Policy Design and Practice

ISSN: 2574-1292 (Online) Journal homepage: www.tandfonline.com/journals/rpdp20

New policy tools and traditional policy models: better understanding behavioural, digital and collaborative instruments

Michael Howlett, Sarah Giest, Ishani Mukherjee & Araz Taeihagh

To cite this article: Michael Howlett, Sarah Giest, Ishani Mukherjee & Araz Taeihagh (2025) New policy tools and traditional policy models: better understanding behavioural, digital and collaborative instruments, Policy Design and Practice, 8:1, 121-137, DOI: 10.1080/25741292.2025.2495373

To link to this article: https://doi.org/10.1080/25741292.2025.2495373

Published online: 24 Apr 2025.

POLICY DESIGN AND PRACTICE
2025, VOL. 8, NO. 1, 121–137
https://doi.org/10.1080/25741292.2025.2495373

Routledge
Taylor & Francis Group

COMMENT

OPEN ACCESS Check for updates

New policy tools and traditional policy models: better understanding behavioural, digital and collaborative instruments

Michael Howlett[a], Sarah Giest[b], Ishani Mukherjee[c] and Araz Taeihagh[d]

[a]Department of Political Science, Simon Fraser University, Vancouver, Canada; [b]Department of Public Administration, Leiden University, The Netherlands; [c]Department of Social Sciences, Singapore Management University, Singapore; [d]Lee Kuan Yew School of Public Policy, National University of Singapore, Singapore

ABSTRACT

The study of policy tools has been undertaken for several decades. This work has isolated and examined many different types of instruments or levers utilized by governments to implement their policies and examined in detail how they are arranged into mixes, packages, or portfolios of tools. However, recent developments in society and technology have highlighted the potential to use new or previously underutilized policy instruments for both traditional tasks and to address new challenges associated with emerging technologies and other contemporary issues. These tools include social media platforms, collaboration, behavioral insights, and data-driven approaches to policy-making and policy design using big data and artificial intelligence, among others. Like any other tool, however, each of these new tools has its strengths and weaknesses. This article addresses the promises and pitfalls of these new kinds of tools and assesses how their deployment and effectiveness can be understood using typologies and concepts developed to deal with traditional policy instruments.

ARTICLE HISTORY
Received 5 September 2024
Accepted 14 April 2025

KEYWORDS
Policy tools; digital government; big data; artificial intelligence; nudges; collaboration

1. Introduction: the tools orientation in policy studies and the emergence of new policy tools

One of the main tasks of policymaking consists of matching policy means to the goals that governments would like to achieve. These means or "policy tools" are the techniques through which policy goals are operationalized and set in motion on the ground. Vedung (1997), for example, defines policy instruments as "the set of techniques by which governmental authorities wield their power in attempting to ensure support and effect social change" (p. 21). Or as Hood (1986) outlines, their attempt to "effect or detect" change in the socio-economic system as well as to "ensure support" for government actions.

CONTACT Michael Howlett howlett@sfu.ca Department of Political Science, Simon Fraser University, Vancouver, Canada.

The specific kinds of policy alternatives that policy-makers consider in arriving at their decisions are composed of different sets or combinations of these tools or instruments, and are deployed in policy contexts conditioned by environmental, political, behavioral, and technological realities (Taeihagh, Ramesh, and Howlett 2021). It is well known that the character and configuration of these tools are critical to policy success and failure, and not surprisingly, the subjects of deliberation and activity at all stages of the policy-making process. Their availability, for example, affects processes of agenda-setting and policy formulation activities, while their advantages and disadvantages affect decision-making and policy implementation, and their impacts and effects are the subject of policy evaluation (Howlett 2005, 2019; Howlett, Ramesh, and Perl 2020).

Not surprisingly, given their prominent role in policy-making, the study of policy tools has been undertaken for several decades in the effort to better understand the character and impact of such tools and the constraints under which they operate. This work has isolated and examined many different types of instruments or levers utilized by governments and examined in detail how they can be, and are, arranged into mixes, packages, or portfolios of tools both in theory and practice (Del Rio and Howlett 2013; Howlett and Del Rio 2015).

Recent developments in society and technology have added some confusion to earlier depictions of instrument strengths and uses, however, as the possibility of using *social media platforms*, *collaboration*, *behavioral insights*, and data-driven approaches using *big data* and *artificial intelligence* as policy tools in themselves or as methods to assess them have come to the fore. These activities have added to the traditional toolbox governments have at their disposal when designing policy responses to problems, but have not been well integrated into the policy tools literature.

The problems with new technologies on policy tool use, and vice-versa, can be seen, for example, in the most recent Artificial Intelligence (AI) applications and use of generative AI. Due to the inherent opacity and unpredictability of AI systems, capacity issues and lack of technical literacy, data governance challenges, information asymmetry and resource advantages of tech giants, governments face a myriad of challenges in balancing the benefits of AI with the imperative of protecting the society from risks and unintended consequences (Taeihagh 2025; Khanal, Zhang, and Taeihagh 2025). This includes when they deploy AI themselves, as the recent Australian AI-centered "Robo-Debt" fiasco has underscored (Whiteford 2021; Carney 2019).

Like more traditional tools, however, each of these new tools has its strengths and weaknesses (Howlett et al. 2019; 2024). Building on the rich history of past policy tool discussions, this article addresses questions about whether traditional frameworks can capture the emergence of novel tools and their integration into policy arrangements, and how these developments challenge or complement existing ways of thinking about 'appropriate' tool deployment. It focuses on two main aspects of these new tools. That is: (a) the evolution and variation in policy tool use influenced by new technologies and behavioral insights, and (b) the role of constraints such as institutional legacies, policy styles, and government capacity on their deployment.

2. Understanding the two basic kinds of procedural and substantive policy tools

Understanding the impact of new policy tools requires recognizing, as the traditional literature has emphasized, that policy instruments generally fall into two types. *Substantive* instruments are those used to directly affect the production, distribution, and consumption of goods and services in society (Knoke 1993; Vedung 1997; Howlett 2000, 2005). These include such well-known tools as *state enterprises*, *regulatory agencies*, *subsidies*, and *information campaigns* which operate over a large field of action. This includes affecting what kinds and amounts of goods and services are provided or affected by markets or state or public provision and regulation and in what ways, as well as those typically provided by non-state, non-market organizations such as the family, community, non-profits, or through voluntary means (Salamon 1989, 2002).

Procedural instruments, on the other hand, are aimed at and affect policy processes and deliberations, affecting actual goods and service delivery only indirectly (Ostrom 1986; Howlett 2000, 2005). These tools, such as *ministerial re-organizations, public hearings*, *freedom of information acts*, *funding interest groups* and the like, are an equally important part of government activities but aim to affect the behavior of the actors involved in formulating policies or how these policies are implemented, or the *production of policies*, rather than the production of goods and services, *per se*.

