THE RULE OF LAW 'BY DESIGN'?

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Abstract

Can technology be deployed to promote, or even guarantee, the rule of law? Can the rule of law be designed into technological systems? The idea of achieving legal objectives through technology 'by design' is not new. However, it has been vividly revived in debates around systems such as blockchain, which has been proclaimed as the 'killer app for corruption'. Other technologies have been used to 'modernise' elections, with claims of improved transparency and reduced human error and fraud. Panoptic governance mechanisms such as China's Social Credit System promise a perfectly predictable, consistent, and equal enforcement of the law. Technology thus is increasingly presented as a tool for fostering rule of law values – a rule of law 'by design'. In this paper we ask whether technological solutions that embed rule of law values do in fact promote the rule of law. Using case studies and analysing current developments, we explore the extent to which the promise of technologies as a means of delivering on the rule of law hold up in practice and what they mean for the idea of a society ruled by law.

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1. *Introduction*

Securing adherence to the rule of law is a perennial challenge in every society. Problems such as corruption and the misuse of public power are endemic to governance and compromise the notion that every person must be subject to and equal before the law. Technologies like blockchain are being held out as a cure for such ills, perhaps in ways that will enable humans, with all their biases and limitations, to be removed from some government operations. The promise is that systems can be designed to ensure functions such as the collection of taxation and distribution of social security benefits are carried out in ways that foster a more 'perfect' rule of law.

An increasing number of governments, in nations as diverse as the United Kingdom, the United States, Sweden, Georgia, Mexico, Australia, China and Honduras, are experimenting with technological solutions to rule of law problems. They are using systems that partially or fully replace humans in tax collection, managing welfare programs, ensuring the integrity of government records, issuing passports, recording land registries, running elections and ensuring better enforcement of the law.[1] These tools are typically aimed at increasing efficiency, and so reducing the taxpayer dollars needed to deliver such programs. But they can also be designed to make government processes more accurate and fair.

One such tool receiving special attention from governments, private actors and civil society is blockchain. At recent World Economic Forum and OECD gatherings, blockchain has been held out as 'the end of corruption' in countries perceived to have a

[1] For an overview, see UK GOVERNMENT CHIEF SCIENTIFIC ADVISER, DISTRIBUTED LEDGER TECHNOLOGY: BEYOND BLOCK CHAIN (2016).

'weak' rule of law.[2] Blockchain has been promoted as 'the killer app for corruption' [3] because its pre-programmed rules, cryptographically protected data and a distributed ledger can eliminate dishonesty, bias and arbitrariness. The rhetoric around blockchain's potential to improve upon the predictability and consistency of government processes dominates the latest discussions of using technology to further the rule of law. Similar promises are echoed in discussions around voting technologies and their ability to promote greater transparency in the conduct of elections and, more controversially, in the potential of technological systems to enhance objectivity in law enforcement, thus providing for the more equal treatment of citizens in nations such as China.

While governments are rolling out these novel programs, scholars are in parallel calling for more scrutiny around their deployment.[4] Some are asking how the latest technological tools affect fundamental human rights, such as privacy and data

[2] See Carlos Santiso, *Can Blockchain Help in the Fight Against Corruption?*, CAN BLOCKCHAIN HELP IN THE FIGHT AGAINST CORRUPTION? WORLD ECONOMIC FORUM, https://www.weforum.org/agenda/2018/03/will-blockchain-curb-corruption/.

[3] Laura Shin, *New Initiative Aims To Eliminate Corruption With Blockchain Technology*, FORBES (Jun. 20, 2016), https://www.forbes.com/sites/laurashin/2016/06/20/new-initiative-aims-to-eliminate-corruption-with-blockchain-technology/ quoting Tomicah Tillemann, director of the Bretton Woods II Initiative at New America; Adedayo Adebajo, *Blockchain Technology and the End of Corruption*, MEDIUM (Jul. 20, 2018), https://medium.com/coinmonks/blockchain-technology-and-the-end-of-corruption-9d631b56d72c.

[4] Slava Jankin Mikhaylov et al., *Artificial intelligence for the Public Sector: Opportunities and Challenges of Cross-Sector Collaboration*, 376 PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A: MATHEMATICAL, PHYSICAL AND ENGINEERING SCIENCES 20170357 (2018); Monika Zalnieriute et al., *The Rule of Law and Automation of Government Decision-Making*, 82 THE MODERN LAW REVIEW 425 (2019)

protection,[5] equality and non-discrimination,[6] or due process safeguard.[7] Others interrogate interactions between normative structures of law and technology's capacity to challenge them.[8] Yet other scholars examine the promise of 'legal artificial intelligence', and its potential to improve access to justice.[9] The use of technology in the public sector is also examined in particular legal and factual contexts, such as in regard to judicial and administrative decision-making, law enforcement and national security.[10]

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[5] For information technologies, data protection and privacy see, for example Margot Kaminski, *The Right to Explanation, Explained*, 34 BERKELEY TECHNOLOGY LAW JOURNAL 189 (2019); Bryan Casey et al., *Rethinking Explainable Machines: The GDPR's Right to Explanation Debate and the Rise of Algorithmic Audits in Enterprise*, 34 BERKELEY TECHNOLOGY LAW JOURNAL 143 (2019).

[6] For technologies and equality, see, PK Yu, *The Algorithmic Divide and Equality in the Age of Artificial Intelligence*, 72 FLORIDA LAW REVIEW 19 (forthcoming); VIRGINIA EUBANKS, AUTOMATING INEQUALITY: HOW HIGH-TECH TOOLS PROFILE, POLICE, AND PUNISH THE POOR (St. Martin's Press) (2018)

[7] Roger Brownsword & Alon Harel, *Law, Liberty and Technology: Criminal Justice in The Context of Smart Machines*, 15 INTERNATIONAL JOURNAL OF LAW IN CONTEXT 107 (2019); Rebecca Wexler, *Life, Liberty, and Trade Secrets: Intellectual Property in The Criminal Justice System*, 70 STANFORD LAW REVIEW 1343 (2018); Danielle Keats Citron & Frank A. Pasquale, *The Scored Society: Due Process for Automated Predictions*, 89 WASHINGTON LAW REVIEW 1 (2014).

[8] ROGER BROWNSWORD, LAW, TECHNOLOGY AND SOCIETY: RE-IMAGINING THE REGULATORY ENVIRONMENT (2019); Francesco De Vanna, *The Construction of a Normative Framework for Technology-Driven Innovations: A Legal Theory Perspective*, *in* USE AND MISUSE OF NEW TECHNOLOGIES: CONTEMPORARY CHALLENGES IN INTERNATIONAL AND EUROPEAN LAW (Elena Carpanelli & Nicole Lazzerini ed., 2019); Simon Stern et al., *Artificial Intelligence, Technology, and the Law*, 68 supp 1 UNIVERSITY OF TORONTO LAW JOURNAL 1 (2018).

[9] Milan Markovic, *Rise of the Robot Lawyers*, 61 ARIZ. L. REV. 325 (2019); Frank Pasquale, *A Rule of Persons, Not Machines: The Limits of Legal Automation*, 87 THE GEORGE WASHINGTON LAW REVIEW 1 (2019); Emily S. Taylor Poppe, *The Future Is ~~Bright~~ Complicated: AI, Apps & Access to Justice*, 72 OKLA. L. REV. 185 (2019).

[10] In the context of judicial decision-making, see Richard M. Re & Alicia Solow-Niederman, *Developing Artificially Intelligent Justice*, 22 STANFORD TECHNOLOGY LAW REVIEW 242 (2019); Monika Zalnieriute & Felicity Bell, *Technology and Judicial Role*, *in* THE JUDGE, THE JUDICIARY AND THE COURT: INDIVIDUAL, COLLEGIAL AND INSTITUTIONAL JUDICIAL DYNAMICS IN AUSTRALIA (Gabrielle Appleby & Andrew Lynch eds., forthcoming 2020). In the context of administrative decision-making, see, for example, Deidre K. Mulligan & Kenneth A. Bamberger, *Procurement As Policy: Administrative Process for Machine Learning* 34 BERKELEY TECHNOLOGY LAW JOURNAL (2019). In the context of

In this article, we focus on the use of technology in the public sector and its potential to promote the rule of law. We ask whether fostering the rule of law 'by design' – which envisages technological solutions rendering non-compliance with rule of law requirements (near) impossible – can promote or guarantee the rule of law in practice. To answer this question, we critically investigate the theoretical assumptions underpinning such narratives and analyse the extent to which claims have been or could be realised. In doing so, we focus on a conception of the rule of law that has the widest political acceptance across divirgent national systems, namely the core rule of law values of: transparency and accountability; predictability and consistency; and equality before the law.

We examine the interaction between these values and claims made for technology in three contexts: 1) the provision of government services and administration, with a case study on public procurement in Mexico; 2) the running of elections and deployment of voting technologies in Australia and elsewhere; and 3) the 'perfect enforcement' program in the Chinese Social Credit System. This provides a diverse range of viewpoints from which to assess the proclaimed capacity of technologies to promote, or even guarantee, the rule of law. In doing so, we do not provide an in-depth consideration of jurisdiction-specific constitutional, administrative and statutory requirements.[11] Our aim is to analyse developments at the conceptual level of how they impact upon the rule of law, rather than to develop a detailed prescription for the design or implementation of such systems in particular nations.

national security and law enforcement, see, for example, ELENA CARPANELLI & NICOLE LAZZERINI, USE AND MISUSE OF NEW TECHNOLOGIES (2019); Marquay Edmondson et al., *Exploring Critical Success Factors for Data Integration and Decision-Making in Law Enforcement*, 18 INTERNATIONAL JOURNAL OF APPLIED MANAGEMENT AND TECHNOLOGY 4 (2019)

[11] For example, in the United States, this would include due process protections in the Administrative Procedure Act §1, 5 USC §§ 551–559 (2006).

2. *The Rule of Law 'By Design'*

A. *The Rule of Law*

The rule of law is one of the most iconic and prominent societal values. It is an antidote to arbitrary government power and is a political work in progress embraced by seemingly irreconcilable political regimes ranging from Russia and China through to the European Union and the United States that all agree society should be governed by law.[12] Its wide acceptance across such different nations is possible because the rule of law is an 'essentially contested concept'[13] lacking an accepted definition. As Krygier has argued, the rule of law should be understood as a goal or ideal; a state in which a legal system is free from certain threats or pathologies.[14] In other words, it is widely accepted that the rule of law is an ubiquitous and elusive concept.[15]

Popular understandings of the rule of law include *formal* conceptions (focusing on sources and forms of legality) and/or *substantive* accounts (focusing on content of the law).[16] Many believe that it entails a combination of both.[17] For example, Lord Bingham claims that the fundamental principle of the rule of law is 'that all

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[12] BRIAN Z. TAMANAHA, ON THE RULE OF LAW: HISTORY, POLITICS, THEORY (2004)

[13] Jeremy Waldron, *The Concept and the Rule of Law*, 43 GEORGIA LAW REVIEW 3 (2008) See also, STEPHEN SEDLEY, LIONS UNDER THE THRONE: ESSAYS ON THE HISTORY OF ENGLISH PUBLIC LAW (2015). On essentially contested concepts more generally, see Bryce Walter Gallie, *Essentially Contested Topics*, *in* THE IMPORTANCE OF LANGUAGE 121–146 (Max Black ed., 1962).

