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INTRODUCTION



## Beyond the hype—the *actual* use of blockchain in government

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### ABSTRACT

The last few years have seen considerable hype around blockchain technology, as well as promises about what it might offer to society, and its challenges to policymakers. Beyond this hype, what is known about the uses of blockchain in government? What can we learn from actual uses of blockchain for public policy? A recent review of the literature on blockchain concluded that the overwhelming majority of studies are still theoretical, and that empirical data on real applications of blockchain are only just starting to emerge. In this light, this Special Issue brings together papers that include insights into actual experiences of blockchain in government, focusing on questions such as blockchain's real benefits, costs and risks, and public policy responses. All the papers included go beyond a purely theoretical approach to blockchain and offer some insight into what we know - or do not know - about the reality of blockchain in government. Papers deal with blockchain technologies implemented in different countries, at distinct levels of government, and in various sectors. In all cases, an effort is made to extract findings and conclusions towards the challenge of thinking about how best policy can be designed and applied to make the best, and minimising the risks and costs, of this new, disruptive technology.

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Blockchain has been heralded by some writers (for example, Tapscott and Tapscott 2016), as well as policymakers (for example, Berryhill, Bourgerly, and Hanson 2018), as a key asset government needs to invest in if it wishes to keep up with future trends. Some of the distinctive features of blockchain—which are potentially disruptive when compared to previous technologies—have led to claims that blockchain is likely to profoundly transform public service production and delivery. In the opposite direction, Atzori (2017) warns of the potential dangers of deploying blockchain in the public sector since, instead of transforming government positively for citizens, could be utilized toward the promotion of a stateless global society populated by disempowered citizens. Whether the vision of the transformative power of blockchain is

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expected to be positive, or negative, there seems to be a tendency to over-hype how blockchain might impact on government and society—accompanied by a lack of empirical research on the effects of *actually using* blockchain in government.

Beyond utopian or dystopian visions of a blockchain-in-government world, an unbiased and disinterested study of the real potential benefits, costs and risks of blockchain for governments need to be carefully conducted. One of the major challenges to date, however, is that most research on blockchain in government is still in its infancy. Additionally, most research on blockchain is largely theoretical, discussing the *potential* benefits, costs or risks of blockchain in government. In a recent systematic literature review of blockchain in government, it was noted around the vast majority of work on this topic is theoretical, with only a small number of applied case studies being analyzed (Cagigas et al. 2021).

This is starting to change. In the recent period, governments and international organizations around the world have started to pilot and implement blockchain across a variety of services, including digital identity management, health, food and agriculture, land registration, public procurement, regulation, value chains, logistics, and other sectors (Cagigas et al. 2021).

Several websites exist that list current, ongoing, and—interestingly—paused, blockchain projects in governments.<sup>1</sup> At the same time, international organizations, such as the OECD and the World Bank, have published early analyses of the opportunities and barriers of real-life blockchain applications in governments around the world (Lindman et al. 2020). From the policy side, governments are now proposing policy responses in an attempt to regulate blockchain. Important cases in point include the European Commission's ongoing work to establish a digital Euro, EU law for crypto-assets and a pan-European regulatory sandbox.<sup>2</sup>

With the number of projects and applications of blockchain growing, and regulatory responses to blockchain in national and international governmental organizations on the ascendant, the time is ripe to promote social science and public policy research on the *actual* use of blockchain in government. This means promoting work based on real-life cases of blockchain in government, involving the use of empirical data when feasible, in order to extract lessons from practice for policy-makers, so they can access the knowledge they require to make the most of the opportunities presented by blockchain—whilst also avoiding some of its potential risks and disadvantages (see Cagigas et al. 2021).

