and ignorance, obscurantism, populism of all kinds. As Boyd and Crawford (2012) argue, 'like other socio-technical phenomena, Big Data triggers both utopian and dystopian rhetoric'. The notion of 'computational agency' (Tufekci 2015) underpins this sense that things could move beyond human control. Scientists dispute how long, or if ever, 'General AI' will take to be developed as distinct from artificial intelligence able to operate in specific domains (Stone et al. 2016; Grace et al. 2017). Machine learning's capacity for producing algorithmic outcomes beyond human understanding has propelled the issue of algorithmic accountability into prominence, leading to calls for regulatory approaches (Pasquale 2015; Mulgan 2016) and early engagement with ethical issues (Mittelstadt et al. 2016).

## 5 | WICKED PROBLEMS?

For Head and Alford (2015), concerns about wicked problems are associated with social pluralism (i.e., multiple stakeholder interests), institutional complexity (including multilevel governance) and scientific uncertainty. They urge the development of a scale of problem types, noting Heifetz's (1994) suggestion of three types: the first or easiest, where the definition of the problem and the likely solution are clear to the decision-maker; the second where definition is clear but the solution is not; and the third type where both problem definition and solution are unclear. They note that decisions on problem definition and solution identification also depend on stakeholder perspectives, drawing on Kingdon (1984) and Sabatier (1988)—in other words, technical issues are only part of the discussion. Issues are contested—there are not only 'cognitive-analytical challenges but also communicative, political and institutional challenges'.

Separately they have argued that the term 'wicked problem' is 'inflated and over-used' and has become 'a totalizing approach' (Alford and Head 2017). There is pressure for 'a dramatic transformative intervention' rather than incrementalist approaches. Genuinely wicked problems which are 'technically complex' require 'thoughtful analysis, dialogue and action' on the part of affected stakeholders. Wicked problems are more likely to be those which have structural complexity, are 'unknowable'—that is, information is hidden, disguised or intangible; where knowledge is fragmented or has less visibility because of its framing, where there are significant conflicts of interest and unequal power between stakeholders. They argue for a more contingent approach, therefore, to the identification and classification of problems which can lead to more appropriate interventions.

Although many of the algorithmic issues might initially appear to be wicked problems, the first five all represent issues in which regulatory or other state bodies are taking action, where there is a high degree of legislative and media scrutiny, and where solutions appear to be at hand. While regulators at local, federal, state or international levels may have had to augment their technical understanding, these largely fall into the area of Heifetz's first two types of problem. It is clear that some of the issues raised by big data, algorithms and artificial intelligence may cross regulatory boundaries: the regulation of political advertising, based on personalized advertisements targeted through data analysis, to take one example, could engage electoral regulators, media regulators, advertising regulators and data protection authorities, requiring cross-organizational attention. That makes them complicated, but not necessarily 'wicked'. Algorithms which challenge human comprehension are the ones that could present as 'wicked problems'.

Addressing complex problems can be as much an issue of problem setting as of problem solving. As Schoen (1983, p. 40) writes, problem setting is:

the process by which we define the decision to be made, the ends to be achieved, the means which may be chosen. In real-world practice, problems do not present themselves to the practitioners as givens. They must be constructed from the materials or problematic situations which are puzzling, troubling, and uncertain.

Within organizations, individuals apply a form of sense-making depending on the social and historical context in which they find themselves (Weick et al. 2005; Weber and Glynn 2006). Hoppe (2011) argues that there is a useful heuristic to be found for policy design in thinking through problems in a series of articulated stages: problem sensing, problem definition and problem solving. This helps us conceive of wicked problems not as static but as evolving and capable of being shaped and managed. Grint (2010) suggests that 'the leader's role with a Wicked Problem ... is to ask the right questions rather than provide the right answers'. The challenge for public leadership in the age of the algorithm is as much about the framing of problems as their resolution.

## 6 | THE DISCURSIVE CONTEXT

Information asymmetry between governance and regulatory institutions and technology companies is one of the factors affecting whether or not a problem might be defined as 'wicked' and solutions found (Danaher et al. 2017). Power relationships between governments and private actors are unbalanced in the 'depleted state' (Lodge 2013), and private actors have the financial resources to recruit available talent with rewards packages that dwarf those on offer from government or academia. Technology entrepreneurs, and the companies they control, are able to shape not only knowledge about but also discourse around the technology, using their 'control of technical language' (Marvin 1988) 'discursively to frame their services and technologies' (Gillespie 2010), as an example of their perceived 'thought leadership' (Drezner 2017) and 'epistemic authority' (Coni-Zimmer et al. 2017). In this context, the word 'algorithm' is used to suggest objective decisions shorn of human biases: Facebook's Trending Topics were 'surfaced by an algorithm', the company said in 2016 after it was accused of anti-conservative bias (Osofsky 2016).

