

# **Innovating Evidence Procedure in International Construction Arbitration**

By Professor Doug Jones AO\*

## **Editor's Note**

Professor Jones has provided a very useful and timely exploration of ways in which the conduct of construction arbitrations can be enhanced through emerging technologies and innovations. The need for more effective and efficient methods advancing arbitration proceedings and better coordination of relevant lay and expert evidence has emerged as a major challenge as the related costs and time consumption have increased.

Professor Jones outlines in very practical terms the key innovations that have emerged in different jurisdictions and makes a compelling case for the embrace of even more advanced techniques to better address the increasingly prohibitive costs of arbitration and the related diminished access to relief in Construction disputes.

## **1. INTRODUCTION**

Innovation is a topic often discussed but seldom in relation to international construction arbitration. However, as these disputes are renowned for their technical evidence and significant complexity, it is appropriate that arbitration practitioners and the construction industry alike explore potential avenues of innovation that can be used to minimize cost and delay, and assist the tribunal's understanding of the case. Innovative new approaches within this space are very much within reach, even in the most complex of construction disputes. Arbitration is, at its core, an innovative and changing process, built upon the creativity of parties, counsel, arbitrators and institutions. It is this flexibility which enables it to be receptive to new forms of evidence and the creation of new ways of tackling evidence.

With this in mind, I address the following in this article. To begin with, I contextualize the importance of innovative evidence in construction

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arbitration. The presentation of evidence plays a vital role in any construction dispute. There exists a strong desire for arbitration to innovate to maintain its value as a method of dispute resolution, as seen through the consideration of technology in the rules and guidelines of arbitral bodies. I then consider developments in arbitral procedure which are particularly innovative. Innovation is not just about technology. It encompasses the refinement and tailoring of evidentiary processes such as the management of document disclosure, and of fact and expert witnesses. Next, after due consideration of procedural innovation, I highlight some present and emerging technologies which provide new ways of seeking and presenting evidence in construction matters. Finally, I reflect on the value of these innovations and the accompanying challenges which will have a significant impact on the future evolution of international arbitration.

## **2. EVIDENCE AND INNOVATION IN INTERNATIONAL CONSTRUCTION ARBITRATION**

### **2.1 The Role of Evidence in Construction Disputes**

Evidence plays a vital role in all disputes, but especially so in construction disputes, due to the complexity of modern projects and contracts. Historically, construction has always played an important role, providing critical infrastructure to society. However, the nature of international construction agreements has changed over time. Prior to the industrial revolution, there were generally two parties to a construction contract: the owner commissioning the project, and the master builder, who undertook both the design and building components of the work. The centuries that followed witnessed the birth of specialization, as owners began to rely on numerous specialists to carry out specific components of the project, in lieu of one master builder.

Today's construction projects are a new breed. They now involve a myriad of participants, existing side-by-side in an intricate web of contracts and subcontracts. In many cases, it is not possible for the contractor to undertake the entirety of the project. Instead, subcontractors are employed to perform certain aspects of the works. In addition, construction disputes are associated with high levels of risk due to unpredictable economic, political and climatic forces that may impact delivery. These risks have prompted the involvement of insurers, with the birth of construction insurance. Further, given their long-term nature, construction projects often rely on funding from external financiers. It is therefore unsurprising that a typical construction project

involves many participants, including subcontractors, financiers, insurers, suppliers, architects, engineers, and of course, the employer and contractor. Indeed, according to the ICC, nearly 50% of new cases involved three or more parties while over 20% involved more than five parties.<sup>1</sup> The result of this is that construction disputes arise from interrelated contracts, making the resolution of construction disputes challenging for those involved. In the advent of the megaproject, construction projects are set to increase in complexity and incorporate new technologies in project planning and management.

A significant challenge arising from construction and infrastructure disputes is the need to navigate technically complex facts. The sheer scale of construction disputes, combined with their intricate and highly specialized factual matrices differentiates construction disputes from those of other industries. The management of the evidence relating to these technical issues is of itself, a huge challenge. The industry boasts a certain level of notoriety due to the sheer volume of documentary evidence. Construction disputes can involve mountains (or terabytes) of documents, particularly when projects span many years from conception to completion. Parties often incur high costs when attempting to trawl through a sea of documents to find those that are relevant to the dispute. Correspondence also accumulates over the life of a project. There was a time when communications occurred on article, but now, most of it is electronic. The challenge of grappling with the data necessary to understand the facts of the dispute is a massive undertaking. In one arbitration involving the construction of an oil and gas platform, the claimant filed 126 document requests, with many documents sought exceeding 1,000 pages in length. These documents might be critical, but producing them can be cumbersome and expensive.

Understanding the factual matrix of each case is rarely straightforward and often requires the aid of expert evidence. Expert evidence is therefore an indispensable component of construction disputes. Reliable and relevant expert testimony serves the dual purpose of providing insight that may support a party's case, whilst also deciphering the technical evidence for the tribunal. While often necessary, the use of expert evidence does not come without its difficulties. Construction disputes often turn on evidence from experts speaking to issues of quantum, the extent or cause of delay or defects. However, where experts are used as a mouthpiece to further a party's own case, rather than to

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<sup>1</sup> International Chamber of Commerce, News Release, "Full 2016 ICC Dispute Resolution Statistics published in Court Bulletin", *ICC* (August 31, 2017), online: < <https://iccwbo.org/media-wall/news-speeches/full-2016-icc-dispute-resolution-statistics-published-court-bulletin/> >.

provide independent insight into an area, expert evidence may prove futile, serving to increase expense and delay proceedings. Therefore, the effective management of expert evidence is crucial to ensure parties and the tribunal derive value from the process.

Finally, infrastructure and construction disputes are time critical in nature. The completion of construction projects by the agreed date relies on the simultaneous performance of many distinct activities.<sup>2</sup> In many construction projects, failure to complete these activities by the agreed milestone will likely result in great monetary losses.<sup>3</sup> Indeed, any delays to project completion may lead to the contractor incurring overhead costs. The employer too may suffer loss as a result of the deferred date of completion, entitling it to liquidated damages. It is therefore unsurprising that delay is an inherent aspect of construction and infrastructure disputes. However, identifying the cause of delay is rarely simple. This will often require the use of complex schedule analyses, site diary entries, weekly or monthly reports, meeting minutes, photographs, witness and expert evidence, as well as critical path network software.<sup>4</sup> It is therefore important that the tribunal has the necessary evidence to deal with difficult questions of delay or applications for extensions of time.

## 2.2 The Momentum for Innovation

There is great momentum for innovation across the legal profession. New technology has transformed the practice of lawyers, judges and arbitrators. In the White & Case and Queen Mary University of London 2018 International Arbitration Survey (Queen Mary Survey), 61% of respondents thought that “increased efficiency, including through technology” is most likely to have a significant impact on the future evolution of international arbitration.<sup>5</sup> Innovation through technology is a vital ally for enhancing the quality and utility of evidence in construction arbitration. Even the most rudimentary technology, when

<sup>2</sup> Mark Lloyd-Williams et al., “A Global Perspective on Arbitrating Construction and Infrastructure”, *Inside Arbitration* 2 (July 1, 2016), 12 at 13, online: <<https://www.herbertsmithfreehills.com/latest-thinking/a-global-perspective-on-arbitrating-construction-and-infrastructure>> . <https://www.herbertsmithfreehills.com/file/14361/download?token=pDtHTHu4>> .

<sup>3</sup> James Bremen & Leith Ben Ammar, “Contractors’ Claims, Remedies and Reliefs” in Stavros Brekoulakis & David Brynmor Thomas, eds, *Global Arbitration Review: The Guide to Construction Arbitration*, 2nd ed. (London: Law Business Research, 2017) 63 at 64.

<sup>4</sup> Yiannis Vacanas et al., “Building Information Modelling (BIM) and Unmanned Aerial Vehicle (UAV) Technologies in Infrastructure Construction Project Management and Delay and Disruption Analysis” (2015), 9535 Proceedings of SPIE - The International Society for Optical Engineering 2.

<sup>5</sup> Paul Friedland and Stavros Brekoulakis, “2018 International Arbitration Survey: The Evolution of International Arbitration” (2018), White & Case and Queen Mary University of London Research Survey, 29.

deployed effectively, can add value. Technology presents three distinct advantages for arbitration: first, it improves the convenience of the process; second, it assists the organization and presentation of evidence; and third, it increases the efficiency of disclosure and production.

Participants in the construction sector have a range of dispute resolution options available to them. It is generally accepted that alternative dispute resolution (ADR) is preferred over litigation to resolve construction disputes.<sup>6</sup> This may be because ADR allows parties to refer their disputes to decision-makers with construction expertise. In the words of the ICC Commission Report on Construction Arbitration, it is “highly desirable” for arbitrators to be familiar with construction contracts and disputes.<sup>7</sup> However, other forms of dispute resolution exist: including dispute avoidance and dispute adjudication boards; adjudication (statutory and contractual), expert determination; and mediation.

Therefore, arbitration must adapt to maintain its value in the industry. Without detracting from its past successes, it is clear that there are areas that can be improved. A driving factor of this dissatisfaction is the perceived “judicialization” of arbitration,<sup>8</sup> as arbitration has been accused of becoming overly formal and procedurally rigid. Extensive evidence, lengthy pleadings, wide ranging disclosure, and protracted evidentiary hearings have driven up the cost, particularly in construction disputes. These concerns with arbitration and the emerging options available to the industry provide motivation for arbitration to embrace innovation, to adopt a flexible approach, and to demonstrate a willingness to adapt procedure to each dispute in order to manage the complexity of infrastructure cases in a cost-effective manner.

