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Virtual Hearings and Blockchain Technology Solutions in Criminal Law

Chantell Bergquist

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**VIRTUAL HEARINGS AND BLOCKCHAIN TECHNOLOGY
SOLUTIONS IN CRIMINAL LAW**

Chantell Bergquist[†]

I.	INTRODUCTION	1249
II.	HISTORY OF TECHNOLOGY IN CRIMINAL CASES	1250
A.	<i>Gathering Evidence</i>	1250
B.	<i>Presenting Evidence in the Courtroom</i>	1250
III.	TECHNOLOGY IN THE COURTROOM TODAY	1251
A.	<i>Trial Presentation Software</i>	1252
B.	<i>Reasons to Keep Up with Technology</i>	1256
IV.	BLOCKCHAIN DISPUTE RESOLUTION	1257
A.	<i>What is Blockchain?</i>	1258
B.	<i>E-Commerce of the 90s to Blockchain Systems</i>	1259
C.	<i>History of Blockchain</i>	1260
D.	<i>Smart Contracts</i>	1262
E.	<i>Core Functions of Blockchain</i>	1263
F.	<i>The Future of Blockchain Dispute Resolution</i>	1265
V.	VIRTUAL HEARING SOLUTIONS TO BIAS	1266
A.	<i>Bias History</i>	1266
B.	<i>What is Bias Today?</i>	1268
C.	<i>Continuing Bias in the Courtroom</i>	1268
D.	<i>Solutions to Eliminating Bias</i>	1270
VI.	POTENTIAL ISSUES WITH VIRTUAL SOLUTIONS IN CRIMINAL LAW	1271
A.	<i>Virtual Hearings</i>	1271
B.	<i>The Confrontation Clause</i>	1271
VII.	BLOCKCHAIN TECHNOLOGY SOLUTIONS IN CRIMINAL LAW	1272
A.	<i>Benefits of Blockchain Technology in Criminal Proceedings</i>	1273
1.	<i>Management of Court Judgments</i>	1273
2.	<i>Management of Warrants</i>	1274
3.	<i>Management of Criminal Histories</i>	1275
B.	<i>Blockchain to Justice</i>	1275
VIII.	VIRTUAL HEARINGS AS A SOLUTION TO PROBLEMS IN CRIMINAL LAW	1276
A.	<i>Chain of Custody</i>	1277
B.	<i>Bail Hearings</i>	1277
C.	<i>Initial Appearance Hearings</i>	1277
D.	<i>Plea Hearings</i>	1278
E.	<i>Trials</i>	1278
F.	<i>Blockchain Data and Discovery</i>	1279
G.	<i>Admissibility of Blockchain Evidence</i>	1280
IX.	THE FUTURE OF TECHNOLOGY IN THE COURTROOM	1281
A.	<i>The Use of Technology During the Era of COVID-19</i>	1282
B.	<i>The Use of Technology After the Era of COVID-19</i>	1285

X.	CONCLUSION	1285
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I. INTRODUCTION

Technology has evolved and raided our personal and professional lives. Although the courts are not immune to the advancement and integration of technology, the courts are not keeping up with relevant technological advancements.¹ Historically, courts have been hesitant to embrace new technologies despite the Federal Rules of Civil Procedure and the American Bar Association Model Rules of Professional Conduct.² Rule 1 of the Federal Rules of Civil Procedure creates the right to a “just, speedy, and inexpensive determination of every action and proceeding.”³ Likewise, the American Bar Association Model Rules of Professional Conduct have determined attorneys must “keep abreast of changes in the law and its practice, including the benefits and risks associated with relevant technology . . .” to maintain competence.⁴ The bench and bar have a responsibility to keep up with the advancement of technology because technology affects the administration of justice.⁵ With the practice of criminal law being far behind in technological advancements and new technology entering the legal field now, criminal lawyers, judges, and other legal community members need to start incorporating this technology and be comfortable using it in their everyday lives.⁶

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¹ Tad Simons, *The Slow Pace of Technological Adoption in the Courts: Q&A with John Rabiej, Director of the Duke Law Center for Judicial Studies*, THOMSON REUTERS (Sept. 27, 2017), <http://www.legalexecutiveinstitute.com/justice-ecosystem-technological-adoption-john-rabiej-duke-law-center/> [https://perma.cc/J44J-K9R5].

² Jess Scherman, *How Courtroom Technology Has Revolutionized Criminal Cases*, RASMUSSEN COLL. (Aug. 18, 2016), <https://www.rasmussen.edu/degrees/justice-studies/blog/courtroom-technology-revolutionized-criminal-cases/> [https://perma.cc/44EY-KAF8]; FED. R. CIV. P. 1; *see also* Simons, *supra* note 1.

³ FED. R. CIV. P. 1 (“They should be construed, administered, and employed by the court and the parties to secure the just, speedy, and inexpensive determination of every action and proceeding.”).

⁴ MODEL RULES OF PROF’L. CONDUCT r. 1.1 cmt. 8 (AM. BAR ASS’N 2020) (“To maintain the requisite knowledge and skill, a lawyer should keep abreast of changes in the law and its practice, including the benefits and risks associated with relevant technology, engage in continuing study and education and comply with all continuing legal education requirements to which the lawyer is subject.”).

⁵ Simons, *supra* note 1.

⁶ *See* Fed. R. Crim. P. 2 (“These rules are to be interpreted to provide for the just determination of every criminal proceeding, to secure simplicity in procedure and fairness in administration, and to eliminate unjustifiable expense and delay.”). This rule showcases the need for law practitioners to be up to date with new technology to simplify procedure, provide fair administration, and eliminate unjustifiable expense and delay.

This Paper will begin with a discussion of the evolution of technology used in criminal cases, culminating in an explanation of the technology currently used in the courtroom. An in-depth examination of the history and development of blockchain technology and how it can be influential in criminal cases follows. Next, the use of blockchain technology for virtual hearings as a solution in criminal cases is discussed. Further, this Paper will examine the possible issues with virtual hearings in criminal cases and how those issues can be reduced by using blockchain technology. A further discussion of how blockchain technology can solve problems currently facing criminal cases follows. This Paper then looks into the future by examining potential technological innovations in the courtroom. Lastly, this Paper concludes with a discussion of how virtual hearings are inevitable in the future of criminal cases, so lawyers and judges should be pushing for these new technologies rather than resisting them.

II. HISTORY OF TECHNOLOGY IN CRIMINAL CASES

A. *Gathering Evidence*

Commonly, the technology used to gather evidence historically included DNA testing, fingerprinting, blood tests, surveillance footage, cell tower data, and polygraph tests.⁷ More recently, the technology used to gather evidence is expanding.⁸ Because of the advancements in technology, scientists and tech experts are working together to create facial and iris recognition.⁹ This entails 3D-image-processing algorithms that enable the technology to recognize a suspect's facial and eye features.¹⁰ Early testing of this new technology found that three out of seven algorithms are better than humans at matching "difficult" pairs and that six out of seven algorithms are better than humans at matching "easy" pairs.¹¹

As the technology used to gather evidence in criminal cases advances, the historical methods of gathering evidence through DNA testing, fingerprinting, blood tests, surveillance footage, cell tower data, and polygraph tests will remain in the past as more efficient methods and technology are created.

B. *Presenting Evidence in the Courtroom*

Traditionally, there have been many procedures for presenting evidence at trial, including, among others, writing information on a

⁷ Scherman, *supra* note 2.

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

whiteboard, handing printed copies of documents or photographs to the jury, reading testimony from a transcript, and showcasing important documents or images on a foam core board.¹² Although these methods of presenting evidence are effective, they are now outdated because new generations of jurors are interested in and familiar with the newest technology.¹³ For example, rather than showcasing documents or images on a foam board, jurors may find a PowerPoint presentation on a big screen to be a more effective method to display evidence. As new technology continues to advance the legal field, older versions of presenting evidence in the courtroom will stay in the past.

III. TECHNOLOGY IN THE COURTROOM TODAY

Today, many courtrooms are electronic courtrooms (E-courtrooms).¹⁴ E-courtrooms range in what technology they adopted and the extent to which such technology has advanced.¹⁵ Technology in the courtroom today has a variety of uses, such as interactive flat-screen television presentations, webcast testimony, dual screens that display many documents to the jury simultaneously, and even individual screens for every juror.¹⁶ Many jurisdictions are using virtual hearings and are experiencing success in improving efficiency and cost-effectiveness and addressing safety and transportation issues “without compromising established legal principles that have guided American courts for centuries.”¹⁷

In addition, juries are, for the most part, reacting positively to the increase in the usage of technology in the courtroom.¹⁸ Herbert B. Dixon, a Superior Court Judge for the District of Columbia, conducted a survey to determine how juries reacted to increased use of technology in the courtroom.¹⁹ Judge Dixon surveyed jurors over several months during complex criminal trials.²⁰ As the chart below displays, Judge Dixon found that 72% to 100% of jurors reacted positively to the use of technology in the

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*; see Herbert B. Dixon Jr., *The Basics of a Technology-Enhanced Courtroom*, AM. BAR ASS'N (Nov. 1, 2017), https://www.americanbar.org/groups/judicial/publications/judges_journal/2017/fall/basics-technologyenhanced-courtroom/ [https://perma.cc/8U6J-VT73] (discussing the pervasiveness of basic courtroom technology).

¹⁵ See Dixon Jr., *supra* note 14.

¹⁶ *Id.*

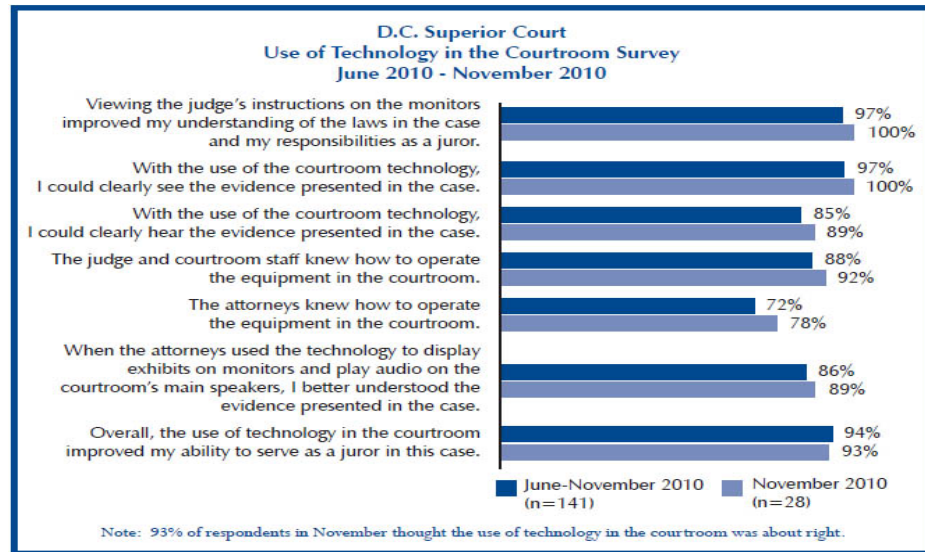
¹⁷ Mike L. Bridenback, *Study of State Trial Courts Use of Remote Technology*, NAT'L ASS'N FOR PRESIDING JUDGES & CT. EXEC. OFFICERS 23 (Apr. 2016).

¹⁸ Scherman, *supra* note 2.

¹⁹ *Id.*

²⁰ *Id.*

courtroom.²¹ The lower figure of 72% related specifically to the jurors' responses to the question of "whether the attorneys knew how to properly operate the advanced equipment."²² The graphic²³ below depicts the result of Judge Dixon's study.



As the lower figure indicates, there is still hesitation from attorneys and judges about using new technology and increasing its use.²⁴

A. Trial Presentation Software

Today, the available trial presentation software is abundant, but this has not always been the case.²⁵ In 1996, Compaq Computer Corporation helped progress the ability to access computer software and

²¹ *Id.*

²² *Id.*

²³ Hon. Herbert B. Dixon, Jr., *The Evolution of a High-Technology Courtroom*, FUTURE TRENDS IN STATE COURT, 31 (2011), <https://ncsc.contentdm.oclc.org/digital/collection/tech/id/769> [https://perma.cc/J9P7-4N5G].

