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**Paper Title**

**Digital regulation: Transforming policy frameworks,  
implementation and delivery systems.**

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**Introduction**

Since the 1990s information and communication technology (ICT) has played an increasingly important role in reshaping the organisation of government agencies and the provision of public sector services (Katsonis and Botros, 2015). A number of authors and agency reports have identified an incremental progression of engagement with technology in reshaping the administration and delivery of public services and with this an associated relabelling of each phase of the reform process. We have moved from e-Government (1990s) to Government 2.0 (2000s) to the current period of Digital Government (2010 onwards) (Katsonis and Botros, 2015, OECD, 2014, OECD, 2016). Over each of these phases there has been a substantial increase in the analytical and processing capacity of ICT and digital technologies (OECD, 2016). The current ubiquity of digital technologies means they are now regularly utilised by governments in the delivery of services, information collection and sharing, structuring platforms for interaction and feedback, and critical to new forms of surveillance and regulation (Kennedy, 2016, Coleman, 2008). Government agencies that deploy these digital tools often cite a range of benefits including increased accessibility, ease of use and convenience, cost and service efficiency, the capacity for services to be more specifically tailored to the individual or firm and greater agency for clients (Kennedy, 2016, Heeks, 1999, Garson and Pavlichev, 2004, OECD, 2009, Katsonis and Botros, 2015, Coglianesi, 2004, Abie et al., 2004, Bamberger, 2010, Hovy, 2008).

However, the day to day experience of those interacting or seeking to engage in digital government services can also reveal more complicated effects. This includes a reduction in access to staff with professional experience, difficulty in accessing services due to lack of technological literacy, cost barriers associated with service plans and device ownership, external barriers imposed by infrastructure limitations with internet and mobile phone network provision, and a greater burden on the client to carry out administrative tasks previously performed by an agency employee (O'Sullivan and Walker, 2018). The evidence suggests digitisation reform processes present both significant benefits as well as risks for communities and government.

This paper aims to explore the growing role of digital government in the delivery of regulation and compliance systems. Discussion starts with a general overview of

digital government and how information and digital technologies have been embedded within broader public sector service reforms. This includes comments on the benefits and risks associated with such change. Then follows a discussion of regulation and how digitisation can be observed in regulatory and compliance practice. Digitisation provides significant advantages for systems that require surveillance and the regular processing of large volumes of data. However, the increasing ease in collecting behaviour and performance data also raises significant social and public policy questions. With reference to recent examples of digital regulation in the transport sector this paper explores the benefits and risk of this approach and other consequential factors that influence the increasing use of digital technologies in regulatory systems. While there has been significant research and analysis of e-government and digital government in terms of reform and general service delivery, limited work explores the specific implications for the practice of digital regulation (Kennedy, 2016). The paper concludes by drawing attention to some of the critical public policy questions that are associated with the emerging and expanding use of digital technologies in regulation and compliance systems.

### **From e-government to digital government**

Government agencies, academic literature and international agencies, such as the OECD, use a range of terms to describe the use of ICT and digitised technologies in the provision of public sector services. E-government is most common but in more recent times the term digital government has gained significant traction. For some, e-government is generally considered a more passive, web-based approach to governing that emphasises the provision of information to citizens and firms. Digital government, however, is understood as more recent and reflective of the capacity of new technologies to deliver interactive forms of governance that involve collaboration and dialogue (Katsonis and Botros, 2015). Robertson and Vatrappu (2010: 319) define digital government as 'the use of information and communication technologies to enable citizens, politicians, government agencies, and other organizations to work with each other and to carry out activities that support civic life'. Drawing on this definition one could simply say digital government involves the use of digital technologies in the governing process. It is worth noting however, that technology is not simply used by governments but is also a 'constitutive element' of the governance process (Coleman,

2008). Authors such as Coleman (2008: 7) point to the transformative capacity that digital technologies have to reshape agency routines, eliminate old and create new work practices, change organisational structure, power relations and norms. Digital government is therefore seen as a potentially 'citizen driven model of developing and managing government services' involving multiple delivery channels (Katsonis and Botros, 2015: 45). It also involves developing more collaborative governance arrangements, and promoting a 'data-driven process for collecting and analyzing information about government services to inform policy development and priorities' (Katsonis and Botros, 2015: 45, OECD, 2016).