These two types of tools are quite different. Substantive policy tools alter or affect the actions of citizens involved in the productive realm, while procedural tools alter or affect aspects of their behavior in the policy-making process (Knoke 1993). In addition, as Klijn, Koppenjan, and Termeer (1995) put it, procedural instruments typically "structure … the game without determining its outcome" (p. 441). That is unlike substantive tools, which may directly impact what kinds and quantities of goods and services are produced in a society; procedural tools affect the way policy-making and implementation unfold without necessarily predetermining the results of those activities.

3. Categorization of policy tools within these basic types: the NATO model

In assessing any instrument, be it traditional or new, it is necessary to first examine whether it is procedural or substantive (Lang 2022). But this is not the only dimension on which tools differ. Many scholars have looked at policy tools, and especially substantive tools, in the past and attempted to develop reasonably parsimonious classifications emphasizing distinctions in, for example, what impact tools have on their target audiences or how expensive or time-dependent they are to implement (Schneider and Ingram 1990; Salamon 2002). This is done to ease the burden of their analysis and deployment by simplifying their central characteristics and thus facilitating their analysis in deployment situations.

Cushman's (1941) study of regulatory agencies, for example, is often cited as one of the first works to attempt to systematically define the range of possible

instruments which could be used in a policy design, stressing the differences that exist between tools in terms of the amount of coercion they deploy or the extent to which they involved the state in directing citizens and other policy actors to undertake certain courses of activity and not others. Regulatory agencies, for example, often compel compliance with government wishes, unlike subsidies, which are generally not compulsory.

Other students of instruments looked at other differences, such as whether or not they are broadly or narrowly cast (Wilson 1974), or how expensive they are in terms of governmental financial or personnel commitments, and other similar characteristics.

In a prominent synthetic study of this early work, Hood (1986) argued that governments ultimately use four resources to either effect changes in their environment or detect them and can be classified accordingly: *nodality, authority*, *treasure*, and *organization* (NATO). These are updates of the more traditional way of thinking about incentives and disincentives in terms of 'carrots, sticks, sermons and organizations' (Balch 1980; Bemelmans-Videc 1998).

All kinds of "traditional" tools, such as those enumerated by Salamon (2002), can be placed into one of these four categories depending upon which 'resource' they rely upon most heavily for their effects and impacts on policy targets (Howlett 2000; Bali, Howlett, and Ramesh 2022). Hence, traditional substantive" policy tools such as public enterprises rely on governments' organizational resources, regulatory agencies rely on delegated government authority, subsidies expend government treasure resources, and exhortation relies on governmental information and its central or 'nodal' position in society (Margetts and John, 2024). The same logic applies to their "procedural" counterparts, such as government reorganizations which focus on organizational resources, government funding for interest groups or think tanks which rely on treasure, advisory commissions which rely on authority, and information-based efforts such as lobby registries or access-to-information laws which rely upon information (Klijn and Teisman 1991; Peters & Van Nispen, 1998).

Taken together, these two distinctions suggest that the universe of policy instruments can first be divided into procedural or substantive purposes and then further subdivided in each category depending on the nature of the governing resources devoted to each task. "Policy instruments" are thus the specific techniques found in each category (Howlett 2000).

4. The use of new technologies for "new" policy tools (and vice versa)

This raises the question whether this long-standing categorization of policy instruments still captures new kinds of tools or new arrangements of traditional and new tools, and the extent to which such models can help the analysis of new developments in the area. It thus addresses two key areas of contemporary policy research, which involve not only tracking the evolution of traditional tool usage patterns but also analyzing and incorporating new types of tools into current policy designs (Hood and Margetts 2007; Giest 2017; Taeihagh 2017).

5. Examining new policy tools in light of traditional evaluative techniques

It has been suggested in many quarters (Hood & Margetts, 2007; Kekez, Howlett, and Ramesh, 2020) that the current era has seen the emergence of several new policy tools that defy easy classification or analysis. These include "*behavioral* tools" such as defaults, "nudges," and other tools derived from the insights of research in behavioral economics (Thaler and Sunstein 2009; Thaler, Sunstein, and Balz 2010; Giest and Mukherjee 2018) as well as "*digital* tools" that, for example, utilize artificial intelligence to detect changes in the policy environment and alter or change the configuration or calibration of policy mixes (Taeihagh 2021, Taeihagh, Bañares-Alcántara, and Givoni 2014; Hood and Margetts 2007; Clarke). And these claims extend to other so-called "*collaborative*" tools and platforms, such as crowdsourcing, co-production, and social media, which have a similar impact on contemporary policy behavior and expectations (Prpićet al. 2015; Taeihagh 2017; Demircioglu 2018).

Each of these three kinds of "new" policy tools is discussed below.

5.1 New behavioural tools

One set of tools that has received a great deal of attention over the past decade is composed of behavioral modifications premised on the deployment of the insights of behavioral economics and psychology. This is especially the case with the notion of "nudges," or 'behavioral insights' (BI) more broadly (Dolan and Galizzi 2015) and the idea of "choice architectures" or the purposeful design of the contexts and content of how policy-relevant decisions are made (Sunstein 2014) both of which have gained much traction within policy-making in recent times.

Sunstein (2014), for example, identified ten new types of behavioral tools that combine traditional procedural and substantive tools in new ways. These include: (i) default rules, (ii) simplification, (iii) the use of social norms, (iv) increase in ease and convenience, (v) disclosure, (vi) warnings, graphic or otherwise, (vii) pre-commitment strategies, (viii) reminders, (ix) eliciting implementation intentions, and (x) informing people of the nature and consequences of their own past choices.

Instead of relying on explicit incentives or direct coercion to motivate policy "takers," the use of behavioral policy tools involve affecting the situation within which individuals make publicly relevant decisions. This is done in such a way that the 'choice architecture' these individuals, groups, or organizations face when they employ their familiar heuristics leads to a more welfare-promoting activity, whether this is realized or not. Examples of such 'nudges' include signs pointing to the stairs rather than escalators in subways to promote exercise, or, for example, using different colored seats in public trains to indicate that commuters should give some up to those in greater need (Moseley and Thomann 2021). None of the desired actions are mandatory, but compliance is nevertheless expected to be higher than if the nudge were not there. Behavioral tools have also been deployed in the area of new technology regulation and use, such as when specific kinds of defaults are used in

service agreements, for example, forcing customers to opt-out of the release of their personnel information rather than having this happen by default (Goyal, Howlett, and Taeihagh 2021).

These are classic substantive tools and rely heavily on information for their effectiveness. They have received a great deal of attention in recent years from specific actors such as policy and behavioral labs, and have been deployed by many governments, albeit often with less than the expected impact on target behavior (Wellstead, Gofen, and Carter 2021; Wellstead and Howlett 2022; Reynolds et al. 2019; Schubert 2017; Sunstein 2017).