²⁴ *Id.*

²⁵ Examples of such software include Trial Director, Sanction, OnCue, and TrialSmart for Apple. Paul J. Unger, *Courtroom Presentation Technology*, 2 (2018), <https://www.cobar.org/Portals/COBAR/Repository/lpm/AffinityWebinars/09-04-18%20Handout%201%20Courtroom%20Presentation%20Technology%20-%20Unger%202018.pdf?ver=2018-08-20-145601-003> [https://perma.cc/2GZF-WYXV].

files over the internet.²⁶ Currently, the main protocol for laypeople is to use digital software to access the internet.²⁷ People are also able to store documents and files on the hard drive of their computers and can store information on cloud services, such as Dropbox and Microsoft SharePoint, which permits information to be synchronized to computers and cell phones.²⁸ Many non-lawyers are already using this software in a variety of ways, and it is becoming more common in the courtroom.

The technology varies across both courtrooms and jurisdictions.²⁹ Some courtrooms are updated and equipped with devices capable of showing video from displays mounted in the jury box.³⁰ Usually, these devices can display exhibits, evidence, graphics, and video.³¹ However, there are courtrooms that are not updated with the newest technology available.³² Some courtrooms have screens that can be pulled down and used to project material onto, while other courtrooms do not have these tools available.³³ Some courtrooms have “video displays, monitors, projector screens, a witness monitor, laptop connections, digital input connections, plugs in the right place, and wireless internet,” while others do not.³⁴ Due to the inconvenience of not knowing which courtrooms or jurisdictions have what technology, attorneys need to call ahead of time to see if they will be assigned a smart courtroom, wasting time and reducing efficiency.³⁵

Attorneys use many techniques during trial, many of which involve the use of technology.³⁶ However, there are also many presentation

²⁶ Matt Lalande, *Courtroom Effective Technology*, L. TECH. TODAY (Aug. 14, 2019), <https://www.lawtechnologytoday.org/2019/08/courtroom-effective-technology/> [https://perma.cc/QGF7-XNAR].

²⁷ *Id.*

²⁸ *Id.*

²⁹ For example, courtrooms 15 and 12W in the Minneapolis Federal District Court building have annotation monitors, control panels, document cameras, voice reinforcement, jury monitors, audio and video conferencing, and computer inputs. *Courtroom Technology-Minneapolis Courtrooms 12W and 15*, U.S. COURTS, 1-7 (Nov. 5, 2019). Likewise, courtroom 7C in the St. Paul Federal District Court building has almost identical technology as the Minneapolis Federal District Court courtrooms. *Courtroom Technology-St. Paul Courtroom 7C*, U.S. COURTS, 1-7 (Dec. 9, 2019). However, instead of jury monitors, the St. Paul District Court building has a jury screen that is a large projection screen set up for the jurors to view evidence presented during trial. *Id.*

³⁰ Lalande, *supra* note 26.

³¹ *Id.*

³² *Id.*

³³ *Id.*

³⁴ *Id.*

³⁵ *Id.*

³⁶ Patrick Michael, *Technology in the Courtroom*, L. TECH. TODAY (July 9, 2013), <https://www.lawtechnologytoday.org/2013/07/technology-in-the-courtroom/> [https://perma.cc/CVV8-8FD6].

techniques that have historically been used by attorneys that do not involve technology.³⁷ Such techniques include, but are not limited to:

1. Writing important information on a large pad attached to an easel;
2. Writing on a whiteboard;
3. Displaying important documents or photographs mounted on 2 foot by 3 foot foam core boards;
4. Publishing documents and handing them to the jurors to pass among themselves; or
5. Conducting impeachment by reading the original testimony from the transcript.³⁸

Although these techniques are still available today, they are not as effective as current technology.³⁹ Specifically, these old techniques are not effective when communicating with juries because members of the jury are technology users, as the majority communicate through smartphones, emails, and texting.⁴⁰ Jury members are familiar with, and utilize, the picture and video capabilities of cell phones, and may upload pictures and videos to websites, such as Facebook and Instagram.⁴¹ Jury members can “communicate their moment-to-moment thoughts and reactions on Twitter” and other similar websites.⁴² Since jurors are used to information being delivered and communicated with the most current technology, attorneys need to be able to use and understand this current technology if they expect to communicate effectively with jurors.⁴³

The use of current technology is important in the trial environment because attorneys and judges need to quickly access and assemble “documents, exhibits, transcripts, graphics, demonstrative evidence, etc.”⁴⁴ Judges and attorneys also need to quickly upload important information for trials in Dropbox or SharePoint, which is critical because it allows the information to be reproduced on a screen through a projector viewable by both the judge and jury.⁴⁵

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁴ Lalande, *supra* note 26.

⁴⁵ *Id.*

Many courts use Sanction,⁴⁶ TrialPad,⁴⁷ or Trial Director⁴⁸ software for “the storage, management, retrieval, and display of documents, photos, images, etc.”⁴⁹ Currently, Trial Director is the most commonly used trial software.⁵⁰ However, although there are many software programs that can be used in the courtroom, technology implemented in the courtroom can be unpredictable—even Trial Director and Elmo can be unreliable.⁵¹

Trials usually involve high-pressure and intense environments.⁵² Technology problems are the last thing anyone wants to happen at critical moments of a trial.⁵³ Because of the uncertainty with the current technology in courtrooms, attorneys and judges still need to have paper copies of exhibits if the technology does not work.⁵⁴ This does not help in cutting down the legal system’s paper usage.⁵⁵

The results of studies on the use of technology in the classroom are being examined by legal professionals to inform their own use of technology in the courtroom.⁵⁶ For example, two recent university studies found that test scores rose by 14 to 15 percent, or one letter grade, when the classroom is equipped, and the professor teaches “with two or three different, simultaneous presentations compared with single screen content.”⁵⁷ These types of studies are influencing courts to upgrade courtroom technology by including multi-screen displays.⁵⁸

Although today’s trial presentation abilities seem limitless and influential, there are still methods that can increase efficiency, reduce costs, and produce transparency. A method that encompasses all three of these characteristics includes virtual trials.

⁴⁶ *Sanction*, LEXISNEXIS, <https://www.lexisnexis.com/en-us/products/sanction.page> [https://perma.cc/AH55-6TZ7].

⁴⁷ *TrialPad*, LITSOFTWARE, <https://www.litsoftware.com/trialpad> [https://perma.cc/JC5K-XZN4].

⁴⁸ *What Is TrialDirector 360?*, CAPTERRA, <https://www.capterra.com/p/182448/2-TrialDirector/#about> [https://perma.cc/K6SU-YWK7].

⁴⁹ Lalande, *supra* note 26.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ Michael, *supra* note 36.

⁵⁷ *Id.*; see Shih-Che Lo, Ching-Yu Wang & Pao-Ta Yu, *Using Multi-Screen Systems in Teaching College Mathematics Based on the Cognitive Theory*, DEPT. OF INDUS. MGMT., NAT’L TAIWAN U. OF SCI. & TECH. (Mar. 4, 2008), <https://www.learntechlib.org/p/27629/> [https://perma.cc/3ZKQ-PUFV].

⁵⁸ Michael, *supra* note 36.

B. Reasons to Keep Up with Technology

Throughout the progression of technological advancement, attorneys and judges have consistently resisted the use of technology in the courtroom and the profession as a whole.⁵⁹ As times change, attorneys and judges are becoming more willing to use technology; however, many judges and attorneys still resist technological advancement.⁶⁰ This is still the case despite the American Bar Association's Model Rules of Professional Conduct Rules and other reasons discussed below.⁶¹

First, the main reason attorneys and judges should keep up to date with technology is that they are required by Rule 1.1, comment 8, since it provides that lawyers need to be competent with the use of technology.⁶² This means practitioners must know and understand current technology.⁶³

Second, attorneys should keep up to date with technology for their clients.⁶⁴ Because most people are dependent on the use of technology, clients will most likely expect that the evidence in their case will be presented through technological means.⁶⁵

Third, technology in the courtroom should be up to date for the jury members.⁶⁶ Jury members, for the most part, are up to date or familiar with technology,⁶⁷ becoming increasingly sophisticated with new technology,⁶⁸ and expect more visual imagery to be presented during a trial.⁶⁹ It has even been shown that demonstrative evidence helps juries comprehend the evidence presented to them.⁷⁰ Presenting photos, diagrams, and blow-up charts can help jury members remember evidence and spark their interest in the evidence.⁷¹ As such, courtrooms need to be able to keep up with jury expectations. Likewise, attorneys must be up to

⁵⁹ Mark C. Palmer, *5 Reasons to use Technology in the Courtroom*, 2 CIVILITY (June 29, 2016), <https://www.2civility.org/5-reasons-to-use-technology-in-the-courtroom/> [https://perma.cc/YC3F-YZLJ].

⁶⁰ *Id.*

⁶¹ MODEL RULES OF PROF'L. CONDUCT r. 1.1, cmt. 8 (AM. BAR ASS'N 2020).

⁶² *Id.*

⁶³ *Id.*

⁶⁴ Palmer, *supra* note 60.

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ Michael, *supra* note 36.

⁶⁸ Palmer, *supra* note 60.

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ *Id.*

date with technology because the use of technology can influence the jury and promote retention of evidence.⁷²

Fourth, technology in the courtroom should be up to date for the judge.⁷³ For judges, technology in the courtroom increases efficiency in their ability to conduct proceedings.⁷⁴ Efficiency for judges comes in the form of being able to present, accept, and share evidence.⁷⁵ For instance, when electronic systems are able to display evidence, this technology allows a judge to be able to quickly look at the evidence and consider whether or not it is admissible before it is presented for the jury to see.⁷⁶

Lastly, technology in the courtroom should be up to date for the legal profession as a whole.⁷⁷ Millennials, as the next generation of lawyers, are either on their way to the profession or are already practicing.⁷⁸ Millennials are tech-savvy, having grown up with technology, navigating numerous technological advancements throughout their school years and initial careers.⁷⁹ They have come to expect technology will be integrated into law classrooms and likewise, expect that updated technology to be utilized in the courtrooms.⁸⁰

Thus, because of the many reasons technology in the courtroom should be updated and used, it is time for attorneys, judges, and courtrooms to embrace the future of where the law is heading and how technology is changing the profession, especially through the integration of virtual hearings, which are slowly being integrated into the legal field.⁸¹ Not only does legal competency demand it, but also clients, juries, judges, and the profession as whole demand it.⁸²

IV. BLOCKCHAIN DISPUTE RESOLUTION

⁷² *Id.*; see H.M. Caldwell, L. T. Perrin, Richard Gabriel & Sharon R. Gross, *Primacy, Recency, Ethos, and Pathos: Integrating Principles of Communication into the Direct Examination*, 76 NOTRE DAME L. REV. 423, 490-91 (2001).

⁷³ Palmer, *supra* note 60.

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² *Id.*

A. What is Blockchain?

Blockchain technology originates from a form of mathematics called cryptography.⁸³ At a basic level, blockchain is “a decentralized, shared digital ledger that relies on the consensus of a global peer network to operate.”⁸⁴ It is impossible to modify the data in one block without modifying the rest of the chain and gaining consensus of the peer network.⁸⁵ Although this can be frustrating, this process makes it extremely difficult for individuals to conduct malicious activity or falsify information because once data is in the blockchain, it is essentially there forever.⁸⁶ Blockchain technology at a more complex level is:

a shared digital ledger encompassing a list of connected blocks stored on a decentralized distributed network that is secured through cryptography. Each block contains encrypted information and hashed pointers to a previous block, making it difficult to retroactively alter without modifying the entire chain and the replicas within the peer network. New blocks are validated by peers on the network, providing credibility and preventing malicious activity and policy violations. Cryptography and membership functions provide easy data sharing between parties without privacy breach and tampering of records. All confirmed transactions are timestamped to provide full record provenance.⁸⁷

Blockchain technology is improving efficiency in dispute resolution.⁸⁸ Displayed below is an illustration of a Blockchain transaction.⁸⁹

⁸³ TIMOTHY LEONARD, NSW, BLOCKCHAIN FOR TRANSPORTATION: WHERE THE FUTURE STARTS 2 (2017); *How Blockchain is Revolutionizing the World of Transportation and Logistics [Infographic]*, WINNESOTA, <https://www.winnesota.com/blockchain> [<https://perma.cc/7RHZ-WYSW>].

⁸⁴ WINNESOTA, *supra* note 84.

