

**JUDGING AND THE JUDICIARY:
CHALLENGES AND LESSONS IN THE AGE
OF TECHNOLOGY**

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The Honourable Chief Presiding Judge of the Seoul High Court, Judge Kang Young-Su,
Honourable Judges of the Korean Judiciary,
Fellow Judges and colleagues from Singapore,
Distinguished guests,

I. Introduction

1. More than two decades ago, at a conference on what must have seemed at the time to be the rather esoteric subject of cyberlaw, Justice Frank Easterbrook famously remarked that there is no more a “law of cyberspace” than there is a “law of the horse”.¹ In other words, cyberspace did not require its

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¹ Frank H. Easterbrook, “Cyberspace and the Law of the Horse” (1996) University of Chicago Law Forum 207 (“*Easterbrook*”) at pp 207 to 208.

own body of law any more than horses required a law unto themselves.² His hypothesis was that the rigorous application of existing laws and legal principles would adequately address the legal challenges posed by emerging technologies.³ Perhaps unsurprisingly, this sentiment would have been met with much consternation, particularly by the participants at the conference who plainly were devotees of this field of special interest and who had just been told, two hours into a day-long conference, that there was little to be gained from the study of “cyberlaw”.⁴ The most famous riposte to Justice Easterbrook was posed by Professor Lawrence Lessig. In his seminal article titled “The Law of the Horse: What Cyberlaw Might Teach”, Professor Lessig outlined his thesis that the architecture of cyberspace played an important role in influencing social conduct and in embodying societal values – a role that is akin to, and sometimes in tension with, that traditionally served by the law.⁵ Therefore, he argued, it was not just valuable but indeed imperative for us, as a society and as a profession, to think carefully about how cyberspace ought to be used and regulated so that it might more closely reflect the values that we cherish.⁶

2. The views of Justice Easterbrook and Professor Lessig are, of course,

² *Easterbrook* at pp 207 to 208, 215 to 216.

³ *Easterbrook* at pp 207 to 208, 215 to 216.

⁴ Lawrence Lessig, “The Law of the Horse: What Cyberlaw Might Teach” (1999) 113 *Harvard Law Review* 501 (“*Lessig*”) at p 501.

⁵ *Lessig* at p 507.

⁶ *Lessig* at pp 545 to 546.

more complex and sophisticated than this brief summary will allow. But at the heart of the debate lies a fundamental question about the extent to which technology has transformed the role of the law, the traditional ways in which it is studied and practiced, as well as the manner in which lawyers and legal institutions ought to respond to these changes. I have spoken on these issues on several occasions.⁷ Today, I will focus on how we, as judges, might approach the impact of technology on the work of the courts. There are, in my view, at least three important types of challenges: (a) **first**, in relation to substantive laws and legal doctrines; (b) **second**, in relation to the rules and processes of evidence; and (c) **third**, in relation to the Judiciary as an institution, including its processes, people, and values. I will elaborate on them in turn before raising a few suggestions as to how we might respond to these diverse challenges.

II. The Law of the Horse

A. *Substantive legal challenges*

3. Let me begin by examining the challenges posed by technology to our substantive legal frameworks and doctrines. This is perhaps best illustrated by examining a few examples involving well-established areas of law familiar to

⁷ See, among others, Sundaresh Menon, Chief Justice of Singapore, “Technology and the Changing Face of Justice”, Negotiation and Conflict Management Group ADR Conference 2019 (14 November 2019) (“*Negotiation Conference 2019*”); Sundaresh Menon, Chief Justice of Singapore, “Mass Call Address 2020”, Admission of Advocates and Solicitors – Mass Call 2020 (25 August 2020); Sundaresh Menon, Chief Justice of Singapore, “Mass Call Address 2019: A Profession of Learners”, Admission of Advocates and Solicitors – Mass Call 2019 (27 August 2019) (“*Mass Call Address 2019*”).

both the civil and common law traditions.

(a) Law of contract in the age of automation

4. The first example concerns the law of contract and challenges posed by the emergence of automated contracting, smart contracts, and other forms of machine-based contracts. One commentator has suggested that these new technologies “mark the beginning of the end of contract law”.⁸ While I would not go so far, I think we will inevitably have to consider difficult issues such as whether parties contracting through machines have had a true meeting of the minds; how their intentions can be ascertained; and how existing doctrines involving the interpretation, breach, and vitiation of a contract should apply.⁹

5. Automated contracting, of course, is *not* a new phenomenon. Contractual issues in relation to vending machines and automated carpark gantries have engaged the courts since more than half a century ago. Take for example one of the first cases that a common law student is likely to encounter in law school, *Thornton v Shoe Lane Parking*.¹⁰ This landmark decision, delivered in 1971, involved wholly unremarkable facts. The plaintiff was on his way to a music event and wanted to park his car at a newly built multistorey carpark operated

⁸ Maren K Woebeking, “The Impact of Smart Contracts on Traditional Concepts of Contract Law” (2019) 10(1) *Journal of Intellectual Property, Information Technology and Electronic Commerce Law* 106 at p 106.

⁹ See, for example, Chamber of Digital Commerce, “Smart Contracts: Is the Law ready?” (2018) at p 17.

¹⁰ *Thornton v Shoe Lane Parking Ltd* [1971] 1 All ER 686 (“*Thornton*”).

by the defendant. *Outside* the carpark was a notice showing the parking charges and stating that cars were parked at the owners' own risk. The plaintiff drove past this display and turned into the carpark, where an automated machine dispensed a parking ticket. No one else was present. In small print on the ticket was a statement that the ticket was issued subject to conditions displayed *inside* the parking premises. And then on a pillar opposite the automated machine – which the plaintiff would only be able to see if he drove even further into the carpark – was a panel containing a long list of conditions, including a disclaimer of all liability for personal injuries to customers howsoever caused. Three hours later, when the plaintiff returned to collect his car, he met with an accident and was severely injured. The question before the English Court of Appeal was whether the disclaimers displayed *within* the defendant's premises had been properly incorporated into the contract by virtue of the small print on the parking ticket, such that it exempted the defendant from liability for personal injuries.

6. It appears that at the time it was decided, this was one of the first cases where the ticket granting entry to the carpark had been dispensed by an automated machine instead of a human being. Lord Denning MR, one of the most famous English judges of the last century, seized upon this distinction in his judgment. In his view, contracting using an *automated* machine made all the difference, because unlike the situation where the transaction was effected by a human booking clerk who would have been able to explain or highlight any

significant term of the contract and if necessary provide a refund, a customer dealing with an inanimate machine became committed once the machine dispensed the ticket. In the language of the traditional doctrine of offer and acceptance – which is the basis upon which a contract is formed under the common law – Lord Denning explained that the defendant’s *offer* came in the form of its notice outside the entrance of the carpark displaying the charges and the disclaimer of liability for property damage to the car itself, and the plaintiff’s *acceptance* of that offer came when he saw this notice and turned into the carpark entrance. A contract was formed at that point.¹¹ Therefore, by the time the ticket was dispensed, the contract had been concluded, and any term written on the ticket itself could not be treated as part of the contract that had been formed an instant before that.