In the Australian context the transformative capacity of digital government is evident across levels of government and agency websites. The Australian Digital Council was established in 2018 and this brings together relevant ministers from Australian jurisdictions to consider issues of national significance in respect to digital data sharing, digitisation strategies and digital government services (Australian Digital Council, 2018). The Australian government has established the Digital Transformation Agency (DTA) (<https://www.dta.gov.au>) that plays a key role in assisting national agencies in developing new services and transitioning existing services onto digital platforms. DTA leads the development of a national digital identity program for users of government services, is involved in building digital skills across government agencies, has developed a national strategy (Roadmap) for digital service transformation across all government services and plays a key role in ensuring consistent delivery platforms across government departments (Digital Transformation Agency, 2019). Similar bodies and strategies can be found at the second tier of government (state level) that push the uptake of digital tools and technologies as part of an ongoing transformation process of government services (see for example *digital.NSW* (<https://www.digital.nsw.gov.au>) and the Queensland Government's *DIGITAL1ST Strategy* (<https://digital1st.initiatives.qld.gov.au>). These strategies and the projects within them speak of engaging with communities and uniquely targeted populations, and seeking user feedback and input towards service design and development. There is an emphasis on bringing services closer, making them timelier and more aligned to the needs and interests of users. There is also a focus on building trust in critical aspects of digitisation, such as privacy protection and more

transparency regarding the management and security of information collected by government agencies as part of the service delivery process (The State of Queensland, 2017, Australian Digital Council, 2018).

The existing commitment of governments and their agencies demonstrates that the digitisation of services, processes and functions is an important component of public sector reform. Digitisation has allowed agencies to address issues of service access, flexibility and responsiveness to client needs and circumstances. As well as extending the reach of services (online services being available 24/7 and remotely accessible) digitisation has been an effective tool in driving operational efficiency reducing the unit cost of transactions while also lifting volume and capacity, often within existing budgets (O'Sullivan and Walker, 2018). Digitisation has been instrumental in progressing broader whole of government initiatives facilitating the dissemination and validation of information across agencies and supporting inter agency cooperation when working with individuals and firms. Here we see how digitisation and data sharing strategies between agencies and across levels of government have underpinned the progression of 'joined up' and coordinated government service reform (McGuirk et al., 2015). These changes have provided greater access to government information and promoted citizen interaction with government services, especially benefiting rural and traditionally under-served communities (Abie et al., 2004). For many transaction and process based services (taxation for example) data collection has improved both in terms of timeliness and accuracy, with information specific to a firm or individual being provided directly and collated from multiple sources (employer, financial institutions etc). As a result processing and transaction times have diminished resulting in efficient and faster service delivery, more timely decision making and more individualised and connected services becoming available to citizens (Abie et al., 2004, Bamberger, 2010, Coglianese, 2004, Garson and Pavlichev, 2004, Heeks, 1999, Hovy, 2008, Katsonis and Botros, 2015, Kennedy, 2016, OECD, 2009).

The use of digital technologies is also shifting citizens' expectations about their relationships with government (OECD, 2014). Some advocates argue that digital government presents opportunities to bring citizens into policy-making and decision-making processes thus facilitating more democratic forms of governance (Coglianese,

2004, Coleman, 2008, Gulati et al., 2014, Katsonis and Botros, 2015, Kennedy, 2016, OECD, 2014, OECD, 2016). This change is encouraging government service provision to evolve away from anticipating the needs of citizens and businesses to providing avenues for these parties to determine their own needs, articulating this and working with government in a 'citizen-driven approach' (OECD, 2014: 2, OECD, 2016). This approach requires governments to re-evaluate their practices and models of governance and their engagement with digital technologies (OECD, 2014).