Fortunately, there are two key factors which enable innovation to flourish within arbitration. First, arbitration’s flexibility and international nature lends itself to embracing change. Participants in arbitration herald from different legal traditions and geographic locations. The rules of arbitration, including decisions about forms of evidence and evidence procedure, are determined by the agreement of the parties, unconstrained by prescribed practice notes and civil procedures of domestic

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<sup>6</sup> Today, standing DABs are prescribed in standard form contracts such as in the FIDIC Suites, and more recently, the NEC4 standard form construction and engineering contracts. DABs are popular amongst international parties for their time and cost savings in resolving disputes: David Kiefer & Adrian Cole, “Suitability of Arbitration Rules for Construction Disputes” in Stavros Brekoulakis & David Brynmor Thomas, eds, *Global Arbitration Review: The Guide to Construction Arbitration*, 2nd ed. (London: Law Business Research, 2017) 81 at 81.

<sup>7</sup> International Chamber of Commerce Commission, “Final Report on Construction Industry Arbitrations” (2001), 12:2 ICC International Court of Arbitration Bulletin 8.

<sup>8</sup> Phillip L Bruner, “Rapid Resolution ADR” (2011) 31:2 The Construction Lawyer 6.

courts. Therefore, tailoring the arbitration to suit the particular features of a complex construction dispute is in the hands of the parties.

Second, it is not merely arbitration's inherent features which make it a suitable vehicle for innovation. If new technologies are to be used more frequently, their use must be supported by soft law and the rules of leading arbitral institutions. The willingness of institutions to adopt technologically-neutral or inclusive rules has opened the door to technological innovation. For example, the International Arbitration (IBA Rules) on the Taking of Evidence in IBA Rules broadly define a document to be "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".<sup>9</sup> This is particularly valuable as documents are the main source of evidence in a construction dispute and are often considered most reliable.<sup>10</sup> The IBA Rules also provide that a witness shall appear in person unless the tribunal "allows the use of videoconference or similar technology".<sup>11</sup> Guidance on the use of technology assisted review within arbitration, discussed later in this article, has been formalized within the CIArb Protocol for E-Disclosure in Arbitration.<sup>12</sup>

A variety of institutions have integrated references to technology which support new forms of evidence and evidence procedure. These rules tend to focus on the use of teleconferencing and videoconferencing during arbitral proceedings. Article 24(4) of the ICC Rules 2017 states that case management conferences may be conducted by video conference, telephone or similar means of communication. Article 3(5) allows hearings to be conducted by those alternative means of communication. A case management technique suggested in the Appendix to the rules also recommends, "using telephone or video conferencing for procedural and other hearings where attendance in person is not essential and use of IT that enables online communication among the parties, the arbitral tribunal and the Secretariat of the Court".<sup>13</sup> The LCIA Rules 2014 Article 19 states that "a hearing may take place by video or telephone conference or in person (or a combination of all three)". The SIAC Rules 2016 contain provisions for an Emergency Arbitrator to provide for proceedings by telephone or video conference as alternatives to a hearing

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<sup>9</sup> Bartosz Kruzewski & Robert Moj, "Documents in Construction Disputes" in Stavros Brekoulakis & David Brynmor Thomas, eds, *Global Arbitration Review: The Guide to Construction Arbitration*, 2nd ed. (London: Law Business Research, 2017) 118 at 119.

<sup>10</sup> *Ibid.*

<sup>11</sup> International Bar Association, *IBA Rules on the Taking of Evidence in International Arbitration* (London: IBA, 2010), art 8(1) [IBA Rules].

<sup>12</sup> Chartered Institute of Arbitrators, *Protocol for E-Disclosure in Arbitration*, (London: CIArb, 2008).

<sup>13</sup> International Chamber of Commerce, *Arbitration Rules* (Paris: ICC, 2017), appendix IV(f).

in person (Schedule 1, Rule 7). However, Rule 24, pertaining to hearings generally, is mute on technology, stating that the tribunal shall “set the date, time and place of any meeting or hearing”. ACICA provides a Draft Procedural Order for the Use of Online Dispute Resolution Technologies, providing convenience to parties by suggesting the procedural issues that should be settled when choosing to use online dispute resolution technologies.<sup>14</sup> The ICC Commission on Arbitration and ADR Task Force on the Use of Information Technology in International Arbitration has similarly issued examples of wording that might be used for directions for the use of IT.<sup>15</sup>

Of particular note are institutional rules which include consideration of how technology can be used fairly and most efficiently. The AAA Rules 2013 provide:<sup>16</sup>

When deemed appropriate, the arbitrator may also allow for the presentation of evidence by alternative means including video conferencing, internet communication, telephonic conferences and means other than an in-person presentation. Such alternative means must afford a full opportunity for all parties to present any evidence that the arbitrator deems material and relevant to the resolution of the dispute and, when involving witnesses, provide an opportunity for cross-examination.

Furthermore, the Rules also provide that “the parties should attempt to agree in advance upon, and the arbitrator may determine, reasonable search parameters to balance the need for production of electronically stored documents relevant and material to the outcome of disputed issues against the cost of locating and producing them”.<sup>17</sup>

Finally, Article 7 of Appendix I of the ICC Rules enables the ICC Court to make a proposal to modify or supplement the Rules to the Executive Board of the ICC in order to take account of developments in information technology, without laying such proposals before the Commission on Arbitration and ADR. Such a provision ensures

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<sup>14</sup> Australian Centre for International Commercial Arbitration, *Draft Procedural Order for Use of Online Dispute Resolution Technologies in ACICA Rules Arbitrations* (Aug. 2016), online: < <https://acica.org.au/wp-content/uploads/2016/08/ACICA-online-ADR-procedural-order.pdf> > .

<sup>15</sup> International Chamber of Commerce Commission, “Information Technology in International Arbitration”, ICC Report (2017), online: < <https://cdn.iccwbo.org/content/uploads/sites/3/2017/03/icc-information-technology-in-international-arbitration-icc-arbitration-adr-commission.pdf> > at 18-24.

<sup>16</sup> American Arbitration Association, *Commercial Arbitration Rules and Mediation Procedures* (New York City: AAA, 2013), Rule 32(c).

<sup>17</sup> *Ibid.*, at Rule 22.

institutional rules can adapt and innovate quickly in response to new technologies.

Having considered the context and forces behind the adoption of innovative evidence procedure, I now move to outline possible procedural and technological innovations in construction arbitration. These range from innovations which are emerging as best practice, to ideas which are rarely presently seen in practice, but which may provide value in the future.

### **3. PROCEDURAL INNOVATIONS**

Arbitrators and parties have capacity to craft the arbitral process in innovative and bespoke ways to enhance the presentation of evidence. For this part of this article, technological innovations are left to one side. Instead, the focus is on evidence procedure, enabled by the inherent flexibility of arbitration and the will of the participants. To that end, I will share my experiences of procedural innovation in the following areas: procedural orders and case management; document disclosure; fact evidence; party-appointed experts; expert teaming; the evidentiary hearing; and bespoke summary proceedings.

#### **3.1 Procedural Orders and Case Management**

It is generally accepted in international arbitration that there needs to be early engagement in the design of the arbitration on a case-by-case basis, often depending on the particular evidentiary issues of a case. One of the theoretical advantages of arbitration is that it can be designed to meet the needs of each particular dispute. It has been accepted for many years that the commencement of that process is at the outset of the arbitration, in a meeting between the disputing parties, their counsel and the tribunal to produce a roadmap for the arbitration, otherwise known as the initial case management conference (CMC). This CMC is for the purpose of producing Procedural Order No.1 (PO1).

However, PO1 is only the first step on the journey to effective procedural innovation. There are some issues which can be usefully settled and decided at the first CMC and dealt with in PO1. There are other matters which should be left to be dealt with in detail later. At that first CMC, topics such as the procedural timetable, the date for the evidentiary hearing, a communication protocol, the format of documents to be exchanged, and hopefully, the assumptions in relation to the disposition of the parties' costs will be dealt with.<sup>18</sup> But there are procedural matters

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that are more amenable to later design, and these include many aspects of evidence-taking: disclosure, factual evidence and expert evidence. Detailed consideration of these issues during the arbitral process increases the efficiency of the process.

Many would agree that the concept of dealing with procedural issues as the arbitration develops is novel, because many arbitrators, particularly in the construction context, will try and set the roadmap for the entirety of the case from the beginning, and only deal with issues the subject of procedural dispute when and if they arise. Therefore, proactive case management through a series of procedural orders and further case management conferences is essential to ensure efficient and effective engagement of the evidentiary issues in an arbitration.

### 3.2 Document Disclosure

Document disclosure is a thorny issue in almost all international commercial arbitrations. This issue is far more intense a problem in international construction arbitrations, because of the mass of data involved. In the civil law system, disclosure is practically non-existent, but in the common law system, it typically forms a very large part of the pre-trial process (and in North America domestic arbitrations often includes depositions which are uncommon in international construction arbitration). The international arbitral community has established a process whereby there is a meeting of the minds between the civil law exponents and the common law domestic traditions. The IBA Rules,<sup>19</sup> which are often used, have established that the approach to disclosure adopts a middle ground between the common and civil law perspectives.