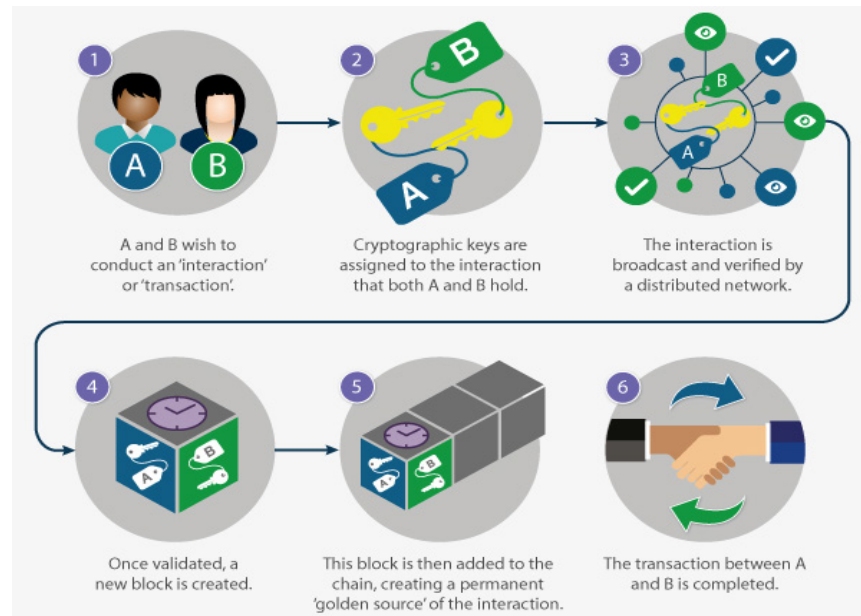
⁸⁵ *Id.*

⁸⁶ *Id.*

⁸⁷ Leonard, *supra* note 84, at 2.

⁸⁸ OpenLaw, *OpenCourt: Legally Enforceable Blockchain-Based Arbitration*, CONSENSYS (Oct. 18, 2018), <https://media.consensys.net/opencourt-legally-enforceable-blockchain-based-arbitration-3d7147dbb56f> [<https://perma.cc/8YHB-LXSL>].

⁸⁹ Leonard, *supra* note 84, at 2.



More recently, blockchain technology addressed the issue of how to administer justice online through decentralized arbitration systems.⁹⁰ Blockchain technology is forming a new era for online dispute resolution that provides low-cost and accessible justice.⁹¹

B. E-Commerce of the 90s to Blockchain Systems

It is inevitable that disputes and conflicts will arise with blockchain.⁹² Likewise, unexpected developments are likely to occur, and the expectations of each party will likely be different.⁹³ This is expected as the e-commerce boom in the 1990s caused nearly the same difficulties.⁹⁴ When e-commerce first began to flourish, disputes were not a priority, and remedies were not common.⁹⁵ In order for e-commerce to develop, a system was needed to invoke and maintain trust by users.⁹⁶ A system was needed to

⁹⁰ OpenLaw, *supra* note 89.

⁹¹ *Id.*

⁹² Kevin Werbach, *Trust, but Verify: Why the Blockchain Needs the Law*, 33 BERKELEY TECH. L.J. 489, 496–97 (2018); Orna Rabinovich-Einy & Ethan Katsh, *Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution*, 2019 J. DISP. RESOL. 47, 48 (2019).

⁹³ Rabinovich-Einy & Katsh, *supra* note 93, at 48.

⁹⁴ *Id.*

⁹⁵ *Id.*; see also Aaron Wright & Primavera De Filippi, *Decentralized Blockchain Technology and the Rise of Lex Cryptographia*, 1, 47 (2015), <https://ssrn.com/abstract=2580664> [<https://perma.cc/J7MT-AG2F>].

⁹⁶ Rabinovich-Einy & Katsh, *supra* note 93, at 48.

address and prevent disputes.⁹⁷ The system institutionalized to handle these problems is now known as online dispute resolution (ODR).⁹⁸

The challenges and lessons learned through the development of ODR are being integrated into the blockchain system.⁹⁹ Some entities are creating ODR tools and procedures that can be used in the blockchain environment.¹⁰⁰ For ODR to be used successfully, a few of the expectations forming the creation of blockchain technology need to be relaxed because conflict with the foundation of ODR's design: "recognizing the inevitability of conflict, understanding trust as a human construct, and assigning weight to individual needs alongside group ideology."¹⁰¹

C. *History of Blockchain*

Blockchain technology has evolved over many phases.¹⁰² The first phase included the creation of Bitcoin a decade ago.¹⁰³ The idea of data chain blocks established over a period of time.¹⁰⁴ Bitcoin faced the design challenge of how to form a "distributed, decentralized database in which anyone could access the data, add to the data, and broadcast the data, while ensuring the accuracy of the database and the authenticity of users' identities."¹⁰⁵ However, Bitcoin is currently the most successful use of blockchain technology.¹⁰⁶ Bitcoin represents the first major step in the evolution of blockchain technology which caused an increase in cryptocurrencies.¹⁰⁷

The second step was the innovation of blockchain.¹⁰⁸ This step consisted of recognizing that the technology used to operate Bitcoin could

⁹⁷ *Id.*; Wright & De Filippi, *supra* note 96, at 48–50.

⁹⁸ Rabinovich-Einy & Katsh, *supra* note 93, at 48 (quoting ETHAN KATSH & JANET RIFKIN, *ONLINE DISPUTE RESOLUTION: RESOLVING CONFLICTS IN CYBERSPACE* (2001)).

⁹⁹ *Id.*

¹⁰⁰ *Id.* Examples of entities include the following: bitcoin; blockchain; Ethereum; "smart contracts"; distributed autonomous organizations ("DAOs"); industries in Estonia and Sweden who are experimenting with blockchain-based data registries, land registries, and official e-currencies; and a new generation of private blockchain entities like NEO, EOS and IOTA. *Id.* at 51.

¹⁰¹ *Id.* at 48.

¹⁰² *Id.* at 49.

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* (referencing SATOSHI NAKAMOTO, *BITCOIN: A PEER-TO-PEER ELECTRONIC CASH SYSTEM* 1, 8 (2009)).

¹⁰⁶ *Id.* at 50 (referencing Massimo Bartoletti & Livio Pompianu, *An Empirical Analysis of Smart Contracts: Platforms, Applications, and Design Patterns*, U. CAGLIARI 1, 4 (Mar. 18, 2017)).

¹⁰⁷ *Id.*

¹⁰⁸ Vinay Gupta, *A Brief History of Blockchain*, HARV. BUS. REV. (Feb. 28, 2017), <https://hbr.org/2017/02/a-brief-history-of-blockchain> [<https://perma.cc/7877-JW4Q>].

be separated from currency.¹⁰⁹ With this discovery, using this technology for other interorganizational cooperation became reality.¹¹⁰

The third step in the history of blockchain was the revolution of the “smart contract.”¹¹¹ The smart contract was incorporated into the second-generation blockchain system known as Ethereum.¹¹² The Ethereum system builds computer programs into blockchain.¹¹³ This system allows for financial instruments, such as loans or bonds, to be symbolized rather than only the tokens of bitcoin.¹¹⁴

The fourth step in the history of blockchain is the present blockchain innovation “proof of stake.”¹¹⁵ The present forms of blockchains are safeguarded by proof of work because the groups with the greatest computing power, known as “miners,” make the judgements.¹¹⁶ Miners manage data centers in order to provide security,¹¹⁷ and in exchange, they receive cryptocurrency payments.¹¹⁸ New systems, projected to come out this year, do not have data centers; instead, they have financial instruments and offer a higher degree of security.¹¹⁹

Lastly, blockchain scaling is the fifth step in the history of blockchain.¹²⁰ This step is coming soon.¹²¹ As of now, each computer in the blockchain network processes every transaction, rather than dividing up the work in an efficient manner.¹²² This current process is very slow.¹²³ Scaled blockchains offer an accelerated process without foregoing security by determining how many computers are needed to authenticate all transactions, and then the system is able to divide up work efficiently.¹²⁴

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ *Id.* Stuart D. Levi & Alex B. Lipton, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, HARVARD L. SCH. F. ON CORP. GOVERNANCE (May 26, 2018), <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> [<https://perma.cc/CHW4-FQ97>] (“Smart contracts” is a phrase used to “describe computer code that automatically executes all or parts of an agreement and is stored on a blockchain-based platform”).

¹¹² Gupta, *supra* note 109.

¹¹³ *Id.*

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

¹²⁴ *Id.*

D. Smart Contracts

Blockchains act as a conceptual space to discover new forms of commercial and social activity.¹²⁵ Blockchain technology manages assets, and smart contracts allow assets to be sent across the world in seconds.¹²⁶ In order for the blockchain system to grow into a pervasive global infrastructure, blockchains need to assist decentralized forms of dispute resolution.¹²⁷

Parties who transfer assets via blockchain or enter into blockchain-compatible agreements will inevitably get into disputes, and the parties will need resources to deal with such disputes.¹²⁸ It is likely that there could be bugs in smart contracts, creating complications.¹²⁹ Since smart contracts are increasingly interacting with outside data, the risk of mistake is greater.¹³⁰ This is because the outside data with which smart contracts are interacting is provided by trusted entities which require humans to perform the terms.¹³¹

Agreements that include smart contracts will not be exempt from disputes and legal challenges.¹³² Parties will inevitably dispute the terms of their performance and how the smart contract was intended to be carried out.¹³³ This is why decentralized dispute resolution procedures are increasing in this new era.¹³⁴

In the future, blockchains have the potential to power judicial systems that provide low-cost and quality dispute resolution services online.¹³⁵ If implemented, the result could provide “a globally accessible ‘online court’ where people have an equal opportunity to receive low cost, sophisticated, and transparent justice regardless of their location or creed.”¹³⁶ To get there, blockchain systems need many tools: “[s]mart contracts to manage an arbitration procedure; [a]greements that seamlessly interact with smart contract code to ensure the enforceability of any arbitral awards; and [s]olid reputation systems to help the community select arbitrators to resolve disputes.”¹³⁷

¹²⁵ OpenLaw, *supra* note 89.

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ *Id.*

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² *Id.*

¹³³ *Id.*

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ *Id.*

¹³⁷ *Id.*

E. Core Functions of Blockchain

Blockchain relies on many functions to work together to form a decentralized, secure, and anonymous system.¹³⁸ The first core function of blockchain is decentralization.¹³⁹ Blockchain is based on the concept that there should not be an intermediary to permit transactions to be executed in a decentralized manner.¹⁴⁰ This is done by allocating jobs previously performed by a single entity to many performers in the system.¹⁴¹ Since the tasks and authority are dispersed among millions of computers, this ensures no one unit can be corrupted or attacked.¹⁴² This characteristic allows for protection against intermediaries' negligence or incompetence in carrying out duties and responsibilities, which assures the accurateness of transactions.¹⁴³ Since many versions of the record can be stored and saved on many computers, there are multiple sources that can be attacked.¹⁴⁴ Together, these characteristics help carry out the blockchain system in a decentralized manner.¹⁴⁵

Immutability is the second core function of blockchain technology, as blockchain records are immutable.¹⁴⁶ While other systems and databases provide the opportunity for alteration and manipulation of records, blockchain does not.¹⁴⁷ Instead, once blocks are permitted, the data chain is formed, and at that point, the chain is permanent with no way to reverse it.¹⁴⁸

¹³⁸ Rabinovich-Einy & Katsh, *supra* note 93, at 52; Valentina Gatteschi, Fabrizio Lamberti, Claudio Demartini, Chiara Pranteda & Victor Santamaria, *Blockchain and Smart Contracts for Insurance: Is the Technology Mature Enough?*, 10 FUTURE INTERNET 1, 4 (2018),

<https://www.mdpi.com/1999-5903/10/2/20/html> [<https://perma.cc/6UD5-C888>]; Wright & De Filippi, *supra* note 96, at 2, 13, 20; MANAV GUPTA, BLOCKCHAIN FOR DUMMIES, IBM LIMITED EDITION 1, 3, 14, 34 (John Wiley & Sons, Inc. 2017).

¹³⁹ Rabinovich-Einy & Katsh, *supra* note 93, at 54.

¹⁴⁰ Wright & De Filippi, *supra* note 96, at 6; Rabinovich-Einy & Katsh, *supra* note 93, at 52.

¹⁴¹ Gatteschi et al., *supra* note 142, at 5; Rabinovich-Einy & Katsh, *supra* note 93, at 52.

¹⁴² Wright & De Filippi, *supra* note 96, at 5-6; Rabinovich-Einy & Katsh, *supra* note 93, at 52.

¹⁴³ Rabinovich-Einy & Katsh, *supra* note 93, at 53 (referencing Scott A. McKinney, Rachel Landy & Rachel Wilka, *Smart Contracts, Blockchain, and the Next Frontier of Transaction Law*, 13 WASH. J.L. TECH. & ARTS 313, 316-17 (2018)).