In this light, this Special Issue brings together papers on actual experiences of blockchain in government, focusing on questions such as its benefits, costs and risks, and public policy responses. Papers are collected from experts writing on blockchain applications in different parts of the world, on blockchain projects implemented within a variety of sectors, and across different levels of government. Contributors encompass both practitioners and scholars involved in actual applications of blockchain in government and also, in public administration, all with the aim of reinforcing our understanding of the consequences of blockchain, and how best policy can be designed and applied to make the best, and minimizing the risks and costs, of this new, disruptive technology (Clifton and Pal 2022; Taeihagh 2023).

An evaluation of the potential of blockchain technology suggests this poses a large variety of potentially beneficial, but also potentially detrimental, effects across multiple dimensions related to the public sector. These effects derive partly from the inherent characteristics of the technology itself, but also, from the fact that any implementation of a new technology is done within a socio-economic context. One question to bear in mind are the tradeoffs that must be identified and measured when implementing blockchain. For example, while blockchain may promise economic savings to governments (savings which should be passed on to citizens), it may also create new environmental costs, such as those that may result from high energy consumption. This tradeoff requires considerable attention. Moreover, technology inevitably interfaces with human beings: it is unclear whether, and to what extent, public sector employees will accept to use this technology (see, for example, Cagigas et al. 2022 on public servant attitudes), and whether citizens as users will engage with service provision based on this technology. From the legal perspective, comprehensive laws need to be created, or existing laws complied with, in order to ensure blockchain is governed in a sound manner. Without real-life applications of blockchain that are observed, measured and assessed, we can learn little about how blockchain will actually work, in practice, in the real world of the public sector. In particular, there is a need to go beyond theory, and focus on what empirical evidence we have on the effects of real-life applications of blockchain technology in the public sector. Of the relatively scant empirical work that exists, most research is based on pilot projects or specific case studies and, as a result, whilst findings can be extracted for a particular case, it is not possibly usually to generalize these findings across a broader context.

The first paper in this special issue presents an original framework designed to facilitate public sector leaders to capture, measure and then, evaluate, the main, and known, benefits, costs and risks of introducing blockchain into the public sector (Cagigas et al. 2023). This framework was built on the basis of a systematic literature review on the topic, but, importantly, also on the experience of four pilot applications of blockchain at different levels of government (from municipal to European) and across distinct sectors done as part of a recently completed Horizon Europe project, TOKEN.<sup>3</sup> Based on their previous systematic review of the benefits, costs and risks posed by blockchain in government (Cagigas et al. 2021), and the pilots conducted, these authors identify and categorize costs, benefits and risks of blockchain across different dimensions: technological, socio-economic, organizational-cultural, and institutional (legal and political). The outcome is a *practical evaluation framework* designed so that policymakers and practitioners (as well as researchers) can use in order to verify that, when blockchain is used in their sector, its benefits are maximized, whilst its costs and risks are controlled.

The second paper in this special issue, by Sousa (2023), also depends on a systematic literature review of blockchain in government but, like the previous paper, also goes beyond this, by extending the analysis to including perceptions and opinions of experts in the Information Technology sector that work within the public sector. Its starting point is that the potential benefits, costs and risks of blockchain technology in the public sector context are of increased interest to scholars and policymakers. The paper argues that, on the one hand, whilst blockchain technology can bring

benefits to public service provision, such as increased trust, security and transparency, among others, it may also involve challenges associated with lack of integration with existent networks, lack of standardization, lack of technical knowledge, high energy demands and issues around legal compliance. Though this has already been established at the theoretical level, there is little *empirical knowledge* about the effects of blockchain technology across these dimensions within the public sector context and, in particular, very little evidence about how these potential benefits, costs and risks are actually perceived by the experts working within public organizations. Going beyond a systematic review of the literature, Sousa also provides quantitative evidence obtained from experts working in public organizations. After conducting a systematic review of the literature on the key dimensions related to the introduction of blockchain technology in the public sector context, and which are the main expected transformations in the public sector generated by blockchain technology, the study implements a questionnaire among experts in Information Technology public sector workers. These experts are asked what their perception is as regards the relative importance of these dimensions and transformations previously identified. Based on these responses, the paper analyses the differences between experts working in public organizations that already use blockchain and those working in public organizations that do not use it, to compare, analyze and interpret their perceptions.

