MASTER THESIS | MASTER'S THESIS

Titel | Title

Technology in international commercial arbitration: policy and practice

verfasst von | submitted by

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angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of

Master of Laws (LL.M.)

Wien | Vienna, 2025

Studienkennzahl lt. Studienblatt | Degree programme code as it appears on the student record sheet:	UA 999 082
Universitätslehrgang lt. Studienblatt | Postgraduate programme as it appears on the student record sheet:	Europäisches und Internationales Wirtschaftsrecht (LL.M.)
Betreut von | Supervisor:	Mag. Dr. Gabriel Lentner

Abstract

In den kommenden Jahren wird Legal Tech die internationale Handelsschiedsgerichtsbarkeit nachhaltig prägen. Globale Ereignisse und technologische Fortschritte haben die Etablierung von Online-Verfahren dramatisch beschleunigt. Mittlerweile gehören E-Filing und Videokonferenzen zum Alltag in der Schiedsverfahrenpraxis. Darüber hinaus eröffnen neue Werkzeuge – von KI-gestützter Dokumentenprüfung bis hin zu blockchain-basierten Streitbeilegungsplattformen – Chancen, das Schiedsverfahren grundlegend neu zu gestalten und zu überdenken.

Die Integration von Technologie in die internationale Handelsschiedsgerichtsbarkeit kann Effizienz, Vertraulichkeit und Fachkompetenz steigern und zugleich Herausforderungen wie wachsende Komplexität und übermäßige Formalität bewältigen. Dafür bedarf es spezialisierter Technologien, die Elemente wie Automatisierung, Barrierefreiheit, nutzerzentrierte Oberflächen und robuste Sicherheitsmaßnahmen vereinen, um eine ethische, sichere und effektive Anwendung zu gewährleisten und gleichzeitig zentrale Grundsätze der Schiedsgerichtsbarkeit zu wahren.

Die Arbeit liefert eine umfassende Bestandsaufnahme des Status quo, beleuchtet die zeitliche Entwicklung der Technologien, kartiert die bereits von führenden Schiedsverfahrenanbietern eingesetzten und getesteten Tools und beleuchtet praxisnahe sowie rechtliche Herausforderungen der Digitalisierung in der internationalen Handelsschiedsgerichtsbarkeit. Dabei werden unter anderem das Fairness-Konzept, die Auswirkungen einer „Hyperregulierung“, die Einhaltung der DSGVO, Durchsetzbarkeitsrisiken und weitere Aspekte analysiert. Zugleich werden Forschungsfelder für die Zukunft aufgezeigt, etwa die rechtlichen Auswirkungen der Blockchain-Technologie in der Handelsschiedsgerichtsbarkeit und weiteres Einsatzpotenzial in der Praxis.

Digitalisierung ist kein isoliertes Phänomen, sondern muss im zeitgenössischen Kontext betrachtet und als Instrument in der Debatte über die generellen Herausforderungen der internationalen Handelsschiedsgerichtsbarkeit verstanden werden.

Abstract

In the incoming years Legal Tech will leave substantial impact on the international commercial arbitration. Global events and technological advancement have dramatically accelerated the adoption of online proceeding. For now, e-filing and videoconferencing is part of normal life in arbitration practice. In addition, new tools, from AI-assisted document review to blockchain-based dispute platforms, are creating opportunities to re-design the arbitration and re-think the arbitration process at a core.

Integration of technology in international commercial arbitration has the potential to enhance efficiency, confidentiality, and expertise while simultaneously addressing challenges such as increasing complexity and excessive formality. For this purpose, arbitration needs specific technology, that must be designed with elements such as automation, accessibility, user-centric interfaces, and robust security measures to ensure its ethical, secure, and effective application while safeguarding core arbitration principles.

Thesis provides an overall assessment on the *status quo*, reflects on the development of the technology in time, maps tools deployed and tested by leading arbitration provider already now and touches upon the practical and legal challenges related to digitalisation in international commercial arbitration. In this regard, concept of fairness, effect of "hyperregulation", compliance with GDPR, risks related to enforceability and other aspects are reflected, *inter alia*, identifying the areas for further research, e.g. legal impact of blockchain technology in international commercial arbitration and further potential for the deployment in practice.

Digitalisation is not a "stand-alone" phenomenon, thus it should be reflected in the contemporary perspective and treated as the instrument in the debate related to the challenges of international commercial arbitration in general.

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Abbreviations

AI: Artificial Intelligence

AAA: American Arbitration Association

CIETAC: China International Economic and Trade Arbitration Commission

CPR: International Institute for Conflict Prevention and Resolution

CIArb: Chartered Institute of Arbitrators

DIAC: Dubai International Arbitration Centre

GDPR: General Data Protection Regulation

ECHR: European Convention on Human Rights

ECtHR: European Court of Human Rights

HKIAC: Hong Kong International Arbitration Centre

IBA: International Bar Association

ICDR: The International Centre for Dispute Resolution

ICC: International Chamber of Commerce

ICCA: International Council for Commercial Arbitration

LCIA: London Court of International Arbitration

ODR: Online Dispute Resolution

SIAC: Singapore International Arbitration Centre

SCC: Stockholm Chamber of Commerce Arbitration Institute

WIPO: Arbitration Center of the World Intellectual Property Organization

UNCITRAL: United Nations Commission on International Trade Law

XR: Extended reality

1. Introduction

Emerging technologies bring a new perspective for creativity and potential to reimagine how disputes could be prevented and resolved. Thus, in the incoming years Legal Tech will leave substantial impact on the arbitration process at all levels (domestic, international commercial and international investment arbitration). International commercial arbitration, that traditionally is associated with physical meetings and paper documents, is going through the digital shift.[1]

Indeed, in recent years, global events and technological advancement have dramatically accelerated the adoption of online arbitration. The COVID-19 pandemic, in particular, forced arbitration providers and practitioners to move proceedings online almost overnight.[2] For now, e-filing, videoconferencing and managing case online is part of normal life in arbitration practice. At the same time, new digital tools, from AI-assisted document review to blockchain-based dispute platforms, are creating opportunities to re-design the arbitration and re-think the arbitration process at a core.

In general, the integration of technology in international commercial arbitration has the potential to enhance efficiency, confidentiality, and expertise while simultaneously addressing challenges such as increasing complexity and excessive formality.[3] However, for this purpose arbitration needs specific technology, that must be designed with elements such as automation, accessibility, user-centric interfaces, and robust security measures to ensure its ethical, secure, and effective application while safeguarding core arbitration principles. In addition, the necessity for well-defined regulatory and policy framework to be considered.

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[1] Petillion F, 'The Future of Arbitration – Identifying Processes That Could Usefully Be Adopted in International Commercial Arbitration' in Jean Engelmayer Kalicki and Mohamed Abdel Raouf (eds), ICCA Congress Series No 20: Evolution and Adaptation: The Future of International Arbitration (Kluwer Arbitration 2018) 769–808 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-icca-congress-20-038-n.

[2] L Chen, 'Will Virtual Hearings Remain in Post-pandemic International Arbitration?' (2024) 37(3) International Journal for the Semiotics of Law - Revue Internationale de Sémiotique Juridique 829–849 https://doi.org/10.1007/s11196-023-10054-7

[3] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

Thus, thesis is focused on the assessment of the *status quo* and future of the technology in arbitration. The particular attention is dedicated to the potential of the technology to further enhance advantaged of the arbitration process (speed, confidentiality, in-depth expertise) and address challenges and recent trends (e.g. increasing complexity and excessive formality, rise of international commercial courts, trend to settle and mediate, trend for the transparency). Particular attention is dedicated to practical aspects and challenges relate to the deployment of the technology and legal framework in this regard.

2. Digitalisation as a trend in international commercial arbitration

Technology as a tool has to serve the core objectives of the contemporary international commercial arbitration, contributing to the efficiency of the process. However, it has also potential to reshape the way how the disputes are resolved, change the overall dynamics and even structure of the disputes, leading to new categories of cases (e.g. disputes related to smart contracts).

Thus, to make the most, it is important to understand how the technology could be integrated, based on key concepts of international commercial arbitration, in light of contemporary trends and in the best way possible addressing the existing challenges.

International commerce continually demands for greater efficiency in dispute resolution. To that end, arbitration must first integrate alternative processes and refine disputes before formal proceedings, particularly in emerging tech and cyberspace.[4] International arbitration must be affordable, fast, relevant and user-friendly. To achieve this, practitioners should collaborate with technologists, in-house counsel and other stakeholders to draft procedural rules that foster innovation without over-regulating. At the same time, arbitral institutions and law schools should train future practitioners in arbitration technology so they are ready for emerging challenges and opportunities.[5]

[4] Petillion F, 'The Future of Arbitration – Identifying Processes That Could Usefully Be Adopted in International Commercial Arbitration' in Jean Engelmayer Kalicki and Mohamed Abdel Raouf (eds), ICCA Congress Series No 20: Evolution and Adaptation: The Future of International Arbitration (Kluwer Arbitration 2018) 769–808 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-icca-congress-20-038-n.

[5] Makhani AK, Nappert S and others, 'Chapter 3: Technology in International Arbitration: Yesterday, Today and Tomorrow' in Ben Beaumont, Alexis Foucard and others (eds), *International Arbitration: Quo Vadis?* (Kluwer

2.1. Scope and key concepts of international commercial arbitration

In order to reflect on the contemporary trends and digitalisation further, the scope, definition and key concepts of international commercial arbitration in the framework of the thesis defined according to UNCITRAL Model Law on International Commercial Arbitration.[6] In particular, focusing on the Articles 1 and 2 of the Model Law, that provides the scope of application, describes the elements related to "internationality" and reflects upon institutional framework the arbitration is administrated by. [7]

According to Article 2(a) of Model Law arbitration could be "or not" administrated by permanent arbitral institution, thus, distinguishing: (i) institutional arbitration and (ii) *ad hoc* arbitration.[8] Institutional arbitration is referred when parties' choice to arbitrate in accordance to the rules of a particular institution (arbitration provider), e.g. ICC or the LCIA. In this case, the institution will provide infrastructure, rules and manage the arbitration as a whole, including setting up and selecting the tribunal. *Ad hoc* arbitration takes place without the assistance of particular formal institution. In the framework of the thesis the use of the technology is addresses primarily in the context of institutional arbitration, however not excluding that the same principles could be applied also in relation to *ad hoc* setting.

In addition, Model Law sets the number of core concepts for international commercial arbitration:

Arbitration 2022) 23–50 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-beaumount-2022-ch03.

[6] UNCITRAL, Model Law on International Commercial Arbitration (UNCITRAL 1985, as amended 2006) UN Doc A/40/17, Annex I.

[7] Under UNCITRAL Model Law on International Commercial Arbitration *the term "commercial" should be given a wide interpretation so as to cover matters arising from all relationships of a commercial nature, whether contractual or not. Relationships of a commercial nature include, but are not limited to, the following transactions: any trade transaction for the supply or exchange of goods or services; distribution agreement; commercial representation or agency; factoring; leasing; construction of works; consulting; engineering; licensing; investment; financing; banking; insurance; exploitation agreement or concession; joint venture and other forms of industrial or business cooperation; carriage of goods or passengers by air, sea, rail or road.*

[8] Geoff Nicholas and Briana Young, *'Global overview: An introduction to international commercial arbitration – key concepts, trends and features'* in JW Rowley (ed), *Arbitration World: Jurisdictional Comparisons* (2nd edn, The European Lawyer Ltd 2006).

(i) Provides definition of arbitration agreement, requiring it to be in writing, ensuring clear, mutual consent to arbitrate, reflecting on party autonomy in choosing to resolve disputes outside the court; [9]

(ii) Defines jurisdiction of the tribunal *(kompetenz-kompetenz)*: one of the unique aspects is that the arbitral tribunal has the authority to decide on its own jurisdiction. This means that the tribunal can decide, even on objections brought before a court, whether it is the proper forum to hear the dispute. This principle helps avoid delays and reinforces the finality of the arbitration process; [10]

(iii) Provides guidance on composition and appointment of tribunal: the Model Law allows parties significant freedom in selecting the arbitrators. It sets out procedures for the appointment of arbitrators in cases of disagreement (for example, by empowering courts or appointing authorities). The emphasis is on ensuring that arbitrators are independent and impartial, that is essential in the dispute resolution process;[11]

(iv) Defines principles of arbitration proceedings: the Model Law establishes general principles for the arbitration proceedings while leaving many specific aspects to the parties' agreement. This flexibility allows to adapt to the needs of different disputes, such as choosing the language of arbitration and the applicable procedural rules, thus streamlining the dispute resolution process;[12]

(v) Defines role of national courts: courts are generally expected to support the arbitration process rather than interfere with it. Assistance is limited to specific functions: enforcement of interim measures, support in the appointment of arbitrators in case of disagreement between the parties, or for the preservation of evidence. Judicial intervention is reserved for narrowly defined circumstances, such as challenges to the legitimacy of the arbitration agreement or issues of public policy;[13]

(vi) Interim measures and preliminary orders: amendments made in 2006 expanded the Model Law's provisions regarding interim measures. Arbitrators (and, in some cases, courts) can grant interim measures to preserve assets, maintain the *status quo*, or secure

[9] UNCITRAL, Model Law on International Commercial Arbitration (UNCITRAL 1985, as amended 2006) UN Doc A/40/17, Annex I., Chapter II, Articles 7-9
[10] Ibid., Chapter IV, Article 16
[11] Ibid., Chapter III, Articles 10-15
[12] Ibid., Chapter V, Articles 18-27
[13] Ibid., e.g. Articles 3(2), 5, 6, 8, 9, 11(3), 11(5), 13(3) and other

evidence, ensuring that the arbitration process is both fair and effective despite any potential asymmetries in power between the parties.[14]

(vii) Finality, recognition, and enforcement of arbitral awards: once an arbitration award has been rendered, it is intended to be final and binding. The Model Law provides a framework for the recognition and enforcement of these awards in national courts, thereby limiting further judicial review to exceptional cases (such as when enforcing the award would contravene public policy).[15] This aspect is central to the appeal of arbitration as a dispute resolution mechanism, particularly in an international context.

The key concepts of international commercial arbitration defined by Model Law to be further reflected in light of digitalisation of international commercial arbitration.

Besides the fact that the Model Law to the large extent frames the international commercial arbitration, as the traditional dispute resolution way, arbitration is evolving in light of contemporary challenges and trends. Technological impact, that is in the focus of this thesis, potentially could be the most transforming factor now and in the incoming years. However, there are number of other challenges and trends, that has to be mentioned.

The other trends, leaving impact on the future of arbitration, addressed in the literature and debate are: (i) rise of international commercial courts as the alternative to arbitration; (ii) increasing interest to mediate and settle; (iii) trend for the transparency.

Availability of funding from third-party financial entities for arbitration is also one of the aspects to bring change and will continue to significantly influence international commercial arbitration, introducing both opportunities and challenges. Third-part funding has a positive impact on access to justice. It allows parties with limited financial resources to pursue arbitration. However, it also requires risk management and is subject to disclosure requirements, as many jurisdictions and arbitral institutions require parties to disclose third-party funding arrangements to address potential conflicts of interest and ensure transparency.