¹⁴⁴ *Id.* (referencing MIT Technology Review Editors, *A Glossary of Blockchain Jargon*, MIT TECH. REV. (Apr. 23, 2018), <https://www.technologyreview.com/s/610885/a-glossary-of-blockchain-jargon/> [<https://perma.cc/NE73-69M7>]).

¹⁴⁵ *Id.* at 52-53.

¹⁴⁶ *Id.* at 53 (referencing Richard M. Weber, *An Advisor's Introduction to Blockchain*, 72 J. FIN. SERV. PROF'LS 49, 50-51 (2018)).

¹⁴⁷ *Id.*

¹⁴⁸ *Id.*

Immutability is also associated with smart contracts regarding the execution of transactions.¹⁴⁹ The execution of transactions usually involves the transfer of data, which is recorded and becomes an immutable record.¹⁵⁰ When information becomes a part of the immutable record, the outcome ensures performance and eliminates uncertainty.¹⁵¹ These characteristics are associated with blockchain because the nature of the blockchain system is virtually trustless. This is accomplished by providing the opportunity for anonymous parties to interact with one another and conduct transactions and transfer funds while ensuring that these interactions are immutably completed.¹⁵²

Anonymity is the third core function of blockchain technology because blockchain allows anonymous and pseudonymous exchanges.¹⁵³ Blockchain allows this while ensuring security by using private key encryption.¹⁵⁴ This kind of encryption can verify the identity of the individuals involved in the transaction.¹⁵⁵ The anonymous function of the identity of individuals is significant for the blockchain system for many reasons.¹⁵⁶ Initially, when authenticating a block, the anonymous function ensures that miners and nodes do not bring parties' identities into account.¹⁵⁷ However, if an individual's identity is disclosed on a public blockchain, the information and data that can be gathered about that individual can be extensive and sensitive.¹⁵⁸ Blockchains are immutable, so an individual may face substantial harm to their privacy.¹⁵⁹

Together, the three core functions of the blockchain system—decentralization, immutability, and anonymity—work in conjunction to provide the opportunity for removal of intermediaries.¹⁶⁰

¹⁴⁹ Gatteschi et al., *supra* note 142, at 4-5; Rabinovich-Einy & Katsh, *supra* note 93, at 53.

¹⁵⁰ Gatteschi et al., *supra* note 142, at 4-5; Rabinovich-Einy & Katsh, *supra* note 93, at 53.

¹⁵¹ Rabinovich-Einy & Katsh, *supra* note 93, at 53 (referencing Scott A. McKinney et al., *Smart Contracts, Blockchain, and the Next Frontier of Transaction Law*, 13 WASH. J.L. TECH. & ARTS 313, 316 (2018)).

¹⁵² *Id.* at 53-54 (citing Alan Cohn, Travis West & Chelsea Parker, *Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids*, 1 GEO. L. TECH. REV. 273, 274, 279 (2017)).

¹⁵³ *Id.* at 54.

¹⁵⁴ *Id.*

¹⁵⁵ *Id.* (referencing Marc Pilkington, *Blockchain Technology: Principles and Applications, Research Handbook on Digital Transformations* 225, 229-31 (Apr. 15, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2662660 [<https://perma.cc/2BQF-6TWK>]).

¹⁵⁶ *Id.* at 54.

¹⁵⁷ *Id.* Nodes are "computers on which a copy of the ledger is kept." *Id.* at 50.

¹⁵⁸ *Id.* at 54.

¹⁵⁹ *Id.*; Gatteschi et al., *supra* note 142, at 4.

¹⁶⁰ Rabinovich-Einy & Katsh, *supra* note 93, at 54.

F. The Future of Blockchain Dispute Resolution

Since blockchain technology is expanding beyond just the use of currency, it is providing the opportunity for the development of new approaches to dispute resolution.¹⁶¹ For example, smart contracts have the capability to ensure decentralization since they can operate autonomously.¹⁶² The combination of blockchain-based dispute resolution and smart contracts creates an opportunity to bring dispute resolution to a new level of both quality and enforceability.¹⁶³

For blockchain dispute resolution to take place, an environment for “creating legally binding, secure and encrypted smart contracts that will be automatically executed at a defined point of time” should be formed.¹⁶⁴ This platform will need to offer “a wide range of tools for drafting and managing Ethereum smart contracts without any programming skills or legal requirements.”¹⁶⁵ This future environment will allow for an implicit arbitration module, where users will be able to handle any disputed issues, with no need to involve intermediaries or reveal personal information.¹⁶⁶

Due to the potential and the ability to create this platform with the above components, the era of decentralized dispute resolution is commencing. Blockchains are providing parties with the opportunity to have global, universally available judicial systems.¹⁶⁷ The potential blockchain dispute resolution system has the potential to offer low-cost, flexible, efficient, and exceptional online dispute resolution services. If this potential blockchain dispute resolution system is utilized, the result could allow for a globally accessible online court system where parties will be afforded low cost, flexible, efficient, quality, and transparent justice, regardless of a party’s location.

To allow a future of blockchain systems to produce online dispute resolutions services, blockchain systems need a few instruments:

- “Smart contracts to manage an arbitration procedure;
- Agreements that seamlessly interact with smart contract code to ensure the enforceability of any arbitral awards; and

¹⁶¹ *Why is Blockchain-Based Arbitration the Only Future for Dispute Resolution?*, CONFIDEAL (Oct. 5, 2017), <https://medium.com/@confideal/why-is-blockchain-based-arbitration-the-only-future-for-dispute-resolution-93e34d99ec83> [https://perma.cc/W5SK-WXAR] (explaining some of the advantages it could have provided to industries that adopt and implement the technology, but Confideal has permanently closed).

¹⁶² *Id.*

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.* (emphasis omitted).

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*; see also Rabinovich-Einy & Katsh, *supra* note 93, at 59; Wright & De Filippi, *supra* note 96, at 48–49.

- Solid reputation systems to help the community select arbitrators to resolve disputes.”¹⁶⁸

It is time for offline and online disputes to find new ways of dealing with disputes. At this point, blockchain dispute resolution is not an option anymore; it is a necessity that provides efficient and low-cost dispute resolution services, especially through virtual hearings.¹⁶⁹

V. VIRTUAL HEARING SOLUTIONS TO BIAS

A. *Bias History*

Our Founding Fathers formed the framework not only for the Constitution, but for America.¹⁷⁰ Through the United States Constitution, ratified in 1789, the Founding Fathers sought to “establish Justice” and “secure the Blessings of Liberty to ourselves and our Posterity.”¹⁷¹ The values of justice and liberty that the Founding Fathers sought to instill in America are exercised during criminal cases where an individual may be subject to prison time, death, or other consequences.¹⁷² The Founding Fathers understood the power that courts have during the criminal prosecution process and decided to dedicate the Sixth Amendment solely to criminal prosecutions.¹⁷³

The Sixth Amendment includes the Impartial Jury Clause.¹⁷⁴ The Impartial Jury Clause encompasses two components. The first requirement is that there must be a “selection of a petit jury from a representative cross section of the community.”¹⁷⁵ The second requirement is that “there must be assurance that the jurors chosen are unbiased, i.e., willing to decide the case on the basis of the evidence presented.”¹⁷⁶ When compared to the First and Second Amendments, the Impartial Jury Clause is not commonly contested or discussed; however, it is equally important. The Sixth Amendment states,

¹⁶⁸ OpenLaw, *supra* note 89.

¹⁶⁹ *Id.*

¹⁷⁰ *The Day the Constitution Was Ratified*, NAT’L CONST. CTR (June 21, 2020), <https://constitutioncenter.org/blog/the-day-the-constitution-was-ratified#:~:text=On%20June%2021%2C%201788%2C%20the,a%20long%20and%20arduo%20process> [https://perma.cc/XEH7-P7V6].

¹⁷¹ U.S. CONST. pmbl.

¹⁷² *See generally* COMM’N ON L. ENF’T & ADMIN., U.S. GOV’T PRINTING OFF., *THE CHALLENGE OF CRIME IN A FREE SOCIETY* 125 (Feb. 1967).

¹⁷³ *See* U.S. CONST. amend. VI.

¹⁷⁴ *Id.*

¹⁷⁵ *Taylor v. Louisiana*, 419 U.S. 522, 528 (1975).

¹⁷⁶ Cong. Rsch. Serv., *Right to an Impartial Jury: Current Doctrine*, CONST. ANNOTATED, https://constitution.congress.gov/browse/essay/amdt6_3_2_1_1/ [https://perma.cc/VCB7-NND2].

[i]n all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defence.¹⁷⁷

The right to an impartial jury is found in the Sixth Amendment,¹⁷⁸ the Due Process Clause, and the Equal Protection Clause of the Fourteenth Amendment.¹⁷⁹ Jury impartiality has two requirements, as mentioned above. First, the selection of individuals from the community is the main component of the Sixth Amendment right to an impartial jury.¹⁸⁰ Second, an assurance needs to be established that the jurors selected are unbiased, meaning that they are able to set biases aside and come to a decision on the case based on the evidence presented in court.¹⁸¹

The no-impeachment rule is a common law rule of evidence that prohibits the impeachment or questioning of a verdict by investigating the jury's internal deliberations.¹⁸² The no-impeachment rule has three exceptions that permit a juror to testify about "(1) extraneous prejudicial information improperly brought to the jury's attention; (2) outside influences brought to bear on any juror; and (3) a mistake made in entering the verdict on the verdict form."¹⁸³ The no-impeachment rule prevents criminal defendants from asserting that their Sixth Amendment right to an impartial jury has been violated by arguing a jury's internal deliberations

¹⁷⁷ *Id.*

¹⁷⁸ See *Gonzales v. Beto*, 405 U.S. 1052, 1504 (1972) (Stewart, P., concurring) (referencing *Turner v. Louisiana*, 379 U.S. 466, 468 (1965)); see also *Witherspoon v. Illinois*, 391 U.S. 510 (1968); *Parker v. Gladden*, 385 U.S. 363 (1966); *Irvin v. Dowd*, 366 U.S. 717 (1961).

¹⁷⁹ See *Castaneda v. Partida*, 430 U.S. 482 (1977); *Hernandez v. Texas*, 347 U.S. 475 (1954). Excluding African American citizens from juries violates the Equal Protection Clause regardless of if the defendant is African American or not. See *Alexander v. Louisiana*, 405 U.S. 625 (1972); *Peters v. Kiff*, 407 U.S. 493 (1972); *Strauder v. West Virginia*, 100 U.S. 303 (1880); see generally, Cong. Rsch. Serv., *supra* note 181 (noting the applicability of the impartial jury requirement of the Sixth Amendment to the Due Process and Equal Protection Clauses of the Fourteenth Amendment).

¹⁸⁰ See U.S. CONST. amend. VI; see also Cong. Rsch. Serv., *supra* note 181 (referencing *Taylor*, 419 U.S. at 528 (1975); *Williams v. Florida*, 399 U.S. 78, 100 (1970)).

¹⁸¹ Cong. Rsch. Serv., *supra* note 181.

¹⁸² *Id.*

¹⁸³ See *id.* at n.20 (referencing FED. R. EVID. 606(b)(2)).

exhibited bias.¹⁸⁴ An “exception” to the no-impeachment rule applies only in the “gravest and most important cases.”¹⁸⁵

A defendant’s Sixth Amendment right to an impartial jury is undermined by bias, whether implicit or explicit. This is because a violation of the defendant’s Sixth Amendment right occurs when a jury member or the entire jury comes to a decision based on bias, influence, or pressure that could impair the defendant’s right to freedom.¹⁸⁶

B. *What is Bias Today?*

There are two main types of bias: explicit bias and implicit bias.¹⁸⁷ Explicit bias stems from conscious attitudes, stereotypes, beliefs, and feelings about an individual or group of individuals that affect our actions, decisions, and understanding.¹⁸⁸ Implicit bias stems from unconscious attitudes, stereotypes, beliefs, and feelings about an individual or group of individuals that affect our decisions, actions, and understandings.¹⁸⁹

C. *Continuing Bias in the Courtroom*

A clearer exception to the no-impeachment rule, which promotes eliminating implicit bias, explicit bias, and racial prejudice from the administration of justice, stems from *Pena-Rodriguez v. Colorado*, where the United States Supreme Court held for the first time that there is a clear Sixth Amendment exception to the no-impeachment rule.¹⁹⁰ The Court reasoned that when a juror makes a “clear statement” demonstrating that the juror relied on “racial stereotypes or animus to convict a criminal defendant, the Sixth Amendment requires that the no-impeachment rule give way.”¹⁹¹

¹⁸⁴ *Id.* at 184.