Forms of digitisation infinitely increase the volume of online and real time data from multiple sources. This includes direct online provision from clients, data generated from applications (apps) and automated surveillance systems that produce large data sets on specific groups, locations or activities (public health data or traffic monitoring for example). The automated analysis of high volumes of various data sets (data mining and analytics) can assist with strategic decision making, identifying emerging trends (monitoring public health issues to determine intervention thresholds for example), strengthening predictions and making decisions and subsequent action more timely. Pederson and Wilkinson (2018:199) note that the closer to real time and the more accurate predictions are, the higher value these forms of analysis and decision making have for individuals, firms and other interested stakeholders. These forms of high volume data driven decision making may also support greater interaction with effected parties (Coleman, 2008). Of course the extent to which citizens and firms feel engaged through digital mechanisms associated with policy development and decision making processes remains contested (Coleman, 2008).

Digital government and the use of ICTs can also have unexpected consequences and carries with them unique risks (Kennedy, 2016). For example, scepticism exists about the transformative and democratising potential of e-government with one study noting significant doubt amongst public servants about the potential of digitisation strategies to increase public engagement and participation (Baldwin et al., 2012). In this study the observed stratified use of e-government by the public was cause for pessimism amongst some public sector agency staff about the ability of digitised services to 'widen participation and increase genuine policy consultation' (Baldwin et al., 2012:119). The operations within government are also seen as problematic.

Practitioners readily cite structural and cultural factors as significant barriers to the establishment of effective and dynamic data sharing arrangements between agencies and across levels of government. Inter-organisational trust remains weak between agencies across many policy sectors and can be a major barrier to achieving joined up government services via the digital exchange of data (Carey and Crammond, 2015, Hurley et al., 2013). Negotiations and shared understandings around agreed data sets to collect, mechanisms for data release and privacy protections are often complex and time consuming and delay the realisation of potential service benefits (Peled, 2011). Trust in digital connections and data exchange is further influenced by the reliability of data collected, the design of systems and capacity of technology (McLaughlin, 2018).

There are also concerns that automated software based decision making systems may actually render governance less transparent as they tend to employ 'closed' systems (Kennedy, 2016). These systems often render 'opaque the fact-gathering and decision-making processes for which they are used' and are closed to input from alternate sources (Kennedy, 2016: 91). For automated decisions such as camera detected traffic speeding fines, the capacity to moderate decision making due to special or unexpected circumstances becomes problematic and cumbersome. Such systems are resistant to non-standard context and alternative decision paths and only the most persistent and articulate clients are able to successfully argue for a non-standard review of processes and decision making. In these circumstances digital government may further exacerbate inequality particularly for those lacking advocacy skills, technological literacy and sufficient resources (Carter and Bélanger, 2005, Coleman, 2008, O'Sullivan and Walker, 2018).

### **Regulation and digital government**

A particular focus of this paper is the implications of digital government for regulation and associated surveillance and compliance systems. For a number of authors regulation is seen as a growing and increasingly important force of public sector innovation and governance (Braithwaite et al., 2007, Black et al., 2005). Definitions and understandings of regulation have shifted from the traditional view of a command and control system reliant on a government agency to make rules, employ an inspectorate and institute mechanisms for enforcement and punishment (Harrison,

2017) to more nuanced and devolved forms of influence that engage public, private and non government agents in processes of monitoring, reporting, persuasion and punishment (Grabosky, 2013, Levi-Faur, 2017, Scott, 2002). The objective of regulation is to influence and change behaviour to help achieve public policy objectives (Freiberg, 2017). This may involve sustained and focussed attempts to control and influence so that compliance is achieved with defined standards, limits or specified outputs, or with more broadly articulated public interest outcomes (Black, 2002). Critical to effective regulation therefore is the monitoring of behaviour and collecting data so that measures and assessments of performance can be made against defined limits or desired outcomes. As digital government has developed, the application of ICT and digital technology to collect and analyse performance data has significantly increased and the circumstances in which such forms of digital monitoring and analysis can be undertaken has expanded considerably.