[14] Ibid., Chapter IV, Article 17 and subsequent
[15] Ibid., Chapter VIII, Articles 35 and 36

Among the challenges mentioned in the current debate related to international commercial arbitration are the costs and delays, leading to "judicialization" of the arbitration process.[16] Encroaching judicialization of arbitration is often perceived as a threat as is contrary to the philosophy and advantages of the arbitration process.[17] Arbitration today is only getting more judicial - thanks to the near-universal adoption of the Model Law and widespread requirements for reasoned awards. To speed up and simplify reason - giving, parties should share data on recurring issues and embrace arbitration's quasi-judicial character by building a common international framework. Over time, this could make proceedings more predictable, less complex and "maybe one day even drop the "A" from ADR".[18]

2.1.1. Increasing complexity and excessive formality

Increasing complexity (in relation to cases and proceeding as such) and excessive formality are mentioned as one of major challenges describing the evolution of domestic and international commercial arbitration.

In general the excessive formality described by the following factors: (i) increased complexity of the procedural rules applied by arbitral institutions; (ii) the reluctance of arbitral tribunals to depart from strictly applying these rules, for fear of endangering the validity and enforceability of an award (thus, to some extent limiting autonomy of the parties); (iii) the greater involvement of lawyers, who tend toward being predisposed to formalized proceedings; and (iv) the lack of an appeal process, placing additional stress on both counsel and arbitrators to ensure that the "right" result is achieved even if this costs disproportionate time and money.[19]

The complexity of cases is increasing also based on the amount of information and evidence produced in light of the technological development and ability to access information. The

[16] George A. Bermann, The Future of International Commercial Arbitration, Cambridge University Press, 2021, available at: https://scholarship.law.columbia.edu/faculty_scholarship/3305
[17] Petillion F, 'The Future of Arbitration – Identifying Processes That Could Usefully Be Adopted in International Commercial Arbitration' in Jean Engelmayer Kalicki and Mohamed Abdel Raouf (eds), ICCA Congress Series No 20: Evolution and Adaptation: The Future of International Arbitration (Kluwer Arbitration 2018) 769–808 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-icca-congress-20-038-n.
[18] Ibid.
[19] George A. Bermann, The Future of International Commercial Arbitration, Cambridge University Press, 2021, available at: https://scholarship.law.columbia.edu/faculty_scholarship/3305

mentioned could significantly increase the overall length of the proceeding. Technology could help to address complexity in this context. Using e-discovery tools allows for the efficient management of the large number of documents and data, simplifying the task to identify the right evidence.[20]

Arbitration providers are focusing on the solutions to expedite proceedings such as introducing institutional rules to "fast track" proceeding[21] and guidelines to simplify dealing with evidence (e.g. Prague Rules).[22] Rules of arbitration tribunals provide for case management conferences, timeframes related to each step of the proceeding, as well as promotes settlement. This makes arbitration in general similar and closer to litigation as the same measures are in place with the objective to support efficiency of national courts. Technology could be especially supportive in this regard.

Overall increasing complexity of regulatory framework also to be mentioned, for example, the impact of the EU General Data Protection Regulation (GDPR) [23] (that *inter alia* has an external effect). In the context of arbitration, nearly every participant - parties, counsels, experts, arbitral institutions, or arbitrators – likely to be regarded as a "data controller". This is due to their role in determining the purpose and means of processing personal data as part of their functions. Additionally, counsel, institutions, and tribunals may also act as "data processors" when transmitting files or evidence on behalf of a controller. If even one arbitrator or party is subject to GDPR compliance, it's highly probable that the entire arbitral proceeding will be influenced by GDPR regulations. This could involve obligations such as secure data handling, adherence to data subject rights, and ensuring confidentiality - all while maintaining the efficiency and integrity of the arbitration process.

[20] M Sundaresh, 'The complexification of disputes in the digital age' (2022) 30(1) *Asia Pacific Law Review* 1
[21] E.g. ICC Expedited Procedure Provisions, rules of HKIAC and SIAC and other arbitration providers
[22] "Rules on the Efficient Conduct of Proceedings in International Arbitration," introduced on December 14, 2018. Aim to streamline arbitration proceedings by encouraging a more proactive role for arbitral tribunals, particularly in managing cases and evidence. These rules are often seen as an alternative to the more common International Bar Association Rules on the Taking of Evidence in International Arbitration, offering a civil law approach to arbitration procedures. Available at: https://praguerules.com
[23] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) [2016] OJ L 119/1

Need for GDPR compliance encourage institutions to deploy more secure ICT solutions and introduce appropriate communication methods. GDPR compliant data controlling and processing is an ongoing activity, starting before an arbitration proceeding, continuing during the proceeding and when the proceeding has ended.[24] The main issues are related to processing evidence containing personal data, whereas issues faced by arbitral institutions include transfer of arbitral data between its entities, storage and archival of personal data once the purpose of processing is complete.[25]

It is admitted that online arbitration has the potential to provide less formal setting for dispute resolution. Digital methods have gained wide acceptance despite globalization makes disputes more complex and raise more third-party interests. E.g. around 40% of arbitrations worldwide involving multiple parties, multi-party dispute-resolution mechanisms have become increasingly important.[26] Consensual philosophy of arbitration limits its ability to handle multi-party disputes. Digitalisation has streamlined proceedings and broadened access for complex, multi-party cases, yet it does not overcome the need for all involved consent. Globalisation has diversified corporate structures and dispute patterns, leading to more multi-party arbitrations. While online arbitration and other digital tools reshape dispute resolution, joinder practices challenge core principles of consent, privacy and confidentiality inherent in traditional bilateral arbitration.[27]

2.1.2. Rise of international commercial courts

As the trend with the objective to provide the alternative to international commercial arbitration the rise of international commercial courts integrated in the national judicial systems to be mentioned. This type of specialized courts is established as to some extent being the competitors

[24] Petillion F and Janssen J, 'Deel 2. Buitengerechtelijke geschillenbeslechting, Titel II. GDPR in Arbitration. A Guide to GDPR Compliant Data Controlling and Processing in National and International Commercial Arbitration' in Charlotte De Muynck, Alexander Hansebout and others (eds), Arbitrage, Bemiddeling en Andere Vormen van Conflictafhandeling: Vandaag en Morgen (Kluwer Arbitration 2024) 71–107 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-goister-2024-ch04.
[25] Ramani GN, 'One Size Doesn't Fit All: The General Data Protection Regulation Vis-à-Vis International Commercial Arbitration' in William W Park (ed), Arbitration International (Kluwer Arbitration 2021) 613–630 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ai-2021-03-003.
[26] Wang, J. (2024). Joinder Mechanism in International Commercial Arbitration: A Trend in the Digital Age? *International Journal for the Semiotics of Law = Revue Internationale de Sémiotique Juridique*, *37*(3), 923–942. https://doi.org/10.1007/s11196-023-10068-1
[27] Ibid.

for the leading arbitration providers globally and with the objective to promote investment at the national level. These courts serve as instruments of soft power, aiming to enhance jurisdictional influence, and build new legal hubs.[28]

There are number of examples of such entities, e.g. Brussels International Business Court, Paris Commercial Court and Court of Appeal, several institutions in Germany (special chambers at regional courts in Frankfurt and Hamburg), Netherlands Commercial Court, Zurich International Commercial Court, London Commercial Court. Also, China, Qatar, Singapore and UAE have established international commercial courts. They are designed to handle complex commercial cases with participation of highly specialized judges, using English as the working language, and providing the opportunities for streamlined procedures.

Unlike arbitration, international commercial courts operate within a national judicial framework, providing greater transparency and the possibility of appeal. However, they address some criticisms, such as high costs, procedural delays, and the main - limited enforcement. Thus, arbitration likely to remain favored for its confidentiality, flexibility, and enforceability under the New York Convention.[29] As the decisions by these entities are not subject to the enforceability under the New Youk Convention, questions concerning international commercial courts include the enforcement of the parties' forum selection clause in favor of an international commercial court and enforcement of the resulting judgments. The Hague Choice of Court Convention aims to enhance the mobility of judgments in international civil and commercial matters by ensuring the recognition and enforcement of judgments based on exclusive choice of court agreements. The Convention establishes uniform rules for jurisdiction and the recognition of judgments, similar to the New York Convention for arbitration, however it is much less popular and for the moment only few countries have ratified it.

[28] Gu W and Tam J 'The Global Rise of International Commercial Courts: Typology and Power Dynamics' (2021) 22 Chicago Journal of International Law 443

[29] Convention on the Recognition and Enforcement of Arbitral Awards (1958 New York Convention), https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/new-york-convention-e.pdf.

2.1.3. Priority to settle and mediation as an alternative

There is growing trend of settlement agreements with an estimated 20-30% of arbitration cases being resolved through settlements. Many arbitration providers are in the position to formalize such agreements in the form of consent awards, which are enforceable under national arbitration laws.[30]

However, settlement agreements not issued as awards have certain limitations. Although they are final, binding, and can serve as a defense on the merits in subsequent proceedings, they do not have the *res judicata* effect of an arbitral award. This means they may not prevent the re-litigation of the same issues in a future dispute. As settlement agreements become more common, the importance of understanding their legal and procedural implications continues to grow.

Hybrid dispute resolution mechanisms are becoming more popular, with mediation emerging as a key alternative or a supplement to international commercial arbitration.[31] The adoption of the Singapore Mediation Convention, which facilitates the enforcement of settlement agreements resulting from mediation, has further encouraged the growth of such mechanisms. Among the most popular is Mediation-Arbitration ("Med-Arb"), where a neutral party initially acts as a mediator. If mediation does not resolve the dispute, the same individual transitions to the role of arbitrator to render a binding decision. These hybrid approaches aim to combine the benefits of mediation's flexibility with arbitration's finality, offering parties an efficient and adaptable means of resolving disputes.[32]

[30] George A. Bermann, The Future of International Commercial Arbitration, Cambridge University Press, 2021, available at: https://scholarship.law.columbia.edu/faculty_scholarship/3305
[31] Kateryna Honcharenko, Mercy McBrayer, Andrew Miller QC, Gordon Nardell QC, Christopher To and Wolf von Kumberg, 'CIArb Professional Practice Guideline on the Use of Mediation in Arbitration' (Chartered Institute of Arbitrators 2021)
[32] George A. Bermann, The Future of International Commercial Arbitration, Cambridge University Press, 2021, available at: https://scholarship.law.columbia.edu/faculty_scholarship/3305

2.1.4. Trend for the transparency

Transparency in arbitration has become increasingly significant.[33] Over the time arbitral institutions have adopted diverse approaches to confidentiality, but a growing shift towards transparency is evident.[34]

For a year's confidentiality has been among the major advantages of arbitration process *verso* traditional litigation: "As a rule, persons enter into these contracts with the express view of keeping their quarrels from the public eyes, and of avoiding that discussion in public, which must be a painful one, and which might be an injury even to the successful party to the litigation, and most surely would be to the unsuccessful."[35] There might be a strong argument to keep process confidential with the objective to protect financial and business interests (including reputational issues) in international commercial arbitration. And in general, in international commercial arbitration, it is more the question of the party autonomy.[36]

However, transparency in arbitration proceedings is an evolving topic and growing demand for greater transparency in the arbitration process is associated with fairness and trust.

For example: (i) some arbitration institutions have started publishing anonymized versions of arbitration awards. This helps to build a body of case law and provides insight into decision-making processes without disclosing sensitive details; (ii) while arbitration hearings are typically private, some institutions or specific cases may allow for open hearings; (iii) arbitrators are generally required to disclose any potential conflicts of interest. Transparency in this area ensures that parties can challenge an arbitrator's appointment if there are valid concerns about impartiality; (iv) different arbitration institutions have their own rules regarding transparency.

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[33] Y Zhao and Y Chen, 'The Evolving Lex Mercatoria: a Game-Changer for Transparency in International Commercial Arbitration' (2025) 16 Journal of International Dispute Settlement <https://doi.org/10.1093/jnlids/idaf029> accessed 12 July 2025

[34] D Okoko, 'Confidentiality and Transparency in Arbitration: Striking a Balance' (JICAM – Centre for Arbitration & Mediation, 30 January 2022) <https://jicam.org/confidentiality-and-transparency-in-arbitration-striking-a-balance/> accessed 12 July 2025

[35] "Confidentiality in International Arbitration: Contractual Agreement and Institution Rules", 2023, available at: https://www.clydeco.com/en/insights/2023/05/confidentiality-in-international-arbitration-contr

[36] Bungenberg, M. & Alvarado Garzón, A. E. (2019). One Size Fits All? Transparency in Investment and Commercial Arbitration. Balkan Yearbook of European and International Law 2019, 1–22.

For example, the ICC and LCIA have specific provisions that promote transparency; (v) in cases involving public entities or significant public interest, there is often a push for greater transparency. This can include publishing procedural orders, submissions, and other documents; (vi) the rise of virtual hearings and digital platforms has also brought new opportunities for enhancing transparency both in litigation and arbitration. For instance, digital platforms can provide secure and transparent access to case documents for all parties involved.

From the perspective of building the practices and body on case law, it could be positive, if the decisions or some of them could be published in the publicly available databases.[37] In 2022 we saw some major changes to the transparency regime in international arbitration, however there is still no consensus on the subject. Major arbitral institutions such as the LCIA, SIAC, HKIAC, DIAC and SCC continue to have the default position that arbitration awards and other documents are to be kept confidential unless the parties agree to their publication.[38]

2.2. Technology in arbitration: scope, objectives and opportunities

In order to dive into the legal and practical challenges related to the deployment of the technology in arbitration process, further the different types of the technology are reflected, as well as objectives and opportunities stressed in the literature are mapped.

It is obvious that, technologies, from online case filing and electronic evidence collection to remote hearings and AI application, are not merely tools for efficiency but are driving power for establishing a new long - lasting standard in dispute resolution.[39] The changes initiated by COVID-19 pandemic reshaped global dispute resolution, especially the arbitration system, new framework is expected to become the standard.[40]

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[37] Some of the decisions are available in *Jus Mundi* data base: https://jusmundi.com/en

[38] "Drive towards greater transparency", Freshfields, 2023, available at: https://www.freshfields.us/insights/campaigns/international-arbitration-in-2023/drive-towards-greater-transparency/

[39] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

[40] M Łągiewska, 'The New Landscape of Arbitration in View of Digitalization' in Shaheeza Lalani and Steven G Shapiro (eds), *The Impact of Covid on International Disputes* (International and Comparative Business Law and Public Policy, vol 2, Leiden-Boston 2022) 208.