As a result, nudges and other behavioral insights are rarely used as standalone instruments and instead often take the form of, or are promoted as, adjustments or calibrations of existing arrangements which can supplement traditional tools, such as removing cigarettes from view at check-out counters in supermarkets, an action which supplements more traditional tobacco control tools such as higher taxes or graphic packaging imagery and public health campaigns intended to discourage consumption (Ekhardt and Wieding 2016).

5.2 New digital tools

Like behavioral tools, digital policy tools are policy innovations that can be understood in two ways: *tools that are themselves of a digital nature*, and *tools enabling or prohibiting technology use and data collection*. Thus, they can be either substantive or procedural tools. The latter category includes instruments that utilize technologies and new volumes or types of data to pursue policy goals—for example, the use of social media platforms (Liu 2017; Taeihagh 2017) to organize the delivery of services through crowdsourcing and other "co-production" procedures (Pestoff 2006; Pestoff, Osborne, and Brandsen 2006; Prpic et al., 2015). Whereas in the former case, instrument mixes can enable or prohibit certain technologies due to their effect on data collection or sharing practices (Taylor, Lips, and Organ 2009; Tan, Taeihagh, and Pande 2023). Smart meters, as tools to change energy consumption behavior, are a good example of such tools because they are usually deployed by private stakeholders (energy companies) but rely heavily on public (data) infrastructure regulated by the government. If data regulation is not updated (in time), however, technology development may be delayed, limiting the effect of smart metering (Giest, 2020).

Bureaucracies use digital systems to make routine decisions and at times to replace bureaucrats altogether, not just in record-keeping and other kinds of clerical tasks, but also in decision-making and regulation, among other areas (Snellen 2002). Numerous governmental organizations have already implemented artificial intelligence technologies to support their processes, for example, for anomaly detection in the context of focusing on the identification of the most likely tax evaders or criminal recidivists (Bullock 2019). These tools can be labeled *digitally-enabled policy instruments* which are intended to enhance traditional tools and techniques of government (Clarke and Craft 2017). This includes the digitization of the back-office work processes of bureaucrats, for example, which is a powerful procedural tool, affecting how they work and with what impact. The work of street-level bureaucrats has changed considerably because of digitization and automation, and many tasks

traditionally conducted by bureaucrats face-to-face are now carried out almost exclusively online (Bovens and Zouridis 2002).

The results of these efforts have generally been positive and resulted in cost savings and greater efficiency. But they too encounter problems. In the context of COVID-19, for example, many governments attempted to integrate digital tools for data collection and virus tracking and tracing through mobile phone apps combining Bluetooth technology and GPS. Some successes occurred in this area in quarantine monitoring and contact-tracing, although less than hoped for or expected. Other digital tools were more successful, however, such as using sensor data from wastewater in order to provide rapid identification and prediction of COVID hotspots. Both these kinds of initiatives, however, raised many concerns around privacy and civil rights, which have proven difficult to overcome (Kitchin 2020; Beduschi 2021; Małagocka 2024).

Another area of concern with digital tools is the widespread adoption of large-scale automation in the use of policy instruments. For instance, a public utility can automatically stop providing services due to unpaid bills through smart contracts based on blockchain technology, without human intervention. Similarly, an AI-powered tool can suspend access to government services based on suspicion of fraud. While these actions are not novel, the introduction of automation through digital tools can significantly impact the efficiency and effectiveness of these measures, potentially leading to severe consequences. For example, automated disconnection of electricity to an elderly couple during winter due to unpaid electricity bills could be more detrimental than the traditional, albeit less efficient, manual processes that allow for rectification before drastic measures are taken (Graycar & Masters, 2022).

Many other similar concerns exist. For instance, with the introduction of autonomous vehicles, humans are no longer needed to carry out the driving task, and concerns are emerging around misalignments between the attention economy and the perverse incentives of the use of digital marketing by the vehicle operators. These include incentives for vehicle operators to extend the travel time and travel routing to increase the time to proselytize passengers with advertisements rather than get them as fast as possible to their destination, as well as ease of data collection due to the presence of a myriad of sensors (Lim and Taeihagh 2019; Ferdman 2020). And there are also many similar concerns with increased surveillance of citizens made possible by digitalization, which highlight the need for new regulations to be put in place to protect privacy rights (Lim and Taeihagh 2019).

These same dynamics can also be seen, to give only one other example, in other cases of crafting policies and guidelines to deploy robotics and autonomous systems in areas such as healthcare, where addressing ethical issues around autonomy, deception and social justice while taking individual rights, transparency and social equality into account is of paramount concern (Taeihagh and Lim 2019; Tan, Taeihagh, and Tripathi 2021; Tan and Taeihagh 2021a; b).

5.3 Collaborative tools

Collaborative processes are a third set of techniques increasingly recognized as policy instruments employed by governments to generate, develop, evaluate, and implement

policy objectives (Capano and Howlett 2020). Several scholars point toward governments increasingly attempring to leverage collaborative processes and an increase in their role in governance more broadly (e.g. Ansell and Gash, 2018; Emerson & Nabatchi, 2015; Hurlbert and Gupta 2015; Eckerberg and et al. 2022). Recent scholarship has also critically explored the conditions under which collaboration can serve as an effective policy instrument, particularly in achieving long-term goals such as in the sustainability context, and when it does not (e.g. Hurlbert and Gupta 2015; Jager et al. 2020; Rogers and Weber 2010).

In many countries institutionalized forms of citizen involvement in policy-making have been used to replace traditional agenda-setting and the exercise of policy influence by only those actors intimately involved in a project or program ("special interests") with processes such as social media campaigns in which "outsiders" as well as "insiders" can promote new and alternative perspectives on issues (Pierre 1998). Common procedural tool examples include cases of industry regulations, citizen juries, and participatory budgeting among others (Smith and Wales 2000; Sintomer, Herzberg, and Röcke 2008).

There are problems with all such tools, however. Information dissemination, for example, remains relatively low-cost in terms of financial and personnel outlay, and collaborative efforts in this area, such as public hearings and budgetary processes, are often thought to be highly cost-effective and, thus, preferable to other, more expensive traditional techniques (John 2013). And in a more substantive vein, compliance with government urgings is a major issue and, just as in private sector advertising (e.g. Pepsi, Coke), accurately evaluating the impact and effectiveness of information dissemination campaigns is difficult, especially when high levels of participation are required. Citizens may not pay attention to the information provided by, for example, nutritional or ecolabels, or may become inured to messages repeated too often in various forums (Howells 2005; Young 2007).