In international commercial arbitration, the civil lawyers have embraced the common law concept of disclosure with a level of enthusiasm. How to effectively handle the process of disclosure is a significant issue. Redfern Schedules can be useful to refine disputes over disclosure, forcing the parties to clarify what they are seeking and why. Unfortunately, many arbitrators and junior lawyers who are obliged to use this method of dealing with disputed disclosure issues regard it as a nightmare. Tribunals often have insufficient information to make informed rulings at the time the requests are made. At this stage, the tribunal's knowledge is generally limited to the contentions raised in the parties' statements of case or in the Redfern Schedule, which may be

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<sup>18</sup> Janet Walker & Doug Jones, "Procedural Order No. 1 Revisited: From Swiss Watch to Arbitrators' Toolkit" in Patricia Shaughnessy & Sherlin Tung, eds, *The Powers and Duties of an Arbitrator: Liber Amicorum Pierre A. Karrer* (Alphen aan den Rijn: Kluwer Law International, 2017) 393.

<sup>19</sup> IBA Rules, *supra*, note 11 at 3.

more formulaic than helpful.<sup>20</sup> This often does not assist in understanding the materiality and relevance of the disputed disclosure, critical to applying the test under the IBA Rules.

My suggestion is that tribunals create more opportunities to have short, focused hearings, or teleconferences, to have counsel explain the key issues of principle that underlie their disputed requests. Lead counsel can then explain these requests and the reasons underlying the parties' dispute as to their production. This can clarify the issues, eliminate irrelevant requests and point to ways to address the concerns regarding production. It enables the tribunal to rule on the key issues of principle, following which large areas of disputed requests may fall away. It may also be helpful to have experts present at this hearing. Many document requests are driven by experts' needs, which when translated by the lawyers drafting the requests, are rarely limited to what is critical. It may help to have the experts themselves explain their needs for production in the context of a proportionate and focused approach.

Ultimately, while the tribunal must actively engage with document production, the parties also have a responsibility to limit document requests to only what is necessary. This is a goal that may only be achieved through the provisions of PO1 and the use of CMCs to deal with disclosure problems, strategies which should be encouraged by an active tribunal.

### 3.3 Fact Evidence

There has been a shift away from oral evidence in chief in international arbitration, particularly in the realm of international construction arbitration. Instead, it is all in writing. The witness statements produced in international commercial arbitration generally, and certainly in infrastructure and construction disputes, are lengthy. The parties spend a significant amount of time, effort and cost into ensuring that the witnesses depose to every issue which might be conceivably relevant.

Parties' cases are presented two broad ways. The first is the pleaded case approach (becoming less common), in which the allegations to be proven are set out in the pleadings. The witness evidence is produced after the pleadings are closed. The second approach, which is more common nowadays, even in huge construction disputes, is the use of memorials. Under a memorial approach, the parties' cases includes arguments, all of the factual witness evidence by way of witness statements and all of the documents relied upon.

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<sup>20</sup> Walker & Jones, *supra*, note 18 at 396.

With the pleadings approach, there is real value in holding a meeting between counsel and the tribunal, before the witness statements are prepared and after the pleadings have been exchanged. This meeting can enable the tribunal to uncover what is actually in dispute. By providing parties and witnesses with clear, precise directions, evidence will be limited to material issues. This saves parties from spending unnecessary time and resources on irrelevant facts or peripheral issues in their factual witness statements. The parties should also be encouraged to prepare a list of issues to narrow the witness evidence to that which is essential. In a recent construction arbitration involving 22 distinct claims, and 47 factual witnesses, it was necessary to provide specific guidance to the parties. In this case, the tribunal explicitly directed the claimant's factual witnesses to confine their reply witness statements to addressing the disruption issues raised by the respondent's factual witnesses. This streamlined the factual evidence, allowing witnesses, counsel and the tribunal to focus on the key issues.

The extent to which one can limit evidence often depends on the approach that is adopted. If the memorial approach is used, it is my practice to have a CMC after the first round, before the reply round comes in, with the tribunal in advance of the CMC summarising for the parties for discussion at the CMC, what it sees as the key issues in dispute. This can result of limiting the evidence needed in reply, to the key issues.<sup>21</sup> This also has the additional advantage of educating the tribunal at an early stage as to what the dispute is about and provides the opportunity to engage with counsel regarding the emerging issues that might prove critical to the case.

Arbitrators often find this process to be a challenging exercise. However, a CMC of this nature is in my experience always helpful in aiding the tribunal's early understanding of the case. It is innovative in the sense that it is not in my view done nearly enough. These case management techniques can help to confine factual evidence to material issues, thus containing time and cost, and should be encouraged by both parties and the tribunal.

### **3.4 Party-Appointed Experts**

Procedural innovation is particularly valuable when engaging with party-appointed experts, to ensure that their evidence is efficient and useful. When it comes to expert witnesses, we are blessed with the clash of cultures between the common law and civil law, which have a completely different approach to experts. In the civil approach, it would

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<sup>21</sup> International Chamber of Commerce Commission, *supra*, note 7.

be rare that a court would be interested in hearing from a party-appointed expert. By and large they will appoint a tribunal expert, who investigates and reports back to the judge and is remunerated through the courts.

For many years the common law world has relied on party-appointed experts which, at times, the judiciary has recognized as being less than helpful.<sup>22</sup> In North America the deployment of party-appointed experts has also been complicated by the use of juries to try civil cases in the United States of America. The role of expert evidence is to assist the tribunal in understanding the technical elements of the dispute. This is often forgotten as party-appointed experts act as “hired guns”, hindering the efficient and economic resolution of the dispute. A failure to manage expert evidence can leave the tribunal floundering as it attempts to understand the facts of the case without any objective guidance on the technical issues.

As with document disclosure, civil law lawyers in international arbitration have embraced the concept of party-appointed experts with enthusiasm, not having experienced the problems faced by the common law world. This “hired gun” problem, which has been experienced by the common law world for quite some time, has become a real issue in international commercial arbitration, including construction arbitration.

Tribunals should take a proactive approach to managing expert evidence throughout the entire arbitration. This section suggests three strategies which collectively span the arbitration: first, early management of expert evidence; second, streamlining the exchange of expert evidence; and finally, assistance with the award and quantum calculations.

#### **a) *Managing Expert Evidence***

Engaging early with the experts is critical to avoiding uncomfortable surprises about the nature or content of their evidence. This begins with the identification of experts and disciplines at an early stage. By doing this sooner rather than later, the tribunal and the parties may be alerted to, and resolve expert issues which can later be intractable. There are many instances where the parties’ willingness to consider expert evidence at the outset has saved all involved from unnecessary delay, cost and stress.

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<sup>22</sup> An empirical study conducted by the Australian Institute of Judicial Administration (AIJA) in 1999 found that Australian trial judges had serious concerns about the poor examination of party-appointed experts in court and the perceived bias of their evidence: Steven Rares Ian Freckelton, Hugh Selby & Prasuna Reddy, *Australian Judicial Perspectives on Expert Evidence: An Empirical Study* (Carlton: Australian Institute of Judicial Administration Inc, 1999) at 37.

This strategy proved particularly useful in a recent arbitration involving the construction of a steelmaking plant. In the initial case management teleconference, the tribunal became aware that one party intended to use an employee as an expert. One can appreciate that this expert could not be considered independent, and in any event, there was not a matching of expert disciplines between the parties. The parties were therefore encouraged to reconsider and produce a Joint Statement, identifying the experts and disciplines, along with expert issues. The parties did this and were able to agree on expert topics and issues, avoiding any further CMCs or pleadings. The problem was thus averted and expert matters efficiently resolved. Had the tribunal and parties not been proactive in addressing these issues, extensive cost and time would have been wasted on considering expert evidence that was not entirely relevant or independent.

Second, the parties should be required to agree, or the tribunal should settle, a List of Expert Issues, identifying the principal issues upon which the experts of each discipline will opine. This may seem obvious, but the failure to create a common list of issues can have very significant consequences that will often be revealed at the hearing. This exercise is valuable in bringing together experts of like discipline and avoiding overlap or gaps between experts of different disciplines, which can leave the tribunal without assistance on critical expert issues. To avoid this situation, a List of Issues should be used to minimize uncertainty and inconsistency as to expert issues. The list should identify areas of disagreement on the relevant issues, which can be discussed between the parties, the experts and the tribunal, at a second CMC. This will ensure that all involved are clear as to the exact issues towards which expert evidence will be directed.

However, these first two strategies are all for naught if experts' opinions are based on different factual assumptions or datasets.<sup>23</sup> This can leave the decision-maker with the dilemma of having to "pick one", which is concerning where both experts' opinions are based on cases pleaded at their highest, with the result that neither opinion appears entirely useful.

Therefore, the third strategy is ensuring that experts from like disciplines, to the extent possible, opine on the same factual assumptions, methodologies and datasets. To this end, the tribunal should suggest, at an early stage, that experts provide their analysis using the alternate assumptions and methodologies adopted by their counterpart. While it may appear that experts (particularly quantum and delay experts) have many differences of opinion, this technique will weed out

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<sup>23</sup> Walker & Jones, *supra*, note 18 at 393.

the differences that are based solely on differing contractual interpretations, methodologies or other assumptions. It will highlight the areas of actual expert disagreement. Reaching consensus and establishing order at this early stage can then pave the way for further helpful engagement as the proceedings unfold.