7. At first glance, *Thornton* might suggest that rigorous analysis and the thoughtful application of traditional legal principles by the courts will suffice to meet the challenges posed by technology to the law of contract. I will examine this in greater detail later, but it may be noted that neither of the other two Judges on the English Court of Appeal in *Thornton* was prepared to expressly agree with Lord Denning on his analysis of the precise time the contract was formed, and while they both similarly rejected the defendant’s reliance on the disclaimer for personal injuries, they did so on other grounds.¹² This is

¹¹ *Thornton* at 689g (per Lord Denning MR).

¹² *Thornton* at 690g (Megaw LJ) and 693f (Sir Gordon Willmer).

understandable. Hard cases, it is said, make bad law. In the fast-evolving field of technology, while some judges might march boldly forward in the cause of justice, others might prefer to defer making broad pronouncements in a setting where it is so easy to be ignorant even about the extent of one's ignorance.

8. A similar divergence in judicial philosophy may be discerned in a much more recent decision of the Singapore Court of Appeal, *Quoine v B2C2*,¹³ where one of the issues was how the longstanding doctrine of unilateral mistake should apply to a contract concluded by the operation of algorithms.

9. Quoine was the operator of an electronic trading platform that allowed its users to trade in cryptocurrencies. B2C2 was a trader using the platform and for this purpose, it used its own algorithmic software to buy and sell cryptocurrency with minimal human intervention, using data gleaned from orders placed on the platform to generate bids and offers. To cater for rare situations where such data was *not* available from the platform, the algorithm had a pre-determined failsafe "deep-price" which would then be invoked to derive an appropriate conversion rate between the cryptocurrencies for the purposes of generating bids and offers.

10. In 2017, Quoine failed to carry out certain steps and this affected the operating systems of its platform. As a result, the platform could not access

¹³ *Quoine Pte Ltd v B2C2* [2020] SGCA(I) 02 ("*Quoine*").

external market data and could not generate any new orders. This created the false impression of a catastrophic lack of a market for cryptocurrency trades, and that activated the failsafe mechanism of B2C2's algorithm and concurrently triggered margin calls on several other platform users. The combined effect of all this was that B2C2's algorithm placed sell orders at the failsafe rates – which were approximately 250 times the actual market rate at the time – and which Quoine's platform then matched against buy orders that were automatically placed for the users whose accounts Quoine had erroneously force-closed. These transactions all occurred without any human intervention, and they resulted in B2C2 reaping a significant windfall. When Quoine realized this the next morning, it unilaterally cancelled and reversed the transactions. B2C2 then sued Quoine for breach of contract, but Quoine claimed that the transactions should be set aside on the basis, among other reasons, of the doctrine of unilateral mistake.

11. Traditionally, the doctrine of unilateral mistake allows one contracting party to resist enforcement of the contract by establishing that it had concluded the contract under a mistake as to a fundamental term of the contract, and that the non-mistaken party had actual or constructive knowledge of this fact.¹⁴ The doctrine is well established in most common law jurisdictions, but its application

¹⁴ *Chwee Kin Keong and others v Digilandmall.com Pte Ltd* [2005] 1 SLR(R) 502 at [33] to [34], [80]; Andrew Phang Boon Leong *et al*, *The Law of Contract in Singapore* (Academy Publishing, 2012) at paras 10.141 to 10.146; *Statoil ASA v Louis Dreyfus Energy Services LP* [2008] EWHC 2257 (Comm) at [87].

in this case presented a unique set of challenges because the transactions in question had been entered into by the *automated* interaction between B2C2's algorithm and Quoine's platform, which meant that none of the parties to those transactions knew, until *after* the transaction was effected, whether an offer would be made or accepted, or the terms on which they would be concluded.

12. In considering how the doctrine of unilateral mistake ought to apply to automated contracts, the majority of the Singapore Court of Appeal took the view that existing legal principles could be extrapolated, albeit incrementally, to deal with the novel factual context at hand. According to the majority, the starting inquiry required an examination of how the contracts that were being challenged had been formed. Here, both B2C2's algorithm and Quoine's platform were *deterministic*. What this means is that that these were programmed to be non-discretionary and would always produce the same output given the same input. On this basis, the majority concluded that the relevant state of mind to be assessed in determining the existence and nature of any relevant mistake was that of the programmers of the algorithm who determined how the algorithm would function. And the relevant timeframe of that inquiry was from the time they wrote the algorithm to the time the contract was formed. Unilateral mistake would be established if it was shown that the programmer had programmed the algorithm with actual or constructive knowledge that the relevant offer would only ever be accepted by a party operating under a mistake, such that the programmer was acting to take

advantage of that mistake.¹⁵ It was *not* relevant to consider what the parties themselves might, would, or did think *after* the contracts were concluded because they had in fact intended to contract using the algorithms without the involvement of human judgment or assessment.

13. Applying this test to the facts, the majority held that since the present transactions had been entered into pursuant to deterministic algorithms that operated precisely as they had been programmed to operate, there could have been no operative mistake as to the transaction price; at best, there was an erroneous assumption as to the manner in which the platform operated, which is *not* in fact a term of the contract.¹⁶ In any event, the majority found that there was **no** evidence of actual or constructive knowledge on the part of B2C2, when it designed its algorithm to generate offers at the failsafe rate, that the counterparties would be operating on this erroneous assumption. Accordingly, the majority held that unilateral mistake could not be established, and the transactions were upheld.

14. The dissenting Judge largely agreed with the majority, but he adopted a more expansive view of the doctrine of unilateral mistake in the context of automated contracts. Under his approach, relief ought to be made available to one asserting unilateral mistake so long as a reasonable party would have

¹⁵ *Quoine* at [103].

¹⁶ *Quoine* at [83] and [115].

immediately perceived, once the automated contract had been entered into, that some fundamental error had occurred.¹⁷ In a world of algorithms and artificial intelligence, the learned Judge thought that existing contractual principles should be adapted in a way that would give rise to outcomes that were compatible with reason and justice.¹⁸ On the facts, the Judge explained that he would have set aside the transactions since any reasonable trader would have immediately identified that they were the result of a computer system breakdown.

15. The *Quoine* judgment is intricate and might be worth a read for those interested in the sort of issues we can expect to confront with greater frequency in the coming years. For present purposes, it might be suggested that perhaps the majority and minority judgments in *Quoine* reflect differing philosophies as to how the law of contract ought to adapt to the growing role of technology in modern commerce. The majority decision aligned more closely with established contractual principles and opted for an approach that leaned in favour of legal certainty and respect for freedom of contract,¹⁹ though some may criticise it for permitting a result where B2C2 retained an unmerited windfall. The minority decision would strip B2C2 of that windfall, but it arguably represented a bolder departure from traditional principles insofar as, among other things, it accepted

¹⁷ *Quoine* at [194].

¹⁸ *Quoine* at [193].