Legal technology in arbitration has reached a moment, as technologists, practitioners, and policy-makers are coming together in the discussion. This alignment offers three key opportunities: cutting costs and time, harmonizing diverse global tech practices, and collaborating with litigation and dispute-resolution experts to refine legal framework. Though individual adopters face risks and uncertainties, collective efforts to modernize arbitration are both timely and worthwhile.[41]

2.2.1. Scoping technology

Implementation of the technology in international commercial arbitration is focused on: (i) further development of online arbitration, including remote communication, e-filing and digital case management; (ii) integration of emerging technologies, such as AI, data analytics for efficiency and research purposes, blockchain technology, potentially extended reality (XR) and virtual reality. In addition, technology is supporting not only case management, but also management of the tribunal, arbitration providers.

In order to adapt to the evolving dynamics, arbitration providers, arbitrators and counsels actively embrace the possibilities offered by emerging technological tools. However, it is important to approach these opportunities provided in the framework of the prompt technological development carefully, choosing the right technology for the context and parties in arbitration and introducing the design approaches in dispute resolution.[42] *Inter alia*, with the broader implementation of technology also cybersecurity becomes an issue in international arbitration.

Online courts operate on two levels. On one hand, they involve human judges or arbitrator deciding cases entirely online, eliminating the need for physical courtrooms. On the other hand, the broader concept of online courts incorporates technology not only to assist judges with decision-making but also to equip users with digital tools that enhance their understanding of the law, help them

[41] Montoya Zorrilla E, 'Towards a Credible Future: Uses of Technology in International Commercial Arbitration' in Jörg Risse, Guenter Pickrahn and others (eds), SchiedsVZ | German Arbitration Journal (Kluwer Arbitration 2018) 106–114 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-schiedsvz-2018-02-005-n.
[42] Amy Schmitz, "Picking the Proper Technological Tool for Problem Solving in Arbitration," in Maud Piers and Sean McCarthy, eds. TRANSFORMING ARBITRATION, Radboud University Press, 2025

formulate arguments, and facilitate evidence collection. Additionally, AI can be employed both as a tool and as a methodological technique within court proceedings.[43]

While online courts and the integration of AI in dispute resolution offer notable advantages, many practitioners and scholars remain skeptical due to a traditionally conservative, risk-averse approach. Moreover, the compulsory adoption of digital technologies can potentially compromise a party's right to present its case fairly and on equal terms. Nevertheless, despite early reservations, the adoption of innovative technologies and the ongoing digital transformation in international dispute resolution - particularly within international arbitration - has become increasingly widespread.[44]

It should be also mentioned that there is strong push at the policy level to digitalise civil justice system (traditional litigation). However, since arbitration is largely a private dispute resolution mechanism, there is no direct pressure and policy for digitalisation. Pandemic drove some digitalisation by necessity, primarily with the move to virtual hearings, recent creation of online platforms and processes for case handling. Thus, most probably we will see the technological advancement in arbitration arena in light of the "change from the bottom up", responding to the interests and needs of parties, rather than the pressure at the policy level.

There are number of objectives and opportunities to be mentioned, potentially provided by the deployment of different technological tools.

2.2.2. Efficiency, costs and enhanced access

At first, efficiency and cost saving, are one of the clearest advantages as traditionally international commercial arbitration is associated with great travel and logistical expenses.[45]

[43] Richard Susskind, *Online Courts and the Future of Justice* (Oxford University Press 2019) 3–4.
[44] Wiliam Brillat-Capello, Laura Canet and Gillian Carmichael Lemaire, 'Paperless Arbitration: The New Trend' (2020) 7(2) International Journal of Online Dispute Resolution 186.
[45] IBANET, *'Clint – September 2022 Feature'* (September 2022) https://www.ibanet.org/clint-september-2022-feature-5 accessed 4 June 2025.

Online arbitration lowers barriers to participation in the justice process, that leads to enhanced access and inclusivity. Parties who might otherwise be unable to pursue a claim, for instance, a small business that cannot afford to litigate abroad - may find online arbitration feasible.

Flexibility means that relatively smaller value disputes or parties with limited resources can still engage in international arbitration. This is evident in initiatives like the APEC ODR Platform, that is focused on micro, small and medium enterprises (MSMEs) involved in cross-border B2B disputes. Under a collaborative framework, APEC's online platform enables a three-stage process (negotiation, mediation, then arbitration) that is conducted entirely online for low-value disputes.[46] Example of CIETAC is one among the first to implement online option under APEC initiative, providing quick, inexpensive resolution for businesses that would otherwise be in the position of limited recourse.[47]

Experience of the domain name dispute system (UDRP) administered by WIPO is also among successful initiatives and it has handled over 60,000 cases online (involving 110,000+ domain names) with parties from 185 countries.[48] With online arbitration, we may see analogous growth in areas like e-commerce buyer-seller disputes, franchise disputes, or other high-volume commercial conflicts that can be algorithmically handled up to a certain point and finalized by arbitrators. International commercial arbitration is no longer focused only on high value claims as it is traditionally associated with, but also potentially becomes accessible to lower value disputes.

In line with these examples, technology has the potential to support the communication with major arbitration provides such as ICC, LCIA and others.

In general, number of cross-border disputes is increasing, strengthening attractiveness of arbitration. New information and communication technologies reshape how parties and arbitrators operate, but their adoption demands a solid, "no-harm" risk-management approach. Overall,

[46] APEC, *'Overview'* (no date) https://www.apec.org/SELI/Overview accessed 4 June 2025.
[47] Fei Lu, *'EN Overview of Dispute Resolution in the Digital Environment i China'* (2024) https://jusmundi.com/en/document/publication/en-overview-of-dispute-resolution-in-the-digital-environment-in-china accessed 4 June 2025.
[48] WIPO, *'WIPO Caseload Summary'* (2025) https://www.wipo.int/amc/en/center/caseload.html accessed 4 June 2025.

digitizing arbitration modernizes the process - enhancing efficiency, overcoming travel and distancing hurdles, and saving both time and money. [49]

2.2.3. Procedural advantages: neutrality and balance, broader pool of experts

Online arbitration has the potential to support perceptions of neutrality. Parties no longer need to decide on the neutral place of arbitration - the hearing taking place in a virtual space is equally accessible to both.

Removing the psychological advantage of hosting a hearing in one of the parties' locations (and the related travel inconveniences imposed on the other) can make both sides feel the process is more balanced. This is particularly relevant in international cases with parties from different continents: rather than traveling over Paris to Singapore for hearings, the answer might be "both parties join by Zoom from their offices." As noted in the IBA analysis, a neutral virtual venue helps ensure parties *"perceive [the process] to be"* fair and avoids any sense of a home-court advantage.[50]

Moreover, greater scheduling flexibility means tribunals can accommodate personal constraints, leading to a less pressured, more considerate process. Parties can have their CEO or expert witness dial in just for their slot rather than take a week out to travel, which makes it easier for key decision-makers to be involved in the hearing when needed.

In an online setting, geography is no barrier to choosing arbitrators, counsel, or experts. This opens opportunities to increase diversity and the quality of decision-making.[51] Parties can appoint the best-suited arbitrator for the case regardless of where that arbitrator is located. An arbitrator in Sao Paulo can just as easily preside over a case with parties in London and Tokyo as an arbitrator based

[49] E Kupchina, 'Implementation of the digital agenda by international commercial arbitrations' (2021) 106 SHS Web of Conferences 2011 https://doi.org/10.1051/shsconf/202110602011

[50] IBANET, *'Clint – September 2022 Feature'* (September 2022) https://www.ibanet.org/clint-september-2022-feature-5 accessed 4 June 2025.

[51] Boris Kasolowsky, Noiana Marigo, Ashley Jones, *International Arbitration in 2023* (2023) https://www.freshfields.com/globalassets/our-thinking/campaigns/international-arbitration-in-2023/international-arbitration-in-2023.pdf accessed 4 June 2025.

in a “central” location. Similarly, expert witnesses (e.g. engineer or an accountant) who might not have been able to attend in person can now be enlisted from anywhere in the world.

This “global talent pool” effect could enhance merit-based selection of arbitrators and also advance diversity goals (as more female or younger arbitrators from various regions can participate without constraints). Some commentators note this as an opportunity to give arbitrators from developing jurisdictions more cases, since parties may be more willing to nominate someone who will participate remotely rather than incur costs for arbitrator to travel. The Equal Representation in Arbitration Pledge and other diversity initiatives stand to benefit from the reduced emphasis on physical locale, focusing the choice on qualifications and availability.[52]

Online arbitration has driven innovation in procedure and case management in general. For instance, the use of shared electronic hearing files with hyperlinks has made it much faster to locate evidence during examinations. Conducting procedural conferences via Zoom or phone, which now is firmly established is significantly saving time for minor applications or status updates. The “tech toolbox” of arbitration is expanding, and as practitioners become comfortable with new tools (like AI transcript search or real-time digital transcript review), these tools will become standard, boosting efficiency and productivity.[53]

2.2.4. New categories of disputes

These innovations also enable arbitration to focus on new market segments. Notably, several legal systems have already emphasized efficiency and cost control as key priorities in arbitration. Moreover, the rapid technology - driven advancements are likely to generate new and complex disputes, either due to the unique characteristics of the technology itself or in light of lack of regulations addressing these issues.[54]

Online processes make it possible to resolve disputes that were previously hard to arbitrate due to practical constraints. One example is mass, small-value cases: if a company faces thousands of

[52] Ibid.
[53] Raoul J.Renard, Kluwer Arbitration, *'2023 Year in Review: Technology'* (22 January 2024) https://arbitrationblog.kluwerarbitration.com/2024/01/22/2023-year-in-review-technology/ accessed 4 June 2025.
[54] F U Soares, 'New Technologies and Arbitration' (2018) 7(1) *Indian Journal of Arbitration Law* 84–85.

similar small claims globally, coordinating in-person hearings for each would be impossible, but online arbitration (potentially with automated flows) can manage a high volume. Another example is disputes in high-tech sectors - smart contract and blockchain related disputes, that are the growing trend.

With the support of the technology, arbitration stays relevant to digital commerce. Thus, specialized online arbitration services are emerging (e.g. platforms specifically for resolving software licensing disputes or influencer contract disputes) which extend arbitration's reach. These represent an opportunity for the arbitral community to innovate tailored dispute resolution mechanisms for various industries, often leveraging a mix of mediation-arbitration (Med-Arb) that can be conducted remotely for better user convenience.[55]

It should be also mentioned, that pandemic generated new kind of disputes with the need to expand access to online means for resolving these disputes.[56]

2.2.5. Environmental benefits ("Green arbitration")

Going online significantly reduces the carbon footprint of international arbitration. Arbitrations can involve dozens of long flights (for counsel, witnesses, experts) and extensive printing of documents.

By introducing virtual meetings and electronic bundles, the environmental impact is lowered. This has become a conscious goal under the Campaign for Greener Arbitrations - a movement launched in 2019 that advocates steps like avoiding unnecessary travel and embracing virtual hearings to make arbitration more sustainable.[57] The pandemic gave this campaign a boost by proving how much travel and paper could be avoided. As companies look to reduce emissions, virtual arbitration can contribute to corporate ESG goals, making it an attractive option.

[55] Matthew Finn, *'Remaining the dispute resolution epicentre:is Med-Arb '* (2021) https://www.ibanet.org/article/DB14C573-6EAA-4540-B1EA-5C7A2F0BCD94 accessed 4 June 2025.
[56] Amy Schmitz, "Picking the Proper Technological Tool for Problem Solving in Arbitration," in Maud Piers and Sean McCarthy, eds. TRANSFORMING ARBITRATION, Radboud University Press, 2025
[57] See: https://www.greenerarbitrations.com/

2.3. Case study: technology in ICC and SCC

Both institutions ICC and SCC is highly encouraging parties to submit their application files electronically, thus actively promoting the online filing of cases.

ICC as one of the leading arbitration providers globally as many other arbitration institutions and specialized commercial courts is now integrating online procedures. ICC is not only focusing on integration of the technology in dispute resolution services but are also embracing digital tools to manage and streamline arbitration processes. These innovations include online case management systems, electronic filing of documents, and virtual hearings, which help ensure that international commercial disputes are resolved efficiently, even when the parties are spread across different continents.

ICC started deployment of the technology already decades ago, in 2004 ICC defined the framework by issuing guidelines on integrating information technology into arbitration processes. In 2005 ICC introduced the NetCase system. Platform allowed both - monitoring the online arbitration process and communication online. The system was replaced by ICC Case Connect in October 2022.

The ICC Case Connect is recognized as a secure online case management system designed to connect the parties, arbitral tribunals, and the ICC Secretariat. Its primary purpose is to streamline communication and facilitate document sharing throughout the arbitration process. The system is currently used to manage cases registered as of October 2022. Importantly, both the parties and the arbitral tribunals have the discretion to decide the extent to which they rely on this free-of-charge platform. Although ICC Case Connect is primarily intended for handling new cases submitted to the tribunal, there are exceptions. In particular, the platform may be employed when: (i) the case file has not yet been transferred to the arbitral tribunal; (ii) all parties involved agree to its usage; or (iii) its use provides a clear benefit to the proceedings.[58] It is launched as a secure

[58] File your Request via ICC Case Connect, "ICC International Court of Arbitration", https://iccwbo.org/dispute-resolution-services/arbitration/file-your-request-via-icc-case-connect/#case-before-2022. Accessed on 6 June 2025.

online case management system designed to enhance efficiency by facilitating communication and document exchange among arbitrators, parties, and the ICC Secretariat.[59]

Digital Case Management System is introduced, when ICC deploys advanced digital platform aimed at streamlining the administrative aspects of arbitration. System facilitates the secure exchange of documents, scheduling of hearings, tracking submissions, and overall case management. By integrating such technologies, the ICC reduces delays and administrative burden, allowing parties and arbitrators to focus more on the merits of the case rather than on technical aspects.[60]

In response to evolving global dynamics, the ICC now offers virtual and hybrid hearings, leveraging videoconferencing and related digital tools to conduct proceedings entirely online or in a hybrid remote/in-person format. By reducing travel time and expenses and enabling participation across multiple jurisdictions, these platforms keep the arbitration process both efficient and broadly accessible.[61]

The ICC now supports a fully digital workflow for filing and exchanging submissions, witness statements and documentary evidence through its secure platform. By uploading key documents and communications online, parties benefit from faster case preparation, transparency, reduction in the time and cost. This paperless approach is especially beneficial in international disputes, where managing physical bundles across multiple jurisdictions can be both cumbersome and slow.[62]

Comprehensive cyber security measures to protect the confidentiality and integrity of the arbitration process are also implemented. Secure communication channels established, compliance with data protection regulation ensured, and specific protocols to manage any potential

[59] Samaa Haridi, Innovation in arbitration: The technological revolution in dispute resolution, 2024, available at: https://www.ibanet.org/innovation-in-arbitration-the-technological-revolution
[60] ICC, *'ICC Arbitration and ADR Commission Report on Leveraging Technology for Fair, Effective and Efficient International Arbitration Proceedings'* (18 February 2022) https://iccwbo.org/news-publications/arbitration-adr-rules-and-tools/icc-arbitration-and-adr-commission-report-on-leveraging-technology-for-fair-effective-and-efficient-international-arbitration-proceedings/ accessed 4 June 2025.
[61] Ibid.
[62] Ibid.

cybersecurity breaches has putted in place. Such measures are essential with the objective to protect confidential information and maintain confidence in the digital aspects of arbitration.[63]

Recognizing that new technology can also introduce challenges, such as potential digital divides in parties' technological capabilities, ICC has developed guidance and best practice protocols. These guidelines assist arbitrators and parties in adopting technology responsibly, ensuring fairness throughout the proceedings.[64]

The Stockholm Chamber of Commerce (SCC) is another example of how digital innovation can modernize arbitration. The SCC has introduced a secure digital platform - known as the SCC Platform to handle all its arbitrations, in accordance with special guidelines mandating its exclusive use.[65] Launched in May 2019, the platform delivers end-to-end services from the initial request through to the rendering of an arbitral award, and is designed to meet four principal goals: efficiency, simplicity, transparency, and security.