**b) *Exchanging Expert Evidence***

Having ensured that the expert evidence is of relevance and is based upon the same assumptions and methodologies, the next consideration is the process of exchanging this evidence. There are of course a broad range of approaches. This article will explore two: the use of expert conclaves and hot-tubbing.

Expert conclaves involve the detailed conferral, “without prejudice”, between experts of like discipline from an early stage in the proceedings. This culminates in a joint report identifying the matters of agreement and disagreement between the experts. Guided by this collaborative effort, subsequent individual reports can be confined to the matters upon which the experts disagree. This discourages experts from taking starkly opposed and deeply entrenched positions from which they may later be reluctant to depart. This process is most effective when experts embrace their duty to assist the tribunal, and engage in good faith in the process of conferring with one another.

This conferral process also enhances the ultimate effectiveness of hot-tubbing, another strategy used to streamline expert issues. Hot-tubbing refers generally to the process of taking evidence from witnesses in the presence of other witnesses (from both sides of the dispute) and allowing them to engage with the tribunal, and each other, as to the accuracy of their claims. It is particularly helpful in circumstances where there are complex factual and technical issues and multiple experts and so is commonly deployed in construction arbitration. Hot-tubbing allows the experts to share their conclusions in response to live issues put to them by the tribunal. Often this will provide the tribunal with insights that go to the root of issues upon which they seek clarification. While the benefits of hot-tubbing are well-known, and the practice is commonplace,<sup>24</sup> it is far more successful in situations where the tribunal has proactively managed the expert evidence.

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<sup>24</sup> Jonathan Lee “Controlling Expert Evidence in International Commercial Arbitration” (2017), 19:1 Asian Dispute Rev 4 at 9.

**c) *Assistance with the Award***

One way to best utilize experts of like disciplines is to have each expert express conclusions on the reasoning or assumptions adopted by the other expert. This is often necessary in complex construction cases, particularly for quantum and delay analysis, where experts may adopt alternative positions. Following the evidentiary hearing, the tribunal will frequently require expert assistance to adjust claim calculations to reflect the tribunal's conclusions. This is the case for damages or interest rates, which are often mathematically complex. Quantum experts are well-equipped to handle these difficult calculations in an efficient and accurate manner through a relational data model. Once the tribunal has formed its view on the relevant issue of principle or factual finding, the tribunal can insert its decision into the model created by the experts using their mathematical methodology. The model will then generate the quantitative value of claims or resultant damages, based on the tribunal's findings.

However, the expense of building such datasets and models can be significant. To reduce cost and obtain full value from the experts, it is useful for the tribunal to have access to the experts during the preparation of the award. In this setting, the experts are asked to confer and produce the relevant calculations based on the tribunal's actual findings of fact and principle. This economical approach eliminates the need to base the experts' conclusions off a range of assumptions or a complex model. Such an arrangement requires the agreement of the experts and the parties. Importantly, communications between the tribunal and the experts must remain confidential from the parties. The parties must also agree that the costs of the experts' work are approved by the tribunal for payment by the parties.

These approaches, either by the use of data modelling, or joint assistance from experts of like discipline, ensure that the tribunal's calculations on quantum are correct, and can reduce the costs which would otherwise be required for the tribunal to ascertain quantum without expert assistance.

### **3.5 Expert Teaming**

In his 2010 paper presented at the International Council for Commercial Arbitration (ICCA) Congress in Rio de Janeiro, Dr. Klaus Sachs introduced the concept of expert teaming.<sup>25</sup> Briefly, expert teaming

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<sup>25</sup> Klaus Sachs, "Experts: Neutrals or Advocates. Protocol on Expert Teaming: A New Approach to Expert Evidence" (Paper delivered at the International Council for Commercial Arbitration Congress, Rio de Janeiro, May 25, 2010).

consists of parties presenting a list of desired experts to the tribunal. Each party is given the opportunity to register any conflicts of interest with the opposing party's listed experts. Taking these into account, the tribunal selects an expert from each list and appoints the two experts jointly as an "expert team". Following this, the tribunal, the experts and the parties meet to establish a protocol by which the expert evidence will be adduced. The expert team will then prepare a joint report, and may be questioned by the tribunal or the parties at their discretion. The expert team will be expected to work as an independent team, and all communication with the parties or the tribunal must be disclosed to both members of the team.

This concept has many strengths, in that it attempts to minimize the feelings of loyalty often associated with party-appointed experts. Further, it ensures that the parties are able to use an expert of their choice, as opposed to the use of a tribunal-appointed expert. By having each party produce their own list of experts, each party is given significant input into the choice of experts, but without the difficulties associated with having both parties agree on a single expert. Finally, expert teaming has cost and time benefits, as only a single expert report is produced, reducing the amount of work undertaken by each expert. This also prevents a situation whereby two conflicting reports are produced, based on disparate assumptions.

Sadly, despite its obvious benefits, expert teaming has not been embraced by parties and tribunals.

### **3.6 Evidentiary Hearing**

A well-planned and managed evidentiary hearing is an essential part of a successful arbitration. To help achieve this, a pre-hearing CMC should be used to establish the procedure of the hearing, and to resolve any unresolved issues. Ideally, this should take place at least several weeks prior to the hearing, in order to leave sufficient time for the parties to address matters arising from that conference. This can include agreement on facts, chronologies and dramatis personae, translation (should this be necessary), and the alignment of both sets of counsel with the procedure agreed or established.

The tribunal should also address the format of opening submissions, which will differ from case to case. Where the parties' cases have not been pleaded in detail, pre-hearing submissions are required. However, the tribunal must consider the cost and time this entails: written opening submissions should be reserved for cases that require them, and where they are adopted, appropriate procedural limitations should be put in



place (e.g. page limits) in order to retain proportionality. Agreeing on the hearing timetable and adhering to it will also help to reduce delay.

Proactive case management does not end at the evidentiary hearing. The tribunal should continue to consider the parties' unique needs when shaping the format and structure of closing submissions. One consideration may be the incorporation of witness testimony from the evidentiary hearing. Ultimately, oral and written opening and closing submissions each have their merits and will depend on the case at hand.

### **3.7 Bespoke Summary Procedures**

Some infrastructure disputes require extraordinary procedures to maintain their cost effectiveness. In the majority of arbitrations, case management techniques will be most effective when deployed by a proactive tribunal. However, some cases require exceptional treatment, in the form of tailored summary procedures.

One such common challenge in construction disputes is where a claimant seeks to arbitrate claims for hundreds of variations and defects arising over a long-term project. Whilst the value of any individual claim may be low, each of those claims still involves disputed issues of contractual interpretation, fact, technical expertise, and quantum. Presenting and defending such claims may require written submissions, witness evidence, expert testimony, and cross-examination time, the cost of which quickly exceeds the claimed amount. It may only become obvious as the proceedings progress that the full-scale arbitration of each claim is not cost effective.

There are ways to adapt standard arbitral procedure to make the unmanageable manageable. The initial step involves identifying the situation at an early stage, and recognizing the alternative procedures available to deal with these issues more efficiently. It is incumbent on tribunals to take the initiative, and to establish with the parties and their lawyers parameters for future constructive discussion to address the situation. A case management conference at an interim stage of the proceedings, with all involved including experts, may be an appropriate forum for this.

The next step, which is of course challenging, is designing a suitable bespoke procedure. I have seen this task taken up by counsel with enthusiasm and skill, with impressive results. I will briefly outline two examples.

In one case, the claims were segregated into a high-value group of claims, and a low-value group of claims. Summary procedures were tailored for

the low value and ultra-low value group of claims. Low value claims were to be decided on the articles, without witness evidence, and on the basis of a strictly limited schedule of expert evidence. This was restricted by an appropriate monetary limit. A separate procedure was adopted for the “ultra-low value” claims, which involved replacing quantum expert evidence in the claims that succeeded with recovery in proportion to the degree of success of the high value claims which were briefed and decided in full detail.

In another complex case, numerous variation and defects claims were grouped into categories based on common legal and factual issues. The tribunal encouraged the parties and their experts to agree on a sampling approach to these claims, without which determination of the issues in dispute would have been uneconomic.

These procedures offered the parties access to justice, by a process designed by the parties themselves, at a commercially sensible cost. It assisted the tribunal by avoiding the voluminous amounts of evidence which would have been required without a tailored procedure. There were two key ingredients in the success of these processes. The first was a proactive tribunal, willing to take initiative and promote creative solutions to the issues in dispute. This required deviation from a standard “formula”. The second was the good faith participation of the parties and their legal counsel, without which such procedures would not have been workable.

These innovative procedures highlight the unique competitive advantage of arbitration that is too often forgotten - namely, that it is a procedure that is owned by the parties, and can be adjusted to the needs of a particular case. The role of the skilled legal adviser or arbitrator is to help craft the procedure to fit these needs. Arbitrators, then, should not be unduly fearful of due process concerns, which have been identified as a substantial barrier to efficiency in arbitration.<sup>26</sup> Rather, tribunals should think laterally and seek out these kinds of opportunities to innovate where appropriate.