A relevant factor contributing to the ongoing roll out of digital applications within the field of regulation has been the general acceptance and expansion of third party players in the task of monitoring and regulating particular behaviours and industrial sectors. Under NPM practices government agencies and regulators readily engage with private and non government agencies to assist in the delivery of services and the progression of policy objectives. In the regulatory space models of smart regulation (Gunningham and Grabosky, 1998, Gunningham and Sinclair, 2017) have developed that draw on a complementary mix of regulatory approaches encompassing self-regulation, economic incentives, information and voluntarism. The approach recognises, that depending on the circumstances, different policy instruments (regulatory tools) are effective in producing regulatory compliance. Smart regulation brings in both state and non state actors into the compliance and enforcement process. It extends monitoring and enforcement activities beyond the traditional state agencies and where appropriate uses third parties as surrogate regulators (Gunningham and Sinclair, 2017:135). It may involve regulators making use of the technical skill and capability of a firm's internal auditing and reporting systems to demonstrate compliance or that of a contracted external third party to report on industry compliance. Third party monitoring and enforcement of compliance might be shaped through contractual and industry incentives (upstream firms requiring specific



conditions of downstream subcontractors) or economic incentives may be initiated through access to regulatory concessions (state relaxation of limits where there is validated evidence of exceptional compliance practices). This innovative mix of instrument combination allows for significant creativity in regulatory design and the development of more complex and dynamic systems that structure the regulatory framework of a particular policy or industrial sector.

These newer forms of regulatory monitoring and reporting have resulted in the development and use of ICT systems that target compliance. The following discussion highlights a small number of cases from the road transport sector that illustrate the emerging use of digital regulation and note the role of third party providers in the process. The case studies are drawn on to support a broader analysis of the risks and benefits of digital regulation, as well as point to some of the public policy developments, opportunities and challenges that emerge with the ongoing expansion of digital regulation.

**Case 1: Monitoring and detection of illegal mobile phone use by vehicle drivers**

In New South Wales a month-long trial was carried out in late 2018 testing hi-definition cameras designed to detect the illegal use of mobile phones by drivers while driving a vehicle. Illegal use while driving includes holding and physically interacting with a phone. This may involve sending text messages, touching a phone screen to accept or divert an incoming call or any other activity with a phone that involves directly handling the device unless it is mounted in a cradle fixed to the vehicle. Based on the success of the trial an operational pilot commenced at two locations in Sydney from January to April 2019. The project was led by Acusensus, an Australian IT and tech company that develops enforcement technology to assist road and transport authorities. The aim of the scheme is to enforce road rules by monitoring and detecting illegal phone use. The policy goal is to encourage behavioural change and reduce the prevalence of distracted driving and consequently improve road safety (Acusensus). The road safety technology uses digital cameras and a radar-based sensor system to visually detect illegal phone use in vehicles, taking high-quality and court admissible digital images of the offending behaviour. The digital technology has the capacity to function 24/7 in all weather conditions providing a comprehensive monitoring system. In terms of system operation, digital images of suspected illegal behaviour are collected and processed by automatic analysis software. This then creates a short-list that is reviewed and verified by an agency employee before warnings (and once formally introduced, fines) are issued. Privacy is integral to the program and licence plate data captured by the automated system is encrypted and only able to be viewed by enforcement authorities. Licence plates and images of passengers are not viewable by the first stage human reviewers. The detection and warning system is highly automated. Once an offence is confirmed licence plate data is used to automatically interrogate the transport authority's vehicle registration data base and then a warning letter is generated and sent to the vehicle owner. The automated nature of the process allows high volumes of transactions to be managed in a timely manner. During the trial in late 2018, 11,000 drivers were detected using a mobile phone illegally and issued a warning letter. The 2019 pilot only issued warning letters, however should the experience and results demonstrate operational success the New South Wales Government plans to introduce the scheme permanently, issuing fines to drivers that are detected breaking the law.