Collaborative policy tools all have: a) a timescale of implementation, which is the time required to implement the measure; b) some delay in the length of time from implementation of the measure to the time its effect is felt; and c) a timescale of effect or the length of time during which the measure's effect will be felt after implementation (Taeihagh, Givoni, and Bañares-Alcántara 2013, Taeihagh, Bañares-Alcántara, and Givoni 2014). New kinds of social media, electronic communication, and digital marketing have all affected the operation of the "political economy of attention" but may not have lasting effects (Bougherara, Grolleau, and Mzoughi 2007). Public campaigns, on the other hand, all have a delay from the time they are implemented to when they create behavioral responses, while discouraged behavior, such as smoking or overeating, can have a very short timescale of effect and reemerge once a campaign has stopped. Where too much information is provided ("information overload") the target audience may stop listening; which leads to diminishing returns and lower timescale of effectiveness (Bougherara, Grolleau, and Mzoughi 2007; Taeihagh, Givoni, and Bañares-Alcántara 2013). Thus, while inexpensive, comparatively speaking, the political risks and costs to the government in using this tool may be high (Young 2007).

In the offline environment it is also well recognized that participatory processes are often dominated by people who are easily recruited, vocal, and "reasonably

comfortable in public arenas," thus failing to reach critical audiences and publics despite their ostensibly mass character (Bryson et al. 2013, p. 29). Digital participation opportunities open up this playing field to less vocal members of society, since the setting is less immediate and confrontational and more easily accessible with offline participation but other problems with doxing, uncivil discourse and mobbing in such venues are all well known and discourage participation.

Thus, online platforms may simply strengthen the participation of people who are readily motivated to participate through other channels and not help to increase inclusivity (Clark, Brudney, and Jang 2013). In fact, research shows that online platforms have been used to prevent collective action through institutionalized use of crowdsourcing for political purposes, to facilitate manipulation in agenda-setting and have led to a *decrease* in transparency in some areas due to the anonymity available through certain types of platforms (Asmolov 2015; Gruzd and Tsyganova 2015).

6. How new are they? Old wine but in problematic new bottles

As this discussion has shown, there are two dimensions to the question of 'new instruments'. One is whether patterns of policy tool use in the contemporary era have been altered due to new developments in behavioral economics, digital technologies and participatory processes. The second dimension concerns to what extent traditional frameworks capture the emergence of novel tools and help understand the circumstances and problems associated with their use.

6.1 Old wine: new policy tools as recast traditional instruments

Older sets of tools are still being deployed to achieve government goals, of course, and in some cases have been augmented by the use of newer behavioral and digital tools and technologies, and the track record of success in these and other areas affected by new tools and technologies remains somewhat uneven. However, based on the arguments raised above, as shown in Table 1, many new developments in fact fit well into the existing NATO categorization scheme.

6.2 Behavioral tools and nudges

In theorizing the place of behavioral tools through the lens of major policy tool categorization efforts such as the NATO framework (Hood 1986), as this discussion has shown, many of the "new" behavioral tools can be seen to be variations on previous efforts to alter public and individual behavior through information dissemination and collection. Most are substantive and designed to alter the production and distribution of goods and services in society. They thus can be seen to be mainly nodality-based tools that work to alter policy taker responses to government initiatives (Mukherjee and Mussagulova 2024). As Peter John has argued, they fit the mantra that, "all tools are informational now" and are foundational to many recent efforts toward "recalibrating the instruments of state" in this direction (John 2013, p. 45). The use of such tools is often observed in the adjustments or recalibrations of how

Table 1. Taxonomy of procedural and substantive policy instruments, including novel tools.

Policy Instruments	Governing resource				
		Information	Authority	Treasure	Organization
	Substantive	Nudges and behavioral insights	Regulation of (personal) data	Choice architecture	Digital service delivery
	Procedural	Digital/ automated supply of information online platforms; digital data exchange for collaboration	Behavioral insights Multi-stakeholder task forces	Financial incentives for collaboration	Digitization of back-office work processes Inter-agency data collaboration

Source: Adapted from Howlett (2000), based on Hood (1986).

traditional activities such as tax incentives or user charges are presented to target groups and individuals (e.g. Mitnick 1980).

6.3 New digital tools

Digital tools, similarly, can be analyzed using these same traditional models, methods and distinctions. Often, for example, it is not entirely new instruments that emerge from digitization, but rather a shift in the prominence or functioning of existing policy tools. Thus, for example, in the case of regulation, digitization provides new opportunities for more effective and precisely targeted actions when more data is collected (Hood and Margetts 2007). The prominence of data created and collected through digital processes changes the supply of information that can be deployed as part of policy efforts and alters the nature of the information and data resources to be brokered and consumed by political staff, elected officials, and citizens (Craft and Howlett 2013).

6.4 Collaborative tools

Of course, efforts to enhance citizen participation in government and policy-making are also not new, but some instruments – such as social media - have only been created recently, altering which kinds of tools have been and are being utilized for this purpose.

At the same time, however, research points out that "internet use increasingly reflects known social, economic, and cultural relationships present in the offline world, including inequalities" (Van Deursen & Van Dijk, 2014, p. 521) and this, to a certain extent, has been trending toward a mirroring of on and offline consultation, albeit on a far larger scale in the latter instance. This can be seen, for example, in the growth and uses of offline and online consultative and other participation fora for major projects and infrastructure initiatives (Van Dijk, Werner, and Marien 2023; Theocharis and van Deth 2018).

6.5 Problematic new bottles: problems with "new" tools

Although less exotic than might seem to be the case at first sight, there is still a high level of uncertainty and complexity involved in the use and deployment of

new tools and governing technologies which the utilization of traditional analytical techniques for understanding policy tool use can help offset.

First, as we have seen, to date, the effective use of new policy tools has relied significantly on the concurrent formulation of more traditional, supporting, regulatory measures, and on alignment with existing institutional contexts conducive to their enactment (Giest, 2020; Kuehnhanss 2019; Lepenies & Małecka, 2015). For instance, ridesharing companies are subjected to combinations of substantive regulatory tools such as training, licenses, standards and fines, and procedural tools such as stakeholder consultations, commissions and inquiries, structured market competition, and government reorganization which combine new substantive policies with older procedural ones (Li, Taeihagh, and De Jong 2018; Icasiano and Taeihagh 2021). The impact of many of these interactions is not well known.

And in addition to the more contextual constraints set out above, there are also concerns about the overall capacity of the government to understand and properly utilize novel instruments. Deploying behavioral and digital tools, for example, requires extensive knowledge of existing evidence on human behavior in specific contexts and how that behavior might be changed when approached in new or novel ways. Digital instrument development also requires allocating resources to review available processes and integrate them with new tools and techniques which may or may not be readily available (Dunleavy et al. 2006; Giest and Mukherjee 2018; Mont, Lehner, and Heiskanen 2014; Taeihagh 2021). And research increasingly shows that "governments lack the expertise to match big data to draw on a broader foundation for designing some of these instruments in conjunction with traditional measures (Giest and Mukherjee 2018, p. 362; Athey 2017; Yeung 2018).