[14] See especially Martin Krygier, *The Rule of Law: Legality, Teleology, Sociology*, *in* RELOCATING THE RULE OF LAW 45 (Neil Walker & Gianluigi eds., 2009); For a discussion of how this approach might apply in a particular legal framework, see LISA BURTON CRAWFORD, THE RULE OF LAW AND THE AUSTRALIAN CONSTITUTION (2018).

[15] Modern accounts include Lord Bingham, *The Rule of Law*, 66 THE CAMBRIDGE LAW JOURNAL 67 (2007); Tamanaha, *supra* note 12; PAUL GOWDER, THE RULE OF LAW IN THE REAL WORLD (2016).

[16] Paul Craig, *Formal and Substantive Conceptions of the Rule of Law: An Analytical Framework*, PUBLIC LAW 467 (1997).

[17] See *id*, at 467.

persons and authorities within the state, whether public or private, should be bound by and entitled to the benefit of laws publicly and prospectively promulgated and publicly administered in the courts'.[18] Many scholars have proposed a list of concrete criteria on how to achieve this goal in practice.[19]

It is not the aim of this paper to develop yet another account of the rule of law.[20] We also do not ask here whether something different to traditional conceptions of rule of law is needed to address the latest technological developments.[21] Rather, we critically evaluate attempts to pitch technology as enhancing a narrow, widely accepted conception of the rule of law. We start by examining core assumptions behind the idea that important societal values, such as the rule of law, can be achieved and realised through technology 'by design'.

B. *Realising the Rule Law through Technological Design*

The idea that legal rules and social values can be translated and inscribed into particular technologies is not new. Prominent legal scholars saw increasing reliance on technology and automation as a positive evolutionary step towards a more 'determinable legal system' back in the 1970s.[22] Such discourse, which some have named 'legal futurism', tends to characterise increasing automation in the legal system as a democratization of law and an

[18] Lord Bingham, *supra* note **Error! Bookmark not defined.**, at 69.
[19] For example, Lord Bingham has articulated eight core principles: accessibility and predictability, application of law, equality of law, protection of fundamental rights, availability of civil disputes proceedings, limits on power exercised by public officials, fairness of adjudicative procedures provided by state, and state compliance with its obligations under international law: Lord Bingham, *supra* note **Error! Bookmark not defined.**, at 69.
[20] Modern accounts include Lord Bingham, *supra* note **Error! Bookmark not defined.**; Tamanaha, *supra* note **Error! Bookmark not defined.**, at 2; Gowder, *supra* note **Error! Bookmark not defined.**.
[21] Brownsword *supra* note **Error! Bookmark not defined.**.
[22] Anthony D'Amato, *Can/ Should Computers Replace Judges*, 11 GEORGIA LAW REVIEW 1277 (1977).

empowerment of ordinary individuals.[23] Rhetoric around more recent technologies, such as blockchain and machine learning, bringing about rule of law 'by design' sits well within this discourse, which conceives the increasing technologization of law as normatively desirable, a 'new form of law' that 'will emerge to provide all of the benefits of both rules and standards without the costs of either'.[24]

The 'by design' idea in contemporary scholarship lies at the intersection of law, philosophy and technology and is developed through two different, yet related, conceptual lenses: 'value-sensitive design' and the 'compliance by design'. These approaches contemplate converting 'values' or 'legal requirements' into technical specifications and, ultimately, the design of socio-technical systems.

Value-sensitive design is a theoretically grounded approach which recognises that technological design choices have 'politics' in that they embed particular values through the affordances they create and foreclose.[25] Relying on this approach, legal philosophers such Mireille Hildebrandt advocate for 'legal protection by design', thereby suggesting that fundamental values ought to be factored into the way we design technologies, in particular in the context of the transparency and contestability of design features.[26] Methodologically, embedding values in design practice begins with identifying the relevant values, stakeholders and method of choice

[23] See, for example, Martin Daniel Katz, *Quantitative Legal Prediction-or-How I Learned to Stop Worrying and Start Preparing for the Data-Driven Future of the Legal Services Industry*, 62 EMORY LAW JOURNAL 909 (2013).
[24] Pasquale, *supra* note **Error! Bookmark not defined.**, at 4, citing Anthony Casey & Anthony Niblett, *The Death of Rules and Standards*, 92 INDIANA LAW JOURNAL 1401, 1403 (2017).
[25] Batya Friedman et al, *Value Sensitive Design and Information Systems'*, *in* THE HANDBOOK OF INFORMATION AND COMPUTER ETHICS (Elinar K. Himma & Tavani Herman eds., 2018); Langdon Winner, *Do Artifacts Have Politics?*, 109 DEADLUS 121 (1980).
[26] MIREILLE HILDEBRANDT, SMART TECHNOLOGIES AND THE END(S) OF LAW: NOVEL ENTANGLEMENTS OF LAW AND TECHNOLOGY 214 (2015)

among values.[27] The feasibility of embedding values in design is then explored through technical investigations.[28] This method does not guarantee that values will be embedded into a design, but rather provides a framework to highlight the values and implications of design choices.

The 'compliance by design' approach is similar, but in this case legal requirements are directly implemented through the design of socio-technical systems.[29] The 'by design' movement claims that even vague and contested values, such as privacy, can be designed-in. For example, proponents of a 'privacy by design' framework argue that: 'Technology… in theory, can apply privacy laws and principles constantly, consistently, objectively, mechanically and without errors, improving the rate, quality and effectiveness of privacy compliance'.[30] The prominence of the 'privacy by design' idea is reflected an explicit adoption of the principle of 'data protection by design' in the EU's General Data Protection Regulation.[31] This demonstrates how 'by design' approaches are not limited to straightforward, non-contested values and rules. A closely related approach, known as 'compliance through design', engages more directly with the fact that human interpretation and evaluation remains a crucial component of designing systems to enhance compliance with less straightforward requirements. [32]

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[27] Batya Friedman et al., *A Survey of Value Sensitive Design Methods*, 11 FOUNDATIONS AND TRENDS IN HUMAN-COMPUTER INTERACTION 63 (2017).
[28] *Id.*
[29] Pompeu Casanovas et al., *Legal Compliance by Design (LCbD) and through Design (LCtD): Preliminary Survey*, *in* PROCEEDINGS OF THE 1ST WORKSHOP ON TECHNOLOGIES FOR REGULATORY COMPLIANCE 33, http://ceur-ws.org/Vol-2049/05paper.pdf.
[30] DEMETRIUS KLITOU, PRIVACY-INVADING TECHNOLOGIES AND PRIVACY BY DESIGN: SAFEGUARDING PRIVACY (2014)
[31] Article 25 of Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing *Directive 95/46/EC (General Data Protection Regulation or GDPR)* OJ L119/1 (2016).
[32] Casanovas et al., *supra* note **Error! Bookmark not defined.**.

More complex compliance requirements require 'bringing together both machine and human interfaces'.[33]

The application of the 'by/through design' ideas to the rule of law is not straightforward. As the compliance through design literature makes clear, complex socio-legal requirements cannot be fully automated. One can design-in features that are related to the rule of law, such as requiring that a decision-making algorithm output not only a decision but also a human-readable explanation for that decision.[34] Such a design requirement might limit the techniques that can be used (for example, limiting machine learning to so-called 'explainable AI'), but it would enhance the transparency of decision-making. Design involves choices – enhancing transparency in this way will close off options that may perform better against other criteria. Linking design to values thus makes such choices visible and explicit.[35] Understanding the impact of design choices on the rule of law thus requires first an explicit statement of the values associated with the rule of law that could, at least to some extent, be implemented technically. This may permit aspects of the rule of law to be enhanced 'through design' as part of a broader socio-techno-legal framework.

C. *Core Rule of Law Values*

Instead of discussing the rule of law 'by design' in the abstract, we limit our analysis to three core aspects associated with the rule of law: transparency and accountability; predictability and consistency; equality before the law. These feature strongly in claims around the promotion of the rule of law through technology; and have general acceptance across a range of nations and political systems as values that are central to restraining

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[33] *Id.*

[34] HENRIK O. OLSEN ET AL., WHAT'S IN THE BOX? THE LEGAL REQUIREMENT OF EXPLAINABILITY IN COMPUTATIONALLY AIDED DECISION-MAKING IN PUBLIC ADMINISTRATION (iCourts Working Paper Series no. 162, 2019).

[35] Steven Umbrello, *Beneficial Artificial Intelligence Coordination by Means of a Value Sensitive Design Approach*, 3 BIG DATA AND COGNITIVE COMPUTING 5 (2019).

arbitrary state power.[36] In applying these principles, our focus is upon the formal and procedural aspects of the rule of law, rather than its capacity to encompass a broader set of human rights, including privacy or freedom of expression. In other words, we focus on whether values associated with a traditionalist, minimalist conception of the rule of law can be designed into new technological government systems.

(i) Transparency and accountability

One of the most widely accepted aspects of the rule of law is that governments must be transparent and accountable in respect of the decisions they make. Transparency, considered to be 'the commitment to openness and candour',[37] requires publicity about government operations, electoral processes, and ability of citizens to access legislation, policy documents and administrative decisions.[38] This is necessary so that individuals can understand the reasons for decisions affecting them and learn how future decisions will be made.

Transparency also plays a key role in ensuring the accountability of government, as encapsulated in Justice Louis Brandeis' famous quote that 'sunlight is the best disinfectant'.[39] Accountability is understood as responsibility for the exercise of power, and further stipulates that government be subject to the law and answerable for its actions.[40] Accountability a fundamental component of the separation of powers thesis, as it is a system of

[36] INTERNATIONAL CONGRESS OF JURISTS, THE RULE OF LAW IN A FREE SOCIETY [1] (1959).
[37] Richard Devlin & Adam Dodek, *Regulating judges: Challenges, Controversies and Choices*, *in* REGULATING JUDGES: BEYOND INDEPENDENCE AND ACCOUNTABILITY 9 (Richard Devlin & Adam Dodek eds., 2016).
[38] See, Gowder, *supra* note **Error! Bookmark not defined.**.
[39] Louis Brandeis, *What Publicity Can Do*, *in* OTHER PEOPLE'S MONEY AND HOW THE BANKERS USE IT (Louis Brandeis ed., 1914)
[40] RICHARD MULGAN, HOLDING POWER TO ACCOUNT: ACCOUNTABILITY IN MODERN DEMOCRACIES (2003).

checks and balances designed to promote the accountability of those who exercise public power.

(ii) Predictability and consistency

Another well-known and indispensable aspect of the rule of law is that the law should be predictable and consistent.[41] Principles of predictability and consistency enhance certainty and efficiency so that individuals may manage their private lives and affairs effectively. Lord Bingham indicated that one of the most important things people needed from the law was predictability in the conduct of their lives and businesses.[42] Similarly, Paul Gowder has argued that one of the main requirements for a political state under the rule of law is regularity: those who use state coercion must actually be bound by reasonably specific legal rules in that use.[43] Furthermore, predictability and consistency also entail a moral significance in that 'like cases ought to be treated alike', an issue explored separately below.