**Implications for regulation**

The above example illustrates a number of characteristics particular to digital regulation. It highlights the inter-relationship of private tech companies and regulatory agencies in the development of monitoring and enforcement solutions. This interaction of public and private firms is typical of contemporary public sector practices and helps facilitate timely analysis of policy problems, the mobilisation of additional resources and skills, and the deployment of potential solutions. The case illustrates the capacity of digital monitoring systems to observe highly specified noncompliant human

behaviour, though the case also displays the importance of data validation through human visual assessment. It is interesting to note however, that as accurate enforcement data is collected over time the feedback loop built into automated intelligence and machine learning systems is expected to continuously increase system detection accuracy and thus minimise the need for human intervention. The technology allows for the processing of high volumes of data and while the 2019 pilot was limited to fixed monitoring locations, it is highly likely that as the technology develops temporary and mobile monitoring stations will emerge. The design of the pilot and approach to data processing also reveals attention to data management and personal privacy. The digital compliance system however, does not display the interactive features that now characterise contemporary digital government. The system is orientated in one direction towards the offender. Offenders are monitored, detected and then issued with instructions regarding their non-compliant behaviour. This is highly representative of traditional command and control forms of regulation, however in a digitised format. In this case digitised systems have replaced inspection and enforcement officers who would normally undertake detecting, detaining and issuing fines. Here the deployment of digital technology has extended the reach and increased the monitoring capacity (volume) of compliance to regulatory rules. The predominantly automated nature of the compliance tool is also expected to be more cost effective than the deployment of enforcement officers to undertake the same task.

**Case 2: Digital Licencing**

A number of regulatory agencies are increasingly moving their licencing systems to digital platforms. In New South Wales one can now apply for a boat driving licence, the Responsible Service of Alcohol/Responsible Conduct of Gambling Competency Card and recreational fishing licences in digital form. Digital driver licences are also currently being trialled. The first digital driver licence trial commenced in 2017 in the regional town of Dubbo, NSW. The licence is accessible on mobile phones and participants of the trial are able to use their digital licences for proof of identity and proof of age for roadside police checks and to gain entry into selected pubs and clubs (Service NSW, 2019). Digital drivers licences can be obtained through the digital platform of Service NSW's website and app (<https://www.service.nsw.gov.au/campaign/digital-driver-licence#joining-the-trial>). The trial of digital licences is continuing to be rolled out in selected locations across NSW with the option now being extended to residents of Sydney's Eastern suburbs. This trial commenced in November 2018. Following the approval of legislation in early 2018 and depending on the results of the Sydney trial, it is expected that a state-wide rollout will commence during 2019 on an opt-in basis. When announcing the digital driver licenses, the NSW Transport Minister stated that "Smartphones have become de facto wallets and we're using cutting edge technology so that drivers can use a digital licence in everyday scenarios" (Service NSW, 2018). The introduction of digital drivers licences and the minister's comments highlight how digital regulation is adapting to both the capability and widespread use of mobile devices such as smart phones.

**Implications for regulation**

The above case highlights how the changing nature of digital technologies allows digital regulation to become much more devolved and adaptive to individual circumstances. In addition to improved convenience where applicants can apply from any location at any time, digital licences allow for interconnective options between the licence holder, the regulator and third parties. This may be for compliance purposes, where online scanning can provide automatic validation against the licencing authority's data base on the currency of the licence, provide real time data on any licence restrictions (for example, the exclusion of specific activities) or provide notice of special conditions imposed on the licence holder (such as a temporary suspension). Where connected to an online application digital licences allow authorities to push out information to licence holders and also collect information relevant to the activity for which the holder is licenced. This might include the online purchase of supplementary permits, the collection of information based on licenced activity (the location and take

of particular species for hunting and fishing licences, for example) and other information that assists regulatory agencies in understanding and tracking the behaviour and activity of particular licence categories. The NSW trial of digital drivers licences shifts the licence from the traditional hard form to digital form and this brings with it the interactive qualities of digital systems.