¹⁸⁵ *Id.* (quoting *McDonald v. Pless*, 238 U.S. 264, 269 (1915)).

¹⁸⁶ See *id.* (referencing *Smith v. Phillips*, 455 U.S. 209 (1982) (finding bias when a juror submitted an application for employment with the District Attorney’s Office during the criminal defendant’s trial); *Remmer v. United States*, 350 U.S. 377 (1956) (remanding to determine whether the defendant was prejudiced by a bribed juror)).

¹⁸⁷ Jerry Kang, Mark Bennett, Devon Carbado & Pamela Casey, *Implicit Bias in the Courtroom*, 59 UCLA L. REV. 1124, 1132 (2012).

¹⁸⁸ *Id.*; Kimberly Papillon, *Two Types of Bias*, NAT’L CTR. FOR CULTURAL COMPETENCE, <https://nccc.georgetown.edu/bias/module-3/1.php> [https://perma.cc/8KJ7-D4UF]; Stanley P. Williams, Jr., *Double-Blind Justice: A Scientific Solution to Criminal Bias in the Courtroom*, 6 IND. J.L. & SOC. EQ. 48, 50 (2018).

¹⁸⁹ *Understanding Implicit Bias*, OHIO STATE U. (2015), <http://kirwaninstitute.osu.edu/research/understanding-implicit-bias/> [https://perma.cc/UKA3-CKKL]; Williams, *supra* note 193; see also Kang et al., *supra* note 192.

¹⁹⁰ 137 S. Ct. 855, 858 (2017); see also Cong. Rsch. Serv., *supra* note 181.

¹⁹¹ *Pena-Rodriguez*, 137 S. Ct. at 858.

The purpose of voir dire is to give both the defense and prosecution an opportunity to inquire about potential jurors' possible biases or prejudice.¹⁹² This process helps to eliminate potential jurors that have already formed an opinion about the case to be tried; however, not every opinion, view, or belief will lead to a juror's disqualification.¹⁹³ The judge determines whether the opinion raises a presumption against impartiality.¹⁹⁴

As noted above, there are steps in place to prevent individuals from becoming jury members when individuals have strong opinions, biases, or beliefs about the case to be tried.¹⁹⁵ However, there are still major concerns and opportunities for individuals with biases to become jury members.¹⁹⁶ Over the past two decades, a significant amount of research consisting of controlled laboratory studies that use hypothetical cases and analyses have determined there are inequalities when it comes to conviction decisions, evaluation of the evidence presented in court, and the sentencing lengths for African American and White defendants.¹⁹⁷ Even with the significant amount of research produced over the last two decades, the effect of implicit bias in the courtroom remains a problem without a solution.¹⁹⁸ Scholars have proposed solutions and other strategies to combat bias in the courtroom; however, the recommended suggestions are incompatible with courtroom use, or the suggestions are unlikely to promote a substantial decline in bias in the courtroom.¹⁹⁹

¹⁹² See Cong. Rsch. Serv., *supra* note 181 (citing *Pointer v. United States*, 151 U.S. 396 (1894); *Lewis v. United States*, 146 U.S. 370 (1892)).

¹⁹³ See *id.* (referencing *Reynolds v. United States*, 98 U.S. 145 (1878); *Witherspoon v. State of Illinois*, 391 U.S. 510, 513-15 (1968)).

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

¹⁹⁷ Kang et al., *supra* note 192, at 1142-48 (describing implicit bias among judges and jurors); Justin D. Levinson & Danielle Young, *Different Shades of Bias: Skin Tone, Implicit Racial Bias, and Judgments of Ambiguous Evidence*, 112 W. VA. L. REV. 307, 331-39 (2010); Kimberly Papillon, *The Court's Brain: Neuroscience and Judicial Decision Making in Criminal Sentencing*, 49 CT. L. REV. 48, 53 (2013); Jeffrey J. Rachlinski, Sheri Johnson, Andrew J. Wistrich & Chris Guthrie, *Does Unconscious Racial Bias Affect Trial Judges?*, 84 NOTRE DAME L. REV. 1195, 1121-26 (2009); Cheryl Staats, Kelly Capatosto, Lena Tenney & Sarah Mamo, *State of the Science: Implicit Bias Review 2016*, 4 KIRWAN INST. FOR THE STUDY OF RACE ETHNICITY 25-26 (2016); Shankar Vedantam, *In the Air We Breathe*, NPR (June 5, 2017 at 10:07 PM), <http://www.npr.org/templates/transcript/transcript.php?storyId=531587708> [<https://perma.cc/QK6Y-YV9Y>] (noting recent discussions of implicit biases, including those by 2016 presidential candidate Hillary Clinton); Natalie Salmanowitz, *The Impact of Virtual Reality on Implicit Racial Bias and Mock Legal Decisions*, 5 J.L. BIOSCI. 174, 176-79 (2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5912078/> [<https://perma.cc/8SA9-NQX4>].

¹⁹⁸ Salmanowitz, *supra* note 202, at 175.

¹⁹⁹ Nilanjana Dasgupta & Anthony G. Greenwald, *On the Malleability of Automatic Attitudes: Combating Automatic Prejudice with Images of Admired and Disliked Individuals*, 81 J. PERSONALITY & SOC. PSYCH. 800, 802-08 (2001); Kang et al., *supra* note 192, at 1174-77;

D. Solutions to Eliminating Bias

With the advancement of technology, the time is coming for virtual hearings to take the place of physical appearances in a courtroom to significantly reduce bias.²⁰⁰ Virtual hearings would eliminate bias because judges and jurors would be blind to the race of the defendant since they would participate in trials through virtual means where they would see an avatar rather than the defendant.²⁰¹ Virtual hearings could provide judges and jurors the experience of self-regulation, perspective-taking, and stereotype reduction.²⁰² When compared to jury instructions and checklists, virtual hearings allow for an “interactive and engaging platform that can induce potent effects without increasing cognitive load.”²⁰³ Virtual hearings would allow participants to embody a different race while simultaneously being able to work toward diminishing race-salience worries.²⁰⁴ Especially by diminishing differences between oneself and an individual of a different race, the negative links that are associated with that race become less severe.²⁰⁵

As many forms of bias continue to infiltrate our legal system, especially in criminal proceedings, the need for virtual hearings is ever-growing to significantly reduce the many forms of bias that currently face individuals during these proceedings.

Casey Reynolds, *Implicit Bias and the Problem of Certainty in the Criminal Standard of Proof*, 37 L. & PSYCH. REV. 229, 248 (2013); Anna Roberts, *(Re)forming the Jury: Detection and Disinfection of Implicit Juror Bias*, 44 CONN. L. REV. 827, 873-74 (2012); Samuel R. Sommers & Phoebe C. Ellsworth, *White Juror Bias: An Investigation of Prejudice Against Black Defendants in the American Courtroom*, 7 PSYCH. PUB. POL’Y & L. 201, 216-21 (2001); Staats et al. *supra* note 202, at 17-41 (examining the effect of implicit biases in the justice system, education system, healthcare field, housing, and employment).

²⁰⁰ See Sunita Sah, Shima Baughman & Christopher T. Robertson, *Blinding Prosecutors to Defendants’ Race: A Policy Proposal to Reduce Unconscious Bias in the Criminal Justice System*, 1 BEHAV. SCI. POL’Y 69, 72-74 (2015) (recommending the practice of blinding in prosecutorial decisions and documenting its potential application to judges and jurors); see also ELSEVIER, *BLINDING AS A SOLUTION TO BIAS: STRENGTHENING BIOMEDICAL SCIENCE, FORENSIC SCIENCE, AND LAW* 25-36, 265-75, 319-31 (Christopher T. Robertson & Aaron S. Kesselheim eds., 2016) (discussing the concept of blinding in the legal system).

²⁰¹ See Sunita Sah et al., *supra* note 205; see also ADAM BENFORADO, *UNFAIR: THE NEW SCIENCE OF CRIMINAL INJUSTICE* 266-71 (2015).

²⁰² Salmanowitz, *supra* note 202, at 181.

²⁰³ *Id.* (citing Sun Joo-Grace Ahn, Amanda Minh Tran Le & Jeremy Bailenson, *The Effect of Embodied Experiences on Self-Other Merging, Attitude, and Helping Behavior*, 16 MEDIA PSYCH. 7, 9-10 (2013)).

²⁰⁴ Natalie Salmanowitz, *Unconventional Methods for a Traditional Setting: The Use of Virtual Reality to Reduce Implicit Racial Bias in the Courtroom*, 15 U.N.H. L. REV. 117, 139 (2016).

²⁰⁵ Salmanowitz, *supra* note 202, at 180 (referencing Lara Maister, Mel Slater, Maria V. Sanchez-Vives & Manos Tsakiris, *Changing Bodies Changes Minds: Owning Another Body Affects Social Cognition*, 19 TRENDS COGN. SCI. 6, 7-10 (2015)).

VI. POTENTIAL ISSUES WITH VIRTUAL SOLUTIONS IN CRIMINAL LAW

A. *Virtual Hearings*

Currently, there is a push across New York state to turn to virtual hearings in civil matters.²⁰⁶ Workers' compensation is the leading practice area of law that is moving toward virtual hearings to allow injured workers, attorneys and representatives, and witnesses to participate in online hearings.²⁰⁷ Parties and participants will not have to travel to the hearing location, which in itself cuts down on time and travel expenses.²⁰⁸ So far, the feedback has been positive.²⁰⁹ However, virtual hearings raise a Confrontation Clause issue, especially in criminal matters.²¹⁰

B. *The Confrontation Clause*

Criminal defendants have many important rights, including the right to cross-examine witnesses, face-to-face confrontation, and to be at trial.²¹¹ Although defendants have the right to confront their accusers, their presence during a hearing is optional as they are able to waive their right to the Confrontation Clause.²¹² Originally, an initial interpretation of the Confrontation Clause by the Supreme Court determined that the main purpose of the Confrontation Clause was "to prevent depositions or ex parte affidavits . . . [from] being used against the prisoner in lieu of a personal examination and cross-examination of the witness."²¹³

During the period in which this decision was made, ex parte affidavits led to defendants being sentenced to death without having the chance to question their accusers.²¹⁴ The defendant's main right stemming from the Confrontation Clause is "to be present in the courtroom at every stage of [the defendant's] trial."²¹⁵ The Supreme Court went further in interpreting the Confrontation Clause, determining "the Confrontation Clause guarantees the defendant a face-to-face meeting with witnesses

²⁰⁶ *Virtual Hearings*, N.Y. STATE., <http://www.wcb.ny.gov/virtual-hearings/> [https://perma.cc/N6CF-FGD2].

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ *Id.*

²¹⁰ *See, e.g.*, U.S. CONST. amend. VI ("[T]he accused shall enjoy the right to . . . be confronted with the witnesses against him . . .").

²¹¹ *Crawford v. Washington*, 541 U.S. 36, 57 (2004).

²¹² *Brookhart v. Janis*, 384 U.S. 1, 3-4 (1966).

²¹³ *Mattox v. United States*, 156 U.S. 237, 242 (1895).

²¹⁴ *Crawford*, 541 U.S. at 44.

²¹⁵ *Illinois v. Allen*, 397 U.S. 337, 338 (1970).

appearing before the trier of fact.”²¹⁶ Although this is how the Supreme Court interpreted the Confrontation Clause, the Constitution does not explicitly require a face-to-face meeting with witnesses.²¹⁷

Since a face-to-face confrontation is merely a preference, not a Sixth Amendment requirement, the preference may be offset by public policy concerns and the dynamics of the defendant’s case.²¹⁸ Despite the right to a face-to-face physical confrontation, public policy concerns can override this right when the reliability of testimony can be guaranteed.²¹⁹

Although virtual hearings have many benefits for the criminal justice system, problems stemming from the Confrontation Clause come into play since there would not be a face-to-face meeting, which the United States Supreme Court has determined to be a guaranteed right for a defendant.²²⁰ However, defendants may waive this right in order to have virtual hearings, which may ultimately benefit criminal defendants in the long run by not being subject to the many biases that they may otherwise have faced.²²¹

VII. BLOCKCHAIN TECHNOLOGY SOLUTIONS IN CRIMINAL LAW

As discussed above, blockchain systems are known for their ability to keep records secure by using cryptography and for their advancement of online dispute resolution.²²² However, blockchain systems have not been fully incorporated into criminal court proceedings.²²³ With the technological components of blockchain systems, blockchain needs to be utilized relatively soon in innovative ways in criminal court proceedings to help solve court recordkeeping and efficiency issues.²²⁴

Ultimately, the criminal justice system would benefit from incorporating blockchain technology because the courts need to be brought

²¹⁶ *Coy v. Iowa*, 487 U.S. 1012, 1016 (1988) (citing *Kentucky v. Stincer*, 482 U.S. 730, 748, 749-50 (1987)).