¹⁹ Goh Yihan *et al*, "Contract Law" in *Singapore Academy of Law Annual Review of Singapore Cases 2020* (Teo Keang Sood & Goh Yihan, forthcoming) at para 12.98.

that the doctrine of unilateral mistake need *not* be confined to mistakes as to contractual terms,²⁰ and it inquired into the non-mistaken party's state of mind by reference to the hypothetical question of what a reasonable trader *would have* thought upon realizing what had transpired.

16. This leads me to my broader point, which is that while judges may extrapolate existing law to respond to new technologies and factual paradigms, especially given the inevitable absence of direct authority governing these situations, this will *not* afford a universal solution to the challenges posed by technology. Instead, we can expect to face a number of practical and philosophical difficulties and we ought to be cognizant of them.

17. First, as has just been suggested, judges will bring different philosophical approaches to the cases before them, and this can naturally lead to divergent doctrinal approaches and outcomes. This will especially likely be so in difficult cases involving unfamiliar technologies. While for the most part, reasonable disagreements may conduce to a more robust legal analysis, this does introduce a degree of indeterminacy which may not be desirable when resolving some quite fundamental issues in modern commerce. One such example is the proprietary status of cryptocurrency, which I will touch on a little later.

18. Second, judicial determinations are by their nature confined to the facts

²⁰ *Quoine* at [169].

before the court, and thus judicial responses to issues posed by technology will necessarily be piecemeal.²¹ The increasing speed and scale at which technology's role and application in society evolve may understandably cause the courts to limit the scope of their pronouncements and thereby limit the implications or impact of their decisions. One example, as I mentioned earlier, is the express caveat by the other members of the court in *Thornton* that they did *not* need to come to a conclusion, as Lord Denning did, on the precise time of contract formation when one interacts with an automated carpark gantry. In like vein, some commentators have noted that the majority decision in *Quoine* appears to be confined to automated contracts formed by the operation of *deterministic* algorithms, leaving open the position where stochastic and other non-deterministic algorithms based on some form of artificial intelligence or machine learning are at play.²² While there are strengths in such an incremental *ad hoc* approach, there are also legitimate concerns over consistency, the breadth of these decisions, and their adequacy in dealing with rapid technological advancements.²³

19. The third difficulty is that judicial pronouncements are limited in reach, in

²¹ One may point out, relatedly, that the courts of both common and civil law traditions generally have no control over the cases – and hence the issues – that are brought before it.

²² Norton Rose Fulbright, "Singapore court's cryptocurrency decision: Implications for cryptocurrency trading, smart contracts and AI" <<https://www.nortonrosefulbright.com/en/knowledge/publications/6a118f69/singapore-courts-cryptocurrency-decision-implications-for-trading-smart-contracts-and-ai>> (last accessed on 14 October 2020).

²³ See, for instance, the discussion in Bennett Moses Lyria, "Adapting the Law to Technological Change: A Comparison of Common Law and Legislation", [2003] UNSW LJ 33.

that they can only address issues within the court's particular jurisdiction, but this may not offer an adequate response to the many problems raised by technology that transcend geographical borders. The legal significance of electronic signatures and communications in the context of cross-border contracts, for instance, offers an example of an issue that might be more amenable to resolution by international consensus than by the pronouncements of a particular court.²⁴ Thus, recognising the need for international solutions to international problems, the UNCITRAL Convention on the Use of Electronic Communications in International Contracts²⁵ ("the Convention") was adopted to establish uniform rules that address a number of thorny issues in transnational commerce compounded by the advent of technology, such as the cross-border recognition of electronic signatures²⁶ and the standards for when electronic communications may be recognized in law as their physical equivalent.²⁷ Singapore and Korea are both signatories to the Convention, although Korea has yet to ratify the Convention.²⁸

²⁴ See, generally, Sarah E Smith, "The United Nations Convention on the Use of Electronic Communications in International Contracts (CEUCIC): Why It Should Be Adopted and How It Will Affect International E-Contracting" (2008) 11(2) SMU Science and Technology Law Review 133.

²⁵ United Nations Convention on the Use of Electronic Communications in International Contracts (2005) (entered into force 1 March 2013) <https://www.uncitral.org/pdf/english/texts/electcom/06-57452_Ebook.pdf> ("Convention").

²⁶ Convention at Art 9(3); Explanatory Statement to the Convention at paras 146 to 165.

²⁷ Convention at Art 9(2); Explanatory Statement to the Convention at paras 143 to 146.

²⁸ Singapore signed the Convention on 6 July 2006 and ratified it on 7 July 2010, before the Convention came into force, and was one of the first countries in the world to sign and ratify it; Korea signed the treaty on 15 January 2008, and has yet to ratify it; see Status: United Nations Convention on the Use of Electronic Communications in International Contracts (New York, 2005)

20. These and other difficulties that may arise from leaving it to the Judiciary to fashion responses to the multifaceted challenges posed by technology lead me to wonder whether there are certain issues we can expect to encounter in this fast evolving field that will be so novel and significant that they should be dealt with by some other modality, such as law reform effected by Parliament or pursuant to the recommendations of a law commission. Indeed, there is a strong case for this to be considered given the limits of judicial wisdom and of the litigation process in reflecting the full range of considerations and perspectives necessary to resolve such issues.

(b) Law of property as applied in a virtual world

21. The difficulties that I have just outlined are not limited to the law of contract and will arise as well in other areas of substantive law where existing legal doctrines and principles will continue to be challenged by the advent of technology. In the interests of time, I mention just one example in the law of property, which goes to the very foundation of the concept – do cryptocurrency and virtual assets qualify as property in the eyes of the law?

22. This deceptively simple question has assumed increased significance in today's financial markets given the growing presence of cryptocurrency and virtual assets. According to a global study conducted by the Cambridge Centre

<https://uncitral.un.org/en/texts/ecommerce/conventions/electronic_communications/status> (last accessed on 14 October 2020).

for Alternative Finance, cryptocurrencies now constitute billions in market capital and there are millions of active cryptocurrency wallets.²⁹ The proprietary status of virtual assets also carry implications for other fields of law, such as criminal law and tort law. Thus, in 2007, a 13-year-old player of an online game in the Netherlands was threatened with a knife and forced to transfer some virtual in-game items to the account of the perpetrator.³⁰ The issue before the court was whether the forceful taking of such virtual items constituted a property crime.³¹ Similarly, in Korea, the Supreme Court has had to deal with the question of whether cryptocurrencies received by the operator of an illegal pornographic website constituted property capable of confiscation by the State.³²

23. The difficulty in addressing this legal question stems, at least in part, from the perceived novelty of holding that a purely digital code could constitute property.³³ Traditionally, the common law sought to define exhaustively the

²⁹ Dr Garrick Hileman and Michel Rauchs, “Global Cryptocurrency Benchmarking Study” (2017) Cambridge Centre for Alternative Finance at p 2.

³⁰ The Virtual Policy Network, “Virtual Items, Virtual Currency and Public Policy” (2012) (“*Virtual Policy Network*”) at p 15.

³¹ *Virtual Policy Network* at p 15.