(iii) Equality before the law

Equality before the law stipulates that all human beings must be subject to and treated equally by the law without inappropriate reference to their status or other circumstances. This implies due process, including that all individuals are subject to the same rules of justice,[44] and that no individual or group be privileged or

[41] LON L FULLER, THE MORALITY OF LAW (1962); see also the lists in JOHN FINNIS, NATURAL LAW AND NATURAL RIGHTS 270–271 (2011); JOHN RAWLS, A THEORY OF JUSTICE 208–210 (1999); Joseph Raz, *The Rule of Law and its Virtue*, *in* THE AUTHORITY OF LAW: ESSAYS ON LAW AND MORALITY 214–218 (Joseph Raz ed., 1999).
[42] TOM BINGHAM, THE RULE OF LAW 38 (2010).
[43] Gowder, *supra* note 15. See also F. A. VON HAYEK, THE CONSTITUTION OF LIBERTY (1960).
[44] Egalitarian moral value is attached to this principle by all theorists who argue that the principle is part of the conception of the rule of law: see, for example, A. V. DICEY, INTRODUCTION TO THE STUDY OF THE LAW OF THE CONSTITUTION 114–115 (1982); Waldron, *supra* note 13; von Hayek, *supra* note

discriminated against due to irrelevant personal characteristics.[45] Equality before the law may give rise to a range of substantive rights, though the scope and content of these remain contested.[46] We apply a narrow conception of equality before the law – people, irrespective of their status, must have equal access to rights in the law (including due process rights) and that, in accessing these rights, 'like cases be treated alike'.[47]

3. *Rule of Law 'By Design' in Practice*

In this Part, we analyse claims that rule of law values can be achieved through technology or, in other words, 'by design'. In particular, we examine three contexts where governments are introducing new technologies to their governance mechanisms, and their roll-out is at least partially justified with reference to 'promoting' the rule of law.

43, at 85, 209. For a classical liberal work on equality before the law, see Adelbert Lathrop Hudson, *Equality Before the Law*, CXII THE ATLANTIC MONTHLY 679 (1913).

[45] For broad, substantive accounts of rule of law, see RONALD DWORKIN, LAW'S EMPIRE (1986); Gowder, *supra* note **Error! Bookmark not defined.**, at ch. 2–3.

[46] For examples of minimalist positions, see JEAN ROUSSEAU, THE SOCIAL CONTRACT (1762, M. CRANSTON TR, 2003); Fuller, *supra* note **Error! Bookmark not defined.**, at ch. 2; Raz, *supra* note **Error! Bookmark not defined.**; Finnis, *supra* note **Error! Bookmark not defined.**, at 270–271; CASS R SUNSTEIN, LEGAL REASONING AND POLITICAL CONFLICT 119–122 (2018); Margaret Jane Radin, *Reconsidering the Rule of Law*, 69 BOSTON UNIVERSITY LAW REVIEW 781 (1989).

[47] See Rawls, *supra* note **Error! Bookmark not defined.**, at 237; H. L. A Hart, *Positivism and the Separation of Law and Morals*, 71 HARVARD LAW REVIEW 593, 623–624 (1958). The notable exception is Raz, for whom, the rule of law does not include principle of equality before the law: see Raz, *supra* note **Error! Bookmark not defined.**.

A. *Government Administration*

(i) The rule of law and corruption

Providing public services is one of the basic functions of government. It is also an area in which claims around technology's ability to facilitate or 'design in' the rule of law is especially prominent. Particularly salient is the rhetoric around the potential of technology to foster the rule of law in contexts where political and legal institutions are perceived to be unreliable, dishonest or ineffective. A good example is the oft-made claim[48] that technology can reduce or even eliminate corruption.

Corruption is generally understood as a form of dishonest conduct, often for personal benefit, engaged in by an individual or institution entrusted with authority.[49] It may range from small favours, known as petty corruption, to a larger-scale government corruption.[50] Political or public corruption occurs when office holders illegitimately use public power for personal gain or to benefit a private interest.[51] Corruption is incompatible with the rule of law value of equality before the law. In public administration,

[48] See, for example, Shirish C Srivastava et al., *You Can't Bribe a Computer: Dealing with the Societal Challenge of Corruption Through ICT*, 40 MIS QUARTERLY 511 (2016); Nasr G. Elbahnasawy, *E-Government, Internet Adoption, and Corruption: An Empirical Investigation*, 57 WORLD DEVELOPMENT 114 (2014); Dong Chul Shim & Tae Ho Eom, *Anticorruption Effects of Information Communication and Technology (ICT) and Social Capital*, 75 INTERNATIONAL REVIEW OF ADMINISTRATIVE SCIENCES 99 (2009); S.R. Salbu, *Information Technology in the War Against International Bribery and Corruption: The Next Frontier of Institutional Reform*, 38 HARVARD JOURNAL ON LEGISLATION XII (2001).

[49] See SUSAN ROSE-ACKERMAN & BONNIE J. PALIFKA, CORRUPTION AND GOVERNMENT: CAUSES, CONSEQUENCES, AND REFORM (2016); David De La Croix & Clara Delavallade, *Democracy, Rule of Law, Corruption Incentives, and Growth*, 13 JOURNAL OF PUBLIC ECONOMIC THEORY 155 (2011); SALLY ENGLE MERRY ET AL., THE QUIET POWER OF INDICATORS: MEASURING GOVERNANCE, CORRUPTION, AND RULE OF LAW (2015).

[50] Kimberly A. Elliot, *Corruption as an International Policy Problem: Overview and Recommendations*, INSTITUTE FOR INTERNATIONAL ECONOMICS 175 (1997).

[51] STEPHEN D MORRIS, CORRUPTION AND POLITICS IN CONTEMPORARY MEXICO (1991). See also de la Croix and Delavallade, *supra* note **Error! Bookmark not defined.**; Merry, Davis and Kingsbury, *supra* note **Error! Bookmark not defined.**.

corruption further opens a gap between 'law on the books' and the law in practice, leading to unpredictability and inconsistency between the law and government action. In recent years, reforms to reduce corruption include not only better systems for detection and quantification,[52] but also replacing government officials with blockchain-based platforms for the provision of public services and government administration.

(ii) What does blockchain offer?

Blockchain is a method for maintaining a distributed digital ledger.[53] Through cryptographic techniques, a reliable permanent chronological record of transactions can be stored as 'blocks' on multiple computers, thus removing the need for a central authority administering the ledger. A transaction recorded on a blockchain, whether the transfer of an asset or a payment in cryptocurrency, is executed according to the rules of the system (as determined by a majority of nodes in the network), which generally ensure that the same asset can only be transferred from or spent by an entity once. Blockchain enables transactions to be verified and authenticated by anyone with access to the system.

Blockchains can be private or public. Public blockchain systems – also known as 'unpermissioned' blockchains – are fully transparent so that anyone can gain access and become a node in the network.[54] In contrast, in private blockchains, the nodes in the

[52] Alexander James Hamilton & Craig Hammer, *Can We Measure the Power of the Grabbing Hand?: A Comparative Analysis of Different Indicators of Corruption* (The World Bank, 2018), http://documents.worldbank.org/curated/en/113281515516828746/Can-we-measure-the-power-of-the-grabbing-hand-a-comparative-analysis-of-different-indicators-of-corruption. For a critique of indicators, see Merry, Davis and Kingsbury, *supra* note **Error! Bookmark not defined.** above.

[53] Read about blockchain in MARK VAN RIJMENAM & PHILIPPA RYAN, BLOCKCHAIN: TRANSFORMING YOUR BUSINESS AND OUR WORLD (2018).

[54] Karen Yeung, *Regulation by Blockchain: The Emerging Battle for Supremacy between the Code of Law and Code as Law*, 82 THE MODERN LAW REVIEW 207–239 (2019),

network are selected by an owner of the blockchain. Public blockchains create a 'distributed, shared, encrypted-database that serves as an irreversible and incorruptible public repository of information'.[55] Therefore, the potential of public blockchain rests in its ability to provide a 'distributed yet provably accurate record' without requiring a central or human intermediary to verify and guarantee the accuracy of transactions. Because of these qualities, blockchain has been hyped as a 'trust machine', [56] a tool for 'trustless trust'[57] which represents a 'shift from trusting people to trusting math' allowing for 'trust-by-computation' across a decentralised network.[58]

Blockchain's promise to promote the rule of law (as well as to revolutionise societies, and redistribute social and economic power)[59] is rooted in its capacity to enable transactions between strangers through reliance on a distributed tamper proof-shared and immutable ledger, which can be updated in real time.[60] What is important from the rule of law perspective is that blockchain distributes the task of verification so that it no longer relies exclusively on government officials and institutions. Therefore,

explaining that 'Blockchains can be public ('permissionless' or 'unpermissioned') or private ('permissioned')'.

[55] Aaron Wright & Primavera De Fillipi, *Decentralised Blockchain Technology and the Rise of Lex Cryptographia*, (2015), https://www.intgovforum.org/cms/wks2015/uploads/proposal_background_paper/SSRN-id2580664.pdf.

[56] *The Trust Machine - The Promise of Blockchain*, THE ECONOMIST (Oct. 31, 2015), https://www.economist.com/leaders/2015/10/31/the-trust-machine.

[57] Kevin Werbach, *Trust, But Verify: Why Blockchain Needs the Law*, 33 BERKELEY TECHNOLOGY LAW JOURNAL 489, 500 (2018) quoting Reid Hoffman, *Reid Hoffman: Why the Blockchain Matters*, WIRED (May 5 2015), https://www.wired.co.uk/article/bitcoin-reid-hoffman.

[58] Andreas Antonopoulos, *Bitcoin Security Model: Trust by Computation*, O'REILLY RADAR (Feb. 20, 2014), http://radar.oreilly.com/2014/02/bitcoin-security-model-trust-by-computation.html.

[59] For an example of a very positive account on blockchain's potential, see Jamie Smith, *There Is More to Blockchain Than Moving Money. It Has the Potential to Transform Our Lives - Here's How*, WORLD ECONOMIC FORUM (Nov. 9, 2016), https://www.weforum.org/agenda/2016/11/there-is-more-to-blockchain-than- moving-money/.

[60] Yeung, *supra* note 54.

blockchain promises to reduce the power of (potentially corrupt) public officials and increase the predictability of government service delivery, the consistency with which legal rules are applied, and the equality with which those transacting with the government are treated. In other words, blockchain may achieve rule of law values 'by design'.

(iii) Use of blockchain in public services

These qualities mean that blockchain is increasingly being trialled and adopted by governments around the world. It is not surprising that governments in the so-called 'developing world' such Honduras, Mexico or Georgia are employing blockchain for establishing secure land registries or designing public procurement systems to ensure that corrupt public officials can no longer tamper with individual entitlements or public resources. However, blockchain is embraced well beyond this. For example, Sweden has moved its title registry to a blockchain system[61] and the UK Department for Work and Pensions has considered trialling, on a voluntary basis, welfare payments in 'Govcoin', a blockchain-based cryptocurrency.[62] This would mean that when the automated system determines that an individual is eligible for a payment, the relevant amount (in 'Govcoin') is debited from the government and credited to the individual.

[61] Sweden's land ownership authority, the Lantmäteriet, has created a Blockchain-based platform for land transactions, see Molly J. Zuckerman, *Swedish Government Land Registry Soon to Conduct First Blockchain Property Transaction*, COINTELEGRAPH (Mar. 7, 2018), https://cointelegraph.com/news/swedish-government-land-registry-soon-to-conduct-first-blockchain-property-transaction.

[62] Robert Herian, *Why a Blockchain Startup Called Govcoin Wants to "Disrupt" the UK's Welfare State*, THE CONVERSATION (Nov. 28, 2017), https://theconversation.com/why-a-blockchain-startup-called-govcoin-wants-to-disrupt-the-uks-welfare-state-88176.

'Blockchain powered government'[63] is also being trialled in UAE under the strategy 'Smart Dubai'. This aims to use blockchain to facilitate transactions such as licence renewals and visa approvals.[64] While the broader strategy has a deadline of 2020, some elements are already in place (such as the use of blockchain for land transactions) or are being trialled.[65] The goal is to ensure '50% of all applicable government transactions are conducted via emerging technology'.[66]

These trials and experiments are part of a much bigger vision in which blockchain could be employed to assist governments in collecting taxes, running social welfare systems, issuing passports, recording land titles, and ensuring the accuracy and integrity of government record,[67] and generally making governments around the world more transparent and accountable.[68] One prominent project to do just this is being conducted in Mexico.