²¹⁷ *See* U.S. CONST. amend. VI.

²¹⁸ *Maryland v. Craig*, 497 U.S. 836, 849-50 (1990).

²¹⁹ *Id.* at 850.

²²⁰ *Coy*, 487 U.S. at 1016.

²²¹ *Brookhart v. Janis*, 384 U.S. 1, 3-4 (1966).

²²² *See supra* notes 90-98 and accompanying text. Generally, cryptograph is used in blockchain systems to keep records secure because cryptography allows parties to share data without privacy breach and tampering of records. Blockchain has allowed for online dispute resolution services through virtual hearings that are efficient and cost effective.

²²³ Di Graski & Paul Embley, *When Might Blockchain Appear in Your Court?*, NAT’L CTR. FOR STATE CTS. 28, 30 (2018).

²²⁴ *Id.*

into the twenty-first century.²²⁵ The benefits are numerous, including maintaining a current record for the individuals involved throughout a criminal case.²²⁶ Blockchain records provide the ability for records to be shared among individuals, including law enforcement, parole officers, attorneys, and judges.²²⁷ Likewise, blockchain technology allows for individuals that are interested in a certain case, such as a victim, to stay updated with the defendant's legal status.²²⁸ Blockchain would also allow for alterations to a defendant's legal status to be instantaneous.²²⁹ Currently, defendants have to deal with the present system where outdated records may cause a defendant to be incarcerated for more than the term initially established.²³⁰

A. *Benefits of Blockchain Technology in Criminal Proceedings*

In the future, courts may utilize blockchain technology to assist in addressing solutions to three issues facing the court recordkeeping systems today: management of court judgments, warrants, and criminal histories.²³¹

1. *Management of Court Judgments*

Technology advancements in the courtroom have led to an increase in court case records being electronically stored.²³² This leads courts to become worried about third parties being able to replicate judgments without a system that guarantees that post-judgment updates are reflected.²³³ When a party expunges a criminal conviction, reopens a civil default judgment, or is granted other post-judgment relief, the party may continue to suffer harm because of dated court records.²³⁴ A party may face harm in employment, housing, or personal finances because dated case records that are still in place.²³⁵ Blockchain technology can be used as a solution for this issue because blockchain would allow updates of a case record to be reflected outside the courthouse.²³⁶ Meaning, “[n]o matter how many third-

²²⁵ Jaliz Maldonado, *10 Ways Blockchain Technology Will Change the Legal Industry*, PRACTICEPANTHER, <https://www.practicepanther.com/blog/blockchain-technology-legal-industry/> [https://perma.cc/A457-NMCT].

²²⁶ *Id.*

²²⁷ *Id.*

²²⁸ *Id.*

²²⁹ *Id.*

²³⁰ *Id.*

²³¹ Graski & Embley, *supra* note 228, at 29.

²³² *Id.* at 32.

²³³ *Id.* at 29.

²³⁴ *Id.*

²³⁵ *Id.*

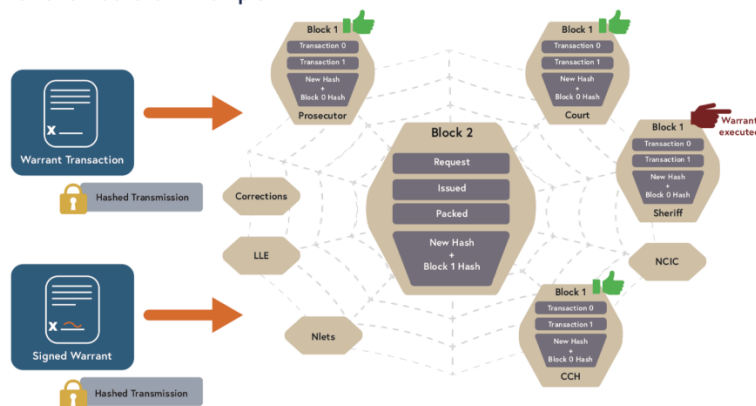
²³⁶ *Id.*

party data aggregators possessed a Blockchain-based order, the record would reflect the most current information.”²³⁷ Since blockchains do not exist in one distinct place, blockchains encompass two advantages over the current systems implemented in courtrooms: broader access and better security.²³⁸

2. Management of Warrants

Another current concern that blockchain technology can provide a solution for is management of warrants.²³⁹ Frequently, courts obtain requests for search and arrest warrants.²⁴⁰ These requests come from many sources, including law enforcement, prosecutors, and probation and parole officers.²⁴¹ Courts themselves issue bench warrants when parties fail to appear for their scheduled hearing or when they fail to follow a court’s orders.²⁴² When a warrant is issued by the court, many sources need access to read and edit the warrant.²⁴³ This applies especially when law enforcement agencies are mandated to contact the issuing court to make sure the warrant is valid before it is executed.²⁴⁴ Also, law enforcement agents can “pack” a warrant with supplementary information regarding the defendant, as is exemplified in the Warrant Blockchain Flow Graphic below.²⁴⁵

Warrant Blockchain Example



²³⁷ *Id.*

²³⁸ *Id.*

²³⁹ *Id.* at 30.

²⁴⁰ *Id.*

²⁴¹ *Id.*

²⁴² *Id.*

²⁴³ *Id.*

²⁴⁴ *Id.*

²⁴⁵ *Id.* at 29–30.

Due to the numerous entities and exchanges involved with warrants, blockchain technology would be a great solution to managing warrants because it increases efficiency by allowing for broader access and better security.

3. Management of Criminal Histories

Lastly, blockchain technology can be a solution for management of criminal histories.²⁴⁶ Blockchain can provide management solutions for criminal histories as soon as law enforcement cites or arrests a criminal defendant.²⁴⁷ This would allow the individuals who fill these roles, such as prosecutors and judges, to update the blockchain record based on the actions they implemented.²⁴⁸ The criminal charges implemented in the blockchain arrest record would proceed during the proceedings of the case, which would allow the charges to be tied to the final judgment.²⁴⁹ The individuals that play a role in updating and maintaining accurate criminal histories put in much effort to ensure these records are up to date, including “manual data entry, data transformations, ongoing audits, and quality-control efforts.”²⁵⁰ Blockchain record technology would be a manageable solution to alleviate these efforts while providing verifiable integrity.

B. Blockchain to Justice

Blockchain systems may also provide many benefits if cases are logged into a blockchain system. These benefits include: 1) giving the public greater access to information; 2) providing permission to view records at various levels; 3) memorializing an auditable trail of amendments to the documents; 4) instantaneously updating interested parties; 5) greatly enhancing recordkeeping; and 6) as more data is available to the public, creating a “glass government.”²⁵¹

In addition to the benefits and solutions blockchain technology can provide for the management of court judgments, warrants, and criminal histories, blockchain will likely have many more impacts and solutions within justice system in the near future, allowing for a more efficient administration of justice.²⁵² To prepare for the advancement of blockchain,

²⁴⁶ *Id.* at 30.

²⁴⁷ *Id.*

²⁴⁸ *Id.*

²⁴⁹ *Id.*

²⁵⁰ *Id.*

²⁵¹ *Id.*

²⁵² Megan Miller, *The Promise of Blockchain in Law*, L. PRAC. TODAY (Jan. 12, 2018), <https://www.lawpracticetoday.org/article/blockchain-in-law/> [https://perma.cc/KF3U-HU5K]. Miller notes that blockchain will allow attorneys to record and authenticate several

judicial leaders should update digital evidence rules and technology standards in the courtroom and replace physical courtrooms with E-courtrooms.²⁵³

VIII. VIRTUAL HEARINGS AS A SOLUTION TO PROBLEMS IN CRIMINAL LAW

It seems that in non-criminal cases, virtual hearings and other forms of technology are more appealing and widely approved for hearings and trials than they are in criminal cases.²⁵⁴ Although jurisdictions are split as to whether virtual hearings should be permitted in criminal proceedings, a fair amount of jurisdictions are moving toward virtual hearings and use of other technological systems.²⁵⁵ Use of virtual hearings in place of physical hearings considers the ability to protect a defendant's rights, the opportunity to save time and expense, and the ability for the judge and the defendant to see and hear one another.²⁵⁶

legal matters, including ledger-based activity. *Id.* The following are likely central to the development of blockchain: "property records, UCC filings, court records, funds transfers, chains of custody, contracts and even legal opinions." *Id.*

²⁵³ Adrian Clarke, *Why Blockchain Belongs in the Courtroom*, ENTREPRENEUR (Nov. 15, 2018),

<https://www.entrepreneur.com/article/322880> [<https://perma.cc/3PXV-6WPQ>].

²⁵⁴ Bridenback, *supra* note 17, at 6 (citing MD. CODE ANN., State Gov't § 10-211 (West 2020) (providing for hearings by "telephone, video conferencing, or other electronic means" in contested cases under the Administrative Procedure Act, subject to objections for good cause); MICH. R. CIV. P. 2.407 (allowing the use of videoconferencing in civil proceedings for participants after the court considers relevant factors, including possible undue prejudice, reliability, and convenience, among others); MO. REV. STAT. § 561.031, subd. 1(8) (2009) (allowing audio-visual communication for civil proceedings, except for jury trials).

²⁵⁵ *See* United States v. Baker, 45 F.3d 837 (4th Cir. 1995) (finding the use of videoconferencing in civil commitment hearings constitutionally permissible); *see also* Guinan v. State, 769 S.W.2d 427 (Mo. 1989) (finding that a post-conviction hearing held by video did not violate defendant's constitutional rights, even though it was "quasi-criminal in nature"); Pappas v. Ky. Parole Bd., 156 S.W.3d 303 (Ky. Ct. App. 2004) (holding that the use of video conferencing for parole hearing did not violate the inmate's due process rights); Wantuch v. Davis, 39 Cal. Rptr. 2d 47 (Cal. Ct. App. 1995) (indicating that prisoner had right of access in his civil action and should have been afforded the ability to appear at status conference by written correspondence or telephone if unable to appear physically); Britt v. Mascara, 830 So. 2d 221 (Fla. Dist. Ct. App. 2002) (finding that denial of inmate's request for telephonic hearing in replevin lawsuit constituted a denial of due process); *In re* Simpkins, 599 N.W.2d 170 (Minn. Ct. App. 1999) (indicating that the court must consider alternatives to requiring personal appearance in case of inmate); Bridenback, *supra* note 17, at 23.

²⁵⁶ Bridenback, *supra* note 17, at 4.

A. *Chain of Custody*

Within criminal cases, chain of custody is a well-known concept used to describe what happens to evidence in a criminal case.²⁵⁷ Usually, it is a paper trail that is created by a piece of paper being produced for each piece of evidence every time the evidence changes hands.²⁵⁸ The paper trail is preserved until the evidence is presented in court.²⁵⁹ Blockchain technology would fit well with the chain of custody, especially for more complex digital files, because the blockchain system can track the custody of documents and also store documents.²⁶⁰ Blockchain technology allows for the digital records to be a permanent component of the chain of custody.²⁶¹ Preserving the record prevents evidence from getting thrown out.²⁶² Blockchain security could help abolish the need for testimony regarding the protection of the chain of custody, which helps save time.²⁶³

B. *Bail Hearings*

Bail hearings are subject to constitutional rights, such as the Confrontation Clause, because defendants have the right to confront witnesses against them.²⁶⁴ It is possible defendants may consent to virtual hearings. Jurisdictions are split as to whether they permit virtual hearings for bail hearings.²⁶⁵

C. *Initial Appearance Hearings*

Initial appearance hearings are the most common criminal proceeding to use virtual hearings.²⁶⁶ During this proceeding, trial courts allow for the initial appearance in front of the court of an individual that has been arrested.²⁶⁷ The main reason for this proceeding is to inform the

²⁵⁷ Jonas P. DeMuro, *7 Ways Blockchain Will Change the Legal Industry Forever*, TECHRADAR (Jan. 18, 2018), <https://www.techradar.com/news/7-ways-blockchain-will-change-the-legal-industry-forever> [<https://perma.cc/TB6G-GJCA>].

²⁵⁸ *Id.*

²⁵⁹ *Id.*

²⁶⁰ *Id.*

²⁶¹ *Id.*

²⁶² *Id.*

²⁶³ *Id.*

²⁶⁴ U.S. CONST. amend. VI. (“[T]he accused shall enjoy the right to . . . be confronted with the witnesses against him”); Bridenback, *supra* note 17, at 3.

