Received: 24 April 2023 | Revised: 9 February 2024 | Accepted: 5 March 2024

DOI: 10.1111/1467-8500.12637

RESEARCH ARTICLE

WILEY

Managing COVID-19 in Morocco: The adoption of novel technology tools in assisting expert policy advisors

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Abstract

The COVID-19 pandemic showed that new digital tools played a major role in the design, implementation, and evaluation of policies aimed at containing and defeating the virus. However, relying on digital tools should not undermine the role of experts in the policy process. This paper answers the following question as means of examing the relationship between technology and expertise: To what extent has the introduction of technology-assisted tools complemented and empowered health experts to provide more effective policy advice? By answering this question, the paper investigates the opportunities and challenges of technology-backed sources of 'policy knowledge' as 'advisory assistants' of conventional expert communities in the policy processes. Drawing on a case study from a developing country, I demonstrate how the introduction of the 'Wiqaytna' mobile application in Morocco facilitated reporting of higher risk locations and provided operational feedback for 'the scientific committee' enabling them to deliver more efficient and effective actions against COVID-19, despite the underlying technical and ethical problems associated with the use of such tools.

Points for practitioners:

- Increasing interest and deployment of technology tools, such as artificial intelligence in the public policy and administration, means that a proper understanding and use of technology assisted tools is crucial for the delivery of smooth and effective public policy.
- The role of human experts remains indispensable in the policy process, but technology assisted tools can be utilised to speed up implementation processes and help give policy feedback.

KEYWORDS
COVID-19, digital knowledge, Morocco, policy experts, public policy, technology

1 | INTRODUCTION

The COVID-19 pandemic revealed many challenges in crisis management leading Ansell et al. (2021) to call 'for robust governance responses to turbulent problems'. To bring about innovation in the field, they urge policy actors to foster public innovation, establish resilient governance strategies, and enable adaptable, flexible adjustments for the exploration and utilisation of emerging options and opportunities in predicting and managing crises (Ansell et al., 2021). Several authors also question governments' integrity in applying technology tools during and after crises. Upadhyaya (2022) argues that the government's growing ability to access and analyse data poses significant challenges to individual privacy. She emphasises that the effectiveness of this technological approach raises concerns about the emergence of a pervasive 'Pandemic Big Brother' scenario. Likewise, Harari (2020) argues that there is a risk of sustained surveillance even after the pandemic.

Against this backdrop, the COVID-19 pandemic stimulated divergent opinions concerning the legitimacy of experts to take on policy roles. Some argue that crisis situations require non-elected experts to formulate action plans that restrict basic democratic values, such as freedoms, liberties, and other human rights. In the context of the COVID-19 pandemic, restrictions on human mobility, imposing lockdowns, mandatory wearing of face masks, and gradually enforcing vaccination, among other measures, were implemented based on expert advice in an attempt to halt the virus and its spread. Indeed, the expansion of such measures, in addition to the social and economic crises that followed, generated protests across the world, including in a number of traditional democracies such as the United States, the Netherlands, Germany, Belgium, and France. In the United States, protest movements were led by far-right movements in response to alleged misinformation by former President Donald Trump[1]. In Germany, anti-COVID protests were stimulated by conspiracy theory groups who deny the existence of the virus and thus call for freedom of mobility and assemblies. This was a move that encouraged other groups in Australia and elsewhere to defy restrictions on movement and lockdowns[2].

While the ethical controversies and social challenges discussed above could put experts' at risk, governments use of technology-assisted tools helped to maintain high degrees of policy effectiveness and efficiency, while preserving the democratic experience and political legitimacy of policy and decision-makers. Mijatović (2019)[3] has argued, for example, that 'digital technologies can improve the quality of our lives, increase efficiency, strengthen accountability, and create new opportunities in many key sectors of life like health care, education, and employment'. Besides, individuals' interests can be gathered and summarised by machine learning, which may eventually allow those preferences to be matched with particular topics that are attracting public opinion from regulatory bodies. At the local and national levels, generative AI can help seasoned politicians and activists persuade different groups. Through the simplification of legislative text and the tracking of representatives' votes, such technology may help improve voters' comprehension of complex legislation that their elected officials are discussing (Eisen et al., 2023). Several authors within both realms of public policy and technology label the technology–government relationships in different terms. Some refer to it as 'e-government', while others refer to it as 'digital government', 'online government', or 'government 2.0'.