³² Supreme Court Judgment 3619/2018 (South Korea) (30 May 2018) at <<https://glaw.scourt.go.kr/wsjo/panre/sjo100.do?contId=2252640&q=%EB%B9%84%ED%8A%B8%EC%BD%94%EC%9D%B8&ng=&w=total§ion=&subw=&subsection=&subld=2&csq=&groups=&category=&outmax=1&msort=&onlycount=&sp=&d1=&d2=&d3=&d4=&d5=&pg=0&p1=&p2=&p3=&p4=&p5=0&p6=&p7=&p8=0&p9=&p10=&p11=&p12=&sysCd=&tabGbnCd=&saNo=&joNo=&lawNm=&hanjaYn=N&userSrchHistNo=&poption=&srch=&range=&daewbyn=N&smpryn=N&idgJyul=&newsimyn=Y&tabId=>>> (“Judgment 3619/2018 (South Korea)”); Chan Sik Ahn, “South Korea: Confiscation of Bitcoin Assets” <<https://www.iflr.com/article/b1lp1whss0ktny/south-korea-confiscation-of-bitcoin-criminal-assets>> (last accessed on 31 September 2020) (“*Chan Sik Ahn*”).

³³ Traditionally, common law categorises personal property into two groups, being *choses in possession* and *choses in action*. *Choses in possession* essentially refer to tangible personal property capable of physical possession, whereas *choses in action* refer to enforceable legal

categories of rights or things that qualify as property. Cryptocurrencies and virtual assets do not fit neatly within any of these categories, and thus bear an uncertain proprietary status in law.³⁴ Similarly, in civil law jurisdictions, legislative definitions of property may not clearly include cryptocurrency and virtual assets. For example, Article 98 of the Korean Civil Act identifies as property “corporeal things, electricity, and other natural forces which can be managed”,³⁵ which appears to leave open the status of purely virtual assets.

24. As with the law of contract, there is a strong case to be made that the controversy surrounding the status of digital currencies may be addressed by the courts carefully extrapolating from existing laws. Indeed, a brief survey of the history of property law lends credence to this, as it shows that the concept of property is not immutable and has in fact evolved in response to societal innovations and advancements. We have already seen this with shares and bonds, commercial instruments, and intellectual property.³⁶

rights such as debts and shares. In *Colonial Bank v. Whinney* (1885) 30 Ch D 261 at 285, Fry LJ famously remarked: “All personal things are either in possession or action. The law knows no *tertium quid* between the two”. See, further on the topic, Katie Szilagyi, “A Bundle of Blockchains? Digitally Disrupting Property Law” (2018) 48 *Cumberland Law Review* 9 (“*Szilagy*”) at p 10.

³⁴ See *David Ian Ruscoe and Malcolm Russell Moore v Cryptopia Limited (In liquidation)* [2020] NZHC 728 at [122(a)].

³⁵ Civil Act 2013 (Act No 11728) (Korea) at Art 98.

³⁶ The origin of property rights began with the concept of possession. Simply put, a person had property rights in an asset if he possessed it and could exclude others from the asset. This definition of property was radically expanded by the courts in the Middle Ages with the recognition of *choses in action*, where, for the first time, proprietary status was conferred upon things that one did not and could not physically possess. Between the 16th to 19th centuries, courts further expanded the definition of property by finding that certain physical documents evidencing a legal right also qualified as *choses in action*. This development gave rise to many of the key instruments used in modern commerce, including bonds, negotiable

25. The difficulty, however, is *not* with the *impossibility* of a judicial solution but rather with the *limitations* that will almost necessarily be inherent in such a response. There are several concerns in this regard. **First**, decisions of the court are themselves open to interpretation. As the Singapore court in *Quoine* recently observed, most Commonwealth decisions that have thus far accepted the property status of cryptocurrency have done so implicitly, without identifying the precise nature of this right.³⁷ While such an approach allows justice to be done in the instant case, it makes it difficult to assess the true jurisprudential scope and impact of the decision. Thus, in Korea, the Supreme Court while recognizing that Bitcoins received by an illegal pornographic website constitute assets amenable to confiscation, appears to have left open the question of whether this extends beyond the context of criminal confiscation.³⁸ **Second**, not all digital currencies share the same features, and therefore judicial pronouncements as to a particular type or class of such currency may not necessarily clarify the position or standard in general.³⁹ **Third**, the status of

instruments, policies of insurance, and bills of lading. In more recent legal history, there has also been significant development in the area of intellectual property, with judicial recognition of proprietary rights in trade secrets and statutorily accorded proprietary rights to copyright, trademark, and patents; see also Krier, James E, "Evolutionary Theory and the Origin of Property Rights" (2009) 95(1) Cornell Law Review 139 at pp 146 to 159; W S Holdsworth, "The History of the Treatment of 'Choses' in action by the Common Law" (1920) 33(8) Harvard Law Review 997 at pp 997 to 1011, 1015.

³⁷ See *Quoine* at [139]-[140].

³⁸ Judgment 3619/2018 (South Korea); *Chan Sik Ahn*; Jung Min Lee *et al*, *The Virtual Currency Regulation Review* <<https://thelawreviews.co.uk/edition/the-virtual-currency-regulation-review-edition-3/1230201/south-korea>> (last accessed on 14 October 2020).

³⁹ Some commentators have suggested that cryptocurrency based on a private block-chain could theoretically be issued limitlessly, and also have unrecognisable property value due to its limited usage, see *Chan Sik Ahn*.

cryptocurrency implicates complex technical and important policy concerns, including fiscal policy, which raises a legitimate question as to whether the judicial forum is the most appropriate for its resolution. **Fourth** and most importantly, given the function of cryptocurrency as a global medium of exchange transcending national borders, judicial discussion of the issue in some jurisdictions may simply not be the answer needed by an interconnected world seeking a clearer international consensus.

26. Of course, many of these concerns over the limitations of judicial responses are not unique to the field of technology. But the critical point of distinction, I think, lies in the astounding pace and scope of the technological revolution that has and will surely continue to fundamentally alter the way we live, work, and interact.⁴⁰ In *Thornton*, the contract at issue was a simple one between a human and an automated gantry. Some half a century later in *Quoine*, the human face had entirely disappeared in the context of a contract formed automatically between two algorithms against a considerably more complex factual and technical setting. And one cannot even begin to imagine how contracts and commerce will continue to be revolutionized in the decades ahead. Thus, against this backdrop, while I do not for a moment suggest that courts should abdicate their function, I do think we must be very cognizant of the limits of judicial wisdom and of the legal process. As we contend with the

⁴⁰ *Mass Call Address 2019* at paras 12 and 15.

difficult substantive law issues raised by technology, we should be alive to the real possibility that there may be alternatives to a judicial response that are more appropriate for the resolution of these issues.

B. Evidentiary challenges

27. Let me next examine the second category of challenges posed by technology, and this is in the context of the rules and processes of evidence. The essential concern here relates to the use of, and ease of access to, increasingly advanced technological tools that facilitate the forgery, falsification, and manipulation of files and documents that may come to be passed off as evidence for use in court. This directly threatens the fact-finding process that is fundamental to the discharge of our adjudicative function.