In September 2017, the Mexican government launched 'Blockchain HACKMX', a joint initiative of the National Digital Strategy and the Ministry of Public Administration in collaboration with Campus Talent Mexico, to 'promote government digital

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[63] SMART DUBAI, *Dubai Blockchain Strategy*, https://smartdubai.ae/en/Initiatives/Pages/DubaiBlockchainStrategy.aspx (last visited Aug. 16, 2018).
[64] *Id.*
[65] Mahmoud Kassem, *Smart Dubai Close to Rolling Out 20 Blockchain-Based Services*, THE NATIONAL (Jan. 14, 2018), https://www.thenational.ae/business/smart-dubai-close-to-rolling-out-20-blockchain-based-services-1.695280.
[66] Smart Dubai (@SmartDubai), TWITTER (Jul. 15, 2018, 5:58 PM) 'The 2018 #HLPF Side Event debated the impact of frontier technologies. Meera AlShaikh discussed the UAE's strategy to implement #AI across government sectors & the UAE Blockchain Strategy to ensure 50% of all applicable government transactions are conducted via emerging technology', https://twitter.com/SmartDubai/status/1018404377416159232.
[67] This assumes that private keys are not lost or compromised: PRIMAVERA DE FILIPPI & AARON WRIGHT, BLOCKCHAIN AND THE LAW: THE RULE OF CODE (2018)
[68] UK Government Chief Scientific Adviser, *supra* note **Error! Bookmark not defined.**, at 30.

innovation' and 'improve the delivery of digital public services.[69] Blockchain HACKMX was introduced in response to suggestions by the World Economic Forum that blockchain could be used by the Mexican government to tackle corruption,[70] which is at high levels in the public sector.[71] According to the OECD, Mexico's economic potential has been hampered by important challenges such as a 'weak rule of law' and 'persistent levels of corruption and crime'.[72] Not surprisingly, more than 8 out of 10 Mexicans believe their political officials are corrupt and do not trust them.[73]

Blockchain HACKMX is built on the open source Etherium platform, which is a decentralised blockchain capable of executing smart contracts. The system has several smart contracts built into it, each one corresponding to each of the phases of Mexico's public contracting process, ensuring that none of the essential stages of the system can be bypassed, and thus helping to avoid manipulation and corruption. [74] These contracts operate as follows:[75]

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[69] Yollanda M. Mancilla, *Blockchain HACKMX*, UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (Mar. 15, 2018), https://www.unece.org/fileadmin/DAM/cefact/cf_forums/2017_Rome/PPTs/BlockChain/PM_05_Yolanda_Martinez_Mancilla_Mexico_Blockchain_HACKMX.pdf.

[70] Fabian Zbinden & Galia Kondova, *Economic Development in Mexico and the Role of Blockchain*, 7 ADVANCES IN ECONOMICS AND BUSINESS 55, 61 (2019).

[71] According to TRANSPARENCY INTERNATIONAL, *Mexico Report*, https://www.transparency.org/country/MEX (last visited Oct. 28, 2019), Mexico only scores 28 points on the corruption perception index, where 0 represents 'highly corrupt' and 100 'very clean'.

[72] OECD, OECD ECONMIC SURVEYS: MEXICO 2017 14 (2017).

[73] Margaret Vice and Hanyu Chwe, *Mexican Views of the U.S. Turn Sharply Negative*, PEW RESEARCH CENTRE (Sep. 14, 2017), https://www.pewresearch.org/global/wp-content/uploads/sites/2/2017/09/Pew-Research-Center_09.14.17_Mexico-Report.pdf.

[74] Jamie Berryhill et al., *Blockchains Unchained: Blockchain Technology and its Use in the Public Sector*, OECD PUBLISHING 45 (2018), https://www.oecd-ilibrary.org/governance/blockchains-unchained_3c32c429-en

[75] See Rodrigo Riquelme, *Gobierno Federal Realizará el Primer Caso Real de Licitación con Blockchain en Agosto*, EL ECONOMISTA (Jul. 27, 2018), https://www.eleconomista.com.mx/tecnologia/Gobierno-federal-realizara-el-

- The first stage involves the registration of the public agency that engaging in the procurement process to acquire a product or to hire a service.
- The second stage involves the registration of bidders.
- The third stage involves the evaluation of the reputation of registered bidders using information stored on the blockchain obtained in previous bids.
- The fourth stage involves the storage of important data relating to the bid.
- The fifth stage involves the evaluation of proposed bids, including a process in which citizens can to vote for public projects on a local, state and federal level, and awards the project to a winner.[76]

Importantly, '[t]he voting process will happen in an anonymous way, preventing interest groups such as involved organizations, politicians and lobbyists from taking influence on voters – combating corruption at its roots'.[77] A government funded prototype of the system was tested with a real tender process in August 2018.[78] There also have been coordinated government efforts through Blockchain HACKMX to establish a national Mexican Blockchain for the public sector which would 'be used as a foundation for further developments in the area of public property registers, identity management and certificates of deposits'.[79]

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primer-caso-real-de-licitacion-con-blockchain-en-agosto-20180727-0035.html; M. Voigt, *Mexico Plans to Hold the First Public Tender with the Use of a Blockchain*, MEDIUM (Aug. 3, 2018), https://medium.com/@ico_6612/mexico-plans-to-hold-the-first-public-tender-with-the-use-of-a-blockchain-22b4f0ff66bf.

[76] See Berryhill, Bourgery and Hanson, *supra* note 74, at 45, suggesting that there may be more stages involved, without explaining what the missing stage(s) are.

[77] Zbinden and Kondova, *supra* note **Error! Bookmark not defined.**, at 61.

[78] Riquelme, *supra* note 75.

[79] Zbinden and Kondova, *supra* note **Error! Bookmark not defined.**, at 61; Government of Mexico, *Blockchain MX*, https://www.gob.mx/cms/uploads/attachment/file/269552/Folleto_blockchain_HACKMX_oct2017_v6.pdf (last visited Oct. 25, 2019).

(iv) Is the rule of law enhanced?

Blockchain and other technologies can be used by governments to increase efficiency and the effectiveness in public administration and to reduce costs the of legal compliance. But the claims around blockchain extend beyond these transactional goals to bolstering the rule of law by providing a technical means through which corruption can be eradicated. Our case study demonstrates this potential, but also reveals tensions with the rule of law values.

With regards to transparency and accountability, in the case of public – but not private – blockchains, the full sequence of blocks is stored in perpetuity on users' computers. There is thus a permanent public record of every transaction that has been accepted and enacted on the blockchain. This enhances transparency and prevents a single 'bad actor' from changing history or enacting a transfer that does not satisfy the requirements of the computer code under which the blockchain operates, at least if cryptographic protections are sufficient. There is, in other words, the potential for full public verifiability of a public blockchain,[80] which could be described as transparency 'by design'.

Our case study further reveals that the use of blockchain in public administration generally enhances predictability and consistency because it is programmed to apply the same rule for all transactions added to the chain. Hence, the Mexican and Dubai governments are able to automatically ensure that particular criteria are met before, say, a licence is renewed. Moreover, predictability and consistency are also strengthened when blockchain eliminates

[80] Note that privacy of individuals transacting on a blockchain can still be protected via encryption, although the risk of re-identification may increase over time.

capacity for corruption and patronage as it removes the need to rely on an individual or agency to record or execute a transaction.

The ability of blockchain technology to ensure transparency, accountability, predictability and consistency depends on both design features and actual implementation. In the context of government use, private blockchains are the most popular, and are used in both Mexico and Dubai. Private blockchain does not have the same features as public blockchain – in particular, it is not possible for any citizen to become a node in the network and thus get access to the full transaction history. By choosing private blockchains, governments are maintaining centralised control but at the cost of the rule of law benefits outlined above.[81] From the rule of law perspective, and transparency in particular, it is a *type* of blockchain – *public* or *private* – that is a crucial factor determining the extent to which blockchain is designed consistently with rule of law values.[82]

Further, tensions between blockchain technology and rule of law values arise on a more fundamental level. In particular, the principle of equality before the law requires that each individual is accorded due process, including that all individuals are subject to the same rules of justice.[83] This includes rights to access and rectify information and the right to appeal a decision. The use of blockchain can compromise individual due process rights because it may undermine the ability of a person to influence or challenge a decision affecting them. This may be because individuals are

[81] Zbinden and Kondova, *supra* note **Error! Bookmark not defined.**; De Filippi and Wright, *supra* note 67.
[82] Zbinden and Kondova, *supra* note **Error! Bookmark not defined.**.
[83] Egalitarian moral value is attached to this principle by all theorists who argue that the principle is part of the conception of the rule of law: see, for example, Dicey, *supra* note **Error! Bookmark not defined.**, at 114–115; Waldron, *supra* note **Error! Bookmark not defined.**; von Hayek, *supra* note 43, 85, at 209. For a classical liberal work on equality before the law, see Hudson, *supra* note **Error! Bookmark not defined.**.

unable to access or determine the correctness of key information used to execute a particular transaction or make a decision.

This tension arises because changes cannot be implemented in a public blockchain unless special built-in mechanisms to facilitate later changes are built in at the design stage. Public blockchain as a design solution is immutable except with the support of a majority of nodes,[84] which is difficult to attain in practice.[85] This offers benefits for predictability and consistency but removes the possibility of appeal as a means of undoing a decision. Other design choices, such as private blockchain, can allow for editing.[86] As noted above, value-sensitive design involves choices; the choice to promote some rule of law values through blockchain may compromise others. Because the procedural elements of the Mexico system are not yet clear, it is difficult to determine what processes to access, rectify or appeal information will be put in place, and whether it is possible to implement these through the blockchain.

To date, blockchain has not been implemented in a way that facilitates diverse rule of law values simultaneously, and it may not be possible to do so with current technology. What would be required to simultaneously satisfy all such values is publicity (for transparency and accountability), protection from manipulation (for predictability and consistency) and correctability (for due process). Public and private blockchains each meet and promote different elements of the rule of law. The choice for governments between private and public blockchain depends on whether they prioritise anti-corruption or access to justice. Our case study

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[84] This is debatable rather than inherent quality of blockchain, see Angela Walch, *Blockchain's Treacherous Vocabulary: One More Challenge for Regulators*, 21 JOURNAL OF INTERNET LAW 1 (2017).
[85] *Id.*
[86] See Richard Lumb et al., *Editing the Uneditable Blockchain: Why Distributed Ledger Technology Must Adapt to an Imperfect World*, ACCENTURE (2016), https://www.accenture.com/t20160927T033514Z__w__/id-en/_acnmedia/PDF-33/Accenture-Editing-Uneditable-Blockchain.pdf.

suggests that there might be different answers to this in different nations. This tension between the different rule of law values qualifies the use of the blockchain and its capacity to promote the rule of law 'by design' in public administration.

B. *The Electoral Process*

(i) The rule of law and elections

For democracies in particular, the rule of law is a crucial component in the operation of elections. Because transparency is often thought of as a prerequisite for social acceptance of the government,[87] it is especially important that elections ensure trust.[88] Transparency requirements are contextual. What might be required will depend on the manner in which elections are conducted;[89] for example, open versus secret ballot, paper versus voting machine; first past the post versus preferential voting.[90] In some cases, it might be seen as necessary for modern elections to provide more than mere access to information about the electoral process, instead engaging with the public around how accuracy, security and accountability measures combine to ensure electoral integrity.[91] It is in this frame of *enhancing* electoral processes that some voting technologies are promoted.