The introduction of technology-assisted tools in governments could minimise the role of traditional policy experts in public policy and governance. In specific and technical terms, governments tend to deploy new forms of policy assistance tools known as big data, AI, and machine learning. These 'virtual' knowledge systems may replace the knowledge and expertise provided by 'real' experts in the public policy process. For example, the Mayor of Budapest, Gergely Karácsony, requested a chatbot to identify the city's needs. This use of AI was meant to criticise the central government's inability to address the major problems faced in Budapest. He started his Facebook post with a note: '*This is what happens when the artificial intelligence is smarter than the government because it knows what we, the people of Budapest, know very well…*'[4].

ChatGPT[5] answered the Mayor's question with a number of suggestions:

- Improve transport, including expanding public transport systems and improving roads and bridges.
- Increase green spaces by strengthening environmental protection, for example to protect against climate change and reduce noise.
- Develop tourism and promote the artistic and cultural values of the city.
- Improve the quality of life for the city's residents, for example by tackling housing problems and improving the city's health services.
- Develop the economy by supporting entrepreneurship and encouraging innovation[6].

In the context of pandemics and deadly diseases, experts in health, biology, and medical sciences, can be influential in the design of policymaking and decision-making. However, the emergence of modern technologies, embodied nowadays in new scientific fields such as algorithmic programming, machine learning, and AI, can pose a threat to the role of traditional human experts in decision and public policy. This paper suggests that new methods and techniques in policy advice, assisted by 'artificial intelligence', can only be a 'complimentary element' to the role 'human experts' play in policymaking. This is based on numerous epistemological, ethical, and technical challenges that may occur when relying fully on AI without input from 'real' experts. As a case study, the policy response of the Moroccan government demonstrates that the 'scientific committee' which directs government decisions utilised assisted technological tools to monitor the spread of COVID-19, thus facilitating its mandate, despite the democratic deficits and social crisis that occurred during and after the lockdown. The paper consists of three parts: The first dis-

cusses key concepts such as public policy, technology (specifically AI), and experts. The second describes some of the strengths and limitations of utilising technologies and AI in governance and public policy, and then explains how technology-assisted tools can be helpful in addressing public policy issues, in a manner that does not undermine or weaken the role of 'real experts' in the policy process. The third part provides a case study of how Moroccan health experts maintained their role in policy decisions during the COVID-19 pandemic.

2 | INNOVATIVE TECHNOLOGY, PUBLIC POLICY, AND EXPERTS DURING CRISIS: CONNECTING THE DOTS

2.1 | AI and public policy

Studies of AI started in the field of computer science in the 1940s, but, its application and effects in the public sphere have not been studied in depth. Application of AI in government involves 'the design, building, use, and evaluation of intelligent algorithms, robotics, and computational techniques to improve the management of public agencies' (Desouza, 2018). Given the rise of AI in recent years, research on the relationship between AI and public policy prior to 2010 has been limited. But discussions and foundational works have provided the framework for comprehending the roles of AI in policymaking. For example. Barth and Arnold (1999) defined AI as a '*new level of computing in which systems would have the capability to act as autonomous agents and learn to learn independently, assess their environment, and think with values, motives, and emotions*'. Moreover, Leondes (2001) explored the concept of 'expert system' as a '*knowledge-based computer system that emulates the decision-making ability of a human expert*'.

AI has also been described as an innovative technological method that can be utilised in almost all phases of the policy cycle from agenda setting all the way to policy evaluation. Valle-Cruz et al. (2020) studied different cases of AI applications and drew a conclusion that throughout each stage of the policy cycle, AI is applied in different ways (Table 1; Parsons et al., 2024).

However, further dependence on AI raises issues that are mainly related to breach of individuals data and privacy. Moreover, weak technological infrastructure in middle- and low-income countries, coupled with a lack of literacy in the IT sector, can present a challenge for governments to implement AI in their policy processes. Last but not least, further deployment of AI can decrease traditional job vacancies that involve bureaucrats. AI can therefore change the outlook of employment into a fully digital community of employees with less human resources engaged, who hold high expertise in IT and AI.