#### **4. TECHNOLOGICAL INNOVATIONS**

In ordinary parlance, the term “innovation” is almost synonymous with technology. Although the procedural innovations highlighted above remind us of the broader meaning of innovation, it is not possible to overlook the significant advantages that technology brings to

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<sup>26</sup> Paul Friedland and Stavros Brekoulakis, “2018 International Arbitration Survey: The Evolution of International Arbitration” (2018) White & Case and Queen Mary University of London Research Survey, at 3.

arbitration. Technology can play a leading role in streamlining an arbitration and enhancing its convenience over the course of the arbitration. Discussed below are existing technologies and potential new developments which may influence the forms of evidence and the procedures for dealing with it in construction arbitrations. I will begin by considering technologies specific to construction disputes, being site visualization technologies, and delay and disruption modelling. I will then address document management, hearing room technologies, virtual hearing rooms, and virtual arbitrators. Although these are applicable to commercial arbitration more broadly, it is particularly useful to consider them in the context of construction arbitration.

#### **4.1 Site Visualization Technologies**

Site visualization technologies are a group of technologies most distinctly tied to construction arbitration. Being able to perceive a site, including its facilities, equipment, access points and dimensions, can be very valuable in some cases (but not all) in assisting the tribunal to form its view on the evidence submitted in support of each claim. Traditionally this was achieved through site visits. My last major site visit was of a high-value light rail project in Korea, constructed through a public-private partnership. Both parties agreed that they wanted the tribunal to see the project, which was completed but not operating.

In another one of my arbitrations concerning the development of onshore natural gas processing facilities, a party made an application for a site inspection to assist the tribunal with developing a visual and physical framework to digest and evaluate the evidence presented during the arbitration (which would not be possible on the articles alone). It was argued that using videos or photographs as an alternative would be a poor substitute for a site visit and could be potentially misleading. New footage would also be required as no proper video was taken at the material time.

However, there are a range of issues with conducting a site visit, which had a bearing on the outcome of that application. There are usually sizeable costs associated with a site visit, including international flights for the majority of the experts and tribunal members, domestic flights, other transport expenses, accommodation expenses and legal and expert fees. These costs often weigh on parties' minds when considering a proposal for a site visit.

There can also be great difficulty in reconciling the parties' varying availability, particularly when the site is in a remote area. In the case described above, the time frame for the visit was of vital importance as

the owner was soon to take charge of the site and could be less sympathetic to a visit. Despite the familiarity with the site that the tribunal would gain, the cost and inconvenience of a site visit outweighed the value. Consequently, I have not had a site visit in quite some time, the need for which has been obviated by technology. The availability of photographs, videos, presentations, satellite imagery and other information has enabled tribunal members to understand spatial relationships without a physical site inspection.

Photographic evidence has come before courts and tribunals in construction cases since at least 1875.<sup>27</sup> Under the International Federation of Consulting Engineers (FIDIC) Red Book, photographs are among the requirements for the progress report that a contractor should send to the owner daily, weekly, and monthly.<sup>28</sup> Therefore, there is typically no shortage of photographic evidence in construction arbitrations, particularly in matters concerning delay, disruption or defects. However, there are limitations to this conventional method of digital camera photography in the viewing of a construction site. Gaining perspective on the high reach points and a broader view of the construction site is an issue which conventional photography cannot capture.<sup>29</sup>

New technologies have sought to provide alternative and supplementary visual perspectives to traditional photographs. These include time lapse cameras, video conferencing, presentation software, computer animations and simulations, and digital video.<sup>30</sup> Of particular note is the “widespread availability of satellite imagery and GPS software to document the physical world in real-time”.<sup>31</sup> These technologies not only improve delay analysis and record keeping in the event of a dispute, but also enhance project management throughout the life of the project. As reasonably inexpensive forms of new technology, they weaken the case for site visits even further.

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<sup>27</sup> Yiannis Vacanas et al., “Building Information Modelling (BIM) and Unmanned Aerial Vehicle (UAV) Technologies in Infrastructure Construction Project Management and Delay and Disruption Analysis” (2015) 9535 Proceedings of SPIE – The International Society for Optical Engineering at 7.

<sup>28</sup> Section 4.21-b.

<sup>29</sup> Masiri Kaamin et al., “The Application of Micro UAV in Construction Project” (Paper delivered at the 2nd International Conference on Applied Science and Technology, Kedah, Malaysia, 2017), (2017) 1891 AIP Conference Proceedings.

<sup>30</sup> Zohreh Soltani et al., “The Challenges of Using BIM in Construction Dispute Resolution Process” (Paper delivered at the 53rd ASC Annual International Conference Proceedings, Seattle April 7, 2017), (2017) online: <<http://ascpro0.ascweb.org/archives/cd/2017/paper/CPRT212002017.pdf>> at 772; Vacanas et al., *supra*, note 4 at 8.

<sup>31</sup> Michael A Becker and Cecily Rose, “Investigating the Value of Site Visits in Inter-State Arbitration and Adjudication” (2016) 8:2 J Intl Dispute Settlement 219 at 248.

Aside from the range of technologies described above, there are two technological developments which have more recently been considered in the realm of construction arbitration. These developments, being Unmanned Aerial Vehicles (UAVs) and augmented and virtual reality (AR and VR), have yet to reach their full potential. Regulatory and technological barriers remain. However, they have the capacity to heighten the tribunal's ability to visualize the physical dimensions of a project without being physically present.

Micro UAV or drone technology can produce remarkably clear aerial footage. Indeed, I recently substituted party-agreed UAV footage in place of a site visit to an offshore oil and gas facility in the Indian Ocean and to an atomic power station construction site in the Middle East. The use of UAVs on these occasions proved useful in enhancing the tribunal's understanding of the issues. When considering the use of UAVs, some brief points should be noted. UAVs are able to capture images from a greater number of angles compared to a common digital camera and generate a higher quality three-dimensional model.<sup>32</sup> UAVs can be remote controlled by a "pilot" stationed on the ground, or can be pre-programmed to fly autonomously on a flight plan.<sup>33</sup> Data from UAVs can be gathered on a daily basis and compared to blueprints to ensure the project is on schedule.<sup>34</sup> Equipping a UAV with high-definition, infrared or thermal-imaging cameras can create evidence which is particularly useful to construction disputes. These specialized cameras can test materials for defects and flaws such as a chemical leakage or detect heat loss and air conditioning problems.<sup>35</sup> This technique has been employed by BP to inspect the Alaska pipeline, using infrared cameras to test for hot spots and other infrastructure faults.<sup>36</sup> Hence, deploying UAVs can be particularly valuable in identifying delay causation, delay impacts and liability for defective works.

From a procedural standpoint, documentary material generated by UAVs should be admissible without substantial changes to the rules of evidence. Traditional evidentiary principles can and should apply. UAV-generated evidence, be it in statistical, graphical, audio, or visual form, "accomplishes nothing in substance that attorneys have not done in the past through documentary, real, demonstrative, or testimonial evidence".<sup>37</sup> Similarly, the institutional rules, IBA Rules and the ability

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<sup>32</sup> Kaamin et al., *supra*, note 29 at 4 6.

<sup>33</sup> *Ibid.*, at 2.

<sup>34</sup> Andrew L. Smith, "Drones Will Change the Game in Construction", (2017), 21:4 *The Critical Path* 1.

<sup>35</sup> *Ibid.*, at 2.

<sup>36</sup> *Ibid.*, at 1.

<sup>37</sup> Timothy M. Ravich, "Courts in the Drone Age" (Paper delivered at the Law + Informatics

for the parties and tribunal to agree on admissibility should leave little barrier for UAV-generated evidence to fall within the scope of evidence considered by the tribunal.

The more substantial barrier to the use of UAVs comes from government regulations. For example, current Federal Aviation Administration regulations in the United States do not permit the commercial operation of a UAV unless an exemption is sought. Of the more than 3300 exemptions granted since 2012, over 450 included the use of UAVs on construction sites.<sup>38</sup> As the prevalence of commercial UAVs increases across the board, due consideration will need to be given to privacy and safety concerns.<sup>39</sup>

Augmented Reality (AR) and Virtual Reality (VR) may become useful tools for evidence visualization in the future. AR allows digital content to be layered over the real world using special glasses or a smartphone.<sup>40</sup> VR completely replaces the real world using goggles and speakers, placing the person inside a virtual environment. The potential of this technology to facilitate efficient arbitral proceedings was displayed at an AR demonstration at the 2018 ICCA Congress.<sup>41</sup> The audience considered a fictional case of negligent manufacturing. AR was demonstrated through an app which visually displayed the structure and physical circumstances of the case.<sup>42</sup>

While the application of this technology in construction matters is in its infancy, its potential is impressive. Augmented reality may improve the presentation of evidence, by enabling the tribunal to visualize projects and understand the anatomy of particular arguments such as design change impacts and causation of alleged defects. VR and AR have a high frame rate and low latency, thus generating an immersive and realistic experience.<sup>43</sup> Data gathered from AR or VR technologies may serve as evidence in a dispute, providing a visual log of what site managers observed over time.<sup>44</sup> Presently, it has been applied in safety training modules in construction and engineering sectors. One mixed reality

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Symposium on Digital Evidence, Northern Kentucky University Salmon P. Chase College of Law, February 27, 2015) at 23.