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[87] See, for example, Brandeis *supra* note 39, at ch. 5.
[88] Michael Halberstam, *Beyond Transparency: Rethinking Election Reform from an Open Government Perspective*, 38 SEATTLE UNIVERSITY LAW REVIEW 1007, 1008 (2015); H. A Garnett, *Election Management*, *in* ELECTION WATCHDOGS: TRANSPARENCY, ACCOUNTABILITY AND INTEGRITY 117 (Pippa Norris and Alessandro Nai eds., 2017).
[89] *Id.*
[90] Rebecca Green, *Rethinking Transparency in U.S. Elections*, 75 OHIO STATE LAW JOURNAL 779 (2014).
[91] Halberstam, *supra* note **Error! Bookmark not defined.** above, at 1009.

(ii) Voting Technologies

A variety of technologies are used to improve election processes. These range from online voting portals and e-voting machines to blockchain voting systems and vote counting software. Voting machines may simply record a vote on a piece of paper or they may transmit the vote electronically to a central vote counting machine.[92] Vote counting software can convert raw election data (such as how boxes are marked on each ballot) into a final result (such as that a particular candidate won the election) in line with the legally mandated vote counting technique.[93] Technology can enable remote voting through the internet (generally called online voting) and possibly using blockchain technology as part of its security and integrity protocols. In practice, different voting technologies are often combined – for example, an online voting system may rely on blockchain technology and votes may be transferred to a separate system running automated vote counting software.

Voting technologies, in various forms, are used in countries including the United States, Australia, Canada, France, Switzerland, Belgium, Ireland, UK, Italy, Spain, Estonia, Ecuador, Mexico, Costa Rica, Brazil, Panama, Peru, Argentina, the United Arab Emirates, Namibia, Nigeria,[94] South Korea, India, Nepal and Bhutan.[95] Despite security concerns, Estonia has used online

[92] WOUTER BOKSLAG & MANON DE VRIES, EVALUATING E-VOTING: THEORY AND PRACTICE (2016), http://arxiv.org/abs/1602.02509.
[93] Lyria Bennett Moses et al., *No More Excuses: Automated Synthesis of Practical and Verifiable Vote-Counting Programs for Complex Voting Schemes*, 66 (International Joint Conference on Electronic Voting, 2017), http://dx.doi.org/10.1007/978-3-319-68687-5_5.
[94] For an interesting article on practical challenges for e-voting in Nigeria, see Obinne Obiefuna-Oguejiofor, *Advancing Electronic Voting Systems in Nigeria's Electoral Process: Legal Challenges and Future Directions*, 9 JOURNAL OF SUSTAINABLE DEVELOPMENT LAW AND POLICY 187 (2018).
[95] Conny B. McCormack, *Democracy Rebooted: The Future of Technology in Elections*, ATLANTIC COUNCIL (Mar. 23, 2016), https://www.atlanticcouncil.org/wp-content/uploads/2016/03/Democracy_Rebooted_0323_web_Updated.pdf; Hye Kim et al., *A Study on Ways to Apply the Blockchain-based Online Voting System*,

voting, or I-Voting, as an option for voters for over a decade and is often referred to as a leader in this space.[96] In Estonia, Internet communications are encrypted and the data is transferred to a Vote Counting Server where counting is automated.[97] Blockchain technology is much newer and has been used for elections at a local level in Moscow in Russia and the province of Gyeonggi-do in South Korea as well as in Sierra Leone's general election in 2018 (albeit only to create a partial tally of election results for the purposes of a comparative count).[98] The Netherlands once relied on voting machines, but abandoned them after flaws were demonstrated, including remotely readable signals that reduced the secrecy of ballots.[99]

The eVACS system, used in Australian Capital Territory, was originally adopted due to concerns about errors in the human counting process, made evident in a recount following a close election in 1998.[100] Legislation was passed to authorise the Electoral Commissioner to approve computer programs for electronic voting and vote counting.[101] Voters can choose to vote on paper or using a computer terminal with barcode authorisation but, either way, the vote is counted automatically (relying on a proprietary but independently audited character recognition

10 INTERNATIONAL JOURNAL OF CONTROL AND AUTOMATION 121 (2017); Sanjay Kumar & Ekta Walia, *Analysis of Electronic Voting System in Various Countries*, 3 INTERNATIONAL JOURNAL ON COMPUTER SCIENCE AND ENGINEERING 1825 (2011).

[96] de Vries and Bokslag, *supra* note **Error! Bookmark not defined.**. Drew Springall et al, Security analysis of the Estonian internet voting system, Proceedings of the 2014 ACM SIGSAC Conference on Computer and Communications Security. ACM, 703–715.

[97] *Id.*

[98] Nir Kshetri & Jeffrey Voas, *Blockchain-Enabled E-Voting*, 35 IEEE SOFTWARE 95, 96 (2018).

[99] McCormack, *supra* note 95 above.

[100] Elections ACT, *Development of the System*, ACCESS CANBERRA (Jan. 6, 2015), https://www.elections.act.gov.au/elections_and_voting/electronic_voting_and_counting/development_of_the_system.

[101] *Electoral Amendment Act 2000 (No 2)* (ACT) (Austl).

scanning system plus human checking[102]). A brochure put out by Software Improvements Pty Ltd claims that, in addition to satisfying legislative requirements, the software enhances equality in voting (through facilitating participation by people with disabilities).[103] In relation to transparency and accountability, the software provider promises a paper trail, independent audit and publicly available ('open source') software code.[104]

(iii) Voting Technologies and Rule of Law Values

Technologies can reduce costs and labour requirements and ensure that the vote count is quick. In addition to these practical benefits, election technologies are also said to enhance accountability and transparency of the election process.[105] For example, e-voting machines have increased transparency in places where there are significant concerns about the potential for manipulation of manual voting, such as Nigeria.[106]

Stronger claims are made about the accountability and transparency that might be facilitated by blockchain voting. In one proposed application, each voter can verify that their vote was received and counted correctly while auditors can verify that all

[102] Features of this system were addressed in Australian Capital Territory, Parliamentary Debates, Legislative Assembly, 25 October 2018, 4402–3 (Joy Burch), http://www.hansard.act.gov.au/hansard/2018/pdfs/20181025a.pdf (Austl).
[103] Software Improvements, *eVACS: Make every vote count'*, SOFTWARE IMPROVEMENTS, http://www.softimp.com.au/evacs/FINAL.Brochure.pdf (last visited Oct. 25, 2019).
[104] *Id.*
[105] Kevin C. Desouza and Kiran K. Somvanshi, *How Blockchain Could Improve Election Transparency*, BROOKINGS (May 30, 2018), https://www.brookings.edu/blog/techtank/2018/05/30/how-blockchain-could-improve-election-transparency/.
[106] Obiefuna-Oguejiofor, *supra* note **Error! Bookmark not defined.**.

legitimate votes have been counted.[107] Views on the feasibility and benefits of blockchain technology in elections range from enthusiastic to circumspect.[108] While some suggest that claims that blockchain would 'ensure the integrity of the democratic process' are overstated,[109] others claim it will eliminate 'most, if not all opportunities for suppression, fraud, or sham charges of fraud'[110] and describe tampering in the context of blockchain voting as 'nearly impossible'.[111]

(iv) Is the rule of law enhanced?

The extent to which particular combinations of voting technologies enhance or detract from the rule of law is deeply contextual. Not only do different technologies have different affordances, but the legality of the process as a whole depends on the extent to which technical choices align with legal requirements and local conditions. Compliance with rule of law values will be a question for the electoral system as a whole including human elements such as electoral roll maintenance and testing and evaluation of systems. Technologies can promise transparency and

[107] DESERT BLOCKCHAIN, http://desertblockchain.com/ (last visited Oct. 25, 2019); Jay Carpenter, 'Decentralised Voting & Zero-Knowledge Proofs', GOOGLE DOCS (May 22, 2019), https://docs.google.com/presentation/d/17APQG13rsgTqxhSXpUtYXekjzpo5Dcc7KboudSwcCfo/edit#slide=id.p (last visited Oct. 25, 2019); see also Kshetri and Voas, *supra* note **Error! Bookmark not defined.**; Brianna Bogucki, *Buying Votes in the 21st Century: The Potential Use of Bitcoins and Blockchain Technology in Electronic Voting Reform*, 17 ASPER REVIEW OF INTERNATIONAL BUSINESS AND TRADE LAW 59 (2017). ELECTIONGUARD PRELIMINARY SPECIFICATION V0.85, https://github.com/microsoft/ElectionGuard-SDK-Specification/blob/master/Informal/ElectionGuardSpecificationV0.85.pdf

[108] *Id*; Bob Violino, *Blockchain Voting: Can it Help Secure our Elections?*, ZDNET (Jul. 30, 2018), https://www.zdnet.com/article/is-blockchain-voting-on-the-way/; Kim, Min and Hong, *supra* note 95, at 121.

[109] Violino, *supra* note 108.

[110] Alex Tapscott, *Opinion: It's Time for Online Voting,* N. Y. TIMES, (Nov. 5, 2018), https://www.nytimes.com/2018/11/05/opinion/online-blockchain-voting.html.

[111] Kshetri and Voas, *supra* note **Error! Bookmark not defined.**, at 97.

accountability, predictability, consistency and equality before the law 'by design' in electoral processes, but many implementations may fail to do so in practice.[112]

An example of a technology that *could* significantly improve transparency and accountability of elections is blockchain. Paper-based elections cannot offer individual accountability – it is impossible for an individual voter to confirm that their particular vote was correctly counted. It has, however, been suggested that blockchain could allow individual voters to verify that their vote was received and recorded correctly and that it contributed to the total tally. This would go beyond the kind of transparency and accountability that can be made available in paper-based elections. However, these ideas remain untested at this stage.

Although the focus of the rhetoric around voting technologies relates to the transparency and accountability of election processes, some technologies may also enhance predictability and consistency. As with many areas where technologies replace humans in a process, voting technologies can reduce human error. For example, in a standard voting process, administrative errors at polling stations may lead to votes being lost[113] and hand-counting can lead to votes being misattributed. Software, on the other hand, always performs in accordance with its programming; and so the absence of random unpredictable errors enhances the predictability of the vote counting process.

To realise this, design choices must be made consistently with legal requirements for a particular election process. Formal verification processes can confirm that software operates in

[112] Thomas Haines, Rajeev Goré and Mukesh Tiwari, 'Verified Verifiers for Verifying Elections', CCS '19: Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security, November 2019, https://doi.org/10.1145/3319535.3354247.
[113] Tapscott, *supra* note 110.

accordance with particular logical specifications.[114] Ideally, such a process should be accompanied by human checking that the legal requirements for a particular election are the same as the technical specifications against which the software is verified.

Finally, voting technologies can increase equality before the law. Treating people equally does not always mean treating them the same. For those who have difficulty attending a polling booth or making pencil marks, online voting can be an effective means of participating in an election. This can be an issue that relates to employment (in particular, ability to vote on a work day), location (for electors living overseas, remote and rural communities, or sometimes members of the military), and people with disabilities (particularly, physical mobility and blindness).[115] For example, the eVACS voting system used in ACT has ongoing programs to increase voting among disabled and remote populations.[116]

Where technologies improve the ability for individuals to exercise a right to vote, it enhances the extent to which the law

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[114] Bennett Moses et al, *supra* note **Error! Bookmark not defined.**; Haines et al, *supra* note 112.