2.2 | Expert communities and the COVID-19 crisis

In the wake of the increasing use and application of technology in the practice of public policy, the role of human experts is at risk of disruption. Valle-Cruz et al. (2020) expect that soon 'a government advisor—robot advisor—will forecast several decision options, their public value for society, and the possible budget for each decision'. AI and other technology tools will likely help the decision-makers to 'choose the best option for their own political purposes or according to their limitations and context' (Valle-Cruz et al., 2020). One could therefore question the place of expert communities in increasingly technology-dominated public policy and governance. First of all, whom do we really refer to as experts? Looking at the term itself can lead us to imagine experts as individuals who hold distinguished levels of expertise. Expertise is often intertwined with science

TABLE 1 The implications of artificial intelligence (AI) in public policy cycle (Valle-Cruz et al., 2020).

Policy cycle stage	AI implication	Examples
Agenda setting	AI is changing the way agenda setting operates nowadays. The selection, classification, and prioritisation of public problems are performed by machine learning.	• The Health Map to track the Ebola outbreak relies on disease surveillance websites that act as key hubs for information processing. • The National Police Lab AI in the Netherlands. The purpose of this case is to develop state-of the-art AI techniques to improve safety in the Netherlands by working on techniques across the full breadth of AI.
Policy formulation and decision-making	The new dynamic of policy formulation and decision-making with AI will increase the speed of this step. Some techniques such as artificial neural networks and evolutionary computation could help with the formulation of policies and decision-making.	• The Assistant for Understanding Data through Reasoning, Extraction, and Synthesis. AUDREY uses AI techniques that can track an entire fire team, sending relevant signals to people and helping to make recommendations on how they might work together. • The Indiana police departments can use drones for search-and-rescue efforts, to record crash scenes, and to help in emergencies.
Policy implementation	AI will improve policy implementation in several ways, including the speed of processing. However, this step requires budgets, progress tracking, and feedback.	• Dubai Police Force, which has built smart police stations run entirely by AI-powered robots. The smart police station, which is in operation 24/7, provides services such as crime reporting, lost-and-found requests, and victim support.
Policy evaluation	At this stage of the cycle, AI could help by providing real-time feedback, instant solutions, and simulations to improve implementation.	• Face-recognition kiosks have been implemented at Chinese airports to accurately identify flight plans, as well as provide a map and instructions for getting to the gate.

and knowledge, although the functions of each of these concepts in society differ quite distinctively. For example, scientists can be viewed as 'experts' in two perspectives: (1) scientists as policy advisors and (2) scientists as public communicators (Peters, 2008).

Benveniste (1984) addressed the code of ethics that experts often lack when providing policy advice. According to Benveniste, policy experts are trained as 'policy analysts', while others join policymaking groups because of their specialised knowledge. Before entering into the policy realm, they identify themselves primarily as what Peters (2008) referred to as 'public communicators' or 'knowledge generators' in a wide range of scientific areas such as biochemistry, engineering, economic development, biology, and so forth. The issue with ethics lies in the fact that the assumed 'profession' of 'policy expert' has 'no organised recruitment, licensing, or evaluation procedures'. Policy experts lack the 'established institutions that would aid in

resolving professional conflicts and that would insulate them from the intrusions of political pressure or harassment' (Benveniste, 1984). Besides, the undemocratic appointment of experts and absence of an institutionalised code of ethics can also undermine their role in public policy and governance. In light of the above, a search for technology-based tools for policy knowledge could assist in producing outcomes with high integrity and public benefit. To help bridge the gap between public policy, technology, and experts, we take examples from the healthcare and biology sectors, where experts remained core policy advisors, but where they are assisted by technology tools in improving the efficiency and effectiveness of healthcare system. For example, German health policy experts encourage the implementation of 'mental health specialist video consultation in primary care settings', where examination in person is not possible due to various personal and external reasons, such as distance and spread of infectious diseases (Tönnies et al., 2021). Nevertheless, they asserted in this regard that the deployment of technology-assisted tools in health sector would perform better when conditions related to technical literacy and availability as well as data security of patients are well maintained.