To achieve these objectives, the SCC Platform provides participants, including parties, counsel, and the arbitral tribunal, an opportunity for direct, efficient and secure communication and document sharing throughout the arbitration process.[66] Data protection and cybersecurity are key priorities, when access is granted solely to participants in the proceedings, with all data encrypted.[67]

Furthermore, the SCC Platform enhances transparency by securely storing case materials and maintaining an archive for one year after the conclusion of arbitration. The effectiveness of these measures has been widely recognized, and the SCC's approach to digital case management has encouraged many arbitral institutions around the world to adopt similar technological solutions.

[63] Ibid.
[64] Ibid., Appendix B-E
[65] Stockholm Chamber of Commerce Arbitration Institute, 'SCC Platform Guidelines for parties and arbitral tribunals' (5 April 2025) https://sccarbitrationinstitute.se/wp-content/uploads/2025/04/SCC_Platform_guidelines_2025.pdf accessed 30 July 2025.
[66] Ibid. p.5
[67] Ibid. p.6

2.4. Conclusions and main insights: digitalisation as a trend

In the framework of academic debate technology to large extent is addressed as one of the trends, rather than the tool in light of the challenges and core values of arbitration process. Thus, it should be beneficial to focus on the potential of the technology to further enhance advantaged of the arbitration process (speed, confidentiality, in-depth expertise) and address challenges and recent trends (e.g. increasing complexity and excessive formality, rise of international commercial courts, trend to settle and mediate, trend for the transparency). Digitalisation is not a "stand-alone" it should be reflected in the contemporary perspective and treated as the instrument in the debate related to the challenges of international commercial arbitration.

Core principle of arbitration and modern challenges should be addressed in designing tools and policy. International commercial arbitration over the years is facing number of challenges, including costs, delay and excessive formality. Trends leaving impact on the development of international commercial arbitration in the long run are: trend for greater transparency, settlement and mediation and increasing number of international commercial courts in general.

Once scoping the implementation of the technology in international commercial arbitration, the following directions could be highlighted: (i) further development of online arbitration, including remote communication, e-filing and digital case management; (ii) integration of emerging technologies, such as AI, data analytics for efficiency and research purposes, blockchain technology, potentially extended reality (XR) and virtual reality. In addition, technology is supporting not only case management, but also management of the tribunal, arbitration providers.

In addition, it should be mentioned, that in light of technological impact, the new categories of disputes could arise (e.g. related to smart contracts), as well as technology itself bring the potential for new market segments for arbitration providers (e.g. ODR for small value claims). Digitalisation could also bring environmental and other benefits.

3. International commercial arbitration online

Online arbitration referred to as "e-arbitration" or "online dispute resolution (ODR)" in arbitration means the conduct of arbitral proceedings through digital platforms and communications, rather

than traditional in-person processes. In this model, parties submit documents, exchange evidence, and even hold hearings online, all of which increases speed and reduces costs compared to traditional, in-person formats. It includes all stages from concluding arbitration agreements electronically to conducting hearings via videoconference and issuing awards in digital form.[68]

The rise of cross-border e-commerce and digital transactions has created the demand for such online mechanisms. As early as 2016, the United Nations noted a *"sharp increase of online cross-border transactions"* and recognized the need for efficient online dispute resolution systems to handle disputes.[69]

Although the concept of ODR is not new, ICC, WIPO, AAA have significantly contributed to its development. Online arbitration integrates technology and digital tools to streamline the process. For example, software programs may help to reduce time and costs in arbitration through such mechanisms as e-filing or streamlining document review applying "predictive coding" (to determine whether documents are relevant).[70]

Scholars focus on the balance between advantages, like case management and cost-effectiveness, and risks, such as cybersecurity and data protection concerns and issues related to procedural fairness (e.g. party consent in remote settings).

3.1. Videoconferencing

However, the technology in the scholar debate is addressed in the broader sense, videoconferencing was in the center as one of the key technologies broadly implemented in arbitration.[71]

[68] Kluwer Arbitration Blog, 'Online Arbitration in Theory and in Practice: A Comparative Study in Common Law and Civil Law Countries' (11 April 2019) https://arbitrationblog.kluwerarbitration.com/2019/04/11/online-arbitration-in-theory-and-in-practice-a-comparative-study-in-common-law-and-civil-law-countries/ accessed 31 May 2025.
[69] UNCITRAL, *Technical Notes on Online Dispute Resolution* (United Nations Commission on International Trade Law, April 2017) https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/v1700382_english_technical_notes_on_odr.pdf accessed 2 June 2025
[70] George A. Bermann, The Future of International Commercial Arbitration, Cambridge University Press, 2021, available at: https://scholarship.law.columbia.edu/faculty_scholarship/3305
[71] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

Videoconferencing enabling remote communication and hearings online is one of the basic technologies deployed in the framework of e-arbitration concept.

3.1.1. Pre - pandemic and post - pandemic practices

The pandemic has accelerated the wider use of virtual hearings in international arbitration,[72] however still the decision to use a virtual hearing is described as "situational".[73]

Undoubtedly, COVID-19 has accelerated the rise of e-arbitration, however, even before the pandemic there was growing momentum toward incorporating online elements in arbitration. Users were open to remote proceedings, in 2018 survey conducted by Queen Mary University, 89% of respondents indicated that videoconferencing should be used more often in arbitration.[74]

International Centre for Settlement of Investment Disputes (ICSID) reported by 2019 the majority of its hearings were already being held via videoconference, reflecting early adoption of online hearings in practice.[75]

In South Korea, the Seoul International Dispute Resolution Center was, by 2018, conducting several arbitrations a year entirely through high-quality video links, expecting those numbers to rise. Major arbitral rules were updated to accommodate technology, namely, e.g. the Korean Commercial Arbitration Board's 2016 rules[76] expressly permitted hearings via videoconference. These developments signaled that online arbitration was gaining popularity, driven by an objective to reduce cost, travel, and delay in cross-border cases.[77]

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[72] L Chen, 'Will Virtual Hearings Remain in Post-pandemic International Arbitration?' (2024) 37(3) International Journal for the Semiotics of Law - Revue Internationale de Sémiotique Juridique 829–849 https://doi.org/10.1007/s11196-023-10054-7

[73] Ibid.

[74] White & Case LLP, *2018 International Arbitration Survey* (2018) https://www.whitecase.com/sites/whitecase/files/files/download/publications/2018-international-arbitration-survey.pdf accessed 4 June 2025.

[75] 'Clint – September 2022 feature 5' (IBA, September 2022) https://www.ibanet.org/clint-september-2022-feature-5 accessed 2 June 2025

[76] KCAB International, *'Arbitration Rules'* (2025) http://www.kcabinternational.or.kr/rules/arbitration_rules.do accessed 4 June 2025.

[77] Kluwer Arbitration Blog, 'Online Arbitration in Theory and in Practice: A Comparative Study in Common Law and Civil Law Countries' (11 April 2019) https://arbitrationblog.kluwerarbitration.com/2019/04/11/online-arbitration-in-theory-and-in-practice-a-comparative-study-in-common-law-and-civil-law-countries/ accessed 31 May 2025.

The outbreak of COVID-19 in 2020 dramatically accelerated these trends. Travel bans and lockdowns made physical hearings nearly impossible, forcing the arbitral community to pivot to virtual proceedings *en masse*. Statistics from ICC indicate the shift: in the first quarter of 2020, only 36% of ICC users had experienced a fully virtual hearing, but by the final quarter of 2020 that number had jumped to 71% of cases conducted fully online.[78]

Alongside this shift, arbitration providers and professional bodies issued guidance and formalized best practices for online arbitration. In April 2020, the ICC adopted Guidance Note expressly outlining how parties and tribunals could mitigate COVID-related delays through virtual hearings and other online measures.

LCIA in its updated 2020 rules explicitly clarified that tribunals have authority to conduct hearings virtually without parties' physical presence.[79] Number of institutions launched similar protocols. Institutions also invested in technology: for example, the Hong Kong International Arbitration Centre opened a dedicated virtual hearing facility, and various providers upgraded their case-management platforms to handle filings and evidence online. The spread effect of these efforts is that by 2021–2023, conducting international arbitration online became routine.

In general, even as physical hearings again become feasible in post – pandemic period, the advantages of remote hearings in terms of efficiency, cost and the environment remain. This in light the need for flexible best practices for remote hearings, as they continue to be refined and evolve in the context of this dynamic landscape.[80]

[78] 'Clint – September 2022 feature 5' (IBA, September 2022) https://www.ibanet.org/clint-september-2022-feature-5 accessed 2 June 2025
[79] London Court of International Arbitration, LCIA Arbitration Rules 2020 (1 October 2020) art 19.2 https://www.lcia.org/Dispute_Resolution_Services/lcia-arbitration-rules-2020.aspx accessed 25 July 2025
[80] Hussein Haeri and Camilla Gambarini, 'Remote Hearings: Practical Considerations' in *ICCA Reports No 10: Does a Right to a Physical Hearing Exist in International Arbitration? Investigating the Legal, Conceptual and Practical Implications of Remote Hearings in International Arbitration* (ICCA Reports Series vol 10, Kluwer Law International 2022) 219–236 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-icca-2022-10-ch08 accessed 22 July 2025

3.1.2. Legal and practical challenges

The discussion on the integration of the remote hearings is focused on number of legal and practical challenges, among them: (i) due process, fairness of the proceeding, including, right to be heard and accessibility; (ii) authority of the institution *verso* party autonomy; (iii) security and data protection.

Fairness is one of the key concepts in dispute resolution and is in the center of legal framework, regulating arbitration at the different levels. Fairness *inter alia* is associated with right to be heard and accessibility. There are number of legal and practical challenges discussed, focusing on procedural fairness from different perspectives.

The right to a fair trial is safeguarded constitutionally in many jurisdictions as well as in the Article 6 of the ECHR[81] (and ECtHR case law)[82] and reflected in arbitration's due-process guarantees focused on the parties' right to be heard, whether through oral argument in a hearing or written submissions. Although hearings are a cornerstone of arbitration, providing the forum for clarifying submissions, cross-examining witnesses and making oral procedural arguments, this right may be waived, and access to justice is ultimately defined by the availability of a fair adjudicative process, not the format of the hearing itself. What matters is that the procedure, whether it is physical, remote or based only on the submission of documents, procedural guarantees, e.g. equality of arms are preserved. Consequently, neither the absence of a hearing nor its virtual form automatically does not leave an impact on access to justice, the important is the context and guarantees ensures in the process.[83]

The right to be heard is one of the most fundamental rights not only for traditional dispute resolution, but also in arbitration proceeding. This entails that the parties involved present their

[81] Convention for the Protection of Human Rights and Fundamental Freedoms (European Convention on Human Rights, as amended) (ECHR) art 6.
[82] In the Council of Europe member states
[83] L V P de Oliveira, 'Access to Justice and the Right to a Hearing in Arbitration' in ICCA Reports No 10: Does a Right to a Physical Hearing Exist in International Arbitration? Investigating the Legal, Conceptual and Practical Implications of Remote Hearings in International Arbitration (ICCA Reports Series, Volume 10, Kluwer Law International 2022) 45–68 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-icca-2022-10-ch02 accessed 23 July 2025

case, including facts, legal arguments, and evidence concerning the relevant facts. In light of deployment of shared virtual workspaces, the question arises regarding the accessibility and possibilities available to the parties (*inter alia* equally available). E.g. complexity in interface and lack of "user-friendliness" might lead to questions of the accessibility and in general, use of online environments initially should be subject to the consents by the parties. The mentioned consents to be obtained by the arbitration provider.

Digitalization demands redesign of arbitration procedures, and virtual hearings have demonstrated that tribunals can achieve greater efficiency and respect for organization by breaking proceedings into segments - starting with fact witnesses and later experts - while reducing travel costs and environmental impact. At the same time, parties with unequal access to technology are under the risk.[84]

Literature characterizes technology as the "fourth party" in dispute resolution, indicating that it has been integrated to support the mediator, arbitrator, or judge - the traditional "third party". While technology promises to focus on inefficiencies in arbitration, it should work alongside, not replace existing institutions and practitioners, acting as a "fourth party" and in the role of mediator, without taking control.[85]

From one side, there are number of simple tools, that support case management, from other side - evaluating body language in online hearings adds an additional level of complexity.[86] In remote hearings, maintaining consistent eye contact gives the impression of engaging directly with other participants.[87] A frequent concern is whether virtual hearings offer the same quality of interaction

[84] Darius Chan and Gerome Goh Teng Jun, 'Chapter 11: Hearing' in Franco Ferrari and Friedrich Jakob Rosenfeld (eds), *Handbook of Evidence in International Commercial Arbitration: Key Concepts and Issues* (Kluwer Law International 2022) 247–284 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ferrari-rosenfeld-2022-ch11 accessed 21 July 2025.

[85] E Montoya Zorrilla, 'Towards a Credible Future: Uses of Technology in International Commercial Arbitration' in Jörg Risse, Guenter Pickrahn and others (eds), SchiedsVZ | German Arbitration Journal (Kluwer Law International 2018) 106–114 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-schiedsvz-2018-02-005-n accessed 23 July 2025

[86] D Protopsaltou, T Schultz and N Magnenat-Thalmann, 'Taking the Fourth Party Further? Considering a Shared Virtual Workspace for Arbitration' (2006) 15(2) *Information & Communications Technology Law* 157

[87] JB Kessler and P King, 'The Significance of Nonverbal Communication in Mediation and Arbitration' (JAMS ADR Insights, 12 August 2021) https://www.jamsadr.com/blog/2021/the-significance-of-nonverbal-communication-in-mediation-and-arbitration accessed 6 June 2025.

as face-to-face hearings. There is also the risk that a witness being examined remotely might receive "off-camera" advice. Technical difficulties and connectivity problems are mentioned as another problematic aspect - online arbitration is highly dependent on technology working smoothly. Dropped connections or frozen video feeds might force repetitious questions or postponements, impeding the hearing and progress within the case. While generally manageable, these issues can disadvantage a party if, say, their connection repeatedly fails during a key cross-examination. Not all participants have equal access to high-speed internet or quality equipment, raising fairness concerns if one parties' experience is lower in quality. Preventing the "digital divide" is important not only in traditional dispute resolution, but also in arbitration, to preserve its core values.