28. The problem of false evidence is, of course, not new. Indeed, it is perhaps as old as lying itself. The authenticity of written contracts, for instance, has been a problem in the common law since at least 1000 AD.⁴¹ To resolve these disputes, contracting parties would write the same contract thrice on the same piece of paper, before cutting it into three along a jagged edge, with symbols drawn along the jagged edge.⁴² The two contracting parties each kept one piece, with the third to be kept by a witness or by the court. The pieces were referred

⁴¹ Kenneth O Morgan, *The Oxford History of Britain* (Oxford University Press, 2011) at p 126.

⁴² W. Scott Stornetta, "The Blockchain: Past, Present, and Future" (24 September 2018), lecture delivered at NYU Stern.

to as “indentures” – a term familiar to common lawyers, though they might not have appreciated its origins. And that term means jagged teeth. The logic was that only the original and authentic indentures would fit perfectly along the jagged edge aligned with the matching symbols. The solution was ingenious even if tedious.

29. But the advancement of technology has exponentially complicated matters with its unprecedented ability to distort reality. Take for example the emerging phenomenon of deepfake technology. In simple terms, deepfakes are digital files, such as pictures and videos, created using artificial intelligence, usually to depict real individuals saying or doing something that they did not in fact say or do.⁴³ But these depictions are so realistic that the untrained eye cannot discern their lack of authenticity.⁴⁴ In 2017, a group of researchers from the University of Washington showcased the technology by presenting a lip-synced video of President Obama giving a speech, created using an algorithm they developed that imposed audio against visuals of the President with hyper-realistic AI-refined facial movements.⁴⁵ While this technology has thus far been used mainly

⁴³ Kyle Wiggers, “Deepfakes and deep media: A new security battleground” <<https://venturebeat.com/2020/02/11/deepfake-media-and-detection-methods>> (last accessed on 1 October 2020).

⁴⁴ Neil Rose, “Deepfake warning over online courts” (29 July 2020) at <<https://www.legalfutures.co.uk/latest-news/deepfake-warning-over-online-courts>>.

⁴⁵ Jennifer Langston, “Lip-syncing Obama: New tools turn audio clips into realistic video” <https://www.washington.edu/news/2017/07/11/lip-syncing-obama-new-tools-turn-audio-clips-into-realistic-video/> (last accessed on 14 October 2020). There have been several other high-profile instances of the use of deepfakes. In 2018, a Belgian political party used similar technology to create a video of President Trump urging Belgium to withdraw from the Paris climate accord, which prompted outrage on social media until it was revealed that the video was nothing but high-technology forgery: see Politico, “Belgian socialist party circulates

in politics, art and pornography, there have been growing concerns over its potential to be used to create false digital evidence in legal proceedings. Indeed, some have predicted that within just a few years, deepfake technology will advance to a stage that will allow its users to create *real-time* fake videos, such that a different person will be able to testify through a video-link imitating the likeness and voice of an actual witness.⁴⁶

30. The implications of deepfakes and similar technologies on our evidential rules and processes of proof are profound, and there is no doubt that courts will need to respond before the insidious attack on truth takes root.⁴⁷ To this end, there are some possible solutions both in the field of *technology*, such as the tools that help detect false evidence,⁴⁸ and in the *law*, such as a revision of the rules on authentication of electronic evidence. I do not propose to go into the details today, but I make a few broad points. **First**, in thinking about the

'deep fake' Donald Trump video" <https://www.politico.eu/article/spa-donald-trump-belgium-paris-climate-agreement-belgian-socialist-party-circulates-deep-fake-trump-video/> (last accessed on 14 October 2020).

⁴⁶ Neil Rose, "Deepfake warning over online courts" <<https://www.legalfutures.co.uk/latest-news/deepfake-warning-over-online-courts>> (last accessed on 1 October 2020).

⁴⁷ Danielle K. Citron & Robert Chesney, "Deep Fakes: A Looming Challenge for Privacy, Democracy, and National Security" (2019) 107 California Law Review 1753; Matt Reynolds, "Courts and lawyers struggle with growing prevalence of deepfakes" <<https://www.abajournal.com/web/article/courts-and-lawyers-struggle-with-growing-prevalence-of-deepfakes>> (last accessed on 14 October 2020).

⁴⁸ Some technical solutions include counter-deepfake technologies to discern deepfakes by analysing the lighting, shadows, blinking patterns, and real-world facial movements of the subject; reverse video-searches to locate the original digital media for comparison; and blockchain-based verification to preserve digital evidence and ensure that they remain unaltered from the time of lodgment onto the blockchain. See for example, Drew Harwell, "Top AI researchers race to detect 'deepfake' videos: 'We are outgunned'" <<https://www.washingtonpost.com/technology/2019/06/12/top-ai-researchers-race-detect-deepfake-videos-we-are-outgunned/>> (last accessed on 1 October 2020).

appropriate response, we ought to be conscious of the impact that changing our evidential rules might have on fundamental policies and priorities of the justice system. We may, for instance, need to weigh the benefits of more stringent processes for authentication against the need to avoid over-complicating our evidential rules, in order to preserve access to justice and mitigate the effects of any inequality of arms between litigants. The short point is that not all litigants will be able to afford an army of experts. **Second**, the enmeshed policy considerations and the extra-legal nature of the problem suggests that a more holistic legislative response is probable and likely desirable. Courts will need to be prepared to work closely with other experts and stakeholders in shaping this response which affects the performance of one of our core adjudicative functions. And **third**, a critical aspect of any response will involve some expectation as to the technological competence of the judges, who will need, at least, to appreciate the pitfalls of electronic evidence and remote testimony. This goes to the issue of judicial learning which I will touch on later.

III. Technology's Impact on the Administration of Justice

31. I turn finally to examine the third category of challenges, and this concerns those posed by technology to the Judiciary as an institution. It is here that I think our most significant responsibilities lie, and where technology also bears its greatest transformative potential.

A. *The evolving dialogue on technology*

32. In the preceding sections, I have spoken about the challenges that technology poses to our substantive and evidential laws and offered some suggestions on how we might think about the possible responses. But our laws do not exist in a vacuum; they stand in service of our enduring pursuit of *justice*. The fundamental role of the courts in both our traditions is to translate the legal framework into a system able to deliver justice fairly and effectively to its users. Technology, in this context, is a powerful enabler that allows the courts to rethink, reengineer, and perhaps reinvent themselves as institutions, so that they might better achieve that goal.

33. It is apt here to recall that my predecessor, Chief Justice Chan Sek Keong, spoke at length about the utility of technology a decade or so ago at a conference here in Seoul.⁴⁹ His speech, titled “Pursuing Efficiency and Achieving Court Excellence – the Singapore Experience”, described the slew of measures introduced in Singapore from the early 1990s to clear the backlog of cases that had accrued in the decades following our nation’s independence.⁵⁰ One of the tools he mentioned was the Integrated Electronic Litigation System,⁵¹ which we had then just introduced as a single platform and access point for the

⁴⁹ Chan Sek Keong, Chief Justice of Singapore, “Pursuing Efficiency & Achieving Court Excellence – The Singapore Experience”, speech at 14th Conference of Chief Justices of Asia and the Pacific, Seoul, South Korea (13 June 2011) (“*Pursuing Efficiency*”).