In the wake of COVID-19, governments across the world relied on various digital tools to help them to develop appropriate policy responses aimed at tracking and containing the disease. Whitelaw et al. (2020) explained that digital technology was utilised by many countries, including South Korea, Germany, and Singapore, for 'containing and mitigation processes—including surveillance, testing, contact tracing, and strict quarantine'. Kumar et al. (2020) also outlined extensive use of modern technology tools during COVID-19. They listed seven areas of application: (1) diagnosis using radiology images, (2) disease tracking, (3) prediction outcome of patient's health condition, (4) computational biology and medicines perspective, (5) protein structure predictions, (6) drug discovery, and (7) awareness and social control through Internet. We can therefore see that governments relied on a wide range of technological tools during the COVID-19 crisis, mostly run by machine learning models and AI algorithms.

The problem that can be posed when involving experts in policymaking—such as health policy experts—lies in the race for agency and weak communication strategies to address either success or failure of a policy. Cairney and Toth (2023) addressed the competition for agency and visibility among expert groups during COVID-19 in Italy and the United Kingdom, by emphasising that many (experts) 'compete for access to the most important advisory bodies and positions to influence policy with their advice'. The other issue is the communication strategy to address the public. Given the nature of health policy as evidence and science based, expert communities are often challenged to transfer the knowledge or advice to decisionmakers and the public. Löblová (2018) asserted on this regard that 'the public health community often sees its efforts as part of a linear knowledge transfer process and tends to blame itself for inadequate communication or translation of its arguments to policymakers' language when its efforts fail'. This problem was also raised in Morocco during the COVID-19 pandemic, when health expert communities often find difficulties communicating their advice to the public.

To exemplify the communication issue, Chakib Abdel Fattah, a member of the Moroccan scientific committee for controlling and monitoring COVID-19 in Morocco, sparked controversy during a television interview when asked to justify the committee's advice (that was then adopted by the government) to close mosques during Ramadan, whilst continuing to allow public gatherings on public transportation and in markets. Abdel Fattah replied literally: '*there is indeed crowding* (in public places), *but crowding is not the same as any crowding*'[7]. This expression stirred public satire in Morocco, despite the expert's best attempts to explain that long periods of contact between people in mosques increases the probability of infection, compared to other public spaces where people do not usually have longer physical contact. Nevertheless, this example is one of the many

cases where public health experts fail to transfer scientific knowledge into a simplified language to explain policy actions or justify possible failures.

3 | MOROCCO'S RESPONSE TO COVID-19: TECHNOLOGY AT THE SERVICE OF HEALTH EXPERTS

On 2 March 2020, the Moroccan Ministry of Health recorded its first case of COVID-19[8]. As soon as the number of cases increased, King of Morocco Mohamed VI held a high-level meeting on 17 March 2020, to set forth a comprehensive strategy to reduce infections and mitigate the socio-economic consequences[9]. As a result, a technical committee was created within the Ministry of Health to monitor and control the spread of COVID-19, followed by an economic commission within the Ministry of Economy and Finance to mitigate the socio-economic effects due to closure of businesses and economic activities in general.

Both committees played a crucial role in the management of the pandemic in Morocco, when most epidemiology-related decisions were guided by the technical committee, which was composed of experts in epidemiology, respiratory, and related diseases. Clear information was not revealed about the the committee's membership, their professional background or work methodology; however, a spokesperson from the committee appeared daily to report on the number of new cases, deaths, and recoveries. As soon as the immediate health crisis had declined by the Summer of 2020, the health scientific committee produced bi-monthly results of the COVID-19 situation. Nevertheless, major government decisions continued to be based on recommendations by the scientific committee since the pandemic started in Morocco in March 2020. The permission to adopt these decisions was granted through an exceptional decree within the framework of the state of health emergency adopted on 24 March 2020[10]. Most decisions on imposing lockdowns, curfews, closure of borders, wearing of facemasks, and so forth were adopted based on the advice of scientific committee. Whilst composition of the committee was not identified, some of its members appeared in press briefings and TV talk shows, were presented as doctors in either epidemiology or virology[11].

Like most countries in the world, and as part of its efforts to track and monitor the spread of COVID-19, Moroccan health experts used various technological tools. According to the domestic and foreign press[12], the COVID-19 pandemic has revealed that the Kingdom of Morocco has an unsuspected potential for scientific and technological innovation. In its fight against the pandemic, this has taken many forms, ranging from the production of masks and artificial respirators to the production of test kits and the design of dedicated applications[13].