[115] Nicole Goodman, *Here's How We Can Get More People to Vote in Elections*, THE CONVERSATION (Apr. 10, 2019), https://theconversation.com/heres-how-we-can-get-more-people-to-vote-in-elections-112486.

[116] SELECT COMMITTEE ON THE 2016 ACT ELECTION AND ELECTORAL ACT, INQUIRY INTO THE 2016 ACT ELECTION AND ELECTORAL ACT (2017), https://www.parliament.act.gov.au/in-committees/select_committees/2016-ACT-Election-and-Electoral-Act/inquiry-into-the-operation-of-the-2016-act-election-and-the-electoral-act; GORDON RAMSAY, GOVERNMENT RESPONSE TO THE SELECT COMMITTEE ON THE 2016 ELECTION AND ELECTORAL ACT REPORT, INQUIRY INTO THE 2016 ACT ELECTION AND ELECTORAL ACT 11–12 (2018), https://www.parliament.act.gov.au/__data/assets/pdf_file/0007/1186810/Governments-response-to-Select-Committee-on-the-2016-ACT-Election-and-Electoral-Act-tabled-10-April-2018.pdf; ACT ELECTORAL COMMISSION, ACT ELECTORAL COMMISSION RESPONSE TO THE ACT LEGISLATIVE ASSEMBLY SELECT COMMITTEE ON THE 2016 ACT ELECTION AND ELECTORAL ACT REPORT OF NOVEMBER 2017 INQUIRY INTO THE 2016 ACT ELECTION AND THE ELECTORAL ACT 8–9 (2018), https://www.parliament.act.gov.au/__data/assets/pdf_file/0019/1208017/ACT-Electoral-Commission-response-to-Select-Committee-on-2016-ACT-Election-and-the-Electoral-Act-tabled-5-June-2018.pdf.

takes account of difference to facilitate the practical equality of legal rights. However, voting technologies can also decrease equality before the law and the extent to which citizens are treated equally. Such a 'voting technology divide' occurred in Florida election of 2000 where the choice to deploy different voting technologies in different parts of the state, [117] meant that technology error had a disparate impact so that, ultimately, ballots of voters from Afro-American or low socio-economic backgrounds were less likely to be counted.[118]

The extent to which voting technologies enhance or detract from rule of law values depends on the particular design choices. For example, the use of open source software enhances transparency while the choice of verifiable vote counting software enhances accountability by facilitating independent confirmation of the result.[119] In Australia, most jurisdictions do not use open source software and none of the vote counting systems is formally verifiable.[120] Similarly, source code is not generally published for voting machines in the United States,[121] nor for voting machines in the Netherlands when they were used in 2006.[122] Publication of source code is a choice, with ACT eVACS using open source software and including auditing procedures, while India and Brazil allow agents of political parties to check equipment and software (respectively) prior to deployment.[123] The only jurisdiction we are aware of demanding that the system is able to be formally,

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[117] Paul M. Schwartz, *Voting Technology and Democracy*, 77 NEW YORK UNIVERSITY LAW REVIEW 625 (2002).
[118] *Id*, 631.
[119] Bennett Moses et al, *supra* note **Error! Bookmark not defined.**.
[120] Richard Buckland & Roland Wen, *The Future of E-voting in Australia*, 10 IEEE SECURITY & PRIVACY 25 (2012).
[121] Matthew Fisher, *Will Your Vote Count?: Can the Current Software Withstand and Guarantee the Constituational Right to Vote?*, 8 THE JOURNAL OF HIGH TECHNOLOGY LAW 91, 99–100 (2008).
[122] de Vries and Bokslag, n **Error! Bookmark not defined.** above, citing L. M. L. H. A. HERMANS & M. J. W. VAN TWIST, STEMMACHINES: EEN VERWEESD DOSSIER (2007).
[123] McCormack, *supra* note 95, at 10 (regarding India and Brazil).

technically verified is Norway.[124] Post-election audits have been rare to date, even where errors are known to have occurred.[125] These examples illustrate how technology's rule of law potential may not be realised because the values are not converted into design requirements of actual systems, perhaps due to cost considerations or other priorities.

Voting technologies can eliminate human errors, but coding, mathematical and other technical errors[126] as well as poor security practices may decrease the predictability and consistency of the electoral process. For example, in 2012 local elections in New South Wales, Australia, an error in vote counting software likely led to the wrong result in one council election and additional errors were found in the code used for the 2016 local government elections.[127] Errors in coding can have a more systemic effect than human error (although not human fraud), making it more likely that the wrong election result is recorded. Similarly, election technologies may increase the overall vulnerability of the system by providing a central point of attack to change the result.[128] In a traditional paper-based voting process, changing an election result requires corruption of significant number of polling booth administrators and vote counters, demanding enormous resources and/or power.[129] However, because voting technologies are often centralised, tampering with a single computer software or bribing a single software company might be enough to corrupt an entire

[124] Buckland and Wen, *supra* note **Error! Bookmark not defined.**, at 29.
[125] Lillie Coney, *E-Voting: A Tale of Lost Votes,* 23 THE JOHN MARSHALL JOURNAL OF INFORMATION TECHNOLOGY & PRIVACY LAW 509, 525 (2006).
[126] Dirk Pattinson, *Vote Counting as Mathematical Proof*, AUSTRALIASIAN CONFERENCE ON ARTIFICAL INTELLIGENCE (May 14, 2015) http://users.cecs.anu.edu.au/~dpattinson/Software/vc-pf.pdf.
[127] ANDREW CONWAY ET AL., AN ANALYSIS OF NEW SOUTH WALES ELECTRONIC VOTE COUNTING (2019), https://dl.acm.org/citation.cfm?id=3014837
[128] de Vries and Bokslag, *supra* note **Error! Bookmark not defined.**.
[129] *Id.*

election.[130] These threats may be mitigated by keeping voting technologies physically secure and offline. However, the risk remains as long as there are any points of centralised vulnerability.

Similarly, voting machines can also prove flawed, as where a considerable number of votes in a 2004 North Carolina election were lost due to poor equipment standards, in particular insufficient data storage,[131] or where WINVote machines used in Virginia elections may have been tampered with by a malicious party.[132] Other issues, such as power failures and poor ballot design, can also impact on the reliability of voting machines[133] leading to decreased consistency and overall accountability of elections. Coding errors and security vulnerabilities can thus lead to inaccurate results, decreasing consistency and accountability of the election.

Even where design attempts to build in rule of law values, for example requiring open source code and formal verification, more needs to be done with respect to non-technical components of the system. For example, the electorate is unlikely to understand technical aspects of voting, so theoretical checkability does not mean that most of the population will be in a position to confirm the reliability of the tools used.[134] Vote counting software can only be checked, in practice, by a small number of technical experts on whom it falls to ensure that the system is accountable.[135] The same point applies to blockchain voting – even if implemented in a way that allows individuals to check that their vote was counted

[130] Jeremy Epstein, *Internet Voting, Security and Privacy*, 19 WILLIAM & MARY BILL OF RIGHTS JOURNAL 885, 900–903 (2011)
[131] Coney, *supra* note **Error! Bookmark not defined.**.
[132] VIRGINIA INFORMATION TECHNOLOGIES AGENCY, SECURITY ASSESSMENT OF WINVOTE VOTING EQUIPMENT FOR DEPARTMENT OF ELECTIONS (2015), https://perma.cc/F59L-LZ8Q.
[133] Walter R Mebane, *Machine Errors and Undervotes in Florida 2006 Revisited*, 17 WILLIAM & MARY BILL OF RIGHTS JOURNAL 375 (2008)
[134] de Vries and Bokslag, *supra* note **Error! Bookmark not defined.**.
[135] Pattinson, *supra* note **Error! Bookmark not defined.**.

correctly, people may not know how to do this or understand the extent to which this feature operates as described.[136]

As well as designing in technical features that promote the rule of law, society will need to revise school curricula and educate the public to better understand these systems. It will also need to ensure that legal and technical experts are involved in the design, evaluation and testing of software so that legal requirements (such as ballot secrecy, counting methods, privacy) correspond to the technical specifications (including by way of formal verification of the operation of the software against those specifications).[137] In some cases, deployment of particular voting technologies will require revision of electoral laws and regulations.[138]

Designing in rule of law values goes beyond a decision to employ technology in elections, or even a decision to use a technology which has been successfully used elsewhere. It requires tracking rule of law values against technical requirements of the system, as in values-based design, and making potentially expensive decisions, such to commission and use purpose-built open source software. It also requires a process to ensure that the system complies with the law (modified as necessary), with human confirmation of the correspondence between legal and technical requirements as well as formal verification that the technical requirements are met by the software both generally and in each particular instance. Without this, electoral technologies will not realise the promised rule of law benefits and may even do harm to those values.

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136 Bogucki, *supra* note 107.

137 Ardita D. Maurer, *Legality, Separation of Powers, Stability of Electoral Law: The Impact of New Voting Technologies* 68 (Apr. 12–13, 2016), https://www.roaep.ro/prezentare/wp-content/uploads/2016/08/Expert_Electoral_Ed_%20Speciala%202016.pdf.

138 ORGANISATION FOR SECURITY AND CO-OPERATION IN EUROPE, GUIDELINES FOR REVIEWING A LEGAL FRAMEWORK FOR ELECTIONS (OSCE Office for Democratic Institutions and Human Rights 2nd ed., 2013), https://www.osce.org/odihr/elections/104573?download=true.

C. *Enforcing Compliance with the Law*

(i) The Rule of Law and Enforcing Compliance with the Law

Enforcing compliance with the law has long been a fertile ground for experimentation with technology. Claims around technology's ability to reduce bias and discrimination in, for example policing and law enforcement – thus promoting equality before the law – have been present in criminology debates since the 1960s.[139] Today, that interest has been taken to a new level where technology is seen as capable of providing 'perfect enforcement' of legal rules and regulations. Such 'perfection', making non-compliance (near) impossible, could be reached through a large-scale deployment of technology-driven tools. The most obvious case study of 'perfect enforcement' of law today is China, which has introduced a variety of tools to address the phenomenon that 'enforcement is difficult' (*zhixing nan*).[140] These tools include increasingly sophisticated CCTV cameras, surveillance via mobile devices, number plate and facial recognition.[141] Through technology, China is seeking more effective enforcement and compliance in areas such as intellectual property, environmental protection and enforcing civil judgments.[142]

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[139] DANIELLE L. KEHL ET AL., ALGORITHMS IN THE CRIMINAL JUSTICE SYSTEM: ASSESSING THE USE OF RISK ASSESSMENTS IN SENTENCING (Berkman Klein Center for Internet & Society, 2017), https://cyber.harvard.edu/publications/2017/07/Algorithms.

[140] Marianne Blomberg, *The Social Credit System and China's Rule of Law*, 2 MAPPING CHINA JOURNAL 77 (2018).

[141] Fan Liang et al., *Constructing a Data-Driven Society: China's Social Credit System as a State Surveillance Infrastructure*, 10 POLICY & INTERNET 415 (2018); Yuhua Wang & Carl Minzer, *The Rise of the Chinese Security State*, 222 THE CHINA QUARTERLY 339 (2015).