In this case we observe the potential for a higher level of interaction between the regulator and the regulatee. Where enabled, the digital licence can connect the regulatee with the agency and effectively bring citizens closer to regulatory processes. It allows for data collection and exchange to improve licencing practices and for the regulator to better understand aspects of licence holder behaviour and the changing context of the licenced environment in a closer to real time context. This case demonstrates how digital regulation can significantly improve the interaction between state agencies, firms and community members. From a regulatory perspective digitisation provides opportunities to personalise regulatory (licencing) systems, providing more responsive and accurate instruments of control. Digitisation allows high volume licencing practices that have traditionally been somewhat cumbersome and unidirectional, to develop into more finely tuned regulatory instruments. Digitisation has the potential to strengthen and enhance licensing as a regulatory and policy tool, reshaping it as a far more interactive instrument.

**Case 3: Heavy Vehicle Compliance. The Intelligent Access Program (IAP)**

For some years now Australia has made use of a compliance framework, known as the IAP, that relies on the satellite tracking of trucks to monitor compliance with speed, route, weight and a range of other potential restrictions imposed on operating vehicles. These restrictions are imposed to protect and assist with effective management of the road asset and to help ensure road safety. The IAP allows trucking firms to contract with certified businesses that provide information and telematic services to the transport industry. These telematic data firms have had their applications certified by the national regulator as providing robust, tamperproof systems capable of providing court admissible evidence when detecting non compliance with various regulatory obligations. The regulatory restrictions can be specific to the vehicle task, for example defining specified routes and hours of travel is generally applied to non standard vehicles that may be carrying an exceptionally wide load that protrudes into the adjacent vehicle lane, or restrictions may apply to extra long or extra heavy vehicles. A key challenge for road transport inspection officers is being present at the right time and at the correct location to inspect non standard and non compliant vehicles. Permits that require the 24/7 satellite tracking of vehicles allow truck operators to negotiate special conditions with road agencies that relate to the transport task. The digital nature of this scheme frees up the regulator and inspection staff from having to be present to inspect and confirm compliance to specified restrictions for each vehicle trip.

The IAP operates across Australia and structures a tripartite relationship between road transport regulators, the transport industry and telematic firms involved in the transport sector. These telematic firms act as intermediaries providing the latest digital technology to trucking firms to assist with compliance requirements while concurrently reporting to transport regulators where breaches of specified restrictions occurs. Where breaches of conditions are reported road transport inspectors then determine the appropriate enforcement action (further inspection, warning or fine). Road transport firms are interested to operate under the scheme since it provides new options for achieving greater regulatory flexibility (running non conventional and highly productive vehicles) and supports business innovation and developments in vehicle design. For example, the longest combination trucks in the world that travel out of a Western Australian mine are constantly monitored for route and speed compliance under this digital monitoring system. For road transport regulators the IAP scheme provides the opportunity to remotely monitor compliance across diverse locations and also tailor compliance requirements to the task and characteristics of the environment. This may mean heavy loads are diverted on alternate routes to avoid weak bridge infrastructure, time of travel restrictions can be applied based on peak and non peak congestion periods, even the minimum permitted distance between vehicles can be specified for high volume traffic travelling from one site, such as large trucks transporting ore from a mine to a port.