Moreover, a team of Moroccan researchers announced the invention of a smart mask for remote automatic detection of COVID-19, called 'Midad'. This mask was accompanied by an application, which offers a method for predicting and diagnosing the disease. According to these researchers, the mask features innovative technology for detecting symptoms of COVID-19, such as fever and dry cough, and can transmit data to health authorities through a smartphone via Bluetooth. Among other industrial endeavours, aeronautical engineers have embarked on the design and production of locally made Moroccan artificial respirators. These respirators were manufactured in accordance with high aeronautical standards. A first batch of 500 respirators was introduced May and June 2020[14].

To monitor the spread of the virus drones using Moroccan technology were also used. These drones, equipped with thermal cameras, were used for disinfecting public places and detecting citizens with a higher temperature than normal. In the Oriental region of Morocco, authorities have

used drones equipped with loudspeakers to advise people to stay at home and warn recalcitrant citizens.

The Moroccan Foundation for Advanced Science, Innovation and Research (MAScIR), a research/development institution based in Rabat, announced that it had designed the first 100% Moroccan COVID-19 diagnostic kit[15] developed with a high degree of sensitivity and reliability, and at a controlled cost. Following validation tests, the kit obtained approval from national and foreign laboratories, in particular the national Army, the Royal Gendarmerie, as well as the Pasteur Institute of Paris. MAScIR indicated that it would manufacture 10,000 kits by the end of June 2020, before moving towards a more substantial production that would cover the national need in this area.

The most remarkable innovative tool to contain the spread of 'COVID-19' in Morocco was the mobile application 'Wiqaytna' (translated as 'our protection') which was launched by the Ministry of Health and aimed for notification and tracking of the virus.

This mobile solution was launched as part of a national awareness campaign, under the Ministry's dubbed theme 'Let's remain vigilant, let's protect each other', whose objective was to encourage citizens to continue to adopt preventive measures limiting the spread of this virus. This included frequent hand washing with soap and water or a hydro-alcoholic liquid, besides wearing masks and ensuring physical distancing. The 'Wiqaytna' application was available for download on Google Play, App store, and on www.wiqaytna.ma.

It should be noted that this application was produced jointly by the Ministry of Health and the Ministry of the Interior in collaboration with the Digital Development Agency (ADD) and the National Telecommunications Regulatory Agency (ANRT), with the voluntary contribution of Moroccan IT companies. It was authorised by the National Commission for the Control of Personal Data Protection (CNDP) and made available as open source[16].

'Wiqaytna', which is based on Bluetooth technology and whose use is voluntary, notifies its users in the event of prolonged physical proximity to another user who has tested positive for Coronavirus in the previous 21 days following contact. Following this notification, the health experts at the Ministry of Health carry out an assessment of the risk of exposure and come into contact with the notified case if necessary. The Ministry of Health recorded more than 1 million downloads of the app only 6 days after its official launch[17] and 2 million users in only 3 weeks[18] despite abstention by a wide range of citizens from downloading the app, mainly due to fear of unethical surveillance, as expressed by human rights organisations.[19] This was a claim that the National Commission for the Control of Personal Data Protection denied, asserting that the app is voluntary and complies with Law No. 09-08 on the Protection of Individuals with Regard to Processing of Personal Data[20]. Health Minister Khalid Ait Taleb debunked the rumours for personal data breach, by explaining that the main features of the app comply with data protection protocols; the app uses open source code; the app uses Bluetooth technology which does not track users' movement; and the only data collected are the users' phone numbers, used to call the user in case of possible infection in his/her network. However, the Ministry of Health did not continue to communicate with its users and inform the public of the statistical data and results achieved, an attitude that sparked doubts about its usefulness but rather supported the hypothesis of its failure (Laayouni, 2020).

Another weakness that discouraged the public from downloading the app is that it requires uninterrupted activation of Bluetooth technology, which may put mobile phones at risk of malwares and unwanted messages. In addition, activation of Bluetooth may cause high consumption of battery life. Therefore, this tracking app can assist health experts in tracking and controlling the spread of COVID-19, but it bears ethical consequences as well as technical challenges for the users. Consequently, the measure could uncover major socio-economic inequalities and prompt social

disparities in healthcare, warned Whitelaw et al. (2020) in their assessment of the role of digital technology applications in tackling COVID-19. As noted previously, communicating technology by health experts could then play a major role in the success of COVID-19 tracking application. A study conducted by Ait Touil and Jabraoui (2022) finds that trust in both the government and technology plays a crucial role in citizen's self-intention to use the Wiqaytna app. The authors add that communication campaign should not be limited to official channels encouraging the use of the app, but that it should be supported by 'social influencers', comprising publicly accepted non-governmental actors, such as civil society organisations, social media influencers, and so forth.