⁵⁰ *Pursuing Efficiency* at paras 4 – 6.

⁵¹ *Pursuing Efficiency* at para 25.

commencement and management of civil cases in the State Courts and the Supreme Court. Today, this system, commonly known as e-Litigation, has become part and parcel of the litigation landscape in Singapore and the backbone of our national case management system.

34. In the decade since Chief Justice Chan's address, the dialogue on technology has radically changed. Today, technology has far transcended its initial role as a tool of convenience of considerable, though ultimately limited, utility. Technology should now be seen as fundamental to an entire re-conceptualization of how justice should be delivered in the age of technology.

35. This will readily become evident if we surveyed the recent tech-driven judicial reforms around the world. The courts in the UK, for example, are undergoing significant transformation, with around £1 billion committed to a program that hopes to see most civil disputes being resolved using online courts by 2022.⁵² And Utah, in the United States, has seen the establishment of one of the first online courts in that country, with a pilot launched in late 2018 for the vast majority of claims involving not more than US\$11,000.⁵³ The online court is accessible through any electronic device. As a first port of call, it will endeavour to assist parties to settle their disputes amicably with the help of facilitators who answer basic legal questions, offer mediation, and assist in drafting settlements.

⁵² Richard Susskind, *Online Courts and the Future of Justice* (Oxford University Press, 2019) ("*Susskind*") at p 166.

⁵³ *Susskind* at p 175.

If amicable settlement is not feasible, the facilitators will assist the parties to prepare their documents for trial, and the matter is then transferred to a judge who may hear the parties orally or, if they agree, decide the matter based on the documents on record.⁵⁴ The shift from physical to online courts in Utah has seen a fall in default rates from 71% to 53%.⁵⁵

36. Our experience in Singapore has been no less ambitious. One example is the Community Justice and Tribunals System, which is an online filing and case management system with dispute resolution capabilities that was first launched in July 2017 in the Small Claims Tribunals.⁵⁶ The positive user experience there led to it being rolled out in the Community Disputes Resolution Tribunals in February 2018 and the Employment Claims Tribunal in January this year.⁵⁷ By the end of February 2019, more than 1,700 claims filed in the Small Claims Tribunals had undergone e-Negotiation using the online platform, with about 35% reaching amicable settlement.⁵⁸ Another example is the Authentic Court Orders system launched earlier this year, under which any party who receives a copy of an eligible court order – whether by email, fax, or even a screenshot – may use the QR Code or Reference Number on it to verify the authenticity of

⁵⁴ *Susskind* at pp 175 to 176.

⁵⁵ *Susskind* at p 176.

⁵⁶ Sundaresh Menon, Chief Justice of Singapore, “Deep Thinking: The Future of the Legal Profession in an Age of Technology”, Gala Dinner Address at the 29th Inter-Pacific Bar Association Annual Meeting and Conference (25 April 2019) (“*Deep Thinking*”) at para 8.

⁵⁷ *Deep Thinking* at para 8.

⁵⁸ *Deep Thinking* at para 8.

the order using a secured database, free of charge.⁵⁹ This dispenses with the old, rather tedious system where applicants had to physically travel to the courthouse to obtain a Certified True Copy of the court order. There are also other initiatives afoot, including our plans to launch an online dispute resolution platform that will deal with a significant portion of motor accident claims in phases over the course of the coming years.⁶⁰

B. Rethinking our model of justice

37. There is no doubt that these judicial reform efforts will continue apace in the decade ahead, especially as courts endeavour to navigate the new normal of the post-pandemic world. But as we design these new systems and processes, I suggest that the first step is to critically examine the model of justice to which we subscribe and the societal role that our courts should serve. Only if we properly understood these “ends” would we be able to appropriately design the “means” necessary to achieve them.

38. I raised this in a lecture I delivered last year, where I proposed the need to reimagine the modalities for the delivery of justice in the age of technology.⁶¹ I suggested there that we should recognize, as one of the overarching values of

⁵⁹ Supreme Court of Singapore, “Media Release: Authentic Court Orders”, media release on Authentic Court Orders <<https://supremecourt.gov.sg/news/media-releases/media-release--authentic-court-orders-aco>> (last accessed on 14 October 2020).

⁶⁰ *Deep Thinking* at para 8.

⁶¹ *Negotiation Conference 2019*.

the justice system, the concept of *proportionality* – which emphasises the importance of ensuring that the nature, complexity, and cost of the *solutions* offered by the legal system bear a suitable relation to the nature, complexity and size of the legal *problems* before it.⁶² I also explained why technology can be such an effective agent for the delivery of this vision of proportionate justice.⁶³

39. I had taken that view not just because technology offers the practical tools and platforms needed to effectively pursue proportionate justice; but more importantly, because technology enables and empowers us to question, and indeed jettison where appropriate, the very premises and assumptions that have long undergirded the design of our existing court processes. Three examples will illustrate the point.

40. The first is the assumption that is held by some that fairness demands that all cases before the court should receive the same procedural treatment. But the real purport of the principle of equal justice requires, in my view, that *like* cases be treated alike, and not necessarily that *all* cases should be treated the same regardless of their nature, value, or complexity. This calls for an effective system for the triage and categorisation of cases so that targeted and appropriate types of procedures are employed for the corresponding types of cases, and this is an area in which technology has proven exceptionally

⁶² *Negotiation Conference 2019* at para 57.

⁶³ *Negotiation Conference 2019* at paras 61 - 66.

effective.⁶⁴

41. An archetypal example of this calibrated approach to case management is the streamlined processes that many jurisdictions adopt in relation to small value claims. But this approach can also be utilised in other areas. For example, in Singapore's Family Justice Courts, divorces are streamed into simplified or non-simplified tracks. In 2019, 58% of divorces were resolved on the simplified track. This meant that these parties agreed on all matters without needing additional court intervention. The system identified these divorces, applied simplified processes appropriate for the problem at hand, and in so doing, spared the parties the costs, emotional turmoil, and procedural complexities that typically accompany contested adjudications.⁶⁵

42. The second assumption that warrants examination is that every grievance demands an exhaustive inquiry. While perfection is ideal, it cannot stand in the way of the good. In a world of limited resources, our justice system must recognise and accept the reality that it is impractical and ultimately undesirable that every complaint be pursued with an unlimited devotion of public and private resources.

⁶⁴ See Ernest Ryder, Senior President of Tribunals of England and Wales, "The Modernisation of Access to Justice in Times of Austerity", 5th Annual Ryder Lecture: University of Bolton (3 March 2016) ("*Ryder*") at para 43.

⁶⁵ See, for example, Justice Debbie Ong, Presiding Judge of the Family Justice Courts in Singapore, "Family Justice Courts Workplan 2020", Address, (21 May 2020) at para 9.

43. One system that has truly challenged this assumption with great success is the private online platform established by eBay to manage disputes between traders using the eBay marketplace. 60 million disputes are resolved each year using this platform.⁶⁶ The turnover of cases is high, and the process is extremely efficient. The outcome, undoubtedly, may not achieve *perfect* justice in every single case, but as I have explained elsewhere,⁶⁷ it has achieved practical and effective justice that is *good enough* for its purpose and context.