The third paper, by Sullivan and Tyson (2023), investigates the potential of blockchain in the public sector but, this time, from one of blockchain's most common applications to date: digital identities. Digital identities involve collecting a body of information about each individual which is required to establish his/her identity for official purposes. Emerging technologies, including blockchain, but also others such as quantum computing and artificial intelligence, pose a challenge to our societies and to the relations between individuals. They also may challenge public administration and the relations between citizens and public organizations. The need for digital identities has emerged as a key tool, even to grant access to public service provision, in a contemporary world where in-person relations are increasingly being substituted by remote relations, which are facilitated by technology. Sullivan and Tyson (2023) examine the increasing importance of digital identity at the national level, and discuss how it can evolve into an international concept. The key contribution of this paper is how blockchain technology can contribute to the emergence of an international digital identity. At the same time, it also discusses the questions and risks of the use of blockchain at an international scale for this purpose, and its potential implications from the perspective of governments, businesses and individuals. Sullivan and Tyson argue that blockchain technology, as a result of its characteristics, can improve transparency and security in two key aspects of digital identity: identity authentication and verification processes. The case of Estonia is highlighted as regards the actual use of blockchain technology to establish a national digital identity, and incipient expansions of the initiative in other countries and regions. Sullivan and Tyson argue this paves the way for an international recognition of individuals' digital identity supported by blockchain technology and, based on that, for a global digital identity.

The fourth paper in the special issue deals with bitcoin and the question of trust. One of the oft-cited advantages of blockchain, understood in this context as a

disruptive technology that challenges the foundations of the core institutions of the economy and the society, is that it is “trustless”. What is meant, in simple terms, is that blockchain technology makes it possible for agents who do not know each other to exchange information and resources *without a central organization*, since, as blockchain can be understood as having certified these exchanges, this renders classic understandings of “trust” and the need for “trust” as provided by institutions, as no longer necessary. Simply put, blockchain enthusiasts purport that this technology can replace core actors in society, such as financial institutions and, in the Atzori (2017) dystopia, even, governments themselves. A case in point is Bitcoin, the most well-known cryptocurrency using blockchain technology, which could be understood to challenge Central Banks’ main role in producing fiat currencies. Cengiz (2023) provides a critical view of blockchain applications in this domain, based on an analysis which contrasts blockchain governance with the State’s utilization of blockchain to govern state-citizen and inter-citizen relationships. Cengiz (2023) describes three different strategies of the State as regards blockchain technology (appropriation, regulation and rejection), which the State would choose depending on which better satisfies its interests in a particular context. Cengiz’s approach describes a contradiction between the foundational objectives or the initial expectations associated with a technology and the real purposes it finally serves. The author illustrates this by using the example of the internet: initially, it was stated the internet would become a global platform which the State was unable to control, however, today, the internet is more associated with being a major tool by which firms and governments control, perform surveillance of, and extract information from citizens. In a similar vein, this paper posits that governance of blockchain, currently in its infancy, may end up facilitating intrusive uses of blockchain technology such as increasing States’ surveillance and behavioral control, and the negative consequences that would have on citizens’ autonomy and rights.

The rise of blockchain has resulted in discussions on how it might lead to new models of governance, involving the collaboration of multiple actors. One such area of analysis is Decentralized autonomous organizations (DAOs), which use blockchain technology to store data and implement governance decision-making rules without the need for a central authority. DAOs can be used in government, and it is argued they can increase citizen engagement, improve the efficiency and transparency of e-government, and reevaluate coordination and control in public-private partnerships. However, in practice, there is very little empirical research on DAO governance. The fifth paper in this special issue, by Rikken, Janssen, and Kwee (2023), seeks to close this gap by examining how governance components affect the long-term viability of DAOs. The authors identify key governance elements (accountability, decision model, and incentives) and conduct an empirical analysis on how they are implemented in active DAOs. They also study the impact of these elements on the long-term viability of DAOs through statistical analysis. Findings are that democratic governance contributes positively to long-term viability of DAOs, whilst non-weighted voting systems (1 person – 1 vote) also have a positive impact. The usage of quorums and the lack of incentive structures for participation do not show significant influence, but further research with more data is recommended. In conclusion, the authors’ findings