In a developing country such as Morocco, the implementation of innovative health technologies faces many challenges. Dehbi et al. (2021) mentioned a variety of factors hindering efficient and effective use of digital technology during health crisis such as COVID-19, including a lack of powerful ICT infrastructure, unstable electric power supply, logistical and cultural issues, and a general lack of efficient data collection tools and resources in healthcare facilities. They also noted the lack of overall policy assessment of the technology tools deployed during both ordinary and crisis times. In spite of the World Health Organisation's recommendations for health evaluation programs, 'the actual impact of the cited digital health strategies on the public health response to the COVID-19 crisis in Morocco remains to be assessed' (Dehbi et al., 2021).

Moreover, the disparity in the use of digitisation is widening the access gap to public services among citizens, as well as across regions. ElHilali (2022) point to a number of ways where such a 'centralisation of digital infrastructure' occurs, including spatial inequality, where some so-called certain areas lack sufficient Internet infrastructure, while the central government's monopoly on the majority of equipment and information solutions results in scarce resources and subpar local government digitisation. From a sociocultural perspective, Zaanoun (2023) argued that digital services increase the risk of making citizens less equal in terms of their access to governmental services. He emphasises that many social groups still lack the tools and resources needed to access digital services because of low digital literacy or limited finances, despite notable advancements in the information technology sector brought about by public and private efforts.

4 | CONCLUSION

In the age of increased application of technology across different scales of society, governments tend to apply tools run by AI not only to improve the public services and administration, but also to set forth effective and efficient policies. Governments have begun to implement these types of technological tools to improve their performance and, at the same time, actively and transparently link with citizens. However, technology-assisted tools in public policy do not come without ethical, legal, and potentially health-related consequences. In middle-income countries, the deployment of technology, specifically AI and autonomous machines, raises questions related to the legality of involving public data in government policy. Moreover, the availability of high-tech infrastructure coupled with public trust and responsiveness can ensure better results. In the case of Morocco, the role of scientific experts is maintained in designing policies and providing advice to decision-makers. This case also highlights the need to address the challenges faced with incorporating innovative technological tools in order to provide meaningful feedback.

In light of these considerations, policy experts appear as a crucial actor in monitoring, controlling, and assessing the performance of technology-assisted tools in public policy and administration. In this sense, technology-assisted tools can be described as 'supporting devices' for

policy experts, especially at times of crisis when decisions should be made in an efficient, timely, and effective manner.

Therefore, it is not possible—at this point of time—to arrive at a conclusion that potential 'policy e-experts' or 'robot experts' driven by AI may replace 'real experts' in government policymaking. However, technology tools can only assist policy experts and the decision-makers to design proper policy ideas, accelerate the implementation process, and provide transparent feedback, in order to ensure the efficacy and quality of public services.

The Moroccan experience with expert advice and technology-assisted tools during COVID-19 represents a typical case study from within middle-income countries. The most notable technology-driven app 'Wiqaytna' manifests an example of how technology helps expert communities to tackle societal issues, especially during times of crisis such as COVID-19. Nevertheless, in spite of efforts being made to advance technology infrastructure and foster its use to solve public problems, achieving policy impact still has a long way to go. Notwithstanding the important role of technology-assisted tools as 'digital assistants' for policy experts, the lessons learned from the Moroccan case with countering and managing the spread of COVID-19 revealed five challenges that need to be addressed: (1) centralisation of digital governance weakens technology diffusion across the whole country; (2) existence of social disparities prevents remote populations from using technology and benefiting from it; (3) fear of privacy breaches when implementing technology-assisted tools; (4) digital literacy among less-privileged populations undermines policy impact and evaluation; and (5) communicating scientific data by relevant experts must meet public terminology in order to avoid mistrust between citizens and the government.

CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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ENDNOTES

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How to cite this article: AIT EL CAID, H. (2024). Managing COVID-19 in Morocco: The adoption of novel technology tools in assisting expert policy advisors. *Australian Journal of Public Administration*, *83*, 257–268. https://doi.org/10.1111/1467-8500.12637