²⁶⁵ Bridenback, *supra* note 17, at 4; *see Larose v. Superintendent, Hillsborough Cnty. Corr. Admin.*, 702 A.2d 326, 329 (N.H. 1997) (holding that videoconferencing for an arraignment and bail hearing did not violate due process considerations); Vt. Admin. Ord. No. 38 (providing that videoconferencing is not allowed for contested bail hearings).

²⁶⁶ Bridenback, *supra* note 17, at 13.

²⁶⁷ *Id.*

individual that has been arrested of the charges against him or her.²⁶⁸ This hearing is also appropriate for setting conditions, such as release, monetary bonds, release on their own recognizance (ROR), and other conditions of release.²⁶⁹ Virtual hearings are an efficient resource that addresses concerns about transportation, safety, time management, and expenses.²⁷⁰

D. Plea Hearings

Courts take into consideration a defendant's constitutional rights, such as the Confrontation Clause, when considering whether the use of virtual hearings for plea hearings is permissible.²⁷¹

E. Trials

As courts are increasingly utilizing digital evidence, blockchain could be utilized with digital evidence to prove evidence's authenticity.²⁷² Blockchain has the potential to increase the level of security in regards to protecting evidence throughout criminal proceedings up until trial.²⁷³ Blockchain could be used as an important tool for evidence collected by police officers' body-worn cameras.²⁷⁴ Today, it is easy to acquire video editing software on a cell phone, which makes it difficult to maintain the trust and integrity of the videos collected by body cameras.²⁷⁵

This raises a major problem regarding the trust and integrity of evidence.²⁷⁶ Blockchain can be used by storing the metadata of body camera videos and other evidence so the evidence to be presented in courts as irrefutable, untampered with evidence.²⁷⁷ Blockchain technology could be helpful in criminal trials because everyone would be able to see the

²⁶⁸ *Id.*

²⁶⁹ *Id.*

²⁷⁰ *Id.*

²⁷¹ *Id.* at 5; see *People v. Guttendorf*, 723 N.E.2d 838 (Ill. Ct. App. 2000) (finding that use of closed circuit television at plea hearings violated individuals' constitutional right to be present where "crucial aspects of a defendant's physical presence may be lost or misinterpreted"); *Seymour v. State*, 582 So. 2d 127 (Fla. Ct. App. 1991) (finding that taking a plea at a sentencing hearing by closed circuit television was improper where defendant did not have the ability to consult with counsel privately during the proceeding).

²⁷² Sam Trendall, *MoJ Talks up Potential Blockchain Benefits for Criminal-Justice System*, PUB. TECH.NET (Nov. 3, 2017), <https://www.publictechnology.net/articles/news/moj-talks-potential-blockchain-benefits-criminal-justice-system> [<https://perma.cc/M7XQ-B9XM>].

²⁷³ Paul Sachs, *The Law & Courts: The Case for Blockchain*, LAW. MONTHLY (Aug. 13, 2018), <https://www.lawyer-monthly.com/2018/08/the-law-courts-the-case-for-blockchain/> [<https://perma.cc/M6RV-LQ5S>].

²⁷⁴ See Trendall, *supra* note 277.

²⁷⁵ *Id.*

²⁷⁶ *Id.*

²⁷⁷ *Id.*

evidence, but only police could change the evidence, which assists with removing the chance of evidence falsification.²⁷⁸ Blockchain technology would help the criminal justice system as a whole because by helping courts retain their data, policies, and procedures, while also being able to share data by maintaining privacy, security, and confidentiality.²⁷⁹ Electronic storage of evidence will reduce paper evidence, and ultimately, the use of paper in the courtroom, all while increasing transparency, trust, and efficiency, in the trial system.²⁸⁰

In addition, brain imaging is being developed to detect a suspect's guilt. Brain imaging uses functional magnetic resonance imaging (fMRI) to scan the brain.²⁸¹ During the scan, the system detects blood flow changes and displays active areas of the brain.²⁸² Brain imaging is 70 to 90% accurate in detecting when an individual is lying.²⁸³ The most popular polygraph test, the CQT, has an accuracy estimate range of 74% to 89% for guilty examinees, with 1% to 13% false-negatives; CQT also has an accuracy estimate range of 59% to 83% for innocent examinees with a false-positive ratio from 10% to 23%.²⁸⁴

F. *Blockchain Data and Discovery*

Blockchain technology is known for its transparency.²⁸⁵ When databases use blockchain technology, they are usually public and decentralized.²⁸⁶ This means the data is accessible to everyone, so the data is not managed, owned, or controlled by a governing body.²⁸⁷ This is not advantageous for the discovery process.²⁸⁸ Discovery requests for documents without an owner may be subject to objections because, despite the

²⁷⁸ *Id.* Although there are valid concerns regarding police falsifying evidence, a discussion on this issue is outside the scope of this Paper.

²⁷⁹ John Reynolds, *Transforming the Justice System with Corda Distributed Ledger Technology*, CORDA (Oct. 3, 2018), <https://medium.com/corda/how-might-distributed-ledger-technology-transform-the-justice-system-ccd9c16ebe54> [<https://perma.cc/G6VM-AJ65>].

²⁸⁰ *See id.*; Sachs, *supra* note 278.

²⁸¹ Scherman, *supra* note 2.

²⁸² *Id.*

²⁸³ *Id.*

²⁸⁴ John Synnott, David Dietzel & Maria Ioannou, *A Review of the Polygraph: History, Methodology and Current Status*, TAYLOR & FRANCIS ONLINE (July 8, 2015), <https://www.tandfonline.com/doi/full/10.1080/23744006.2015.1060080> [<https://perma.cc/4W3N-WS8Y>] (citing Don Grubin, *The Polygraph and Forensic Psychiatry* 38 J. AM. ACAD. PSYCHIATRY LAW 446 (2010)).

²⁸⁵ *Preparing for Blockchain Litigation as a Legal Professional*, FIRST LEGAL (Aug. 9, 2019), <https://www.firstlegal.com/blockchain-litigation/> [<https://perma.cc/46AC-SRAJ>].

²⁸⁶ *Id.*

²⁸⁷ *Id.*

²⁸⁸ *Id.*

transparency of its data, users of blockchain technology are provided anonymity, which makes the data unverifiable.²⁸⁹ When the data is stored as an “off-chain,” meaning it is stored to the side of a blockchain, the data has the possibility of having a definable custody trail.²⁹⁰ When data is stored as an off-chain, this can provide favorable results in the eDiscovery process due to it being more easily authenticated.²⁹¹ Off-chain data is “any non-transactional data that is too large to be stored in the blockchain efficiently, or, requires the ability to be changed or deleted.”²⁹² The best way to authenticate information from blockchain technology in court is still being determined.²⁹³

G. *Admissibility of Blockchain Evidence*

There is no consistent standard of the admissibility of blockchain technology evidence in the United States.²⁹⁴ However, some jurisdictions such as Arizona have found that “[t]o properly admit evidence in court, the evidence must be relevant, reliable, and authenticated.”²⁹⁵ Blockchain technology as evidence likely follows the same criteria as other forms of evidence.²⁹⁶ Jurisdictions are handling authentication of blockchain technology differently.²⁹⁷ For example, Vermont legislation says that for blockchain technology to be self-authenticating, it must be “accompanied by a written declaration” that lists:

- (A) the date and time the record entered the blockchain;
- (B) the date and time the record was received from the blockchain;
- (C) that the record was maintained in the blockchain as a regularly conducted activity; and
- (D) that the record was made by the regularly conducted activity as a regular practice.²⁹⁸

At the federal level, Federal Rule of Evidence 902 had a recent amendment, effective as of December 2017, which “permits self-authentication of digital evidence.”²⁹⁹ This amendment allows for the

²⁸⁹ *Id.*

²⁹⁰ *Id.*

²⁹¹ *Id.*

²⁹² IBM STORAGE, WHY NEW OFF-CHAIN STORAGE IS REQUIRED FOR BLOCKCHAINS 5 (2018).

²⁹³ FIRST LEGAL, *supra* note 290.

²⁹⁴ DANIEL J. NEALLY & MARIA L. HODGE, CTR. FOR L., SCI. & INNOVATION, BLOCKCHAIN IN THE COURTS 9 (Nov. 3, 2018).

²⁹⁵ *Id.*

²⁹⁶ *Id.*

²⁹⁷ *Id.* at 10.

²⁹⁸ *Id.* (citing 12 V.S.A § 1913(b)(1)).

²⁹⁹ *Id.*

admissibility of blockchain technology evidence if it is uncontested.³⁰⁰ However, the Federal Rules of Evidence have not addressed the issue of whether blockchain technology evidence is hearsay evidence that is thus unreliable and not admissible.³⁰¹

IX. THE FUTURE OF TECHNOLOGY IN THE COURTROOM

Every year, technology in the legal profession changes at an accelerated rate.³⁰² The challenge persists in pushing the legal profession to keep up to date with technological changes.³⁰³ However, the COVID-19 pandemic is forcing court rooms and the legal profession, in general, to adopt technology at an exponential rate.³⁰⁴ While COVID-19's impact is discussed in a later Section, courtroom changes over time, beginning in the 1990s, must first be highlighted.³⁰⁵

In 1994, the Supreme Court of Delaware affirmed the Superior Court's holding that denied a writ to prevent an order that required electronic filing of documents.³⁰⁶ The Supreme Court of Delaware reasoned that:

The use of computers to access information is a commonplace feature of modern law office operation. If the court system is to be able to respond to the demands of complex litigation, parties and their counsel who seek the intervention of the judicial system may be required to incur the reasonable expenses of participation in the modern information systems.³⁰⁷

In 2012, eighteen years after the Delaware Supreme Court's push to the bar to use updated technology, the American Bar Association amended the comments to Model Rule of Professional Conduct 1.1.³⁰⁸ The American Bar Association added to competence by including language that

³⁰⁰ *Id.* at 10-11.

³⁰¹ *Id.* at 11.

³⁰² Judge Herbert B. Dixon Jr., *Technology Changes Coming Faster and Faster*, AM. BAR ASS'N (Nov. 1, 2014), https://www.americanbar.org/groups/judicial/publications/judges_journal/2014/fall/technology_changes_coming_faster_and_faster/ [https://perma.cc/85CV-3RT4].

³⁰³ *Id.*

³⁰⁴ Lyle Moran, *Covid-19 Sparks Rapid Tech Adoption that has Helped Lawyers Weather Economic Downturn*, AM. BAR ASS'N J. (Oct. 13, 2020), <https://www.abajournal.com/news/article/covid-19-sparks-rapid-tech-adoption-among-lawyers-that-has-helped-them-weather-economic-downturn> [https://perma.cc/RZR3-DTH7].

³⁰⁵ See *infra* section IX.

³⁰⁶ Dixon Jr., *supra* note 307.

³⁰⁷ *Id.*

³⁰⁸ *Id.*

maintaining competence requires lawyers keep up with the changes in the legal profession, “including the benefits and risks associated with relevant technology”³⁰⁹

Now, the legal profession—especially in criminal law—is facing a major technological advancement with virtual hearings.³¹⁰ The push for the legal profession, especially courtrooms, to adopt technology changes is due to economics because technology can be used to do more for less.³¹¹ Opinions and other documents are increasingly available in digital forms, and they usually include hyperlinks to cases, charts, videos, and other attachments.³¹² Virtual hearings and trials are going to increase.³¹³ Virtual appearances are already taking place in courtrooms with expert witnesses.³¹⁴ However, in the future, it is likely jurors will appear virtually, and trials will be viewable online.³¹⁵

As blockchain becomes increasingly relevant and utilized in the legal profession, legal professionals need to keep up to date with this new technology.³¹⁶ To do so, legal professionals can reach out to experts in the electronically sourced information (ESI) field for assistance.³¹⁷ As of now, courts and the legal system in its entirety are still trying to figure out how to authenticate, find, and present data from blockchain technology in the courts.³¹⁸ How to handle blockchain data during the discovery process is continuously being updated.³¹⁹ Despite the confusion with blockchain technology, legal professionals should still take advantage of the technology because the transparency in its data has the potential to transform the legal industry.³²⁰

A. The Use of Technology During the Era of COVID-19

While this Paper was primarily written prior to the COVID-19 pandemic, this topic is ripe for future evaluation. This Section is limited

³⁰⁹ MODEL RULES OF PRO. RESP. R. 1.1, cmt. 8 (AM. BAR ASS’N 2016); *see also* Dixon Jr., *supra* note 307.