7. Conclusion: something old, something new

This study has highlighted the rise of behavioral, digital, and collaborative policy instruments which have caused some confusion among practitioners and those interested in policy instruments. While tools like nudging, AI systems, and co-production platforms do not necessarily introduce completely new mechanisms, their rapid and widespread adoption strongly signals a change in governance practices, and it is clear that they are here to stay. For instance, since the introduction of the first "nudge unit" in the UK government 2010, similar behavioral units have been widely adopted worldwide (Straßheim, 2021). Likewise, data analytics and machine learning-based tools and collaborative platforms are increasingly being embedded in policymaking in various domains. The practical entrenchment of these "new" instruments is undeniable. As such, policy scholars must engage with them and incorporate them into their analytical toolboxes (Benoit 2024).

Our findings, however, underscore the continuing relevance of existing theoretical frameworks such as the NATO model and the distinction between procedural and substantive tools when examining these new instruments. Foundational frameworks such as NATO allow us to examine how new tools draw from one or multiple resources and identify their mode of influence and operation, while the distinction between substantive and procedural tools draws our attention to whether the tools directly provide goods or services to society or indirectly shape outcomes by affecting

how institutions and actors interact. They offer a valuable lens for comparing, categorizing, and assessing policy instruments. This does not mean that these new tools are inconsequential; rather, only that they operate much like other traditional tools and their importance is often due to the additional adaptability and flexibility they bring for the calibration, customization and automation of government efforts as well as the co-creation of policies through enhanced participation and collaboration.

The deployment of these new instruments, like their more traditional counterparts, presents a range of challenges and addressing them requires a better understanding of their performance in different domains and contexts, the effects of capacity constraints (e.g. analytical and organizational) on their design and use, as well as the concerns they raise about issues such as data governance, algorithmic bias, and fairness.

Such issues may well necessitate further theoretical refinements, such as reexamining the notion of a unitary policy instrument when platforms perform multiple functions, or when machine learning-based systems can continuously learn and adapt, and platforms increasingly offer both procedural and substantive functions. And more and better empirical research is also required to understand their nuances and effects in different situations and contexts. The kinds of new governance arrangements developed to help assess and manage these impacts, such as data collaboratives, regulatory sandboxes, and AI ethics boards, also require better analysis and study if "new" policy instruments and their effects on policy-making and policy outcomes are to be properly understood.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Michael Howlett http://orcid.org/0000-0003-4689-740X

References

Ansell, Chris, and, Alison Gash. 2018. "Collaborative Platforms as a Governance Strategy." *Journal of Public Administration Research and Theory* 28 (1): 16–32. https://doi.org/10.1093/jopart/mux030.

Asmolov, G. 2015. "Vertical Crowdsourcing in Russia: Balancing Governance of Crowds and State-Citizen Partnership in Emergency Situations." *Policy & Internet* 7 (3): 292–318. https://doi.org/10.1002/poi3.96.

Athey, S. 2017. "Beyond Prediction: Using Big Data for Policy Problems." *Science* 355 (6324): 483–485. https://doi.org/10.1126/science.aal4321.

Balch, G. I. 1980. "The Stick, the Carrot, and Other Strategies: A Theoretical Analysis of Governmental Intervention." *Law and Policy Quarterly* 2 (1): 35–60. https://doi.org/10.1177/0952076720977588.

Bali, Azad Singh, Michael Howlett, and M. Ramesh. 2022. "Unpacking Policy Portfolios: Primary and Secondary Aspects of Tool Use in Policy Mixes." *Journal of Asian Public Policy* 15 (3): 321–337. https://doi.org/10.1080/17516234.2021.1907653.

Beduschi, A. 2021. "Rethinking Digital Identity for post-COVID-19 Societies: Data Privacy and Human Rights Considerations." *Data & Policy* 3: e15. https://doi.org/10.1017/dap.2021.15.

Bemelmans-Videc, M. L. 1998. "Introduction: Policy Instrument Choice and Evaluation." In *Carrots, Sticks and Sermons: Policy Instruments and Their Evaluation*, edited by M. L. Bemelmans-Videc, R. C. Rist, and E. Vedung, 21–58. New Brunswick: Transaction Publishers.

Benoit, Kenneth. 2024. "AI and Data Science for Public Policy." *LSE Public Policy Review* 3 (3): 1–6. https://doi.org/10.31389/lseppr.115.

Bougherara, D., G. Grolleau, and N. Mzoughi. 2007. "Is More Information Always Better? An Analysis Applied to Information-Based Policies for Environmental Protection." *International Journal of Sustainable Development* 10 (3): 197–213. https://doi.org/10.1504/IJSD.2007.017643.

Bovens, M., and S. Zouridis. 2002. "From Street-Level to System-Level Bureaucracies: How Information and Communication Technology is Transforming Administrative Discretion and Constitutional Control." *Public Administration Review* 62 (2): 174–184. https://doi.org/10.1111/0033-3352.00168.

Bryson, J. M., K. S. Quick, C. S. Slotterback, and B. C. Crosby. 2013. "Designing Public Participation Processes." *Public Administration Review* 73 (1): 23–34. https://doi.org/10.1111/j.1540-6210.2012.02678.x.

Bullock, J. B. 2019. "Artificial Intelligence, Discretion, and Bureaucracy." *The American Review of Public Administration* 49 (7): 751–761. https://doi.org/10.1177/0275074019856123.

Capano, Giliberto, and Michael Howlett. 2020. "The Knowns and Unknowns of Policy Instrument Analysis: Policy Tools and the Current Research Agenda on Policy Mixes." *Sage Open* 10 (1): 1–13. https://doi.org/10.1177/2158244019900568.

Carney, Terry. 2019. "Robo-Debt Illegality: The Seven Veils of Failed Guarantees of the Rule of Law?" *Alternative Law Journal* 44 (1): 4–10. https://doi.org/10.1177/1037969X18815913.

Clark, B. Y., J. L. Brudney, and S. G. Jang. 2013. "Co-Production of Government Services and the New Information Technology: Investigating the Distributional Biases." *Public Administration Review* 73 (5): 687–701. https://doi.org/10.1111/puar.12092.

Clarke, A., and J. Craft. 2017. "The Vestiges and Vanguards of Policy Design in a Digital Context." *Canadian Public Administration* 60 (4): 476–497. https://doi.org/10.1111/capa.12228.

Craft, J., and M. Howlett. 2013. "Policy Advisory Systems and Evidence-Based Policy: The Location and Content of Evidentiary Policy Advice." In *Evidence-Based Policy-Making in Canada*, edited by S. P. Young (pp. 27–44). Toronto: University of Toronto Press.

Cushman, R. E. 1941. *The Independent Regulatory Commissions*. New York: Oxford University Press.

Del Rio, Pablo, and Michael P. Howlett. 2013. "Beyond the 'Tinbergen Rule' in Policy Design: Matching Tools and Goals in Policy Portfolios." *SSRN Scholarly Paper*. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=2247238.