Fairness in the framework of the procedure is precondition for further enforcement. Virtual hearings can undermine procedural fairness and equality of arms, leaving impact on the enforceability of awards. The New York Convention allow annulment for due-process failures - most notably Article V(1)(b) of the New York Convention, which applies when a party was unable to present its case.[88] In this regard, tribunals *inter alia* should therefore consider factors like time zones and parties' access to technology.[89] Also traditionally, arbitration is oriented on traditional, hearing – centric dispute resolution, providing for the parties opportunities to present evidence. Thus, the right to be heard in the appropriate way is essential and significant in the framework of arbitration process.[90]

Another issue is related to the examination of experts and witness online, as part of the fairness concept, when it is under discussion whether online examination of experts and witness during a virtual hearing provides as effective judicial protection as a face-to-face examination during a

[88] Nika Madyoon, 'Virtual Hearings in International Arbitration: Challenges, Solutions, and Threats to Enforcement' in Stavros Brekoulakis (ed), Arbitration: The International Journal of Arbitration, Mediation and Dispute Management (Kluwer Law International 2023) 597–611 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-amdm-870408 accessed 21 July 2025.
[89] Ibid.
[90] Darius Chan and Gerome Goh Teng Jun, 'Chapter 11: Hearing' in Franco Ferrari and Friedrich Jakob Rosenfeld (eds), *Handbook of Evidence in International Commercial Arbitration: Key Concepts and Issues* (Kluwer Law International 2022) 247–284 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ferrari-rosenfeld-2022-ch11 accessed 21 July 2025.

physical hearing. In the debate there is reference to the findings from the social science research, describing the different context on the online hearing in terms of interaction.[91]

Other issue under discussion is authority of the institutions to take the decisions in the framework of the arbitration proceeding *verso* the authority of the parties, especially in light of the fact of the importance of the autonomy of the parties. *A priori* parties have the right to be heard orally, sharing their opinions and exchanging the arguments. The procedure for the arbitration to large extent is the subject to the consent between parties, also use of the videoconferencing should be part of this consent.

Remote hearings could be fully remote or semi-remote (legal argument and evidence-taking, each requiring distinct assessment under the law of the seat and any applicable rules). Some jurisdictions and arbitration rules expressly permit remote hearings, while others rely on general principles to be heard and tribunals' procedural discretion. When one party insists on remote and another on in-person hearings, tribunals must balance fairness and the right to be heard with their duty to run proceedings efficiently.[92]

E.g. the cornerstone of virtual hearings under Swedish law is due process and equal treatment, foreseen in section 24 of the Swedish Arbitration Act (in light of Article 6 ECHR). Sweden's Code of Judicial Procedure likewise accepts virtual hearings, and neither the 2017 SCC Arbitration Rules nor the IBA Rules on Evidence prohibit them. [93]

Even when an arbitration agreement expressly calls for an in-person hearing, tribunals will generally retain discretion to allow some witnesses to appear remotely, provided the governing rules grant such procedural flexibility. Finally, parties may waive a hearing entirely, proceeding

[91] Bas van Zelst and Bas Keizers, 'Chapter 6: The effects of online examination of experts and witnesses in international arbitration: familiar or uncharted territory?' in Pietro Ortolani, André Janssen et al (eds), *International Arbitration and Technology* (Kluwer Law International 2022) 83–100 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ortolani-2022-ch06 accessed 22 July 2025.
[92] Maxi Scherer, 'The Legal Framework of Remote Hearings' in Maxi Scherer, Niuscha Bassiri et al (eds), *International Arbitration and the COVID-19 Revolution* (Kluwer Law International 2020) 65–104 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-scherer-2020-ch04 accessed 21 July 2025
[93] Edward Jansson Stiernblad, 'Virtual Arbitration Hearings under Swedish Law' in Axel Calissendorff and Patrik Schöldström (eds), *Stockholm Arbitration Yearbook 2021*, Stockholm Arbitration Yearbook Series, vol 3 (Kluwer Law International 2021) 279–296 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-calissendorff-ch15 accessed 21 July 2025.

on written submissions and documentary evidence or, where the agreement permits, seek dispositive motions that, if granted on all claims, obviate the need for any hearing.[94]

To address security and privacy concerns, especially in the context of the confidentiality as one of the key values in arbitration, it is crucial to select an appropriate digital platform to conduct hearings. Although there are many free and public platforms that can easily accommodate multiple participants, they do not provide an accurate level of protection for arbitral proceedings. Therefore, it is much more desirable to introduce tailor-made platform, focusing on the needs of the arbitration procedure. It is recommended to choose a platform that offers the so-called end-to-end encryption and secure user access. Additionally, platforms to be developed and deployed taking into account the EU data protection framework, also in light of its extraterritorial scope.

The rise of virtual communication in arbitration has made protecting confidentiality and privacy more complex, as a few tech giants now collect, store and process vast amounts of sensitive data in ways that users often cannot fully understand. Parties consent to these practices when they accept ICT providers' subscription terms, leaving them unaware of and unable to quantify potential breaches. To remedy this, arbitration stakeholders should update their rules to disclaim liability for provider misconduct, create advisory protocols warning users of data-consent risks, and promote storage of personal data despite the large quantity of documents and information. Above all, dialogues between arbitration bodies and ICT providers are essential to safeguard sensitive information.[95]

Arbitration bodies have embraced email, cloud storage and video conferencing but largely overlooked how big-tech platforms' data collection, storage and processing expose sensitive proceedings. To safeguard privacy, stakeholders must refine international rules and choose forums that offer stronger protections in digital landscape.[96] Effective arbitration depends on robust

[94] K Taylor and CD Bloomfield, 'Navigating Conflict in the Digital Age: Virtual ADR' in NG Ziadé (ed), BCDR International Arbitration Review (Kluwer Law International 2021) 121–132 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-biar-100109 accessed 23 July 2025
[95] N Teramura and LE Trakman, 'Confidentiality and Privacy of Arbitration in the Digital Era: Pies in the Sky?' (2024) 40(2) Arbitration International 277–306 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ai-2024-03-002 accessed 23 July 2025
[96] Ibid.

information security. Potentially there is need for model cybercrime rules to harmonize national rules and for institutions to retain specialist security firms under clear contractual obligations.[97]

In terms of practical challenges, it should be mentioned, that however, in general the videoconferencing is presented as efficiency tool, in light of international commercial arbitration, where the parties might be located in the different time zones, there might still arise logistical difficulties related to scheduling the call, *inter alia* causing "Zoom fatigue".

To ensure accessibility and manage the technical issues related to the hearings online arbitration providers should appoint special technical support agent responsible for handling the digital platform. Such an agent can be arranged either from a third-party provider or may be provided by the arbitral tribunal itself. To avoid any technical difficulties, it is advisable to appoint an agent to operate the platform properly, even if the arbitral tribunal is handling the online proceedings. This solution helps to avoid any delays and additional costs provided that arbitrators may not have the required technical knowledge and expertise.

To properly handle remote proceedings, the arbitral tribunal have to clarify whether all participants who attend such hearings have necessary technical equipment, including microphones, speakers, cameras, monitors, and a reliable connection. All the parties must comply with the minimum requirements of the chosen platform. E.g., Seoul Protocol on Video Conferencing in International Arbitration sets technical standards in relation to organization of the remote hearing, there are requirements on minimum transmission speed with high-definition standards.[98] It is also important to ensure compatibility between hardware and software in the course of arbitral proceedings. Testing in remote hearings in another significant step to ensure the accessibility.

[97] Hussien AS and Mounes HM, 'Cybersecurity in International Commercial Arbitration (Legal Vision)' (2024) 11(2) International Journal of Advanced and Applied Sciences 219–229 https://doi.org/10.21833/ijaas.2024.02.023.
[98] Korean Commercial Arbitration Board (KCAB International), 'Seoul Protocol on Video Conferencing in International Arbitration' (March 2020) https://irp-cdn.multiscreensite.com/ffb7ea18/files/uploaded/Seoul%20Protocol%20on%20Video%20Conference%20in%20International%20Arbitration.pdf accessed 30 July 2025.

3.2. Electronic filing and digital case management

In line with videoconferencing and opportunity for remote communication, another cornerstone of online arbitration is the end-to-end electronic handling of documents, including e-filing (submissions online).

Arbitrations often involve voluminous document and evidence submissions, that could be realized through the special digital platform, *inter alia*, ensuring simplified access to the case file for all involved. Majority of arbitration providers have developed e-filing systems where parties upload pleadings, evidence, and correspondence through a web portal or case management software.

By 2023 all leading institutions (ICC, LCIA, ICDR, HKIAC, SIAC and others) support electronic submissions and communication. For example, the ICC's case management platform allows tribunals and parties to share documents and track the procedural calendar online, significantly reducing reliance on couriered hardcopies or even email.[99]

By 2024 CIETAC rules not only prioritize electronic service of documents (email or platform delivery is prioritized as "by default")[100] but also formally recognize online case filing as a standard practice (Article 11 of CIETAC rules).[101] CIETAC rules further provide that an arbitrator's electronic signature on an award is legally equivalent to a handwritten signature, and awards can be delivered electronically with party consent. Such provisions remove any uncertainty about the validity of digital documents in the arbitral process.

In a digitized commercial environment where courts already use digital communications, electronically signed awards are the logical next step - but their adoption faces four hurdles: most

[99] Raoul J.Renard, Kluwer Arbitration, *'2023 Year in Review: Technology'* (22 January 2024) https://arbitrationblog.kluwerarbitration.com/2024/01/22/2023-year-in-review-technology/ accessed 4 June 2025.

[100] Article 11 (Commencement of Arbitration) of CIETAC Rules foresee: "the arbitral proceedings shall commence on the day on which the Arbitration Court receives a Request for Arbitration. Where the Claimant submits a Request for Arbitration in writing and/or via CIETAC's online case filing system, the arbitral proceedings shall commence on the day when such Request is first received." Available: China International Economic and Trade Arbitration Commission, *CIETAC Current Arbitration Rules* (2021) <https://www.cietac.org/en/category/rules> accessed 9 June 2025.

[101] Fei Lu, 'Overview of Dispute Resolution in the Digital Environment in China' (Jus Mundi Arbitration Review, vol 1, no 1, July 2024) https://jusmundi.com/en/document/publication/en-overview-of-dispute-resolution-in-the-digital-environment-in-china accessed 2 June 2025

practitioners lack advanced e-signature tools or skills, parties in less tech-advanced jurisdictions risk unequal access and fairness. Many courts and enforcement officers aren't equipped to verify digital awards; and arbitrators often resist learning new technologies until forced to do so. To overcome these challenges, leading arbitration institutions and associations are advised to jointly create a dedicated body - working with technical providers - to build a secure, resilient virtual facility for reliable e-signatures (and related innovations) under diverse legal regimes. Electronic signatures on awards may be just one aspect, but they would ensure broader shift toward fully digitized arbitration.[102]

In general, comprehensive electronic case records as an e-file have become the norm in online arbitration. All submissions, exhibits, and tribunal orders are stored in a digital file accessible to all the participants. This facilitates access to information in the framework of the proceedings and support arbitrators on the daily basis. It also enables remote collaboration – arbitrators can deliberate together over a shared digital record, and parties can jointly review evidence in real time during hearings using screen-sharing or systems for electronic presentation of evidence. Specialized software allows litigants to present documents, zoom into exhibits, and present videos within the virtual hearing room. Digital evidence bundles with hyperlinks make it simpler for arbitrators to navigate evidence during questioning. Some platforms enable a shared annotation (mark-up) of exhibits visible to all, closely simulating the collaborative examination of a physical document in court.

In addition, transcripts of hearings are often generated automatically and shared instantly in electronic form. In general, the move to digital case management increases transparency and efficiency.

[102] E Schäfer, 'Chapter 8: E-Signature of Arbitral Awards' in M Scherer, N Bassiri and others (eds), International Arbitration and the COVID-19 Revolution (Kluwer Law International 2020) 151–166 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-scherer-2020-ch08 accessed 23 July 2025

3.3. Rules and protocols for online proceeding (videoconferencing and digital case file)

The current collaboration between technologists, arbitrators and policy-makers presents an opportunity to deploy technology to reduce time and costs of arbitration, harmonize diverse global applications and collaborate across dispute-resolution domains, even if ADR platforms do not emerge as swiftly as consumer apps. To capitalize on these advances, stakeholders should adopt clear videoconferencing protocols that ensure equal treatment, accommodate time-zone differences, authenticate participants, safeguard against unauthorized access, and preserve the integrity of witness and expert examinations through measures against technical failures.[103]

International and regional arbitration bodies suggested to prioritize e-arbitration to boost efficiency and better integrate digital methods with offline dispute-resolution frameworks.[104]

The need for the protocol is continuously stressed in the legal debate - there should be a "protocol" followed by global actors of e-arbitration to establish trust when proceeding videoconferencing.[105] International treaties providing guidelines about ODRs should include provisions "promoting party autonomy and implementing core legal principles with technologically neutral clauses." Besides legal professionals should be properly educated about the definition of arbitration and how technology could assist them in their daily tasks.[106]

In order to ensure that potential of the technology is reflected in practice and provide framework for integration of online arbitration, arbitration providers in line with rules of proceeding have adopted number of special rules or protocols dedicated to digitalization. *Inter alia*, rules are

[103] E Montoya Zorrilla, 'Towards a Credible Future: Uses of Technology in International Commercial Arbitration' in Jörg Risse, Guenter Pickrahn and others (eds), SchiedsVZ | German Arbitration Journal (Kluwer Law International 2018) 106–114 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-schiedsvz-2018-02-005-n accessed 23 July 2025

[104] Mohamad Fateh Labanieh, Mohammad Azam Hussain and N Mahdzir, 'The Legal Capacity of International Conventions and Laws to Legalise E-Arbitration' (2021) 17 Journal of International Studies (Sintok, Kedah, Malaysia) 211 <https://doi.org/10.32890/jis2021.17.9>

[105] A J Schmitz, 'Building on OArb Attributes in Pursuit of Justice' in M Piers and C Aschauer (eds), Arbitration in the Digital Age: The Brave New World of Arbitration (Cambridge University Press 2018) 208.

[106] Faye Fangfei Wang. Online Arbitration. 1st ed. London: Routledge; 2019, at 8.

adopted with the objective to ensure that legal and practical challenges in deploying ODR are reflected and core principles of arbitration are preserved.

It has to be mentioned that impact of the technology in this regard has led to hyperregulation and complexity. Technology added another layer of regulation, providing the need for additional standards and rules. In addition, it is also important to understand are there any adjustments needed also in the existing legal framework.