### **Implications for regulation**

An important feature of regulatory practice highlighted by this case concerns the role of intermediaries in the regulatory task. The development of the digital regulation scheme has required the regulator to work closely with industry to ensure private telematic firms assist in the delivery of the regulatory framework. The regulator did not develop nor does it deliver the electronic vehicle monitoring and tracking service. Private firms undertake this task and have become integral to the success and ongoing operation of the regulatory scheme. There is a co-dependent relationship between the regulator, the telematic firms and truck operators. Each is dependent on the other to ensure the operational success of the scheme. The regulatory framework supports the commercial interests of telematic providers since trucking firms must purchase the satellite tracking service to be eligible to participate in the IAP. Trucking firms are prepared to purchase these services where the commercial value of the regulatory concession or flexible arrangement exceeds the value of the satellite tracking and digital compliance service. Here we observe both the regulator and the regulatee having some level of dependence on the intermediary telematic firm. The intermediary works with truck operators to assist with their participation in the IAP and at the same time often reports back to the regulator on operational challenges associated with the scheme. Regulatory continuity is dependent on the economic viability of the market that has also been constituted through the compliance scheme.

This case study highlights how digitised services have extended surveillance capability. In an effort to make use of this capability regulators have devised innovative partnership arrangements to progress new regulatory systems. The constraints of government provision have been avoided by drawing on the skills and resources of private firms to deliver the technical capability required by the scheme. In this example the application of digital technology to regulatory processes has enabled the development of finely tuned regulatory requirements that seek to respond to industry innovation and demand, while also taking into account the infrastructure and safety concerns of road agencies. Regulation has become more devolved and brings into the discussion additional players who assist both regulators and regulatees in navigating

the application of digitised rules to localised circumstances. The IAP is a digitised model of regulation that has effectively extended the reach of regulatory surveillance at low cost and also allowed for more nuanced and responsive regulatory design. While not significantly iterative through the use of digital regulation the design of the scheme has embedded new players (private intermediaries) into the regulatory scheme and by design this has facilitated greater dialogue and participation in regulation.

### **Analysis and Conclusion: The risks, benefits and implications of Digital Regulation**

As the above cases show, an evident concern with the expanding forms of digital regulation is that with increasing surveillance and automated systems tracking our location and movement, individual autonomy and privacy can be eroded (Kennedy, 2016). The almost utopian accuracy and super surveillance capacity of digital regulation can generate fear and a lack of trust in government, undermining confidence in governance structures and regulatory processes. A reliance on software and 'expert scientists, ICT, and numerical analysis' also contains the risk of losing sight of 'the human element that should exist in all systems of government and the core values which should underlie the regulatory process' (Kennedy, 2016: 87). Questions regarding interoperability and the 'plasticity' of ICTs also exist, with the possibility that once initial arrangements and parameters have been programmed and committed to, making changes in accord with a shifting context and different requirements becomes slow and cumbersome (Bamberger, 2010, Coleman, 2008). Like any other form of regulation, digitised regulatory systems link operational practices and procedures (such as data collection forms, procedural check lists and specified processes) with formal regulation and state authority. Amendments to how this authority is exercised and changing the codification of this authority where it is embedded into ICT and digital surveillance systems can be both costly and time consuming. Unless adaptive systems are implemented from the start, institutional resistance to adaptation and change can emerge. Exacerbating this risk is the rapid pace that technological developments and advancements occur. Speed makes it difficult for governments and their processes of policy-making, testing, implementation and review to keep pace with the digital evolution (OECD, 2016). In practice there is



an inevitable tension between what might be currently achievable with digital technology and the time it takes for government processes to test, validate and cross check with other interests and concerns (privacy and security for example) before approval is reached to adopt and deploy a new digital regulatory scheme.