Demircioglu, M. A. 2018. "Examining the Effects of Social Media Use on Job Satisfaction in the Australian Public Service: Testing Self-Determination Theory." *Public Performance & Management Review* 41 (2): 300–327. https://doi.org/10.1080/15309576.2017.1400991.

Dolan, P., and M. M. Galizzi. 2015. "Like Ripples on a Pond: Behavioural Spillovers and Their Implications for Research and Policy." *Journal of Economic Psychology* 47: 1–16. https://doi.org/10.1016/j.joep.2014.12.003.

Dunleavy, P., H. Margetts, S. Bastow, and J. Tinkler. 2006. *Digital Era Governance: IT Corporations, the State, and e-Government*. New York: Oxford University Press. https://doi.org/10.1177/0894439307304515.

Eckerberg, Katarina, Therese Bjärstig, Duncan Russell, and Nick Kirsop-Taylor. 2022. "Collaborative Approaches for Sustainable Development Governance." In *Handbook on the Governance of Sustainable Development*, edited by Duncan Russell and Nick Kirsop-Taylor, 175–189. Cheltenham: Edward Elgar. https://www.elgaronline.com/edcollchap/book/9781789904321/book-part-9781789904321-20.xml.

Ekhardt, F., and J. Wieding. 2016. "Nudging and Environmental Law." In *Nudging – Possibilities, Limitations and Applications in European Law and Economics*, edited by K. Mathis & A. Tor (Eds.), (pp. 247–262). Cham: Springer.

Emerson, Kirk, and Tina Nabatchi. "Evaluating the Productivity of Collaborative Governance Regimes: A Performance Matrix." *Public Performance & Management Review* 38 (4): 717–747. https://doi.org/10.1080/15309576.2015.1031016.

Ferdman, A. 2020. "Corporate Ownership of Automated Vehicles: Discussing Potential Negative Externalities." *Transport Reviews* 40 (1): 95–113. https://doi.org/10.1080/01441647.2019.1687606.

Giest, S. 2020. "Making Energy Personal: Policy Coordination Challenges in UK Smart Meter Implementation." *Journal of Public Policy* 40 (4): 553–572. https://doi.org/10.1017/S0143814X19000163.

Giest, S. 2017. "Big Data for Policymaking: Fad or Fasttrack?" *Policy Sciences* 50 (3): 367–382. https://doi.org/10.1007/s11077-017-9293-1.

Giest, S. 2020. "Do Nudgers Need Budging? A Comparative Analysis of European Smart Meter Implementation." *Government Information Quarterly* 37 (4): 101498. https://doi.org/10.1016/j.giq.2020.101498.

Giest, S., and I. Mukherjee. 2018. "Behavioural Instruments in Renewable Energy and the Role of Big Data: A Policy Perspective." *Energy Policy* 123: 360–366. https://doi.org/10.1016/j.enpol.2018.09.006.

Goyal, Nihit, Michael Howlett, and Araz Taeihagh. 2021. "Why and How Does the Regulation of Emerging Technologies Occur? Explaining the Adoption of the EU General Data Protection Regulation Using the Multiple Streams Framework." *Regulation & Governance* 15 (4): 1020–1034. https://doi.org/10.1111/rego.12387.

Graycar, Adam, and Adam B. Masters. 2022. "Bureaucratic Bastardry: Robodebt/Debt Recovery, AI and the Stigmatisation of Citizens by Machines and Systems." *International Journal of Public Policy* 16 (5/6): 333. https://doi.org/10.1504/IJPP.2022.10052425.

Gruzd, A., and K. Tsyganova. 2015. "Information Wars and Online Activism during the 2013/2014 Crisis in Ukraine: Examining the Social Structures of Pro-and Anti-Maidan Groups." *Policy & Internet* 7 (2): 121–158. https://doi.org/10.1002/poi3.91.

Hood, C. 1986. *The Tools of Government*. Chatham: Chatham House Publishers.

Hood, C., and H. Margetts. 2007. *The Tools of Government in the Digital Age*. Basingstoke: Palgrave Macmillan.

Howells, G. 2005. "The Potential and Limits of Consumer Empowerment by Information." *Journal of Law and Society* 32 (3): 349–370. https://doi.org/10.1111/j.1467-6478.2005.00328.x.

Howlett, M. 2000. "Managing the "Hollow State": Procedural Policy Instruments and Modern Governance." *Canadian Public Administration* 43 (4): 412–431. https://doi.org/10.1111/j.1754-7121.2000.tb01152.x.

Howlett, M. 2005. "What is a Policy Instrument? Policy Tools, Policy Mixes and Policy Implementation Styles." In *Designing Government: From Instruments to Governance*, edited by P. Eliadis, M. Hill, & M. Howlett, (pp. 31–50). Montreal: McGill-Queen's University Press.

Howlett, Michael, and Pablo del Rio. 2015. "The Parameters of Policy Portfolios: Verticality and Horizontality in Design Spaces and Their Consequences for Policy Mix Formulation." *Environment and Planning C: Government and Policy* 33 (5): 1233–1245. https://doi.org/10.1177/0263774X15610059.

Howlett, Michael, M. Ramesh, and Anthony Perl. 2020. *Studying Public Policy: Principles and Processes*. Fourth edition. Don Mills: Oxford University Press.

Howlett, Michael. 2019. *Designing Public Policies: Principles and Instruments*. 2nd Edition. London: Routledge.

Howlett, Michael. 2024. *Designing Public Policies: Principles and Instruments*. 3rd ed. London: Routledge. https://doi.org/10.4324/9781003343431.

Hurlbert, Margot, and Joyeeta Gupta. 2015. "The Split Ladder of Participation: A Diagnostic, Strategic, and Evaluation Tool to Assess When Participation Is Necessary." *Environmental Science & Policy* 50: 100–113. https://doi.org/10.1016/j.envsci.2015.01.011.

Icasiano, C. D. A., and A. Taeihagh. 2021. "Governance of the Risks of Ridesharing in Southeast Asia: An In-Depth Analysis." *Sustainability* 13 (11): 6474. https://doi.org/10.3390/su13116474.

Jager, Nicolas W., Jens Newig, Edward Challies, and Elisa Kochskämper. 2020. "Pathways to Implementation: Evidence on How Participation in Environmental Governance Impacts Environmental Outcomes." *Journal of Public Administration Research and Theory* 30 (3): 383–399. https://doi.org/10.1093/jopart/muz034.

John, P. 2013. "All Tools Are Informational Now: How Information and Persuasion Define the Tools of Government." *Policy & Politics* 41 (4): 605–620. https://doi.org/10.1332/030557312X655729.

Kekez, Anka, Michael Howlett, and M. Ramesh, eds. *Collaboration in Public Service Delivery: Promise and Pitfalls*. Cheltenham: Edward Elgar, 2020.