[142] See Rogier Creemers, *China's Social Credit System: An Evolving Practice of Control*, AVAILABLE AT SSRN 3175792 (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3175792, citing B van Rooij et al., *Pollution Enforcement in China: Understanding National and Regional Variation*, *in* ROUTLEDGE HANDBOOK OF ENVIRONMENTAL POLICY IN CHINA

(ii) China's Social Credit System

Of particular interest is the Social Credit System (*shehui xinyong tixi* – 'SCS') developed by central government in China and implemented by 43 'demonstration cities' and districts at regional and local levels.[143] According to the Chinese government planning document outlining the system:

> its inherent requirements are establishing the idea of a sincerity culture, and promoting honesty and traditional virtues, it uses encouragement for trustworthiness and constraints against untrustworthiness as incentive mechanisms, and its objective is raising the sincerity consciousness and credit levels of the entire society.[144]

To achieve such goals, the SCS establishes a system based on rewards and punishments as a feedback to individuals and companies in their economic, social and political conduct.[145]

The SCS system is a mix of technologies including pre-programmed rule-based systems and tools such as facial recognition technology. The Chinese government has also partnered with private companies with sophisticated data analytics

(Eva Sternfeld & Arthur Mol eds., 2017); MARTIN DIMITROV, PIRACY AND THE STATE: THE POLITICS OF INTELLECTUAL PROPERTY RIGHTS IN CHINA (2009).

143 A linguistic note made by Rogier Creemers is useful in this context: 'the Mandarin term "credit" (*xinyong*) carries a wider meaning than its English-language counterpart. It not only includes notions of financial ability to service debt, but is cognate with terms for sincerity, honesty, and integrity': see Creemers, *supra* note **Error! Bookmark not defined.**.

144 ROGIER CREEMERS, PLANNING OUTLINE FOR THE CONSTRUCTION OF A SOCIAL CREDIT SYSTEM (2014-2020), https://chinacopyrightandmedia.wordpress.com/2014/06/14/planning-outline-for-the-construction-of-a-social-credit-system-2014-2020/ (last visited Aug 16, 2018)

145 For a detailed analysis of thinking and design process behind the SCS, see Creemers, *supra* note **Error! Bookmark not defined.**.

capacity, such as Chinese technology giant Alibaba, to further expand SCS. One of such partnerships is the Sesame Credit system that combines information from the Alibaba database with other personal information, such as individual browsing and transaction history online, tax information and traffic infringement history, to determine the trustworthiness of individuals. Among other things, the system calculates individual credit scores based on potential borrowers' social network contacts.[146] This means that those with low-score friends or connections will see a negative impact on their own scores because of an automated assessment.[147]

Each of 43 'model cities' implement the SCS program differently. For example, under the Rongcheng City model,[148] a base score of 1,000 points is assigned to each individual on a credit management system, which connects four governmental departments. Public officials can then add or deduct points on the system for specific behaviour, such as late payment of fines or traffic penalties. 150 categories of behaviour are classed as positive and lead to reward of additional points on the system, while 570 categories of conduct are categorised as 'negative' and lead to point deductions.[149] A person's score can have serious repercussions. For example, those with low scores may be ineligible for loans and certain jobs or buying tickets for fast trains or flights. In contrast, those with high scores enjoy benefits such as cheaper public transport, free gym facilities and priority for waiting times in hospitals.

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[146] Mara Hvistendahl, *Inside China's Vast New Experiment in Social Ranking*, WIRED (Dec. 14 2017), https://www.wired.com/story/age-of-social-credit/.
[147] Raymond Zhong & Paul Mozur, *Tech Giants Feel the Squeeze as Xi Jinping Tightens His Grip*, N. Y. TIMES (May 2, 2018), https://www.nytimes.com/2018/05/02/technology/china-xi-jinping-technology-innovation.html.
[148] Rongcheng: The Making of a Demonstration City for the Social Credit System(荣成：建信用体系 创"示范城市) XINHUA NEWS AGENCY (新华社) (Jul. 13, 2017), http://xinhua-rss.zhongguowangshi.com/13701/6003014383535113117/2049163.html.
[149] *Id.*

(iii) SCS and Rule of Law Values

As was the case with technologies discussed in earlier sections, financial considerations play an important role in the rationale of China's technological upgrade and SCS. For example, the government wishes to attract more investors by ensuring contracts will be honoured and by preventing illegal behaviour,[150] and to bolster the banking sector and development of the financial credit rating system.[151] Rule of law ideals also play a prominent role in rhetoric around the benefits of the SCS. It is suggested that the SCS can help 'to create better democratic societies by enhancing transparency by ensuring that everybody knows the score of everybody'.[152]

A majority of Chinese citizens are said to be supportive of the SCS and view it as necessary promote transparency and accountability of institutions and fellow citizens in contemporary China.[153] A survey of Chinese citizens shows 80 percent of

[150] '[B]y trying to prevent illegal behavior, to ensure contracts are being honored, and to strengthen the environmental focus, may all help in attracting more companies to do business in China': Alexander Mortensen, *The Chinese Social Credit System in the Context of Datafication and Privacy*, MEDIUM (Feb. 1, 2018), https://medium.com/@alexanderskyummortensen/the-chinese-social-credit-system-in-the-context-of-datafication-and-privacy-cafc9bb7923b.

[151] See Jun Liu, *Is China's Social Credit System Really the Dystopian Sci-Fi Scenario that Many Fear*? SCIENCENORDIC (Dec. 6, 2018), http://sciencenordic.com/china%E2%80%99s-social-credit-system-really-dystopian-si-fi-scenario-many-fear, stating that: 'A national wide credit system, in this sense, would allow responsible borrowers access to a line of credit. It will not only service Chinese bankers, but also has constructive effects on the economic realities of individuals and companies and the whole Chinese economy in the long run'. See also Genia Kostka, *China's Social Credit Systems are Highly Popular – For Now,* MERCATOR INSTITUTE FOR CHINA STUDIES (Sep. 17, 2018), https://www.merics.org/en/blog/chinas-social-credit-systems-are-highly-popular-now.

[152] Mortensen, *supra* note 150.

[153] Bing Song, *The West May Be Wrong about China's Social Credit System*, THE WORLDPOST (Nov. 29, 2018), https://www.washingtonpost.com/news/theworldpost/wp/2018/11/29/social-credit/?utm_term=.27f37716d9ff, states that 'a system that bolsters trust is seen by many Chinese citizens as necessary'.

respondents approve of SCS and view it 'as a more effective and efficient way to promote good behaviour and protect them from fraud and bad business'.[154] The survey results further demonstrate that respondents from urban wealthier and more educated backgrounds regard SCS 'as a useful tool to fill institutional and regulatory gaps, leading to more honest and law-abiding behaviour in society, and less as an instrument of surveillance'.[155] The positive view and acceptance among the citizenry is well-illustrated by a comment made an average business person in their mid-thirties in China*:* 'I feel like in the past six months, people's behaviour has gotten better and better. For example, when we drive, now we always stop in front of crosswalks. If you don't stop, you will lose your points. At first, we just worried about losing points, but now we got used to it'.[156] Such survey results illustrate that government officials, citizens and the media can perceive technology as capable of improving transparency, the accountability of institutions, and reducing the proliferation of fraud and other difficulties in ensuring compliance with and the enforcement of laws and regulations.[157]

(iv) Is the Rule of Law Enhanced?

Technological systems can in theory offer enhanced transparency, predictability, consistency and equality before the law through fostering *absolutely* consistent enforcement of the law, such as by picking up every act of jaywalking. Our case study of the SCS in China, demonstrates, however, that 'securing' rule of law values

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154 Bernard Marr, *Chinese Social Credit Score: Utopian Big Data Bliss Or Black Mirror On Steroids?* FORBES (Jan. 21, 2019), https://www.forbes.com/sites/bernardmarr/2019/01/21/chinese-social-credit-score-utopian-big-data-bliss-or-black-mirror-on-steroids/#24b16a2048b8.

155 Kostka, *supra* note 151.

156 Alexandra Ma, *China Has Started Ranking Citizens with a Creepy 'Social Credit' System -- Here's What You Can Co Wrong, and the Embarrassing, Demeaning Ways They Can Punish You*, BUSINESS INSIDER AUSTRALIA (Oct. 30, 2018), https://www.businessinsider.com.au/china-social-credit-system-punishments-and-rewards-explained-2018-4?r=US&IR=T.

157 Song, *supra* note 153.

through technological systems can result in 'overenforcement of law' and an imbalance of power between government and citizens. We discuss this imbalance below after demonstrating how SCS can formally 'tick the boxes' of core rule of law values.

First, a rules-based technological system such as the SCS may allow people to understand how every variable was set and why each conclusion was reached, thereby enhancing the transparency and accountability of government efforts in ensuring compliance with the law. In comparison, a government official may come up with justifications for a particular course of action or a decision *ex post* that do not accurately represent why a particular action was taken or decision was made.[158] For example, the SCS can report back to an affected individual that the reason have been denied a particular service was because they did not meet a criterion that is a requirement of a legislative or operational rule that is pre-programmed into the logic of the system. This also enhances predictability and consistency of the law. For these reasons, scholars suggest that a well-governed SCS 'could bring transparency, oversee those in power, regulate the economy with less direct government intervention, and encourage people to treat each other more fairly, as the government maintains'.[159] It is important to note, however, that while such feedback could be technically designed into the rules-based systems, it is at the discretion of those designing the system.

Similarly, technological tools used in China may enhance the principles of predictability, consistency, and equality before the law by reducing arbitrariness in the application of law. For instance, the use of cameras and face recognition technology could be

[158] Richard E. Nisbett & T. DeCamp Wilson, *Telling More Than We Can Know: Verbal Reports on Mental Processes*, 84 PSYCHOLOGICAL REVIEW 231 (1977).
[159] MARTIN CHORZEMPA, CHINA'S SOCIAL CREDIT SYSTEM: A MARK OF PROGRESS OR A THREAT TO PRIVACY? PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS (2018), https://www.piie.com/publications/policy-briefs/chinas-social-credit-system-mark-progress-or-threat-privacy.

understood as tool for ensuring that the consequences apply to everyone who breaches certain rules (such as jaywalking or parking illegally) without exception. This removes arbitrariness, albeit at the cost of exercising discretion that might be seen as desirable, such as to prevent the penalisation of a person parking illegally in front of a hospital in a medical emergency.[160] Without technological tools, systems in place for minor infringements of this kind require a person to be 'caught', with the severity of the penalty often depending on the discretion and 'generosity' of the officials in question. This is one reason why many Chinese citizens are supportive of the SCS.[161]

These positive qualities in theory are undermined by other factors that place the SCS at odds with the rule of law values discussed in this paper. Firstly, the rule of law values of transparency and accountability are undermined in the face of the Chinese government plans to use by 2020 the information obtained through the SCS in combination with machine learning, facial recognition technology and predictive policing practices.[162] Such combined use of the rule based system and machine learning could lead to different forms of opacity[163] which may fundamentally challenge the rule of law values of transparency and accountability.