Progressing the development and roll out of digital regulation requires a new range of analytical skills and capabilities of public servants. Traditional practices such as road side inspections of vehicles or visits to firms and places of manufacturing, are replaced with the remote desk based analysis of large volumes of data. Data analysis then guides the strategic deployment of inspection and enforcement resources. At this analytical end there is an increasing need for experts in digital technologies to be involved in regulatory sectors traditionally populated by policy workers and public servants. This may come about because policy officers do not fully understand the digital specifics of the technology they are investing in or have the capacity to rigorously analyse the data generated through digitised regulatory systems. Existing digital surveillance systems also highlight that the capacity to process and act on large volumes of breach data is an emerging concern. Continuous surveillance systems like the IAP generate data on all breaches by the regulator. This includes finely grained offences that would otherwise go undetected, to significant breaches requiring prosecution. Under traditional road side inspection systems many of these breaches would have gone undetected. Prior to digitisation the volume of offences detected and prosecuted directly related to the volume of staff active in enforcement. Digital regulation and digital surveillance systems has significantly extended the reach of regulators and now generates large volumes of data on detected offences and rule breaches. A key challenge for regulators is how they intend to manage and respond to large volumes of non compliance where it is evident agencies lack sufficient resources to prosecute all reported offences. In practice agency preference has been for non appealable offences where the onus of proof rest with the regulatee. This means the party being penalised has to proof they did not commit the offence if they wish to have the matter overturned. This discourages appeals and shifts the digital enforcement and penalty process to one of high volume payment transactions.

An interesting observation from the case studies presented in this paper is that digital regulation has both enhanced and constrained regulatory development. The use of cameras and ICT within the regulatory context more often than not tends to enforce traditional systems of command and control. Here the emphasis is on monitoring, detection of the offence and subsequent prosecution. Uptake has been particularly active where monitoring and processing of large volumes of data is required and avenues for appeal are limited. A challenge for this mode of regulation, particularly where there are high volumes of prosecutions and limited supplementary educative approaches, is that community resentment and resistance can develop in opposition to the regulatory tool. For example, governments regularly face popular claims that interest in the deployment of roadside speed cameras is primarily underpinned by the devices capacity to generate significant revenue through fines, rather than being based on sound road safety principles and evidence. For example, during 2017/18 digital camera technology in NSW generated \$185M in revenue from fines (NSW Revenue, 2018) and there is little articulation from the road agency on how this has improved road safety. In the case of the IAP we see digital regulation extend agency capacity to provide more flexible and adaptive regulatory rules. Though this comes with the imposition of 24/7 monitoring of location and movement. Concerns for excessive state agency surveillance and data collection on movements has been offset by incorporating commercial third parties to undertake the vehicle tracking and reporting of non compliance. In this example, privacy concerns are offset by the regulator only having access to surveillance information that concerns a specific breach of regulatory conditions rather than continuous tracking data on the vehicle's operation. This hybrid model of regulation has effectively offset privacy concerns by engaging non state actors in the surveillance and data collection process. This innovative regulatory design has allowed digital regulation to respond to the changing demands and practices of industry across diverse geographic locations while still supporting broader public policy objectives around privacy and safety.

The digital licencing example best illustrates the potential for interactive digital regulation. The strength and value of this development in licensing is to a large extent dependent on the willing interaction and self-compliance of licence holders. Here we see digitisation allowing for an expanded mix of regulatory approaches drawing on self

regulation, voluntarism and command regulation. Using digital licences and connected applications to collect data from licence holders represents, for some forms of licencing, a new development in what regulatory licencing entails. Continuous or voluntary data collection from licence holders can form highly valued intelligence for the regulator about the regulated environment and the manner in which licence holders interact in this context. This then can assist the agency in exercising more nuanced and timely decisions about the sector and the role of licencees. And while the ability to push out information to licence holders is not new, the directness, convenience and cost effective nature of online applications connected to digital licences does present new opportunities to inform licence holders about emerging risks and better practices. The collection and delivery of information that may occur under a digital licencing system has the potential to significantly reshape regulator-regulatee relations.

Finally, consideration needs to be given to the new skills and workforce demands that digital regulation generates for agencies. While already noted above, policy and regulatory design needs to demonstrate greater capacity to understand and navigate the rapidly changing world of ICT and digital technologies. New skills are required in data analytics and higher levels of technological competencies are required to work with and negotiate with ICT providers who are increasingly central to the operational delivery of digital regulation.

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