The use of new technology is not explicitly prohibited by current legal framework, as procedure how the arbitration to be handled is determined by contract between the parties (following the principle of party autonomy). Article 19(1) of the UNCITRAL Model Law foresee that "subject to the provisions of this Law, the parties are free to agree on the procedure to be followed by the arbitral tribunal in conducting proceedings".[107] Thus, agreement on the use of the technology could be part of the agreement between parties to arbitrate and procedure the arbitration to be handled. Another important, but non-binding instrument in this regard is UNCITRAL Technical Notes on Online Dispute Resolution 2017.[108] Notes, that has been adopted already in pre-pandemic period outline the stages of an ODR process (from negotiation to arbitration) and emphasize basic principles like impartiality, efficiency, due process, fairness, accountability, and transparency for online proceedings. This guidance provides a template to develop online arbitration platforms in line with best practices. It emphasizes, for example, the necessity for clear communication of procedural rules to parties in an online environment and the importance of secure communications and confidentiality. Thus, further arbitration providers and institutions designing ODR systems have implemented the UNCITRAL guidance as a basic framework.

In order to simplify the agreement between parties and support parties in integration of the technology in the dispute resolution process, arbitration providers around the world adopted their

[107] UNCITRAL, *UNCITRAL Model Law on International Commercial Arbitration* (1985) with amendments as adopted in 2006 (Vienna: United Nations 2008), p. 14 https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-09955_e_ebook.pdf, accessed 7 June 2025.
[108] UNCITRAL, *Technical Notes on Online Dispute Resolution* (2017) https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/v1700382_english_technical_notes_on_odr.pdf accessed 4 June 2025.

own rules and protocols, focusing on procedural fairness and tackling cybersecurity and data protection risks.

Article 19(1) of the SIAC Rules foresee that "the tribunal shall conduct the arbitration in such matter as it considers appropriate, after consulting with the parties, to ensure the fair, expeditious, economical and final resolution of the dispute". Article 19(2) of SIAC Rules foresee that "the Tribunal shall determine the relevance, materiality and admissibility of all evidence [and] is not required to apply the rules of evidence of any applicable law in making a such determination".

Similar provisions are provided in LCIA Rules, the HKIAC and the ICC Rules. IBA Rules on the Taking of Evidence in International Arbitration defines "document" as "a writing, communication, picture, drawing, program or data of any kind, whether recorded or maintained on paper or by electronic, audio, visual or any other means".[109]

The ICC Arbitration Rules[110], while written in technology-neutral language, were interpreted in light of the ICC 2020 Guidance Note[111] to fully authorize virtual hearings and electronic communications.

The LCIA 2020 Rules[112] authorize documents to be transmitted via the LCIA's online system and provided the framework for hearing to be held online. The arbitration practices are modernized by implementing the "digital - first" approach. The Rules foresee that arbitration to be initiated electronically, filing the documents online, all communication between parties and the tribunal in the framework of the proceeding to be conducted by electronic means. This not only streamlines

[109] International Bar Association, *IBA Rules on Document Production in International Arbitration* (September 2018), p. 4 https://www.international-arbitration-attorney.com/wp-content/uploads/2018/09/IBA-Rules-Document-Production-Arbitration.pdf accessed 7 June 2025.
[110] International Chamber of Commerce, *ICC Arbitration Rules*, 2021 https://iccwbo.org/dispute-resolution/dispute-resolution-services/arbitration/rules-procedure/2021-arbitration-rules accessed 10 June 2025.
[111] International Chamber of Commerce, *Guidance Note on Possible Measures Aimed at Mitigating the Effects of the Covid-19 Pandemic* (9 April 2020) https://jusmundi.com/en/document/rule/en-icc-international-chamber-of-commerce-guidance-note-on-possible-measures-aimed-at-mitigating-the-effects-of-the-covid-19-pandemic-2020-icc-guidance-on-covid-19-2020-thursday-9th-april-2020 accessed 10 June 2025.
[112] London Court of International Arbitration, *LCIA Arbitration Rules 2020* (2020) https://www.lcia.org/Dispute_Resolution_Services/lcia-arbitration-rules-2020.aspx accessed 4 June 2025.

the initiation of proceedings but also ensures that document service and other communications are efficient and prompt. Rules clearly introduce virtual hearings. Tribunals are empowered to decide on holding hearings via videoconference or other suitable digital platforms. This flexibility reflects a practical adaptation to circumstances such as those encountered during the COVID-19 pandemic, where remote hearings became the norm.[113] Rules now also permit arbitral awards to be signed electronically, with such signatures holding the same legal status as handwritten ones. In response to the growing reliance on digital communication, rules mandate that tribunals pay careful attention to data protection and confidentiality. This means that appropriate safeguards must be implemented to ensure personal and sensitive information remains secure throughout the arbitration process.

AAA and ICDR adopted a Model Order and Procedures for Remote Videoconference Hearings in 2020, providing parties framework to agree upon.[114]

The HKIAC updated its guidelines and built a special virtual hearing framework with recommended technical parameters (hardware) and encryption for parties to use.[115]

Institutional protocols now focus on the decision between online and in-person hearings as a matter of logistical consideration. Necessity to introduce secure, high-quality videoconferencing systems, backed by pre-hearing technical tests to verify that all participants have appropriate audio, video, and internet connectivity.

Safeguarding sensitive information is a primary concern. Accordingly, HKIAC protocols recommend robust measures such as encrypted communications, confidentiality practices, and strong data security protocols to protect all parties. The guidelines also acknowledge that technical

[113] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

[114] American Arbitration Association and International Centre for Dispute Resolution, *AAA-ICDR Model Order and Procedures for a Virtual Hearing via Videoconference* (2021) https://go.adr.org/rs/294-SFS-516/images/AAA270_AAA-ICDR%20Model%20Order%20and%20Procedures%20for%20a%20Virtual%20Hearing%20via%20Videoconference.pdf accessed 4 June 2025.

[115] Hong Kong International Arbitration Centre, *'HKIAC Guidelines for Virtual Hearings'* (15 May 2020) https://www.hkiac.org/news/hkiac-guidelines-virtual-hearings accessed 4 June 2025.

difficulties can arise, so they advise the establishment of backup procedures and alternate communication methods to ensure that virtual hearings proceed smoothly even if issues occur.

Furthermore, the guidelines set forth clear standards for the conduct of virtual hearings, including procedures for managing digital evidence, handling electronic documents, and defining the specific responsibilities of both the tribunal and the parties involved. By codifying these practices, HKIAC reinforces its commitment to maintaining procedural fairness and efficient case management, all while adapting its processes to the evolving landscape of remote and hybrid hearings.

In addition to formal rules, there are number of soft law instruments introduced. KCAB adopted Seoul Protocol on Video Conferencing in International Arbitration[116], setting out the best practice guidelines to ensure that videoconference proceedings in arbitration are conducted reliably, securely, and fairly. The protocol establishes guidelines for witness examinations in remote settings, outlining both technical and procedural requirements. For instance, it mandates that witnesses be positioned with their faces clearly visible- typically by sitting at an unoccupied desk or standing at a lectern - to allow all parties and the tribunal to observe the testimony unambiguously.

In 2018 - 2020, a working group of ICCA and New York City Bar in cooperation with CPR developed the ICCA-NYC Bar-CPR Cybersecurity Protocol for International Arbitration (2020 Edition).[117] Protocol established framework for arbitrators and parties to assess cybersecurity risks in each proceeding and to implement reasonable security measures. It recognizes that maintaining the confidentiality and integrity of sensitive data is *"crucial in arbitration, since the credibility and integrity of the process depends on it."* The protocol recommends concrete measures such as classifying information based on its sensitivity, using controlled access methods (such as

[116] Korean Commercial Arbitration Board (KCAB), *Seoul Protocol on Video Conferencing in International Arbitration* (2018) https://irp-cdn.multiscreensite.com/ffb7ea18/files/uploaded/Seoul%20Protocol%20on%20Video%20Conference%20in%20International%20Arbitration.pdf accessed 4 June 2025.

[117] International Council for Commercial Arbitration (ICCA), New York City Bar Association (NYC Bar) and the International Institute for Conflict Prevention and Resolution (CPR), *The ICCA-NYC Bar-CPR Protocol on Cybersecurity in International Arbitration* (2022) https://www.arbitration-icca.org/icca-reports-no-6-icca-nyc-bar-cpr-protocol-cybersecurity-international-arbitration accessed 10 June 2025.

passwords and encryption), securing recordings of the hearing, and even limiting the types of devices that can be present in both physical and virtual hearing environments to prevent unauthorized recordings.

Both the "hard law" (national statutes, treaties) and "soft law" (rules, protocols) governing international arbitration have adjusted to validate and support online practices. Digital transformation in arbitration is not solely about virtual hearings - it also addresses evolving legal frameworks. National laws in various civil law countries have expanded traditional form requirements to include electronic communications, meaning that arbitration agreements made online can achieve the same enforceability as their paper-based counterparts. This evolution is particularly crucial for cross-border disputes, where digital transactions and communications have become the norm. Such changes reflect the broader international efforts to adapt dispute resolution mechanisms to the digital age, ensuring that arbitration remains an effective method irrespective of geography or technological setting.[118]

3.4. Conclusions and main insights: arbitration online

Arbitration is an area very well suited to innovation, but implementation of the technology may be limited by the traditional rules used by arbitral institutions. In addition, it has to be mentioned, that necessity to regulate technology, has added another level of complexity in the framework of regulation, leading to "hyperregulation". However, scholars and practitioners are calling for a global protocol - ideally initiated by states and international bodies - to establish clear rules and distinguish between online and offline arbitration.

The most popular types on technologies deployed by arbitration providers (already before pandemic) are videoconferencing and digital case file, these technologies are traditionally associated with ODR or e-arbitration. However, the integration in practice brought numerous considerations with the objective to balance fairness, efficiency, and compliance. Planning is

[118] Ihab Amro, *'Online Arbitration in Theory and in Practice: A Comparative Study in Common Law and Civil Law Countries'* (11 April 2019) https://arbitrationblog.kluwerarbitration.com/2019/04/11/online-arbitration-in-theory-and-in-practice-a-comparative-study-in-common-law-and-civil-law-countries/ accessed 4 June 2025.

crucial to avoid disruptions, and potential challenges, such as recognition and enforcement issues in certain jurisdictions. The digital divide also poses a concern. As technology proficiency becomes increasingly relevant, arbitrators skilled in using such tools may gain a competitive edge, impacting their selection over the time.

Effective case management should address practical issues like electronic communication, notifications, and the use of online platforms, with procedural language tailored to specific technological needs. Cybersecurity and data protection are essential, requiring oversight by arbitration providers to adhere to varying national standards. Cost allocation for technology use should be agreed upon by parties, clarifying whether such expenses fall under arbitration costs. Additionally, differences in electronic signature requirements across jurisdictions may impact enforceability, necessitating careful consideration of local regulatory frameworks to ensure seamless integration of technology into arbitration.

4. Enforcement of arbitration agreement made online

At the core of any arbitration is the arbitration agreement and the final arbitral award. Traditionally, many jurisdictions required both to be in writing and signed. With transactions moving online, laws have been updated to explicitly recognize electronic forms. However, there are still number of aspects in discussion.

4.1. Legal framework and challenges

The use of technology and maintaining international standards in the commercial sector globally should encourage the practice of harmony and proper enforceability.[119] The New York Convention, which governs enforcement of international arbitral awards, speaks of an agreement "in writing" (Article II) and an award that may need to be duly authenticated.[120]

[119] V Singh and M Bahmani, 'Arbitration Agreement and Arbitral Award: The Online Perspective' (2021) 8(1–2) Journal of National Law University Delhi 45–61 https://doi.org/10.1177/22774017221094924
[120] Convention on the Recognition and Enforcement of Arbitral Awards (1958 New York Convention), https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/new-york-convention-e.pdf.

Many countries have modernized their arbitration statutes or interpretative practice to accommodate electronic communications within the "writing" requirement. For instance, courts in Germany, France, Switzerland, the Netherlands and others have held that an arbitration agreement concluded by email or electronic exchange satisfies the writing requirement of the New York Convention.[121] The Swiss Supreme Court notably ruled that an "exchange of letters or telegrams" under the Convention should be read to include any modern means of communication, effectively validating agreements made via email or other electronic record.[122] The Netherlands went as far as to amend its Code of Civil Procedure to say "an arbitral award may be made and signed electronically."[123]

Similarly, national laws now commonly recognize that an arbitral award may be issued in electronic form without jeopardizing its enforceability. The UK Arbitration Act 1996 allows parties to agree on the form of an award, implying that an award signed digitally is acceptable if the parties' consent.

These provisions guarantee that an award delivered as a PDF with digital signatures is legally equivalent to a paper award bearing wet ink signatures. In practice, arbitrators often adopt a cautious strategy by issuing the award with a secure digital signature while also sending an original hard copy to each party, thus safeguarding against potential challenges in jurisdictions that maintain more traditional requirements. But the clear trend is that electronic arbitral awards are widely accepted under modern legal standards, as long as basic integrity and authentication are assured.

However, it has to be mentioned that the cautious strategy is applied also as in light of e-arbitration agreement concluded online in the literature there is an observation that it is difficult to fulfill formal criteria according to 1958 New York Convention on the recognition and enforcement of

[121] Ihab Amro, *'Online Arbitration in Theory and Practice: A Comparative Study in Common Law and Civil Law Countries'* (Kluwer Arbitration Blog, 11 April 2019) https://arbitrationblog.kluwerarbitration.com/2019/04/11/online-arbitration-in-theory-and-in-practice-a-comparative-study-in-common-law-and-civil-law-countries/ accessed 10 June 2025.

[122] *Compagnie de Navigation et Transports SA v MSC Mediterranean Shipping Company SA*

[123] Marnix Leijten, Abdel Zirar, Erin Cronjé and Eva Koopman, 'Challenging and Enforcing Arbitration Awards: Netherlands' (Global Arbitration Review, 7 March 2024) https://globalarbitrationreview.com/insight/know-how/challenging-and-enforcing-arbitration-awards/report/netherlands accessed 10 June 2025.

arbitral awards ("New York Convention").[124] Article 11(2) of the New York Convention foresee that "agreement in writing" means either an arbitral clause included in a contract or an arbitration agreement that has been signed by the parties or included in an exchange of letters or telegrams.[125] Thus, in general it has to be mentioned, that in order to ensure clarity, New York Convention needs adjustments in light of technological development. As mentioned, number of national laws regarding international commercial arbitration have adjusted their requirements on the written form in light of modern ways of communication. Apparently, such laws validated the existence of a technological equivalent of the already binding requirement on written form instead of altering or even rejecting it.[126]

Another aspect to mentioned, is that electronic evidence and communications are widely accepted in arbitration due to its flexible evidentiary rules. The primary issue has never been their admissibility, but rather whether the process of reaching an agreement or issuing an award online meets the formal requirements for validity. With legal reforms and supportive case law, this challenge has mostly been resolved - online arbitrations now yield outcomes that are enforceable in almost the same manner as traditional arbitrations under the New York Convention.

The central issue is harmonizing long-established standards related to the evidence with modern technology. Under Article IV(1)(a) of the New York Convention, an enforceable arbitral award must be provided in its "original" form - a concept traditionally linked to a physical document (wet ink signature). In contrast, Article 8(1)(a) of the UNCITRAL Model Law on Electronic Commerce[127] offers a modern perspective: by allowing a data message (or electronic message) to meet the "original form" requirement provided there is reliable assurance about its integrity from when it was generated. Then, an e-award can satisfy the criteria necessary for recognition and enforcement.