In particular, the details of the cooperation between the central government and the private sector in the Sesame Credit system are

[160] Christina M Mulligan, *Perfect Enforcement Of Law: When To Limit And When To Use Technology*, 14 RICHMOND JOURNAL OF LAW AND TECHNOLOGY 1 (2008)
[161] As one respondent to the survey said 'For example, when we drive, now we always stop in front of crosswalks. If you don't stop, you will lose your points': see Ma, *supra* note 156.
[162] For more information on the government plans on SCS, see Yu-Jie Chen et al., *"Rule of Trust": The Power and Perils of China's Social Credit Megaproject*, 32 COLUMBIA JOURNAL OF ASIAN LAW 1 (2018); Emile Yeoh, *Brave New World Meets Nineteen Eighty-Four in a New Golden Age: On the Passing of Liu Xiaobo, Advent of Big Data, and Resurgence of China as World Power*, 4 CONTEMPORARY CHINESE POLITICAL ECONOMY AND STRATEGIC RELATIONS 593, 694 (2018).
[163] Jenna Burrell, *How the Machine 'Thinks': Understanding Opacity in Machine Learning Algorithms*, 3 BIG DATA & SOCIETY 1 (2016).

not clear. This intentional secrecy is also be protected as a 'trade secret' by Chinese tech giant Alibaba.[164] While it is known that the system will use machine learning and behavioural analytics in calculating credit scores,[165] individuals have no means to know what information from their social network contacts was used or its precise impact on their scores.[166] Such secrecy and lack of publicity decreases transparency and accountability of the system. This intentional opacity is compounded by opacity due to technical complexity and opacity due to the emergent properties of machine learning processes (which by their nature may involve such a high level of complexity as to be beyond human understanding).[167]

Reduced transparency and accountability in the SCS system may further decrease the principle of equality before the law, which requires that individuals are able to access, challenge and rectify information used in making decisions about them. Surveys of Chinese citizens demonstrate that high rates of approval for the SCS stem from the assumption that transparent and fair methods will be used in calculating credit scores.[168] As Genia Kostka noted, 'respondents expressed concerns over what they perceived as unfair scoring methods, with some worrying that the same standards might not apply to 'people in powerful positions'. One interviewee pointed out the difficulties in repairing a low credit score after an extended period of sickness or personal (financial) difficulties'.[169]

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[164] Karen L. X. Wong & Amy S. Dobson, *We're Just Data: Exploring China's Social Credit System in Relation to Digital Platform Ratings Cultures in Westernised Democracies*, 4 GLOBAL MEDIA AND CHINA 220 (2019); Shazeda Ahmed, *Cashless Society, Cached Data. Security Considerations for a Chinese Social Credit System*, THE CITIZEN LAB (Jan. 24, 2017), https://citizenlab.ca/2017/01/cashless-society-cached-data-security-considerations-chinese-social-credit-system/.
[165] Hvistendahl, *supra* note 145.
[166] Zhong and Mozur, *supra* note 147.
[167] Burrell, *supra* note **Error! Bookmark not defined.**.
[168] Kostka, *supra* note 151.
[169] *Id.*

From the perspective of equality before the law, only factors relevant under law should be taken into account, and individuals must have a right to access, challenge and rectify the information that government is using to make decisions affecting them. This may not always be realised in the different ways that the system is implemented. For example, the Sesame Credit system relies on variables that are problematic and irrelevant from a rule of law perspective, such as the rankings of an individual's social network contacts, which could lead to differential treatment based on social status, sex or ethnic origin.[170]

Moreover, rights of access and rectification also vary. For example, under Shanghai Municipality SCS model, individuals have a right to know about the collection and use of their social credit information and can access and challenge the information contained in their credit reports.[171] The municipal Public Credit Information services centre will determine whether to rectify the information within five working days of receiving the objection materials. These rights were tested in practice by Chinese citizen Liu Hu, who was blacklisted on the SCS and unable to book plane ticket after he accidentally transferred the payment for a fine to a wrong account.[172] After a court learned that Liu Hu made an honest mistake, the information on his social credit report was

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[170] Michal Kosinski et al., *Private Traits and Attributes are Predictable from Digital Records of Human Behavior*, 110 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 5802 (2013) (finding that easily accessible digital records such as Facebook 'likes' can be used to automatically and accurately predict highly sensitive personal information, including sexuality and ethnicity).

[171] 上海市社会信用条例 [Shanghai Social Credit Regulations] (promulgated by the Shanghai Development and Reform Commission, Jun. 29, 2017) art 34, https://www.chinalawtranslate.com/ 上海市社会信用条例/?lang=en (translated from http://www.shdrc.gov.cn/gk/xxgkml/zcwj/zgjjl/27789.htm) (China). Article 36 further states, 'Where information subjects feel that there was error, omissions, and other such circumstances … they may submit an objection to the municipal Public Credit Information service center, credit service establishments, and so forth'.

[172] Simina Mistreanu, *Life Inside China's Social Credit Laboratory*, FOREIGN POLICY (Apr. 3, 2018), https://foreignpolicy.com/2018/04/03/life-inside-chinas-social-credit-laboratory/.

rectified. However, it is not clear whether the same standards apply to Sesame Credit system, where trade secrets and complex opacity may prevent the exercise of fundamental protections of due process. In addition to major concerns with the privacy in the accumulation of personal information, such complex opacity undermines the principle of equality before the law and decreases the ability of citizens to hold state entities accountable.[173]

Further significant incompatibility of the SCS with rule of law values arises because the SCS does not have a legal basis. There is no legal instrument establishing or defining the system or the behaviours it aims to punish or reward. This contravenes the value of transparency requiring that society be regulated by laws that are accessible to the citizens. Moreover, the lack of legal basis and definitions undermines the values of predictability and consistency, which should enable citizens to know what behaviour is punishable so that they can manage their lives with predictability and certainty. Instead, the SCS is built upon vague social management concept of 'trust' and opaque procedures, undefined in legislation, that further undermine the rule of law value of accountability.

The SCS is grounded in social management theory and operates without legal clarity or definitions. Arguably, it derogates from the notion of 'governing the country in accordance with the law' as enshrined in China's constitution.[174] Currently, the 'perfect enforcement' or 'compliance by/through design' in China thus runs counter to rule of law values such as transparency and accountability as it allows the government in China to bypass promulgated law and court orders as mechanisms of control, instead relying on less transparent technological design features to achieve their objectives. Such 'perfect enforcement' therefore

[173] See Liang et al, *supra* note **Error! Bookmark not defined.**. See also Chorzempa, *supra* note **Error! Bookmark not defined.**.

[174] See, for example, Chen, Lin and Liu, *supra* note **Error! Bookmark not defined.**. Western scholars, such as Marianne von Blomberg, also argue that SCS, having its conceptual heritage is social management theory which does not operate with the traditional notion of law, fundamentally challenges the rule of law: see von Blomberg, *supra* note **Error! Bookmark not defined.**.

removes a practical check on the exercise of government power. Our case study suggests that, while the SCS displays some theoretical benefits for the rule of law values, it is nonetheless fundamentally incompatible with them. Lacking legal basis and clear definitions of punishable behaviours, the SCS can impose significant risks of harm to the individuals it affects and leave them unable to hold government institutions to account.

It is hard to dispute that a system entailing wide-ranging punishments, which are not codified in law, is fundamentally at odds with the rule of law. However, it is important to ask whether the rule of law *could theoretically* be achieved by design through a system of perfect enforcement if it was codified in law? Hypothetically, if the SCS had a legal basis and clear definitions, would it be compliant with the rule of law? The answer is no, especially within democratic systems which would see such a system as being incompatible with more substantive conceptions of the rule of law.

No system of 'perfect enforcement' can design-in even the more formal – or minimalist – rule of law values discussed in this paper. Such a system significantly reduces the power of citizens relative to governments by enabling the surveillance of the population without limits.[175] Absolute surveillance is not just about privacy, but also about magnifying government power and control. From the rule of law perspective, few citizens will challenge the exercise of government power – either because surveillance itself deters them, or because law enforcement is able to deter any such action or more generally uprisings or activities that might challenge the state. Ultimately, even if legislated, a perfect enforcement system, resembling an 'Orwellian system of social control',[176] cannot be designed with sufficient accountability to bring it in line even with the minimalist conceptions of the rule of law.

[175] JONATHAN ZITTRAIN, THE FUTURE OF THE INTERNET – AND HOW TO STOP IT 112–114 (2008).
[176] Chorzempa, *supra* note **Error! Bookmark not defined.**.

4. *Conclusion*

New technologies are frequently objects of fascination and hyperbole.[177] This is equally true in public governance: technology promises not only greater government efficiency, but also the prospect of 'designing in' important values. If privacy and legal compliance can be achieved 'by design', then why not transparency, accountability, predictability, consistency and equal treatment? Rhetoric around this possibility is evident in all three of our case studies – blockchain has been said to remove corruption, voting technologies have been marketed as improving election processes, and the Chinese SCS is said to foster perfect enforcement. Our analysis demonstrates that such values can (to an extent) be designed into government systems. Well-designed systems can better ensure the consistent application of the law, enhance the accountability of election processes and enable citizens to be treated equally when laws are enforced.

The rule of law 'by design' envisages leveraging technological design by making deliberate decisions in the design process to realise this important social value. There is significant potential for this, and so that new technologies can play a role in addressing some of the more serious threats to the rule of law, including corruption and arbitrary decision-making. Doing so though is a complex and contextual process that requires a sensitivity to rule of law values at a range of points, including in respect of selecting technology and in its design and implementation. Such decisions must also have regard to the limitations of such technologies, including where they may give rise to tensions between rule of law values or even intractable problems in respect of a particular value.

[177] Marita Sturken & Douglas Thomas, *Introduction: Technological Visions and the Rhetoric of the New*, *in* TECHNOLOGICAL VISIONS: THE HOPES AND FEARS THAT SHAPE NEW TECHNOLOGIES (Marita Sturken et al. eds., 2004).

Such regard will highlight the ongoing limitations of these technologies, and where rule of law values will be better realised through ongoing human intervention, even given the well-known problems and frailties inherent in human decision-making.

In practice, this article shows that technology often falls short of its promise. A larger concern is that rule of law 'by design' may produce systemic risks and harms. It is true that humans, including public officials, 'can err about facts or misrepresent precedent; human judges for example may be influenced by extraneous factors or bias'.[178] But while human corruptibility, bias and unpredictability are problems for the rule of law, socio-technical systems designed by humans are also not perfect solutions. This, again, can be seen in all three case studies. Just as the choice to use a private blockchain undermines the accountability, transparency and predictability that public blockchain-based systems are promoted as achieving; reliance on non-verifiable, closed source software in elections turns random errors and inconsistencies into more concerning systemic risk that undermines accountability. Finally, the SCS lacks a legal basis and enhances rather than constrains government power. As these examples show, not only will humans often fail to make design choices that align with rule of law values, it may be impossible to do so within technical and political constraints.

Governments may lack the resources and human capacity to resolve these challenges. The cost of doing so may be significant, and beyond state budgets. This explains the prevalence of outsourcing, where public officials procure such systems from private entities. The reasons for this are understandable but can result in heightened inconsistencies with rule of law values. Such systems may be even less likely to reflect imperatives such as public accountability, and instead may give greater weight to private-

[178] OZKAN EREN & NACI MOCAN, EMOTIONAL JUDGES AND UNLUCKY JUVENILES (National Bureau of Economic Research, 2016), http://www.nber.org/papers/ w22611.pdf.

sector considerations such as profitability and the need for secrecy when it comes to proprietary software. These challenges arise in respect of government outsourcing generally, but may be of greater concern in regard to the rollout of government-wide technological solutions, such as for elections, that may affect vast numbers of the populace and underpin the effectiveness of and trust in government as a whole.

The role of 'by design' thinking in the context of the rule of law is thus helpful, but potentially limiting. Governments can make better decisions and enhance the rule of law through design decisions – such as to reliably deliver citizen entitlements, formally verify automated vote counting, and reduce arbitrariness in enforcement. Yet increased reliance on technology by government can also consolidate power and generate systemic risks that reduce trust in the operation of government in ways that undermine the rule of law. As a result, the rule of law cannot be guaranteed 'by design', but design choices remain crucial in ensuring that government programs express rather than undermine the values that the rule of law embodies.