³¹⁰ Terry Carter, *Technology Advances will put Mobility into Trials, Doing More for Less*, AM. BAR ASS’N J. (Oct. 1, 2013), https://www.abajournal.com/magazine/article/technology_advances_will_put_mobility_into_trials_doing_more_for_less [<https://perma.cc/V448-4D8X>].

³¹¹ *Id.*

³¹² *Id.*

³¹³ *Id.*

³¹⁴ *Id.*

³¹⁵ *Id.*

³¹⁶ FIRST LEGAL, *supra* note 290.

³¹⁷ *Id.*

³¹⁸ *Id.*

³¹⁹ *Id.*

³²⁰ *Id.*

because COVID-19 is ongoing at the time of this Paper's publication and the courts and legal profession still have many issues to address, including constitutional issues.³²¹

The use of technology, especially virtual hearings, during COVID-19 has increased dramatically, forcing the legal profession and courts to adapt rather quickly to immediately implementing the available technology.³²² Even the Supreme Court has been forced to move toward virtual hearings.³²³ On May 4, 2020, the Supreme Court heard its first oral argument in history that was done telephonically and broadcast live.³²⁴

Although there are many benefits of this new technology, there are also issues that need to be addressed, which will impact the future of technology in the legal profession and the courts even after COVID-19.

The Coronavirus Aid, Relief, and Economic Security Act ("The CARES Act"), signed into law on March 27, 2020, helped promote virtual hearings.³²⁵ Although this act is mostly known for providing a stimulus check to United States citizens, it also included section 15002.³²⁶ Section 15002 allows for the use of videoconferencing in select federal judicial matters if two conditions are met.³²⁷ First, the judicial conference of the United States needs to find that emergency conditions due to COVID-19 have and will materially affect the functioning of federal courts.³²⁸ Second, the chief judge of the federal district court needs to authorize video teleconferencing.³²⁹ The CARES Act approves of the use of video conferencing for many pretrial and post-conviction proceedings.³³⁰ These proceedings include detention hearings, initial appearances, arraignments, and others.³³¹

³²¹ See generally Lyle Moran, *Will the COVID-19 Pandemic Fundamentally Remake the Legal Industry?*, AM. BAR ASS'N J., (Aug. 1, 2020), <https://www.abajournal.com/magazine/article/will-the-covid-19-pandemic-fundamentally-remake-the-legal-industry> [<https://perma.cc/C72T-FWF7>].

³²² *Impact of COVID-19 on in-Person Proceedings*, JD SUPRA (May 6, 2020), <https://www.jdsupra.com/legalnews/impact-of-covid-19-on-in-person-72279/> [<https://perma.cc/EU8X-2RDG>].

³²³ Meera Gajjar, *SCOTUS Tackles Technology in First Virtual, Livestreamed Oral Argument*, WESTLAW INTELL. PROP. DAILY BRIEFING, May 5, 2020, 2020 WL 2121662.

³²⁴ *Id.*

³²⁵ *CARES Act Overview*, U.S. DEP'T OF THE TREASURY, <https://www.treasury.gov/about/organizational-structure/ig/Pages/cares-overview.aspx> [<https://perma.cc/4TRL-8N5B>].

³²⁶ Coronavirus Aid, Relief, and Economic Security Act (CARES Act), Pub. L. No. 116-136, 134 Stat. 281 (2020).

³²⁷ *Id.* § 15002.

³²⁸ *Id.* § 15002(b)(2)(A).

³²⁹ *Id.*

³³⁰ *Id.* § 15002(b)(1)(A)-(J).

³³¹ *Id.*

Currently, during the COVID-19 pandemic, most courts are conducting virtual hearings through Zoom.³³² Although courts have been using Zoom and other virtual meeting software for a relatively short period, courts and legal professionals have identified some advantages and disadvantages of virtual hearings.³³³

Initially, courts are identifying timing, decreased anxiety and stress, and reduced expenses as advantages to using Zoom over in-person proceedings.³³⁴ Using Zoom helps save time.³³⁵ People do not have to worry about commuting, finding parking, metal detector lines, or the wait time for a case to be called.³³⁶ Virtual proceedings forced the courts to schedule organized and structured hearing appointments, which have gotten rid of many people being in the courtroom at the same time waiting their turn in line, a relatively inefficient process that wastes everyone's time.³³⁷ In addition, individuals other than attorneys are avoiding the anxiety of being in an intimidating courtroom because they are able to stay in a comfortable place while using a platform familiar to them, as most people are familiar with virtual meeting platforms, such as Skype or Facetime.³³⁸ Lastly, parties save money because they do not have to take time off from work, and they save on gas and money for other expenses, like parking and other tolls.³³⁹

Potential negatives of virtual hearings were addressed earlier.³⁴⁰ Courts and the legal profession are now forced to deal with these same issues. Additionally, one of the issues addressed earlier pertained specifically to virtual trials, including the Sixth Amendment right to confront witnesses and due process rights.³⁴¹ It is possible, even after COVID-19, virtual trials in criminal matters will be limited due to criminal defendants' constitutional right to confront witnesses during trial.³⁴² However, defendants can always waive this right and proceed with a virtual trial.³⁴³ Ultimately, it comes down to whether the defendant is willing to give up his or her

³³² Shalini Nangia, Julia A. Perkins & Erika L. Salerno, *The Pros and Cons of Zoom Court Hearings*, NAT'L L. REV. (Sept. 29, 2020), <https://www.natlawreview.com/article/pros-And-cons-zoom-court-hearings> [https://perma.cc/U392-P2YG].

³³³ *Id.*

³³⁴ Alan Peyrouton, *Zoom Was Our Last Resort, but It Can Never Replace Court*, N.J. L.J. (July 13, 2020), <https://www.law.com/njlawjournal/2020/07/13/zoom-was-our-last-resort-but-it-can-never-replace-court/?slreturn=20200829193640> [https://perma.cc/8YSJ-J4KC].

³³⁵ *Id.*

³³⁶ *Id.*

³³⁷ *Id.*

³³⁸ *Id.*

³³⁹ *Id.*

³⁴⁰ *See supra* Part VI.

³⁴¹ *See supra* Part VI.

³⁴² *See* U.S. CONST. amend. VI.

³⁴³ *Cf. Brookhart v. Janis*, 384 U.S. 1, 3-4 (1966) (finding that presence of defendant at trial is optional because defendants may waive their right to Confrontation Clause).

protected constitutional right in exchange for speed and convenience.³⁴⁴ Despite the main issues presented for criminal trials, it seems other areas of law are appropriate candidates for virtual hearings, such as civil cases and criminal pretrial work.³⁴⁵

Some additional issues with virtual proceedings include credibility and confidentiality.³⁴⁶ Credibility has been addressed as an issue because people, especially judges, are unable to view a witness's body language.³⁴⁷ It is hard to judge credibility without seeing a person's shaking hands or other demeanor indicators.³⁴⁸ Likewise, confidentiality is another issue because lawyers, judges, and others are required to keep sensitive information private.³⁴⁹ This means family members should not hear this information, which is difficult when working at home.³⁵⁰ Eventually, these issues will likely be addressed and resolved, and others will likely emerge.

B. *The Use of Technology After the Era of COVID-19*

Although the courts, litigators, and other legal professionals face valid issues with virtual proceedings and the use of technology to carry out proceedings, it seems courts and the legal profession as a whole is embracing virtual technology.³⁵¹ It remains to be seen how courts will change how they operate in the future.³⁵² However, it seems that virtual technology will be an important tool even after the pandemic ends because of its ability to save time and money and provide improved accessibility and convenience for litigants.³⁵³

X. CONCLUSION

Technology sources are growing at an incredible speed.³⁵⁴ With the development in technology, there is no doubt blockchain technology and virtual hearings can provide opportunities and solutions to the legal

³⁴⁴ See generally U.S. CONST. amend. VI.

³⁴⁵ Bridenback, *supra* note 17, at 6.

³⁴⁶ Wendy L. Patrick, *Remote Advocacy: A Silver Lining on the New Abnormal*, PROSECUTOR, July 2020, at 30.

³⁴⁷ *Id.*

³⁴⁸ *Id.*

³⁴⁹ *Id.*

³⁵⁰ *Id.* at 31.

³⁵¹ *State Court Judges Embrace Virtual Hearings as Part of the "New Normal"*, NAT'L CTR. FOR STATE CTS. (April 1, 2020), <https://www.ncsc.org/newsroom/public-health-emergency/newsletters/videoconferencing> [<https://perma.cc/7RU5-NNA2>].

³⁵² *Id.*

³⁵³ *Id.*

³⁵⁴ Bridenback, *supra* note 17, at 22.

system, especially for court proceedings.³⁵⁵ Such solutions include improving efficiency and cost-effectiveness and addressing safety and transportation issues.³⁵⁶

Presently, virtual hearings are becoming more common in court proceedings throughout the United States.³⁵⁷ However, virtual hearings are more common in civil proceedings than criminal proceedings, as civil proceedings are more likely to use virtual hearings throughout the entire case, including trials.³⁵⁸ The courts as a whole, especially in criminal proceedings, must catch up with the times. As virtual hearings are being implemented in courtrooms, the courts need to be cautious and consider defendants' constitutional rights when implementing virtual hearing policies and practices, which may vary depending on the type of case.³⁵⁹

In criminal proceedings, the usage of virtual hearings is more scrutinized than other types of cases.³⁶⁰ This is due to constitutional issues, such as due process, the right to counsel, the right to confront witnesses, and the right to be present.³⁶¹ Although some jurisdictions are more accepting of virtual hearings for first appearances, most jurisdictions are less likely to use virtual hearings in criminal proceedings because of Constitutional rights concerns.³⁶²

As technology continues to develop and the need to improve efficiency and cost-effectiveness in court proceedings increases, virtual hearings will likely become the common method of conducting criminal proceedings up through trial.³⁶³ With this increased use, more guidelines and rules for the incorporation of virtual hearings for all criminal proceedings need to be established.³⁶⁴ Even more, courts will need to make sure use of a virtual hearing in lieu of a physical hearing complies with a defendant's constitutional rights and evidentiary rules.³⁶⁵ Currently, there are jurisdictions using virtual hearings and experiencing success in improving efficiency and cost-effectiveness and addressing safety and transportation issues, without compromising defendant's rights and other legal principles that have been regulating American courts for centuries.³⁶⁶

³⁵⁵ *Id.* at 13.

³⁵⁶ *Id.*

³⁵⁷ *Id.* at 22.

³⁵⁸ *Id.* at 6-7, 23.

³⁵⁹ *See supra* Part VI.B.

³⁶⁰ Bridenbeck, *supra* note 17, at 23.

³⁶¹ *Id.*

³⁶² *Id.* at 4-6.

³⁶³ Graski & Embley, *supra* note 228, at 29.

³⁶⁴ *Id.* at 32.

³⁶⁵ *See supra* Part VI.B.

³⁶⁶ *See, e.g., Virtual Hearings, supra* note 211.

Historically, courts and the legal profession have resisted technology, especially its use to carry out virtual hearings.³⁶⁷ Due to COVID-19, courts and the legal profession were forced to adapt to technological advancements that otherwise would have taken years to accept.³⁶⁸ Virtual court proceedings will likely continue even after COVID-19.³⁶⁹ However, the issues presented with the use of virtual hearings before COVID-19 remain the same, and the courts and legal profession are grappling with them currently.³⁷⁰ Hopefully, the courts, especially the United States Supreme Court, will rule on these issues and provide solutions to them going forward so that these technology advancements can outlive the COVID-19 era.

As a whole, the criminal justice system would benefit from blockchain technology.³⁷¹ Ultimately, blockchain technology, if implemented, could provide the advancement that the legal system needs by increasing efficiency, reducing errors, and allowing more individuals to be able to access the courtroom.³⁷² This would allow the legal system in its entirety to finally be more representative and up to date with the digital age.³⁷³

The day is coming where virtual hearings and the use of blockchain technology will be the expectation, and lawyers and judges need to adapt to uphold and practice legal competency.

³⁶⁷ Palmer, *supra* note 60.

³⁶⁸ *Impact of COVID-19 on In-Person Proceedings*, *supra* note 327.

³⁶⁹ *State Court Judges Embrace Virtual Hearings as Part of the “New Normal”*, *supra* note 358.

³⁷⁰ Nangia et al., *supra* note 337.

³⁷¹ Maldonado, *supra* note 230.

³⁷² *Id.*

³⁷³ Palmer, *supra* note 60.