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[124] Convention on the Recognition and Enforcement of Arbitral Awards (1958 New York Convention), https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/new-york-convention-e.pdf.
[125] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025
[126] L Biukovic, 'International Commercial Arbitration in Cyberspace: Recent Developments' (2002) 22 Nw J Intl L & Bus 346–347
[127] UNCITRAL Model Law on Electronic Commerce with Guide to Enactment 1996 with additional article 5 *bis* as adopted in 1998, https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-04970_ebook.pdf.

However, despite this theoretical equivalence, many scholars and practitioners note that the prevailing practice remains the issuance of physical, signed copies of arbitral awards. This approach mainly stems from concerns about guaranteeing unequivocal authenticity, preserving the original content intact, and mitigating the risk of varied interpretations of digital formats by different national legal authorities.[128] There are also best-practice recommendations provided such as using robust e-signature platforms, timestamping and archiving electronic agreements, and drafting arbitration clauses with explicit electronic-form provisions.

Thus, while an e-arbitral award might technically fulfil the criteria under both the New York Convention and the UNCITRAL framework, the practical challenges - concerning trust, authenticity, and judicial standards mean that physical copies remain the standard in order to avoid any challenges during enforcement proceedings.[129]

4.2. Conclusion and main insights: enforcement

Technological advancements bring significant benefits, such as cost and time savings and increased procedural flexibility, but also introduce new challenges. These challenges include also the enforcement of e-arbitration agreements and e-awards.

The problem relates to the term “in writing” used in the New York Convention in relation to arbitration agreement and award. Many countries have modernized their arbitration statutes or interpretative practice to accommodate electronic communications within the “writing” requirement. However, it has to be mentioned that still the cautious strategy is applied in practice, transferring the documents also in the traditional form. Thus, there is a question on the potential necessity for modernization of the New York Convention.

[128] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

[129] Mohamad Fateh Labanieh, Mohammad Azam Hussain and N Mahdzir, 'The Legal Capacity of International Conventions and Laws to Legalise E-Arbitration' (2021) 17 Journal of International Studies (Sintok, Kedah, Malaysia) 211 https://doi.org/10.32890/jis2021.17.9

5. Other emerging technologies in international commercial arbitration

In addition, not focusing on the details and legal challenges in in-depth manner, in line with the videoconferencing and case management online, also deployment of emerging technologies in arbitration should be reflected. Without doubt in the incoming years technologies as AI, blockchain and even potentiality XR and VR will change the future of dispute resolution.

5.1. AI and automation for data analytics and case management

Technology in general has driven efficiency and reduced costs in some areas, but the underlying legal tasks have not materially changed. That may not be the case in the future as AI is supposed to change the kinds of disputes that need to be resolved and the way in which parties will want and require them to be resolved.[130] AI and data analytics hold strong potential for dispute resolution, but they also come with challenges. [131] However, important of trust in relation to such instruments is continuously stressed.[132] Trust in AI decisions remains a major aspect, so human oversight in arbitration cannot be avoided. [133]

AI and data analytics provides the following opportunities as for traditional litigation as also for arbitration: (i) implementation of AI for case management purposes, streamlining workflows and organizing complex information; (ii) use for identifying patterns and providing data-driven insights; (iii) supporting document review, enhancing efficiency in discovery processes; (iv) use in decision support, assisting arbitrators and other actors involved with detailed analytics (*inter alia* could be implemented for risk management purposes in the third-party funded arbitration, Burford Capital, a leading litigation funder, is exploring the use of AI to predict case outcomes based on their proprietary database of past cases)[134]; (v) use for translation and interpretation in

[130] Iain Quirk KC, Guy Pendell, "Arbitration Tech Toolbox: The Future of Dispute Resolution: Evolution or Revolution?", 2024, available at: https://arbitrationblog.kluwerarbitration.com/2024/02/01/arbitration-tech-toolbox-the-future-of-dispute-resolution-evolution-or-revolution/

[131] Mimoso MJ, 'Artificial Intelligence in International Commercial and Investment Arbitration' (2023) 3(2) International Investment Law Journal 156–166.

[132] Aranya Chatterjee and Sharique Uddin, 'Online Dispute Resolution: An Effective Mechanism and an Alternative Tool for Justice at a Reasonable Time' in Stavros Brekoulakis (ed), Arbitration: The International Journal of Arbitration, Mediation and Dispute Management (Kluwer Law International 2023) 529–549 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-amdm-870405 accessed 21 July 2025.

[133] K Buhuri, 'Arbitration in the era of e-commerce: A comprehensive overview' (2024) 23(3) World Journal of Advanced Research and Reviews 89–103 https://doi.org/10.30574/wjarr.2024.23.3.2628

[134] Samaa Haridi, Innovation in arbitration: The technological revolution in dispute resolution, 2024, available at: https://www.ibanet.org/innovation-in-arbitration-the-technological-revolution

global disputes. For example, law firms and arbitral institutions widely piloting AI tools.[135] There are two-stage AI adoption differentiated: short-term: AI tools function as predictive and analytic assistants to counsel and tribunals, enhancing legal research, document analysis, and argument drafting; long-term - as prediction costs fall and financing grows, AI will tackle more sophisticated tasks, potentially resolve discrete issues and automate routine tribunal functions.[136]

One of the recent instruments - CIArb guidelines on the use of AI in arbitration[137] provide a comprehensive framework for incorporating AI tools into arbitration proceedings, addressing potential benefits and associated risks. Guidelines emphasize that AI can enhance the arbitration process by improving efficiency, quality, and accessibility. However, despite the benefits, there are significant legal, procedural, and ethical challenges. These include threats to confidentiality, data security, and the potential for algorithmic bias. There is also an emphasis on maintaining human oversight to ensure that AI does not compromise the integrity or due process of arbitration. In order to issues the award, there should be explanation how the decision is reached, thus AI tools could be deployed partly and it cannot replace human reasoning in awards.[138] Also AI issued awards would be subject to public policy in the enforcing states.[139]

The mentioned guidelines are divided into several sections that outline the benefits and risks of using AI in arbitration, recommend due diligence on AI tools, and provide model agreements and procedural orders. This structured approach helps parties and arbitrators navigate the balance between leveraging technological advancements and preserving the traditional safeguards of arbitration. The document advises that any use of AI must be transparent and proportionate, with clear assessments of its impact on procedural fairness and compatibility with existing legal

[135] Gülüm Bayraktaroğlu-Özçelik and Ş Barış Özçelik, 'Use of AI-Based Technologies in International Commercial Arbitration' (2021) 12(1) European Journal of Law and Technology
[136] Orlando Federico Cabrera Colorado, The Future of Arbitration in an Age of Artificial Intelligence," 40 J. Intl Arb 301 (2023)
[137] Blakes, 'CIArb Issues its First Guidelines for the Use of AI in Arbitration' (25 April 2025) https://www.blakes.com/insights/ciarb-issues-its-first-guidelines-for-the-use-of-ai-in-arbitration/ accessed 10 June 2025
[138] Florescu CI, 'The Interaction Between AI (Artificial Intelligence) and IA (International Arbitration): Technology as the New Partner of Arbitration' in Cristina Emilia Alexe (ed), *Revista Română de Arbitraj* (Kluwer Arbitration 2024) 42–73 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-rra-2024-01-003.
[139] Bayraktaroğlu-Özçelik G and Özçelik ŞB, 'Use of AI-Based Technologies in International Commercial Arbitration' (2021) 12(1) European Journal of Law and Technology 1.

frameworks. The guidelines also caution against over-reliance on AI, reminding arbitrators that they must retain full responsibility for decisions, regardless of any AI assistance. In general, the aspects and basic principles emphasized are similar to the legal issues regulated by EU AI Act.[140]

The challenge in integration of AI solution in arbitration, e.g. for research purposes, is related to availability and access to qualitative data. Much like other AI systems in general, the performance of an AI in arbitration depends heavily on the volume of available data. To apply general principles to new scenarios accurately, an AI system must analyze a large number of past cases. However, the essential concept of "big data" is not typical for international commercial arbitration in light of confidentiality. This restricted access makes difficult to have sufficiently large dataset for training an AI, for example, for predictive purposes.[141] It also has to mentioned, that the current legal framework technically neither regulates nor prohibits data mining and text analytics in international commercial arbitration, leaving room to adopt advanced search tools that benefit parties, counsel and arbitrators.[142]

Silicon Valley Arbitration and Mediation Center has developed Guidelines on the Use of Artificial Intelligence in Arbitration, that is voluntary, principle-based framework for using AI in arbitration without overruling mandatory rules. According to the guideline philosophy - all users must understand AI's limits, safeguard confidentiality, and assess disclosure needs. Counsels have a duty to verify AI outputs, avoid evidence manipulation, and uphold procedural integrity. Arbitrators must retain core decision-making, disclose AI use outside the record, and protect due process. Guidelines also include a model procedural-order clause and illustrative compliance examples.[143]

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[140] Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) [2024] OJ L, 2024/1689, 12 July 2024 http://data.europa.eu/eli/reg/2024/1689/oj accessed 10 June 2025.

[141] G H Kasap, 'Can artificial intelligence ("AI") replace human arbitrators? Technological Concerns and Legal Implications' (2021) 2 Journal of Dispute Resolution 221–222

[142] Wilinski P and Durbas M, 'Chapter 9: Data Mining, Text Analytics and International Commercial Arbitration' in Pietro Ortolani, André Janssen and others (eds), *International Arbitration and Technology* (Kluwer Arbitration 2022) 159–188 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ortolani-2022-ch09.

[143] Silicon Valley Arbitration and Mediation Center, Draft Guidelines on the Use of Artificial Intelligence in Arbitration (Consultation Draft, 31 August 2023) <https://thearbitration.org/wp-content/uploads/2023/08/SVAMC-AI-Guidelines-CONSULTATION-DRAFT-31-August-2023-1.pdf> accessed 12 July 2025.

AI systems can inherit biases from training data, leading to potentially unfair outcomes, AI struggles with nuanced legal interpretation and contextual understanding, AI systems may lack reliability in delivering accurate or context-aware results. Thus, there are number of technical and substantive limitations that should be taken into account.

Rather than replacing human decision-making, AI can serve as a valuable assistant in dispute resolution. It could provide guidance by offering general information to frame arguments, used as the "chatbots" to support participants without taking over critical decision-making responsibilities. AI could potentially predict costs and duration, propose settlement ranges based on arbitrations of similar size and complexity, thus encouraging parties toward settlement.[144]

AI-powered tools are transforming the landscape of arbitration and legal practice by streamlining a variety of tasks already now. Tools like ChatGPT, Jus Mundi's AI research assistant, and Thomson Reuters' CoCounsel assist arbitrators and lawyers with legal research, document review, and summarization, significantly reducing time and effort while enhancing efficiency. In China, the integration of AI into arbitration is advancing, with institutions like the Shenzhen Court of International Arbitration testing AI's role in drafting decisions.[145] This innovative technology has recently been at the Guangzhou Arbitration Commission (China). The AI assistant has been deployed with the objective to offer guidance regarding the recognition of identity, maintenance of written documents during trial proceedings, and other aspects.[146] However, in light of these developments, to ensure fair dispute resolution, there is need for clear regulatory framework, combining technological and legal aspects.[147]

Taking into account the growing complexity of arbitration, AI has the potential to support the arbitration providers on the daily basis. At the same time, similarly to traditional dispute resolution,

[144] George A. Bermann, The Future of International Commercial Arbitration, Cambridge University Press, 2021, available at: https://scholarship.law.columbia.edu/faculty_scholarship/3305
[145] Paul Mozur, 'Beijin Wants A.I. to Be Made in China by 2030', 2017, available at: https://www.nytimes.com/2017/07/20/business/china-artificial-intelligence.html
[146] Qiu, Q. *AI arbitration used for dispute in Guangzhou*, "China Daily" 01.09.2023, https://global.chinadaily.com.cn/a/202309/01/WS64f13406a310d2dce4bb34ad.html.
[147] Qiu W, 'The Main Risks of Applying Artificial Intelligence in Commercial Arbitration and Strategies to Mitigate its Risk' (2024) 34(4) Journal of Arbitration Studies 117–136.

the question arises whether the arbitration could be substituted by AI. New York Convention mentions arbitrators in two articles (namely Art. I(2) and Art. V(1)(b), but does not mention or imply that arbitrators must be human beings. As the Convention was drafted before the deployment of the emerging technologies, there is presumption that arbitrators is assumed to be a human being.[148] Even the Convention is not explicitly against the use of AI for decision making, it must be noted, that there might be problematic aspects in light of fairness concerns as regards the further enforcement and recognition of award.[149] In addition, it should be mentioned that use of AI in international commercial arbitration to be evaluated also in light of EU AI Act, that could be another aspect for more in – depth research.

After the rise of agentic AI, several arbitration events and publications focused on AI – for example, ICCA conference showcased tools such as *ArbiLex, Harvey AI*, and *Clearbrief*, which can assist counsel in legal research and drafting. The integration of AI promises efficiency gains: AI text-generation could speed up drafting of routine parts of awards; AI analysis might help tribunals quickly identify key facts or inconsistencies. However, these promises come with significant caution. A survey in late 2023 of arbitration practitioners (by Bryan Cave Leighton Paisner LLP) found that while 90% were aware of AI tools for arbitration tasks, a majority (53%) *opposed using AI to draft substantive legal submissions*, and 88% were concerned about AI "hallucinations" – i.e. an AI tool generating false or misleading content.[150]

AI is being used to analyze cases, review documents, and assist arbitrators in preparing initial drafts of awards, showing its potential as a practical and efficient support system that complements human expertise without replacing critical judgment. This growing adoption highlights how AI can improve accuracy, efficiency, and accessibility across various aspects of arbitration.[151]

[148] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

[149] Gicquello, M. 2020 Artificial Intelligence in International Arbitration, [in:] The Oxford Handbook of International Arbitration¸ Oxford University Press, p. 7.

[150] Raoul J Renard, '2023 Year in Review: Technology' (Kluwer Arbitration Blog, 22 January 2024) <https://arbitrationblog.kluwerarbitration.com/2024/01/22/2023-year-in-review-technology/> accessed 10 June 2025.

[151] Samaa Haridi, Innovation in arbitration: The technological revolution in dispute resolution, 2024, available at: https://www.ibanet.org/innovation-in-arbitration-the-technological-revolution

However, only by leveraging AI thoughtfully and maintaining human oversight, it can enhance informed decision-making while preserving the integrity of dispute resolution processes.

Probably, AI could be significantly helpful in the framework of ODR platforms for high volume of small typical cases, that does not require substantive and detailed decision, but rather based on facts. AI definitely could be also helpful for real-time transcription and translation purposes, deepfake detection and authentication in the discovery process.[152]

5.2. Blockchain and smart contract disputes

The rise of blockchain technology and smart contracts has created both new challenge and potential for commercial arbitration. Disputes arising from cryptocurrencies, blockchain platforms, or smart contract enforcement are cross-border, but there are problems of jurisdiction and forum selection, that creates uncertainty and risks for parallel litigations.