<sup>38</sup> Smith, *supra*, note 34 at 2.

<sup>39</sup> Kaamin et al., *supra*, note 29 at 6.

<sup>40</sup> Mark A. Lemley & Eugene Volkh, "Virtual Reality and Augmented Reality" (2018) 166:5 U Pa L Rev 1051 at 1055.

<sup>41</sup> Geneva Sekula, "ICCA Sydney: The Moving Face of Technology", *Kluwer Arbitration Blog* (April 18, 2018), online: <<http://arbitrationblog.kluwerarbitration.com/2018/04/18/icca-sydney-moving-face-technology/>>.

<sup>42</sup> *Ibid.*

<sup>43</sup> Xiao Li et al., "A Critical Review of Virtual and Augmented Reality (VR/AR) Applications in Construction Safety" (2018), 86 *Automation in Construction* 150 at 152.

<sup>44</sup> Lemley and Volkh, *supra*, note 40 at 72.

technology, Microsoft HoloLens, has also been used by the Gilbane Building Company to visualize projects and identify potential defects.<sup>45</sup> Parties may be drawn to these technologies as it enables them to interactively present a construction site and its technical features. However, only time will tell the true appeal of AR and VR in construction arbitration.

#### 4.2 Delay and Disruption Modelling

Beyond site visualization techniques, modelling of construction sites can also provide high quality evidence for delay and disruption claims. Building Information Modelling (BIM) and System Dynamics (SD) Modelling are two technologies which can be applicable to construction disputes.

BIM has been defined as “a digital representation of physical and functional characteristics of a facility and a shared knowledge resource for information about a facility forming a reliable basis for decisions during the project life-cycle”.<sup>46</sup> It is a multi-dimensional digital planning method rich with information such as contracts, specifications, staff, schedule, quantities, cost, and design data.<sup>47</sup> BIM is not usually proposed at the dispute stage. Rather, it is a resource for the entire project life-cycle. It has been suggested that a BIM model which has been in use for the duration of the project can act “like a witness” because of the large quantity of data it possesses.<sup>48</sup> If the BIM project collected regular “as-built” survey data, it would be able to serve as a reference point for data and across the project’s life and assist the tribunal in understanding what has occurred and why.<sup>49</sup> A study recommended that even if the project did not adopt a BIM model earlier, a model can be created for a smooth process during the claiming and resolution of disputes.<sup>50</sup> For these reasons, the Society of Construction Law Delay and Disruption Protocol recognizes the use of BIM as a format of records which can be used in claims assessments and dispute resolution.<sup>51</sup> This creates the need for project management teams to

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<sup>45</sup> Elizabeth Woyke, “Augmented Reality Could Speed Up Construction Projects”, *MIT Technology Review* (August 10, 2016), online: < <https://www.technologyreview.com/s/602124/augmented-reality-could-speed-up-construction-projects/> > .

<sup>46</sup> Aref Charehzehi et al., “Building Information Modelling in Construction Conflict Management” (2017), 9 *International Journal of Engineering Business Management* 1 at 4.

<sup>47</sup> Serdar Koc & Samer Skaik, “Disputes Resolution: Can Bim Help Overcome Barriers?” (Paper delivered at the CIB 2014: Proceedings of the 2014 International Conference on Construction in a Changing World, Sri Lanka, May 4-7, 2014), 8.

<sup>48</sup> Vacanas et al., *supra*, note 27 at 7.

<sup>49</sup> Graham Mills, “The Use of BIM in Dispute Resolution”, *Technics Geospatial Surveyors* (October 15, 2013), online: < [www.technicsgroup.com/2013/10/the-use-of-bim-in-dispute-resolution](http://www.technicsgroup.com/2013/10/the-use-of-bim-in-dispute-resolution) > .

<sup>50</sup> Koc & Skaik, *supra*, note 47 at 2.

consider a protocol to order and preserve large amounts of data collected through BIM in the event that a dispute arises.<sup>52</sup>

The applications of BIM in other phases of the project life-cycle have been successful. In the United Kingdom, all major public sector construction projects are required to implement BIM technology.<sup>53</sup> In China, BIM has been included in the Ministry of Science and Technology's Outline of the National Long-Term Science and Technology Development Plan (2006-2020).<sup>54</sup> A US survey found that BIM was being used in construction for visualization, architectural design/modelling, collision detection, estimating, MEP design/modelling, structural design/modelling, and marketing and scheduling.<sup>55</sup>

The usage of BIM in the investigation of the collapse of the I35W Bridge in Minnesota in 2007 resulted in the model being named the Forensic Information Model (FIM).<sup>56</sup> However, despite its impressive capabilities, BIM's application in dispute resolution has so far been limited, having being documented less than a dozen times.<sup>57</sup> Forensic engineers and construction lawyers have been asked to consider why BIM is not being utilized more greatly in a courtroom context.<sup>58</sup> Cost and time barriers involved with creating a 3D model appear to be prohibitive, particularly if conventional tools could yield the same investigative results. The complexity of BIM, even for experts, and issues with its reliability were also factors against its usage in a dispute resolution context.<sup>59</sup> The prevalence of experienced expert witnesses may also mean that long standing practices are more likely to be utilized, compared to new technologies that are less familiar.<sup>60</sup>

In my view, these experiences are transferable to construction arbitration. In a recent hearing concerning claims for extensions of time and variations, I enquired as to whether BIM was used on the

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<sup>51</sup> Society of Construction Law (UK), *Delay and Disruption Protocol* (United Kingdom: SCL, 2014), 14.

<sup>52</sup> Matthew DeVries, "Risk or Reward, Using Drones on Your Construction Project", *Best Practices Construction Law* (October 14, 2015), online: < <https://www.bestpracticesconstructionlaw.com/2015/10/articles/technology/risk-or-reward-using-drones-on-your-construction-project> > .

<sup>53</sup> UK Government, *Building Information Modelling* (2012), online: < [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/34710/12-1327-building-information-modelling.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/34710/12-1327-building-information-modelling.pdf) > .

<sup>54</sup> Vacanas et al., *supra*, note 27 at 3.

<sup>55</sup> Anoop Sattineni & R Harrison Bradford II, *Estimating with BIM: A Survey of US Construction Companies* (Paper delivered at the Proceedings of the 28th ISARC, Seoul, South Korea, June 29—July 2, 2011), 564-569.

<sup>56</sup> Soltani et al, *supra*, note 30 at 773.

<sup>57</sup> *Ibid.*

<sup>58</sup> *Ibid.*, at 774.

<sup>59</sup> *Ibid.*

<sup>60</sup> *Ibid.*, at 775.



project. The response from counsel was that BIM should help in the coordination of projects between contractors and subcontractors and minimize or resolve disputes. However, the implementation of BIM is not sufficiently advanced and it was not used for this particular project.

SD modelling is “a computer simulation of a construction project which allows for ‘but for’ scenarios to be simulated to postulate the impact of employer-responsible disruption”.<sup>61</sup> Like BIM, it requires significant expertise to master a technical understanding of the model. Also similar is the fact that SD modelling has typically been used prospectively, at an early stage of project development. While it has had limited usage in practice for dispute resolution, there is anecdotal evidence of its admissibility and consideration in an ICC arbitration.<sup>62</sup> Larger hurdles have been faced in its admissibility in court proceedings.<sup>63</sup> Its inclusion in the SCL Delay and Disruption Protocol suggests that its usage may be on the rise. However, the protocol makes clear that SD modelling is “not as commonly used as other methods in calculating loss of productivity” because the robustness of the conclusions it derives are dependent on multiple variables and carrying out this analysis has a substantial cost.<sup>64</sup>

### 4.3 Document Management

Given the immense documentary evidence present almost universally in construction arbitrations, technological innovations in document management can be harnessed to combat the consuming task of disclosure. Technology has enabled the generation of documents to become both more voluminous and more intelligent. A consolidated, indexed electronic hearing bundle formed at an early stage of the process can remove duplication of documents and assist arbitrators and counsel in retrieving and reviewing large volumes of documentary evidence. “E-brief” technology, such as hyperlinking to authorities and exhibits, and optical character recognition (OCR) has developed significantly in the last decade.<sup>65</sup> While e-briefs remain quite expensive to produce, the efficiency gains are enormous. By way of contrast, matters on occasion rely on exhibits that are numbered by hand and scanned, and are not text-searchable. The review of these documents then becomes a

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<sup>61</sup> Ralph Goodchild, “Proven by Computer? System Dynamics and Disruption Claims” (2018), Society of Construction Law Paper No 212 at 1.

<sup>62</sup> *Ibid.*, at 10.

<sup>63</sup> *Ibid.*, at 9.

<sup>64</sup> Society of Construction Law (UK), *supra*, note 51 at 48.

<sup>65</sup> Philippe Pinsolle, in Albert Jan van den Berg, ed, *Arbitration and New Technologies in International Arbitration: The Coming of a New Age?* (ICCA Congress Series, Kluwer Law International, 2013) at 646.

painstaking process, and they are only marginally easier to navigate compared to physical hearing bundles.