Khanal, S., H. Zhang, and A. Taeihagh. 2025. "Why and How is the Power of Big Tech Increasing in the Policy Process? The Case of Generative AI." *Policy and Society* 44 (1): 52–69. https://doi.org/10.1093/polsoc/puae012.

Kitchin, R. 2020. "Civil Liberties *or* Public Health, or Civil Liberties *and* Public Health? Using Surveillance Technologies to Tackle the Spread of COVID-19." *Space and Polity* 24 (3): 362–381. https://doi.org/10.1080/13562576.2020.1770587.

Klijn, E. H., and G. R. Teisman. 1991. "Effective Policy Making in a Multi-Actor Setting: Networks and Steering." In *Autopoiesis and Configuration Theory: New Approaches to Societal Steering*, edited by R. J. In 't Veld, L. Schaap, C. J. A. M. Termeer, & M. J. W. Van Twist (pp. 99–111). Dordrecht: Kluwer.

Klijn, E. H., J. Koppenjan, and K. Termeer. 1995. "Managing Networks in the Public Sector: A Theoretical Study of Management Strategies in Policy Networks." *Public Administration* 73 (3): 437–454. https://doi.org/10.1111/j.1467-9299.1995.tb00837.x.

Knoke, D. 1993. "Networks as Political Glue: Explaining Public Policy-Making." In *Sociology and the Public Agenda*, edited by W. J. Wilson (pp. 164–184). Newbury Park: Sage.

Kuehnhanss, C. R. 2019. "The Challenges of Behavioural Insights for Effective Policy Design." *Policy and Society* 38 (1): 14–40. https://doi.org/10.1080/14494035.2018.1511188.

Lang, Achim. 2022. "The Need to Understand and Integrate Procedural and Substantive Tools." In *The Routledge Handbook of Policy Tools*, edited by Michael Howlett. London: Routledge. https://doi.org/10.4324/9781003163954.

Lepenies, R., and M. Małecka. 2015. "The Institutional Consequences of Nudging – Nudges, Politics, and the Law." *Review of Philosophy and Psychology* 6 (3): 427–437. https://doi.org/10.1007/s13164-015-0243-6.

Li, Y., A. Taeihagh, and M. De Jong. 2018. "The Governance of Risks in Ridesharing: A Revelatory Case from Singapore." *Energies* 11 (5): 1277. https://doi.org/10.3390/en11051277.

Lim, H. S. M., and A. Taeihagh. 2019. "Algorithmic Decision-Making in AVs: Understanding Ethical and Technical Concerns for Smart Cities." *Sustainability* 11 (20): 5791. https://doi.org/10.3390/su11205791.

Liu, H. K. 2017. "Crowdsourcing Government: Lessons from Multiple Disciplines." *Public Administration Review* 77 (5): 656–667. https://doi.org/10.1111/puar.12808.

Małagocka, K. 2024. "Navigating Digital Privacy and Surveillance: Post-Covid Regulatory and Theoretical Insights." *Politics and Governance* 12: 8572. https://doi.org/10.17645/pag.8572.

Margetts, Helen, and Peter John. 2024. "How Rediscovering Nodality Can Improve Democratic Governance in a Digital World." *Public Administration* 102 (3): 969–983. https://doi.org/10.1111/padm.12960.

Mitnick, B. M. 1980. "Incentive Systems in Environmental Regulation." *Policy Studies Journal* 9 (3): 379–394. https://doi.org/10.1111/j.1541-0072.1980.tb00947.x.

Mont, O., M. Lehner, and E. Heiskanen. 2014. *Nudging. A Tool for Sustainable Behaviour? (Report No. 6643)*. Stockholm: Swedish Environmental Protection Agency.

Moseley, A., and E. Thomann. 2021. "A Behavioural Model of Heuristics and Biases in Frontline Policy Implementation." *Policy & Politics* 49 (1): 49–67. https://doi.org/10.1332/030557320X15967973532891

Mukherjee, I., and A. Mussagulova. 2024. *Designing Behavioural Insights for Policy: Processes, Capacities & Institutions. Elements in Public Policy*. Cambridge: Cambridge University Press.

Ostrom, E. 1986. "A Method of Institutional Analysis." In *Guidance, Control, and Evaluation in the Public Sector*, edited by F. X. Kaufmann, G. Majone, & V. Ostrom (pp. 459–475). Berlin: De Gruyter.

Prpić, J., A. Taeihagh, and J. Melton. 2015. "The Fundamentals of Policy Crowdsourcing." *Policy & Internet* 7 (3): 340–361. https://doi.org/10.1002/poi3.102.

Pestoff, V. 2006. "Citizens and Co-Production of Welfare Services." *Public Management Review* 8 (4): 503–519. https://doi.org/10.1080/14719030601022882.

Pestoff, V., S. P. Osborne, and T. Brandsen. 2006. "Patterns of Co-Production in Public Services." *Public Management Review* 8 (4): 591–595. https://doi.org/10.1080/14719030601022999.

Peters, B. G., & Van Nispen, F. K. M. (Eds.) 1998. *Public Policy Instruments: Evaluating the Tools of Public Administration*. New York: Edward Elgar.

Pierre, J. 1998. "Public Consultation and Citizen Participation: Dilemmas of Policy Advice." In *Taking Stock: Assessing Public Sector Reforms*, edited by B. G. Peters & D. J. Savoie (pp. 137–163). Montreal: McGill-Queen's University Press.

Reynolds, J. P., S. Archer, M. Pilling, M. Kenny, G. J. Hollands, and T. M. Marteau. 2019. "Public Acceptability of Nudging and Taxing to Reduce Consumption of Alcohol, Tobacco, and Food: A Population-Based Survey Experiment." *Social Science & Medicine (1982)* 236: 112395.

Rogers, Ellen, and Edward P. Weber. September 2010. "Thinking Harder About Outcomes for Collaborative Governance Arrangements." *The American Review of Public Administration* 40 (5): 546–567. https://doi.org/10.1177/0275074009359024.

Salamon, L. M. (Ed.). 1989. *Beyond Privatisation: The Tools of Government Action*. Washington, D.C.: Urban Institute.

Salamon, L. M. (Ed.). 2002. *The Tools of Government: A Guide to the New Governance*. New York: Oxford University Press.

Schneider, A. L., and H. Ingram. 1990. "Behavioural Assumptions of Policy Tools." *Journal of Politics* 52 (2): 511–529.

Schubert, C. 2017. "Green Nudges: Do They Work? Are They Ethical?" *Ecological Economics* 132: 329–342. https://doi.org/10.1016/j.ecolecon.2016.11.009.

Sintomer, Y., C. Herzberg, and A. Röcke. 2008. "Participatory Budgeting in Europe: Potentials and Challenges." *International Journal of Urban and Regional Research* 32 (1): 164–178. https://doi.org/10.1111/j.1468-2427.2008.00777.x.