provide preliminary insights into governance and DAO survivability, and could therefore be used to assist policymakers and businesses in making informed decisions when designing DAO structures for public administrations.

Much has been said about how blockchain can be applied within the public sector. Areas that are often mentioned include identity verification, asset registries, supply-chain management, and central bank digital currencies. Despite identifying areas ripe for blockchain implementation, on the ground, it appears that actual uptake of blockchain projects in the public sector is rather limited. What are the reasons for this relatively slow uptake? Various reasons for this limited uptake can be found in the literature, including a lack of guidelines and regulations, security and privacy concerns, data infrastructure limitations, energy consumption, administrative transitions, and governance models. The sixth paper in this special issue, by Tan (2023), delves into this question by conducting a bibliometric analysis to identify six thematic areas of interest related to blockchain technology within the public sector in the literature. These include business and strategic management, technology adoption, system infrastructure, cryptocurrency and decentralized economy, regulations and geopolitics, and governance. The bibliometric analysis finds a high degree of co-occurrence between the terms “barriers” and “blockchain adoption”, suggesting that, as expected, there are several perceived challenges when adopting blockchain in the public sector. The association of the term “barrier” with other key terms suggests theoretical, technological, resource-based, and managerial challenges as the main showstoppers. Tan (2023) provides key lessons for those responsible for designing policy around blockchain implementation in the public sector. First, the challenges and issues related to blockchain go beyond technical expertise, and require a policy approach that incorporates technological, managerial, legal, business, and political expertise. Secondly, the interconnected nature of cross-disciplinary issues, particularly in relation to governance considerations. Designing blockchain governance in the public sector should involve considerations at technical, techno-social, and social levels, with a focus on design processes, rather than just implementation decisions.

Over the last few years there have been many prominent “announcements” about the fact that blockchain will be used (blockchain “use cases”). However, what happens after the use cases are announced? Are these blockchain applications actually developed and put into use? Or are they “paused” or even “abandoned”? Meyers et al. (2023) provide an interdisciplinary study combining public law, science & technology studies, philosophy of technology, and ethics, on what happens to blockchain development after the “announcement” of the use cases. In particular, focus is placed on the “Red Button” case study. The “Red Button” project aims at providing “debt rest” by offering a temporary payment suspension to people with problematic debts after signaling their distress to a public creditor, the Central Judicial Collection Agency. The paper investigates issues such as data protection, the project’s connection to municipal debt help, and the impact of administrative decision-making automation on discretionary powers in a governance network. The authors’ findings demonstrate the high degree of complexity involved in developing blockchain-based applications in the public sector, and highlight how interdisciplinary research can shed new light on the development of blockchain applications after the use case



announcement. Interdisciplinary approaches can place continuous attention on legal issues throughout the entire design process and after implementation. Additionally, interdisciplinary approaches can capture how a successful implementation of blockchain technology relies on a good integration with preexisting infrastructures, technologies, and legal frameworks. Finally, they deploy interdisciplinary insights as to why not all blockchain projects ultimately utilize blockchain technology, and why some blockchain projects fade away after the initial “announcement”.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Notes

1. See, for example, <https://medium.com/consensys-media/which-governments-are-using-blockchain-right-now-327c0e7fb8a1>.
2. See the ongoing work by the European Commission on blockchain at <https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-blockchain>.
3. See the official link at <https://cordis.europa.eu/project/id/870603> and the project website at <https://token-project.eu/>

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