Running parallel to the increased prevalence of electronic documents is the online storage format of these documents. File storage has been revolutionized, with documents being stored on password-protected servers or online hosting platforms, often pioneered by law firms through systems such as ShareFile and ownCloud.<sup>66</sup> These platforms allow large volumes of documents to be accessed and downloaded remotely, and also enable collaborative review, as editable documents can be shared amongst teams.<sup>67</sup> Several arbitral institutions have also set up online platforms to exchange documents and correspondence between parties, arbitral tribunal and experts. Examples include the ICC NetCase platform, the AAA WebFile or the WIPO ECAF.<sup>68</sup> The Queen Mary Survey revealed that cloud-based storage such as File Transfer Protocol (FTP) sites and data rooms were used “always” by 18% of respondents and “frequently” by 36% of respondents.<sup>69</sup> They also ranked second highest in the list of technologies which should be used more often in international arbitration, with a response selection rate of 91%.<sup>70</sup>

The speed and reliability of these platforms are marked improvements from previous forms of storage, and boost the convenience and efficiency of an arbitration. The use of electronic hearing bundles assists in reducing arbitrators’ dependence on physical hearing bundles, which often need to be transported and couriered across the world. From personal experience, this dependence has sometimes proven to be less than reliable. However, the benefits of technology are yet to be realized. Tribunal members and counsel will usually have a hard copy or USB version of files even when a version exists online. In a survey into the present use of Information and Communication Technology (ICT), only 12% of arbitration practitioners place their trust in storing their files solely on an electronic carrier.<sup>71</sup>

Data security is another common concern to practitioners. Practitioners stated that they stored information electronically because of the lower risk of loss or theft.<sup>72</sup> From the arbitrators that store sensitive

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<sup>66</sup> *Ibid.*, at 643.

<sup>67</sup> Emma Martin, “The Use of Technology in International Arbitration” in Carlos Gonzalez-Bueno, *40 under 40 International Arbitration* (Madrid: Dykinson, 2018) 337.

<sup>68</sup> Pinsolle, *supra*, note 65 at 643.

<sup>69</sup> Friedland and Brekoulakis, *supra*, note 26 at 32.

<sup>70</sup> *Ibid.*, at 33.

<sup>71</sup> Maud Piers & Christian Aschauer, “Survey on the Present Use of ICT in International Arbitration” in Maud Piers & Christian Aschauer, eds, *Arbitration in the Digital Age: The Brave New World of Arbitration* (Cambridge, Cambridge University Press, 2018) 15 at 20.

information in the cloud, 91% do so in a secured manner, while 90% work with a service provider that guarantees the security of the sensitive information stored.<sup>73</sup> The importance of confidentiality in arbitration heightens the diligence paid to security. This concern is stronger still in situations where exhibits may contain designs protected by intellectual property rights, such as in construction disputes, or reveal trade secrets.

Artificial Intelligence (AI) has also transformed the management of documents. In its most basic definition, AI is “the theory and development of computer systems able to perform tasks that normally require human intelligence”.<sup>74</sup> AI can play a multitude of roles in the legal industry, from predicting the outcome of a case, to analyzing a contract.<sup>75</sup> In construction evidence, it is most useful as a tool for electronic discovery. Technology assisted review (TAR) has proven to be “faster, better, cheaper, and much more consistent than human-powered review”.<sup>76</sup>

TAR includes several techniques designed at reducing the number of documents to review, for instance by removing duplicate documents or text in e-mail chains or by filtering and sorting documents by date, title, name or file extension.<sup>77</sup> Predictive coding, a more sophisticated type of TAR, trains a machine on a sample of relevant documents “so that it can ‘predict’ what documents a real lawyer would have selected”.<sup>78</sup> In the field of construction, however, TAR still has limitations. Construction documents often do not rely on searchable written content. As such, TAR is often unable to analyze photographs, drawings and schedules or unable to read handwritten project logs and diaries.<sup>79</sup>

#### 4.4 Hearing Room Technologies

Hearing room technologies refer to innovations such as multimedia presentations and real time electronic transcripts present at the main evidentiary hearing. There is a clear appetite for arbitrators to embrace

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<sup>72</sup> *Ibid.*, at 19.

<sup>73</sup> *Ibid.*, at 20.

<sup>74</sup> David Schatsky, Craig Muraskin & Ragu Gurumurthy, “Demystifying Artificial Intelligence”, *Deloitte Insights* (November 4, 2014), online: <<https://www2.deloitte.com/insights/us/en/focus/cognitive-technologies/what-is-cognitive-technology.html>> .

<sup>75</sup> Michael Mills, “Artificial Intelligence in Law: The State of Play 2016”, *Thomson Reuters Legal Executive Institute* (2016), online: <<https://www.neotalogic.com/wp-content/uploads/2016/04/Artificial-Intelligence-in-Law-The-State-of-Play-2016.pdf>> at 5.

<sup>76</sup> *Ibid.*, at 4.

<sup>77</sup> *Ibid.*

<sup>78</sup> Pinsolle, *supra*, note 65 at 646.

<sup>79</sup> Eric AO Ruzicka & Kate Johnson, “Constructing a Successful E-Discovery Strategy: Foundational Principles and Building Blocks” (2018) 12:2 *J American College of Construction Lawyers* at 21.

hearing room technologies as a means of improving the efficiency of presenting evidence.<sup>80</sup> 75% of respondents to the Queen Mary Survey indicated that they either “always” or “frequently” used hearing room technologies in an international arbitration,<sup>81</sup> making it the most popular form of information technology presently used. Overwhelmingly, 98% of respondents thought that hearing room technologies are tools an arbitrator should make use of more often.<sup>82</sup>

Hearing room technologies include paperless e-hearings involving the use of hearing rooms equipped with computer screens. A central operator controls what documents are displayed on screen, depending on what is being referred to by counsel or tribunal members. This has the advantage of ensuring the tribunal, witness and opposing party are, quite literally, on the same page. Participants are better able to focus on the document or exhibit displayed, rather than browsing a physical bundle of evidence.

Removing the need to trawl through documentation and focussing one’s concentration on the oral presentation is useful in complex construction matters, not only as a presentation aid, but also as a means of saving time. According to the International Law Office, an electronic hearing can take 25% to 30% less time than a traditional hearing.<sup>83</sup> There is no longer a need to locate documents among volumes of folders, which causes disruption and delay to the hearing.

Smart hearing facilities equipped with centralized computer screens also advances counsel’s addresses at the hearing, providing parties and the tribunal with new ways of engaging with the issues in dispute. The use of demonstrative exhibits can be an important persuasive tool.<sup>84</sup> In a recent arbitration, counsel effectively used demonstrative exhibits to highlight the amendments made to a contract. Animated and annotated PowerPoint slides visually depicted the transformation of a contract across seven iterations. This saved the tribunal from having to read each contract and compare the amendments. Real-time electronic transcript is another common piece of hearing room technology, which increases the accuracy and efficiency of testimony and enables more efficient review of testimony.

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<sup>80</sup> Friedland and Brekoulakis, *supra*, note 26 at 32.

<sup>81</sup> *Ibid.*

<sup>82</sup> *Ibid.*

<sup>83</sup> Rahul Thyagarajan, “Online Dispute Resolution and Electronic Hearings”, *Norton Rose Fulbright* (October 26, 2017), online: <<http://www.nortonrosefulbright.com/knowledge/publications/157157/online-dispute-resolution-and-electronic-hearings>> .

<sup>84</sup> Martin, *supra*, note 67 at 337.

Other improvements come in the form of instant translation technology, such as that developed by Microsoft Translator. The international nature of many construction arbitrations makes instant translation eminently applicable and was demonstrated at the ICCA Congress in Sydney earlier this year.<sup>85</sup> However, instant translation software is likely to require further refinement before it can be adopted in arbitration, particularly in a construction context, due to the technical or legal statements contained in disputes.

The use of smart technology has also extended beyond the hearing room itself and into the administrative and logistical aspects of a hearing facility. Earlier this year, Maxwell Chambers in Singapore declared itself the world's first "smart hearing facility".<sup>86</sup> Earning this title was the result of a significant investment in cutting-edge technology by the Singapore Ministry of Law. The initiative contributes to evidence procedure in two ways. First, the streamlining of hearing facility arrangements is designed to result in significant time and cost savings. For example, it introduces Max, a robot with the ability to deliver documents (as well as refreshments) to hearing rooms. This enables the disputing parties to focus on evidence and legal dispute. Second, these facilities will also increase the security of hard copy documentary evidence as secure access to hearing rooms can be provided electronically via mobile phones.

#### 4.5 Virtual Hearing Rooms

In spite of the innovations outlined above, the need for a physical hearing room has reduced as online dispute resolution processes develop. Communication in cross-border disputes is made difficult by different languages, time zones and geographic locations. However, technology facilitates convenient communication between parties and the tribunal. Email correspondence, teleconferences and video conferences assist in overcoming these barriers. This reduces the need for scheduled discussions and allows participants greater involvement in the process of the arbitration.

Holding a CMC and other procedural conferences via teleconference and videoconference has become commonplace in international arbitration. However, while 60% of respondents had used videoconfer-

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<sup>85</sup> Geneva Sekula, "ICCA Sydney: The Moving Face of Technology", *Kluwer Arbitration Blog* (April 18, 2018), online: <<http://arbitrationblog.kluwerarbitration.com/2018/04/18/icca-sydney-moving-face-technology/>> .