Smith, G., and C. Wales. 2000. "Citizens' Juries and Deliberative Democracy." *Political Studies* 48 (1): 51–65. https://doi.org/10.1111/1467-9248.00250.

Snellen, I. 2002. "Electronic Governance: Implications for Citizens, Politicians, and Public Servants." *International Review of Administrative Sciences* 68 (2): 183–198. https://doi.org/10.1177/0020852302682002.

Straßheim, Holger. 2021. "Who Are Behavioural Public Policy Experts and How Are They Organised Globally?" *Policy & Politics* 49 (1): 69–86. https://doi.org/10.1332/030557320X15956825120821.

Sunstein, C. R. 2014. "Nudging: A Very Short Guide." *Journal of Consumer Policy* 37 (4): 583–588. https://doi.org/10.1007/s10603-014-9273-1.

Sunstein, C. R. 2017. "Nudges That Fail." *Behavioural Public Policy* 1 (1): 4–25. https://doi.org/10.1017/bpp.2016.3.

Taeihagh, A. 2017. "Crowdsourcing: A New Tool for Policy-Making?" *Policy Sciences* 50 (4): 629–647. https://doi.org/10.1007/s11077-017-9303-3.

Taeihagh, A. 2021. "Governance of Artificial Intelligence." *Policy and Society* 40 (2): 137–157. https://doi.org/10.1080/14494035.2021.1928377.

Taeihagh, A. 2025. "Governance of Generative AI." *Policy and Society* 44Iss (1): 1–22. https://doi.org/10.1093/polsoc/puaf001.

Taeihagh, A., and H. S. M. Lim. 2019. "Governing Autonomous Vehicles: emerging Responses for Safety, Liability, Privacy, Cybersecurity, and Industry Risks." *Transport Reviews* 39 (1): 103–128. https://doi.org/10.1080/01441647.2018.1494640.

Taeihagh, A., R. Bañares-Alcántara, and M. Givoni. 2014. "A Virtual Environment for the Formulation of Policy Packages." *Transportation Research Part A: Policy and Practice* 60: 53–68. https://doi.org/10.1016/j.tra.2013.10.017.

Taeihagh, A., M. Givoni, and R. Bañares-Alcántara. 2013. "Which Policy First? A Network-Centric Approach for the Analysis and Ranking of Policy Measures." *Environment and Planning B: Planning and Design* 40 (4): 595–616. https://doi.org/10.1068/b38058.

Taeihagh, A., M. Ramesh, and M. Howlett. 2021. "Assessing the Regulatory Challenges of Emerging Disruptive Technologies." *Regulation & Governance* 15 (4): 1009–1019. https://doi.org/10.1111/rego.12392.

Tan, S. Y., and A. Taeihagh. 2021. "Governing the Adoption of Robotics and Autonomous Systems in Long-Term Care in Singapore." *Policy and Society* 40 (2): 211–231. https://doi.org/10.1080/14494035.2020.1782627.

Tan, S. Y., and A. Taeihagh. 2021b. "Adaptive Governance of Autonomous Vehicles: Accelerating the Adoption of Disruptive Technologies in Singapore." *Government Information Quarterly* 38 (2): 101546. https://doi.org/10.1016/j.giq.2020.101546.

Tan, S. Y., A. Taeihagh, and D. Pande. 2023. "Data Sharing in Disruptive Technologies: Lessons from Adoption of Autonomous Systems in Singapore." *Policy Design and Practice* 6 (1): 57–78. https://doi.org/10.1080/25741292.2022.2162247.

Tan, S. Y., A. Taeihagh, and A. Tripathi. 2021. "Tensions and Antagonistic Interactions of Risks and Ethics of Using Robotics and Autonomous Systems in Long-Term Care." *Technological Forecasting and Social Change* 167: 120686. https://doi.org/10.1016/j.techfore.2021.120686.

Taylor, J. A., M. Lips, and J. Organ. 2009. "Identification Practices in Government: Citizen Surveillance and the Quest for Public Service Improvement." *Identity in the Information Society* 1 (1): 135–154. https://doi.org/10.1007/s12394-009-0007-5.

Thaler, R. H., and C. R. Sunstein. 2009. *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New York: Penguin Books.

Thaler, R. H., C. R. Sunstein, and J. P. Balz. 2010. *Choice Architecture (SSRN Scholarly Paper No*. ID 1583509). Rochester: Social Science Research Network.

Theocharis, Yannis, and Jan W. van Deth. 2018. "The Continuous Expansion of Citizen Participation: A New Taxonomy." *European Political Science Review* 10 (1): 139–163. https://doi.org/10.1017/S1755773916000230.

Van Deursen, A. J., and J. A. Van Dijk. 2014. "The Digital Divide Shifts to Differences in Usage." *New Media & Society* 16 (3): 507–526. https://doi.org/10.1177/1461444813487959.

Van Dijk, Lisa, Hannah Werner, and Sofie Marien. 2023. "The Perceived Problem-Solving Potential of Deliberative Minipublics: Evidence from a Survey of Belgian Citizens." *European Journal of Political Research* 63 (3): 862–883. https://doi.org/10.1111/1475-6765.12639.

Vedung, E. 1997. "Policy Instruments: Typologies and Theories." In *Carrots, Sticks and Sermons: Policy Instruments and Their Evaluation*, edited by M. L. Bemelmans-Videc, R. C. Rist, & E. Vedung (pp. 21–58). New Brunswick: Transaction Publishers.

Yeung, K. 2018. "Algorithmic Regulation: A Critical Interrogation." *Regulation & Governance* 12 (4): 505–523. https://doi.org/10.1111/rego.12158.

Young, S. 2007. "The Regulation of Government Advertising in Australia: The Politicisation of a Public Policy Issue." *Australian Journal of Public Administration* 66 (4): 438–452. https://doi.org/10.1111/j.1467-8500.2007.00555.x.

Wellstead, Adam M., and Michael Howlett. 2022. "(Re)Thinking Think Tanks in the Age of Policy Labs: The Rise of Knowledge-Based Policy Influence Organisations." *Australian Journal of Public Administration* 81 (1) : 224–232. https://doi.org/10.1111/1467-8500.12528.

Wellstead, Adam M., Anat Gofen, and Angie Carter. 2021. "Policy Innovation Lab Scholarship: Past, Present, and the Future – Introduction to the Special Issue on Policy Innovation Labs." *Policy Design and Practice* 4 (2) : 193–211. https://doi.org/10.1080/25741292.2021.1940700.

Whiteford, Peter. 2021. "Debt by Design: The Anatomy of a Social Policy Fiasco – Or Was It Something Worse?" *Australian Journal of Public Administration* 80 (2): 340–360. https://doi.org/10.1111/1467-8500.12479.

Wilson, J. Q. 1974. "The Politics of Regulation." In *Social Responsibility and the Business Predicament*, edited by J. W. McKie, 135–168. Washington D.C.: Brookings Institute.