In Silicon Valley, say Levina and Hasinoff (2017), 'disruption is portrayed as a strategy that both drives technological progress and improves the market by helping to dismantle ossified government regulations and inefficient monopolies, which is said to liberate and empower individuals'. This is the doctrine of 'disruptive innovation' (Christensen 1997) as expressed in the Facebook formulation 'Move fast and break things' (Taplin 2017). As Beck (1992) noted, the notion of technology as progress has become the hegemonic position. I call this approach 'Silicon values', as opposed to public or human values. In 2016, President Obama made a deliberate and considered defence of public value over Silicon values, stating that 'government will never run the way Silicon Valley runs' since government had to deal with problems that no one else wanted to address (White House 2016).

Carr (2016) suggests that political leadership in the 'information age' requires understanding that politics can shape technology. In reaction to the assertion that the internet was ungovernable, Spar (2001) analysed earlier developments in communications technologies to identify phases of evolution towards rules-based governance, arguing that when a technology is new, it often looks ungovernable. She identifies four phases of development: innovation, commercialization, creative anarchy, and rules (see also Kohl 2012). She identifies the challenge of rule-making: that 'old laws are unlikely to cover emerging technologies and new ones take time to create'. Entrepreneurs may storm into 'an unformed market' planning to dominate it. But soon there becomes a need for clear ownership rules, coordination of technical standards, and avoidance of monopoly, or regulation where natural monopolies are formed. Sometimes the pressure comes from the technological pioneers, sometimes their competitors, or 'sometimes it is the state, and sometimes a coalition of societal groups affected by the new technology and the market it has wrought'. Regulation is never neutral: as Moe (1990) said, 'for most issues, most of the time, a set of organized interest groups already occupies and structures the upper reaches of political decision making'. He suggests that compromise is often built into the construction of regulatory institutions, whether they are agencies or laws. Governance and regulation develop in a contested context.

## 7 | DISCUSSION

Questions of ethics and value are central to development of governance of the most complex algorithms (Walport 2017). This section will examine the search for public value in policy-making utilizing Moore's organizing principle of the strategic triangle (Benington and Moore 2011):

- The development of a clear public purpose
- Management of the authorizing environment
- Development of the relevant capacity.

Moore's revised 'philosophical basis' (2014) for PVT has direct relevance. As Geuijen et al. (2017) argue, setting the public value goal needs to take into account vindication of rights and enforcement of duties, balancing social costs and benefits, in the interests of a collectively conceived global just society. Cath et al. (2018) suggest that the concept of human dignity assumed in the European General Data Protection Regulation (GDPR), which draws on the 1948 Universal Declaration of Human Rights, should be the pivotal concept for the 'good AI society'. The report on data governance by the Royal Society and British Academy (2017) argues that 'the promotion of *human flourishing* is the overarching principle that should guide the development of systems of data governance'.

Alford et al. (2017) recognize that in Moore's account building legitimizing constituencies is a necessary part of strategic public management and can include 'lawmakers, interest groups, regulators, clients and ... the general public'. Creating the authorizing environment means building a public demand for action. The empirical evidence shows that that means problematizing, in political terms, the issues which bear on people's everyday lives, rather than algorithms per se. Establishing any case for action is unlikely to be uncontested. Those with existing power, such as corporate technology companies, may argue that intervention is both unnecessary and also a threat to innovation. In some cases, governments partner with them in making policy, as has been the case with Facebook and UK policy on artificial intelligence (Hall and Pesenti 2017). There may be competing policy priorities: privacy issues may dominate in one domain but economic competitiveness aspirations may compete with safety concerns in another (for example, driverless cars). Political challenges cannot be wished away (McConnell 2018). The argument is being played out on a case-by-case basis in each policy domain, developing wider understanding of the challenges across government, Parliament and regulatory networks, in the media, and through public engagement.

The debate on algorithmic governance rests within elite political, policy and media circles, although sometimes structured public dialogue with focus groups, polling and discussions has been carried out (Royal Society/IPSOSMori

2017). The empirical research suggests that specific actions have been undertaken to call into being an authorizing environment, including:

- a clear mobilizing narrative (Royal Society/British Academy 2017)
- the endorsement of experts in the field (Hall and Pesenti 2017)
- broad, cross-party political endorsement (House of Lords 2018).

The overall conclusion from the Royal Society/IPSOSMori research and further survey evidence from the EU's Digital Single Market programme (European Commission 2017) suggests that people are open to exploring the role of artificial intelligence, although they believe that these technologies require 'careful management'.