<sup>86</sup> Singapore Ministry of Law, Press Release, "Maxwell Chambers Innovates to Become World's First Smart Hearing Facility" (April 4, 2018), online: <<https://www.mlaw.gov.sg/content/minlaw/en/news/press-releases/maxwell-chambers-world-first-smart-hearing-facility.html>> .

encing always or frequently, only 8% stated in the Queen Mary Survey that they “always” or “frequently” used virtual hearing rooms.<sup>87</sup> Respondents of the survey also had reservations about increasing the use of virtual hearing rooms. 66% said they should be used more often, the lowest scoring of the technologies considered in the survey.

The concept of a virtual hearing room has gained traction in selected contexts. For example, a completely online cyber court has commenced operations in Hangzhou, China.<sup>88</sup> All documents are submitted via an online portal and evidentiary hearings are conducted via a livestream. More advanced systems of “telepresence”, which “attempt to replicate, as closely as possible, an in-person experience”, have also been developed,<sup>89</sup> although they are still rarely used in practice.<sup>90</sup>

Conducting virtual hearings has the obvious benefit of saving the time and cost involved with transporting all participants in the arbitration to the site of the hearing. This may also empower parties to choose diverse arbitrators who are the most experienced and specialized in construction disputes, regardless of how geographically proximate they are to the parties and counsel. It frees up the capacity of counsel and arbitrators who no longer need to work their schedules around complex travel plans. However, the low uptake of this technology may be due to “reservations as to the effectiveness of conducting cross-examinations of witnesses or delivering and hearing the parties’ closing arguments through a videoconference”.<sup>91</sup>

If taking testimony via a virtual hearing, the tribunal and parties should be aware of local laws in each location and ensure that all participants are operating under the same understanding of the applicable law.<sup>92</sup> Furthermore, when various participants are in different locations, they must ensure there is no *ex parte* communication with the tribunal and no improper witness coaching.<sup>93</sup> The use of interpreters must also be considered if they are to be physically based with the witness or working from another connection point.

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<sup>87</sup> Friedland and Brekoulakis, *supra*, note 26 at 32.

<sup>88</sup> Thyagarajan, *supra*, note 83.

<sup>89</sup> Douglas Thomson, “Virtual Arbitration Spells End to Air Miles?”, *Global Arbitration Review* (June 23, 2015), online: < <http://globalarbitrationreview.com/news/article/33913/virtual-arbitration-spells-end-air-miles/> > .

<sup>90</sup> Pinsolle, *supra*, note 65 at 643.

<sup>91</sup> Friedland and Brekoulakis, *supra*, note 26 at 32.

<sup>92</sup> Adesina Temitayo Bello, “Online Dispute Resolution Algorithm: The Artificial Intelligence Model as a Pinnacle” (2018), 84:2 *Intl J Arbitration, Mediation and Dispute Management* 159 at 165.

<sup>93</sup> *Ibid.*

A question remains as to whether documentary evidence can be introduced via videoconferencing in arbitration. In the context of videoconferencing in litigation in Europe, jurisdictions have adopted varying approaches. In Germany, documentary evidence is not permitted to be taken through videoconference or for visual inspection via videoconference.<sup>94</sup> By contrast, England and Wales permit documentary evidence to be introduced and recognized by a witness by video conference. Videoconferencing arrangements should ensure that equipment can enable documents to be transmitted during the course of the videoconference transmission.<sup>95</sup> Developing a consistent approach to this question and reconciling contrasting legal traditions may be necessary within international arbitration. Nevertheless, the efficiency of virtual hearings will ultimately depend on the quality of ICT applications used, including the strength and suitability of e-connections and the frequency of delays or interruptions that might occur.<sup>96</sup>

#### 4.6 Virtual Arbitrators

The handling of evidence by virtual arbitrators marks a high point for technological innovation. In some areas of law, providing evidence to an AI dispute resolution platform has proved successful. For example, the Rechtwijer platform in the Netherlands can determine a child custody issue by asking the ages of the children and being sensitive to their development needs.<sup>97</sup> Contractual disputes can be resolved through an online arbitration platform called Kleros, which uses blockchain technology and crowdsourced jurors to adjudicate disputes quickly and affordably.<sup>98</sup>

The use of AI in construction dispute resolution has not attracted extensive attention.<sup>99</sup> One rare example is a system in Egypt called DRExM which uses AI to provide recommendations for the most suitable procedure for dispute settlement by inputting current project data such as project value, project duration, start, date completion date, and the major source of disputes (contract documents, contract management, project related issues, financial issues, or other sources).<sup>100</sup>

<sup>94</sup> Miguel Torres, “Cross-Border Litigation: ‘Videotaking’ of Evidence within EU Member States” (2018) 12:1 J Dispute Resolution Section Intl Bar Assoc 71 at 84.

<sup>95</sup> *Ibid.*, at 85.

<sup>96</sup> Piers and Aschauer, *supra*, note 71 at 39.

<sup>97</sup> Bello, *supra*, note 92 at 167.

<sup>98</sup> Clement Lesaege and Federico Ast, “Kleros”, Kleros White Paper (2018), online: <<https://kleros.io/assets/whitepaper.pdf>> .

<sup>99</sup> AA Elziny et al., “An Expert System to Manage Dispute Resolutions in Construction Projects in Egypt” (2016), 7 Ain Shams Engineering J 57 at 62.

<sup>100</sup> *Ibid.*, at 63.

However, even this technology does not determine the outcome of a dispute. Fortunately for humans, the use of virtual arbitrators to replace human adjudicators in complex construction arbitrations still appears to be a distant prospect. The need to reason through complex legal and factual contentions, to creatively and proactively manage the parties throughout the arbitration process, and to provide thorough reasons appears to be beyond the bounds of what virtual adjudication platforms are currently able to achieve. Aside from whether the capacity exists to introduce this technology, one must also consider whether it is ultimately desirable. The French law on arbitration issued in 2011 explicitly endorsed the universal presumption that an arbitrator cannot be anything but human.<sup>101</sup>

## 5. EVALUATING PROCEDURAL AND TECHNOLOGICAL INNOVATIONS

Innovative evidence procedure in construction arbitration canvasses a broad range of concepts. Both procedural and technological advancements can make construction arbitration more efficient and effective. Innovations in these two spheres frequently overlap. For example, a proposal to visit a project site or use UAVs would have to be placed on the procedural timetable and may be the subject of a CMC via teleconference before a decision is reached. The integration of BIM could be particularly useful in creating a common set of data which expert witnesses can then be directed to opine on.

However, my contention is that procedural innovations ultimately have primacy. Arbitration is inherently concerned with party autonomy and requires a dialogue between the tribunal and parties to determine the best process for a particular matter. Getting the consent of the parties for a bespoke and efficient method can be a challenge but this is the only hurdle to such forms of innovation. Technological innovations encounter a second hurdle. Not only do they require party consent and procedural management, but they also require technology that is sufficiently advanced, and practitioners with the skills to engage with it. A number of technologies specific to the construction industry such as SD modelling, AR and UAVs must enjoy more widespread integration with project planning and development before they can be effectively engaged in dispute resolution. Legal practitioners must become literate in a range of complex information technologies so that the application of evidence gathered and presented with this technology is properly understood.

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<sup>101</sup> Piers and Aschauer, *supra*, note 71 at 48.



Procedural innovations are also the enablers of technology. As technologies continue to mature, considerations such as confidentiality, data integrity and privacy are coming to the fore. Although many institutional rules are supportive of technology, specialized protocols are still being developed to accommodate for arbitration in the digital age. ICCA has formed a Working Group on Cybersecurity in Arbitration with the New York City Bar Association and the International Institute for Conflict Prevention and Resolution to develop a Cybersecurity Protocol for International Arbitration. A draft Protocol is currently available for public consultation and considers possible procedural orders or frameworks for dealing with cyber threats and changing technology.<sup>102</sup>

One must also address the cost of implementing new technology and the potential for prejudice to a party that does not have the means of affording these technologies in seeking and presenting evidence. Arbitral tribunals may have to draw a line when deciding whether allowing or requiring the use of a particular technology would deprive a party of procedural fairness or support the adversarial process. Therefore, handling the use of technology is becoming a vital component of case management for arbitrators.

## 6. CONCLUSION

It is clear that the complexity of construction disputes commands special attention and a drive to constantly innovate. Arbitration is well-equipped to meet the challenges of such disputes. My experiences have shown, time and time again, the value of proactive procedural management, which can be deployed to reduce cost and delay. There is no one size fits all approach in arbitration. A creative tribunal and open-minded parties can create boundless innovation and provide parties with maximum value. Although technology cannot be as flexible as procedure, the examples of technological innovation highlight that the tribunal should remain open to new technology, particularly where it will reduce cost and delay. Regardless of one's technical prowess, even the most basic forms of technology can contribute to the efficiency of construction arbitration. It is hoped that the ideas discussed will advance the quest for efficient arbitrations, in an industry with great potential for innovation.

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<sup>102</sup> International Council for Commercial Arbitration, New York City Bar & International Institute for Conflict Prevention and Resolution, "Draft Cybersecurity Protocol for International Arbitration", Consultation Draft (2018), online: < [https://www.arbitration-icca.org/media/10/43322709923070/draft\\_cybersecurity\\_protocol\\_final\\_10\\_april.pdf](https://www.arbitration-icca.org/media/10/43322709923070/draft_cybersecurity_protocol_final_10_april.pdf) > .