Thus, arbitration has the several advantages for crypto sector, providing flexibility, opportunity for tailor - made solution, including technical expertise, and the most important - neutral forum and globally enforceable awards according to the New York Convention.[153]

The questions also arise in relation to the arbitration agreement as part of smart legal contract. For example, there are three categories or smart legal contracts defined: (i) natural language contract with automatic performance by code; (ii) hybrid contract, covering a broad spectrum of situations, but in which some contractual obligations are defined in natural language and others are defined in the code of a computer program; (ii) contract recorded solely in code. Inclusion of an arbitration agreement in first two categories is "straightforward". However, arbitration agreement in the coded part of a smart legal contract is more complex issue. There are also number of issues related to the validity of arbitration agreement in crypto asset user agreements.[154]

[152] Raoul J Renard, '2023 Year in Review: Technology' (Kluwer Arbitration Blog, 22 January 2024) <https://arbitrationblog.kluwerarbitration.com/2024/01/22/2023-year-in-review-technology/> accessed 10 June 2025.
[153] Sam Brown, *Arbitration of Cryptoasset and Smart Contract Disputes: Arbitration Unchained?* (Clifford Chance, 19 July 2023) https://www.cliffordchance.com/content/dam/cliffordchance/briefings/2023/08/arbitration-of-cryptoasset-and-smart-contract.pdf accessed 9 June 2025.
[154] Ibid.

In addition, it has to be mentioned that use of blockchain technology will require new skills. It calls on arbitration institutions, as a starting point, to develop guidance notes for the technical application of blockchain and tokens used in evidence. More specifically, expert evidence is and will become crucial to being able to trace the actual dispute of the token (its supporting technology) and blockchain.[155]

There are notable innovations in how arbitration itself can be conducted for blockchain disputes. One concept is "on-chain arbitration," where the arbitration process or award enforcement is built into the blockchain or smart contract logic. In an on-chain arbitration, code can automatically trigger an arbitration if certain conditions arise, and a resulting decision (for example, by a designated arbitrator or juror panel) is enforced by the smart contract without needing court intervention. Today, there are already a number of platforms offering "on-chain" arbitration services (e.g. *Kleros, Juris, Confideal, Mattereum and CodeLegit*).[156] E.g, *Kleros* is a decentralized ODR platform that leverages blockchain technology, game theory, and crowdsourced justice to resolve disputes.[157] *Kleros* aims to provide a system that is positioned as fast, cost-effective, transparent and reliable.

There is highlighted need for empirical studies on Kleros's long-term impact on claim rates and business relationships, legal analysis of enforcement under the New York Convention, standard-setting for de-identification, token staking rules, and juror selection criteria, exploration of hybrid on-chain/off-chain protocols to due-process safeguards.[158]

Alternatively, "off-chain" blockchain arbitration refers to using conventional arbitration (with human arbitrators, hearings, etc.) to resolve a dispute about blockchain or smart contract issues, but not automating the outcome. Off-chain arbitration may still be facilitated by specialized rules. For instance, in Poland, a dedicated Arbitration Court for Blockchain has been established under

[155] Walters R, 'Tokens and Blockchain Evidence in International Commercial Arbitration: Its Current Status?' (2025) Arbitration International https://doi.org/10.1093/arbint/aiae041
[156] Gide, 'Blockchain, Smart Contracts and Alternative Dispute Resolution' (Gide News & Insights, 5 July 2023) https://www.gide.com/en/news-insights/blockchain-smart-contracts-and-alternative-dispute-resolution/ accessed 11 June 2025.
[157] See: https://kleros.io/
[158] L Bergolla, K Seif and C Eken, 'Kleros: A Socio-Legal Case Study of Decentralized Justice & Blockchain Arbitration' (2021) 37 Ohio State Journal on Dispute Resolution 55–98.

the Chamber of Commerce for New Technologies, with rules tailored to blockchain disputes. Whether on-chain or off-chain, the key point is that digital transactions are bringing new cases for online arbitration. Institutions and facing the need of expertise in this area and number of the, (AAA, JAMS, SIAC) have also formed panels of arbitrators experienced in crypto and fintech disputes, recognizing this need.[159]

Without doubt disputes will evolve in the future, technology introduces novel types of disputes, particularly as systems like smart contracts encounter bugs, coding errors or failures. This creates a growing need for innovative dispute resolution mechanisms.[160]

5.3. Extended reality (XR) and virtual reality (VR)

XR and VR potentially could emerge in the nearest future of arbitration process.[161] Arbitrators have begun experimenting with virtual reality headsets and 3D simulations to better visualize evidence.

In one case study, an XR headset was used to recreate a 3D model of an accident site during a hearing, allowing the tribunal to virtually "walk through" the scene. Such technology can bring evidence to practice in a way that goes beyond photos or diagrams. It can also substitute for in-person physical visits – instead of bringing a tribunal to factory or property, a high-resolution 360° video or VR environment can be shared online to inspect the location. While still novel, these techniques show promise in making online hearings more informative. At the same time, the legal aspect related to the procedure and accessibility of evidence should be explored further in the detailed manner.

[159] Kluwer Arbitration Blog, '2023 Year in Review – Technology' (Kluwer Arbitration Blog, 22 January 2024) https://arbitrationblog.kluwerarbitration.com/2024/01/22/2023-year-in-review-technology/ accessed 11 June 2025
[160] Amy Schmitz, "Picking the Proper Technological Tool for Problem Solving in Arbitration," in Maud Piers and Sean McCarthy, eds. TRANSFORMING ARBITRATION, Radboud University Press, 2025
[161] Ryan Gallagher, 'Extended Reality for Alternative Dispute Resolution' [2025] J Disp Resol 9 [online] https://scholarship.law.missouri.edu/jdr/vol2025/iss1/9 accessed 20 July 2025.

5.4. Conclusions and main insights: emerging technologies

AI, blockchain, XR and VR technologies have the potential to support the arbitration process and it values in future. However, the application of the particular tools lead to number of practical and legal concerns, *inter alia* in the cross-border perspectives (e.g. in relation to the standards applied by the EU AI Act). Fundamental rights, privacy and confidentiality, dealing with sensitive data and ethical concerns should be also taken into account. Mentioned aspects have to be studied in more detailed manner.

Another challenge that particularly applies to deployment of AI based tools is confidentiality of arbitration proceeding. Confidentiality of the process may substantially limit access to data for further training purposes in the process of development AI solutions. Since most claims are resolved privately without producing public data, AI trained solely on published cases lacks a comprehensive view, making research or prediction result less accurate. Despite of this challenge there are already tools on the market, that are successfully applied by parties and arbitration providers in practice (e.g. *Jus Mundi*).

In addition, it should be mentioned, that blockchain technology and smart contracts bring new and promising potential for commercial arbitration. Despite of legal concerns related to arbitration agreement as part of smart legal contract, potentially in future these technologies could substantially transform the future of international commercial arbitration (especially with continues development of FinTech).

6. General conclusions and areas for further research

Thesis provided an overall assessment on the *status quo*, reflected on the development of the technology in time, scoped the tools deployed and tested by leading arbitration provider (e.g. ICC and SCC) already now and touched upon the practical and legal challenges related to digitalisation in international commercial arbitration. It has been found that deployment of the technology in arbitration is multidimensional task and it requires dialogue between policy makers, arbitration providers and tech industry.

Rapid development and adoption of innovation-driven technologies will fundamentally transform the practice of international commercial arbitration, new framework for dispute resolution is expected to become the standard.[162] In this regard one of the most important aspects stressed in the thesis is that digitalisation is not a "stand-alone" phenomenon, thus it should be reflected in the contemporary perspective and treated as the instrument in the debate related to the challenges of international commercial arbitration (e.g. increasing complexity and excessive formality, rise of international commercial courts, trend to settle and mediate, trend for the transparency).

Technology could help to address complexity, e.g. e-discovery tools allow for the efficient management of the large number of documents and data, simplifying the task to identify the right evidence.[163] Settlement and mediation could be efficiently digitalized. Digital platforms can provide secure and transparent access to case documents for all parties involved. Although, the importance of availability of compatible e-signature is important precondition for deployment of e-file.[164]

It has been found that online arbitration has the potential to provide less formal setting for dispute resolution, that has both positive and negative impacts. Although, digitalisation has streamlined proceedings and broadened access for complex, multi-party cases, yet it does not overcome the need for all involved consent to use it. In addition, with the rise of AI there has been observed increase in the complexity of the disputes and amount of the documents in the possession of the parties.[165]

Technologies has been mapped in the thesis, providing the following classification, namely, implementation of the technology in international commercial arbitration is focused on: (i) further

[162] Montoya Zorrilla E, 'Towards a Credible Future: Uses of Technology in International Commercial Arbitration' in Jörg Risse, Guenter Pickrahn and others (eds), SchiedsVZ | German Arbitration Journal (Kluwer Arbitration 2018) 106–114 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-schiedsvz-2018-02-005-n.
[163] M Sundaresh, 'The complexification of disputes in the digital age' (2022) 30(1) *Asia Pacific Law Review* 1
[164] E Schäfer, 'Chapter 8: E-Signature of Arbitral Awards' in M Scherer, N Bassiri and others (eds), International Arbitration and the COVID-19 Revolution (Kluwer Law International 2020) 151–166 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-scherer-2020-ch08 accessed 23 July 2025
[165] Wang, J. (2024). Joinder Mechanism in International Commercial Arbitration: A Trend in the Digital Age? *International Journal for the Semiotics of Law = Revue Internationale de Sémiotique Juridique*, *37*(3), 923–942. https://doi.org/10.1007/s11196-023-10068-1

development of online arbitration, including remote communication, e-filing and digital case management; (ii) integration of emerging technologies, such as AI, data analytics for efficiency and research purposes, blockchain technology, potentially extended reality (XR) and virtual reality. In addition, technology is supporting not only case management, but also management of the tribunal, arbitration providers.

Most popular types on technologies deployed by arbitration providers (already before pandemic) - videoconferencing and digital case file (these technologies are traditionally associated with ODR or e-arbitration) are analyzed in more detailed manner. Deployment of these tools in practice led to "hyperregulation" effect, mitigating the fairness, accessibility, privacy and security concerns.[166] On the one hand, the technology supports the parties and arbitrators in more efficient and less expensive proceeding, on the other hand leads to additional level on complexity imposed by new regulatory frameworks. In this regard, there is potentially a field for the discussion of unified and coordinated standards between the leading arbitration providers. The necessity for model laws and protocols has been stressed by number of scholars[167], especially in the context of use of the videoconferencing.

Overall increasing complexity of regulatory framework also mentioned in light of GDPR compliance, that on the other hand has also the positive effect, encouraging institutions to deploy more secure ICT solutions and introduce appropriate communication methods.[168]

[166] E Montoya Zorrilla, 'Towards a Credible Future: Uses of Technology in International Commercial Arbitration' in Jörg Risse, Guenter Pickrahn and others (eds), SchiedsVZ | German Arbitration Journal (Kluwer Law International 2018) 106–114 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-schiedsvz-2018-02-005-n accessed 23 July 2025

[167] E.g. V Singh and M Bahmani, 'Arbitration Agreement and Arbitral Award: The Online Perspective' (2021) 8(1–2) Journal of National Law University Delhi 45–61 https://doi.org/10.1177/22774017221094924

[168] Petillion F and Janssen J, 'Deel 2. Buitengerechtelijke geschillenbeslechting, Titel II. GDPR in Arbitration. A Guide to GDPR Compliant Data Controlling and Processing in National and International Commercial Arbitration' in Charlotte De Muynck, Alexander Hansebout and others (eds), Arbitrage, Bemiddeling en Andere Vormen van Conflictafhandeling: Vandaag en Morgen (Kluwer Arbitration 2024) 71–107 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-goister-2024-ch04.

However, the technology in the scholar debate is addressed in the broader sense, videoconferencing was in the center as one of the key technologies broadly implemented in arbitration.[169] Videoconferencing enabling remote communication and hearings online is one of the basic technologies deployed in the framework of e-arbitration concept. The discussion on the integration of the remote hearings is focused on number of legal and practical challenges, among them: (i) due process, fairness of the proceeding, including, right to be heard and accessibility[170]; (ii) authority of the institution *verso* party autonomy[171]; (iii) security and data protection[172].

One the most significant problems relates to the term "in writing" used in the New York Convention in relation to arbitration agreement and award. Many countries have modernized their arbitration statutes or interpretative practice to accommodate electronic communications within the "writing" requirement. However, it has to be mentioned that still the cautious strategy is applied in practice, transferring the documents also in the traditional form.[173] Thus, there is question on the potential necessity for modernization of New York Convention. Also, procedural aspects in general leave impact on the enforcement, e.g. presence in the framework of the remote procedure and equality of arms.

[169] L Chen, 'Will Virtual Hearings Remain in Post-pandemic International Arbitration?' (2024) 37(3) International Journal for the Semiotics of Law - Revue Internationale de Sémiotique Juridique 829–849 https://doi.org/10.1007/s11196-023-10054-7

[170] L V P de Oliveira, 'Access to Justice and the Right to a Hearing in Arbitration' in ICCA Reports No 10: Does a Right to a Physical Hearing Exist in International Arbitration? Investigating the Legal, Conceptual and Practical Implications of Remote Hearings in International Arbitration (ICCA Reports Series, Volume 10, Kluwer Law International 2022) 45–68 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-icca-2022-10-ch02 accessed 23 July 2025

[171] Maxi Scherer, 'The Legal Framework of Remote Hearings' in Maxi Scherer, Niuscha Bassiri et al (eds), *International Arbitration and the COVID-19 Revolution* (Kluwer Law International 2020) 65–104 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-scherer-2020-ch04 accessed 21 July 2025

[172] N Teramura and LE Trakman, 'Confidentiality and Privacy of Arbitration in the Digital Era: Pies in the Sky?' (2024) 40(2) Arbitration International 277–306 https://www-kluwerarbitration-com.uaccess.univie.ac.at/document/kli-ka-ai-2024-03-002 accessed 23 July 2025

[173] Magdalena Łągiewska, 'New Technologies in International Arbitration: A Game-Changer in Dispute Resolution?' (published online 13 December 2023) https://link.springer.com/article/10.1007/s11196-023-10070-7#Sec5 accessed 2 June 2025

Fundamental rights, privacy and confidentiality, dealing with sensitive data and ethical concerns should be taken into account in deployment of the new emerging technologies such as AI[174], blockchain, XR and VR in practice.

In general, there are number of areas for further in-depth research, e.g. legal impact of blockchain technology in international commercial arbitration and further potential for the deployment in practice; ways and strategies to focus on the core objectives and challenges of international commercial arbitration once the technology is implemented and designed; ways to avoid and reduce the "hyperregulation" effect related to the digitalisation.

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