44. The third assumption we should challenge is the belief that disputes are inherently confrontational and therefore, that solutions must be adversarial in nature. The advent of alternative dispute resolution methods in recent decades has, to some extent, already undermined this premise. Indeed, there is a growing recognition that not every dispute is a zero-sum game and that there are often interests that remain aligned even in the most fractured relationships. The strong show of support for the Singapore Convention on Mediation, coming into force and gathering signatures from more than 50 States within a year of its opening for signature is evidence of this trend.⁶⁸ And technology, I suggest, will only accelerate it as courts increasingly recognise and tap on its potential to design processes that help the parties see past the emotions that cloud their

⁶⁶ *Susskind* at p 98.

⁶⁷ *Negotiation Conference 2019* at para 46.

⁶⁸ See Ministry of Law, “Singapore Convention on Mediation Enters into Force”, Media Release <<https://www.singaporeconvention.org/media/media-release/2020-09-12-singapore-convention-on-mediation-enters-into-force>> (last accessed on 14 October 2020).

common interests.

45. One example of this is the concept of an “online continuous hearing” outlined by Sir Ernest Ryder, the Senior President of Tribunals of England and Wales.⁶⁹ Interestingly, there are some similarities between the key features of this concept and the practice of the civil law courts. The concept, first and foremost, requires one to reframe one’s view of litigation from an adversarial dispute in search of a winner to a problem in search of a solution. The judge therefore takes on an inquisitorial and problem-solving role, guiding the parties to explain and understand their respective positions, rather than serving a purely adjudicative function. And instead of having tranches of physical hearings, the case is heard through a single online hearing that spans an extended period of time, during which all parties, including the judge, are able to comment iteratively and informally on the case documents in order to clarify the issues and to explore possible resolutions.

46. One may or may not agree with all the features of this concept, but it will be difficult not to appreciate the aspirations expressed by Lord Justice Ryder. In his words, “[d]igitisation presents an opportunity to break with processes that are no longer optimal or relevant and at the same time to build on the best [...] we have to eliminate structural design flaws and perhaps even the less

⁶⁹ *Ryder* at para 29.

attractive aspects of a litigation culture”.⁷⁰ I wholeheartedly agree.

C. Challenges to substantive and procedural fairness

47. With a new vision of the justice system in mind, the next question is how we ought to go about in achieving this. In this regard, Professor Richard Susskind has saliently observed in his recent book that critics of online courts – and of most other technologically-driven changes to the justice system – often point to the imperfections in the new processes as reasons why these changes should not be embraced.⁷¹ Of course, some of these criticisms are exaggerated and almost always they miss the woods for the trees. Importantly, as Professor Susskind rightly points out, we ought not to allow the presence of *some* injustice to deter us from our pursuit of *less* injustice.⁷² But it would be equally foolish to deny the risks that technological tools may bring if we are not careful with the way they are used in our court processes. So, let me in this final section, touch on a few potential pitfalls, which relate to a shared value of both the Korean and Singapore Supreme Court, namely, fairness.⁷³

(c) Procedural fairness

⁷⁰ *Ryder* at para 32.

⁷¹ *Susskind* at p 89.

⁷² *Susskind* at pp 89 – 90, 182 – 184.

⁷³ Supreme Court of Singapore Official Website <<https://www.supremecourt.gov.sg/who-we-are/vision-and-mission/vision-mission-and-values>> (last accessed on 1 October 2020); Supreme Court of Korea Official Website <<https://eng.scourt.go.kr/eng/supreme/about/vision.jsp>> (last accessed on 1 October 2020).

48. The first concern is that a greater use of technology within our adjudicative processes may threaten the procedural fairness and accountability of our judicial decisions. The reasons for this are complex and multifaceted, but for present purposes, let me mention two that have direct relevance to the discharge of our judicial function.

49. The first reason is that technological tools are often accompanied by a significant degree of opacity.⁷⁴ It is difficult to fully understand the technology and its limitations unless one is an expert in that field, and sometimes even to them, the workings of technology can be elusive. The opacity may in some instances arise out of specific interests in protecting the source codes from disclosure, such as for reasons of trade secrecy.⁷⁵ But opacity can also be a consequence of the very nature of the relevant algorithm.⁷⁶ Many forms of modern technology, such as automated vehicles and sentencing algorithms, employ deep machine learning. In other words, the machine does not simply execute pre-set instructions or operate within pre-defined parameters; it develops its own cognitive framework and produces assessments or opinions autonomously.⁷⁷ Neither the machine nor its programmer would be able to articulate its reasoning to a judge. It's rather like the parent who is unable to

⁷⁴ Ethan Katsh *et al*, *Digital Justice: Technology and the Internet of Disputes* (Oxford University Press, 2017) at p 49.

⁷⁵ Andrea Roth, "Trial by Machine" 104 *Geo. L.J.* 1245 (2016) at p 15 ("*Roth*").

⁷⁶ The Law Society of England and Wales, *Algorithms in the Criminal Justice System* (June 2019) (Lead Author: Dr Michael Veale) at para 5.4.3.1 ("*Veale*").

⁷⁷ *Veale* at para 5.4.3.1.

explain the thought processes of her child.⁷⁸ In effect, the algorithm becomes what is referred to as a “black box”,⁷⁹ and its use in court proceedings introduces a significant risk of tainting the accountability of judicial decisions.

50. Second, there is a well recorded but unquantifiable human tendency to place undue reliance on the predictions and findings of intelligent machines. This is referred to as the “automation complacency”.⁸⁰ This phenomenon has been well documented in many fields. For instance, a Royal Majesty cruise ship was grounded because its crew blindly followed a malfunctioning radar plotting system;⁸¹ and aircraft pilots continue to face documented difficulties in managing such complacency as reliance grows on intelligent machines to steer complex aeroplanes.⁸² In the judicial context, studies have also shown a tendency among judges to “defer to the results of actuarial instruments or to allow the availability of such results to inflate the importance of recidivism risk in their sentence calculation”.⁸³ The dangerously unknowable extent of such reliance highlights the need for one to critically and continually assess one’s own biases and thinking processes, and for all significant decisions to be clearly

⁷⁸ *Roth* at p 15.

⁷⁹ *Roth* at p 15.

⁸⁰ Parasuraman, Raja & Manzey, Dietrich “Complacency and Bias in Human Use of Automation: An Attentional Integration. Human factors.” (2010) *Journal of Human Factors and Ergonomics Society* (“*Parasuraman*”) at p 381.

⁸¹ *Parasuraman* at p 382.

⁸² *Parasuraman* at p 382.

⁸³ *Roth* at p 19.

reasoned so that any sign of error is addressed at first instance.

(d) Substantive fairness

51. In the same vein, technology may also pose a threat to our ability to deliver substantive justice that is fair, explicable, and rational. Our history of experimenting with the use of technological aids to guide adjudicative decisions have yielded some failed examples that stand as reminders of the heightened caution that is needed when navigating this area.