Lodge and Wegrich (2014) highlight four capacities necessary for governance readiness: delivery, regulatory, coordination, and analytical. These are said to be necessary to address 'wicked problems'. Such capacities may include new powers, including in respect of enforcement, like those tabled by the UK government for the Information Commissioner in 2018 (House of Commons 2018b) or augmented finance, staffing and organizational learning (Denham 2018; Information Commissioner's Office 2018b). In terms of algorithms in high-frequency trading, the objective of the regulator, the Financial Conduct Authority, was 'not to let the best become the enemy of the good', recognizing that 'perfection is, frankly, an impossibility' (Wheatley 2014). This illustrates the real-time dilemmas facing regulators: they need to operate on the basis of judgements and heuristics, rather than on absolutely final laboratory-controlled tests. Regulatory readiness, therefore, is not a settled state but a dynamic and interactive process of learning and adjustment, in which regulators are always, to a degree, 'catching up' with the technology (Gomber and Gsell 2006).

The empirical analysis has identified a number of ways in which governmental institutions are seeking to make themselves 'governance ready' for the algorithmic age. These have included the publication of authoritative scientific evidence from internal government experts (Walport 2013, 2016; Executive Office of the President 2016); the commissioning of external ethical and analytical advice (Hall and Pesenti 2017; Royal Society/British Academy 2017); the organization of deliberative encounters with the public and opinion polling (Royal Society/IPSOSMori 2017); formal public consultation (European Commission 2017); the engagement of committees of legislators in evidence-based inquiries into these areas (European Parliament 2016; House of Commons 2016, 2017, 2018a, 2018c; House of Lords 2016, 2018); the creation of new institutions such as the Allan Turing Institute, the Centre for Data Ethics and Innovation and the Office for AI (DBIS 2014; DCMS 2018); and sectoral investment (DBEIS/DCMS 2018).

Empirical analysis of contemporary UK regulatory discussions has identified specific policy solutions advocated for future regulation of algorithms and big data, which include technical, governance, regulatory, legislative and institutional solutions (for a fuller summary see Andrews 2017). In addition, there will be sector-specific challenges on algorithmic regulation (Royal Society 2017). Limited attention appears to have been given to issues of multi-level governance at local or federal level, although international cooperation has been widely discussed (European Parliament 2016; Cath et al. 2018).

## 8 | CONCLUSION

Technological change remains under-researched and under-theorized in the public administration literature, but the technological challenges facing public administration practitioners are growing in complexity. This article has reviewed some of these in respect of the governance of algorithms, big data, machine learning and artificial intelligence as they are presented in the media and public policy context. The article identifies that certain kinds of algorithms may be considered 'wicked problems', but that others are being addressed through existing laws such as data protection, privacy and equality and human rights laws, or regulatory procedures. Regulators may have to develop

new capacity to make sense of the challenges that are arising, and in some cases laws may have to be updated. In respect of algorithmic challenges which do not test the boundaries of human comprehension, there is a need for domain-by-domain analysis of the challenges and likely future risks (Reisman et al. 2018). Regulators need to give attention to the ways in which problems are constructed by market participants, including large corporate technology companies. Algorithms whose workings raise issues that challenge human comprehension—often identified as ‘black boxes’ (Pasquale 2015)—should be considered ‘wicked problems’, and the article extends our understanding of the nature of ‘wicked problems’ in that light.

The article has also considered whether public value theory can be considered as an analytical framework for examining how regulators and governments address complex and novel issues. The article discusses this in the specific context of work in the UK on data and algorithmic governance. The empirical analysis outlined here suggests that it can. Moore’s original (1995) work developed PVT from detailed case examination of the ways in which public managers conducted themselves. More recently, he and others (Geuijen et al. 2017) have considered how PVT might be utilized to address wicked problems. In this article I have looked at how those engaged in issues of data and algorithmic governance have clearly identified a public value objective, explored the issues raised deliberatively in a constructed if tentative ‘authorizing environment’, and considered whether the necessary governance capacity exists, leading to specific recommendations such as the creation of a new Centre for Data Ethics and Innovation, now being established ‘with a specific remit for algorithms’ (House of Commons 2018c) and other capacity-building measures (House of Lords 2018). Just as public value was being developed before Moore constructed PVT, so data scientists, ethicists, lawyers and public leaders are creating public value in a new field of governance, even if PVT is not explicitly cited as underpinning their work. Clearly, there is a need for more research into the use of PVT as both an analytical and normative framework for regulatory assessment, using case studies, qualitative interviews, documentary analysis and quantitative modelling. This might include empirical analysis of how regulators address new challenges on a case-by-case, domain-by-domain or comparative basis. The article therefore hints at new and fruitful ways in which PVT might be explored in governance and regulatory contexts, giving additional support to Moore’s (2014) philosophical analysis.

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