52. One such example is the controversy arising from the use of the COMPAS system, which stands for the Correctional Offender Management Profiling for Alternative Sanctions system, that was deployed in the United States. This essentially is a risk-assessment algorithm that purports to predict recidivism and the risk of an accused person skipping bail. In recent years, it has been referred to by some US courts in a variety of judicial contexts, including in applications to set bail and grant parole. In 2016, when COMPAS's risk assessment of arrested individuals was compared with how those people *actually* performed in reality, three findings emerged: **first**, the algorithm "correctly predicted recidivism for black and white defendants at roughly the same rate"; **second**, when the algorithm was wrong, it was wrong in different ways for black and for white defendants with the former "almost twice as likely ... to be labeled a higher risk but not actually re-offend"; and **third**, the algorithm was far more likely to

assess false-negatives for white offenders.⁸⁴ These results illustrated an unappreciated trend of *algorithmic bias*, which refers to the algorithm's tendency to import the biases and prejudices of the dataset on which it was trained. Put in blunt terms, "rubbish in, rubbish out". Indeed, subsequent research showed that when 400 volunteers were given 7 pieces of information about an offender, on a pooled basis, they achieved a 67% accuracy in predicting the offender's likelihood of recidivism within 2 years, which was somewhat higher than COMPAS' accuracy rate of 65%.⁸⁵

IV. Lessons for the learning judge

53. As I approach the end of this lecture, it will be evident that I, for one, do not think that there will be easy solutions to many of the issues that lie ahead of us. Indeed, the challenges that arise from technology will prove varied, controversial, and multifaceted. To fully understand and address them, we will need to go far beyond the law and the courts. Yet, it is inevitable that we will have to contend with these issues at some point, since it is simply inconceivable that we can live in a world without technology. To this end, there are three suggestions I wish to offer that I hope might help courts and judges in thinking about the way forward.

⁸⁴ Julia Angwin *et al*, "Machine Bias", ProPublica 23 May 2016, <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing> (last accessed on 1 October 2020).

⁸⁵ Ed Yong, "A Popular Algorithm is No Better at Predicting Crimes Than Random People", The Atlantic, <https://www.theatlantic.com/technology/archive/2018/01/equivant-compass-algorithm/550646/> (last accessed on 2 October 2020).

54. First, I suggest that in incorporating technology into our systems and processes, we ought to adopt an attitude of vigilance and be wary of pursuing technology for technology's sake. As I mentioned elsewhere recently, a serious complexity problem is becoming endemic in adversarial models of dispute resolution, including court litigation.⁸⁶ Cases are becoming so rich in facts and evidence that they challenge the physical and cognitive limits of judges and indeed of the justice system. In common law jurisdictions, there is a further problem with the number of legal authorities brought before the court indiscriminately for little if any marginal value. If this is not managed properly, such unnecessary and excessive complexity may degrade the quality of justice that we deliver and impede access to justice by those who do not have the same resources to engage in such a legal arms' race. Technology must not add to the problem, but must form part of the solution, by helping us trim the excess and focus on what is important. We are already seeing hints of this, for instance, in electronic discovery. To address this, we will need to have a firm grasp on the profile of our court users, and be willing to discuss, honestly and critically, the rationale, benefits, and limitations of the various tech-driven changes that we implement and how they will ultimately help advance our mission.

55. Second, just as many of the concerns I have outlined fall in the intersection

⁸⁶ Sundaresh Menon, Chief Justice of Singapore, "Dispelling due process paranoia: Fairness, efficiency and the rule of law", Chartered Institution of Arbitrators Australia, Annual Lecture (13 October 2020).

between law, technology, and other fields of study, their solutions will also likely require a blend of knowledge and expertise. It follows that the usual self-contained working style of the legal profession is unlikely to be helpful in equipping us to confront these challenges. Instead, we should be prepared to learn from and work with experts from other fields, as well as our allied professionals, as we endeavour to develop holistic solutions to the anticipated problems arising from technology.

56. Third, and most importantly, we must accept that more than ever before, judgeship is a role that demands a lifetime of learning. Many of us were educated at a time when computers were the special preserve of Governments and large corporations. Learning to type with ten fingers may have represented the peak of our personal technological achievements. But today's society has vastly changed, and it will only continue to do so at an accelerating rate. The expectation is no longer just that we know how to *use* a handphone, or laptop, or even to turn on Zoom; instead we will need to *understand*, at least minimally, the technologies commonly used in modern commerce and in society – their systems, their logic, and their limits. Otherwise, not only will we encounter issues in trying to harness and use the technological tools available to us, we may also be blind to the fallacies in our reasoning or find it difficult to articulate coherent reasons for the decisions we make. In some situations, we may even be the unfortunate cause of a miscarriage of justice.

57. It is with these in mind that I take a strong view that it is both the judge's *personal* responsibility, and that of the judiciary as an *institution*, to ensure that every judge – senior or junior; civil, family, or criminal – is sufficiently familiar with the knowledge and language of technology. To this end, the Singapore Judiciary recently announced the establishment of a Judiciary Competency Framework to identify and anchor competency-based training for all Judges and judicial officers at all levels of our courts. While the details are still being worked out, there is no doubt that *technological* competency will feature heavily in this framework.

58. At the institutional level, I also wish to commend the collaborative efforts of the Judicial Research and Training Institute of the Supreme Court of Korea (“JRTI”) and the Singapore Judicial College (“SJC”). Their partnership goes some way back, and two years ago, they formalised it with a memorandum on judicial training. This facilitated several exchanges and mutual visits, including the SJC's participation at the JRTI International Conference last year. While the pandemic has no doubt caused some disruption, I understand that both institutions have expressed a willingness to extend the memorandum for two more years when it expires next month. This, I think, will prove mutually beneficial and I warmly welcome it.

V. Conclusion

59. I return in conclusion to where I began – the Lessig-Easterbrook debate.

There, the question was whether a rigorous application of established laws will suffice to meet the challenges posed by the advent of technology. For reasons I have explained, the answer I would offer, so far as substantive laws and evidential rules are concerned, is “possibly, and perhaps partially”. We should bear in mind that just as there are limits to how much one may stretch a new pair of shoes to make it fit, there will also be limits to the courts’ ability to extrapolate existing law to fit these new technologies and factual paradigms.

60. The inquiry does not, however, end with the *law* itself. Technology also facilitates, and indeed calls for, a systemic review of the Judiciary as the institution that is charged with the responsibility to deliver and dispense *justice*. Here, technology offers us a precious opportunity to think deeply about the justice system, the assumptions that underlie our court processes, and their purpose and relevance in a technological era. It also challenges us to consider carefully the use of technology in our decisions and processes, and to keep abreast of key developments in this field so that we are not intimidated or overwhelmed by the presence of novel technology in any case before us.

61. Let me close by expressing my gratitude to the organisers of this event. Their efforts have made today’s online lecture possible despite the disruption and uncertainty brought about by the pandemic, and they indeed have shown us, first-hand, the benefits and transformative promise of technology.

62. Thank you all very much.