Scholarly Paper

Experts Involved in Claims and Disputes Resolution: Mapping and Classification of Engagement Possibilities

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Abstract: The resolution of claims and disputes requires the typical involvement of professionals belonging to the various entities participating in the project construction process, including owners, contract engineers, project managers, contractors, and subcontractors. Depending on the availability of expertise within such organizations, it is common to see the engagement of outside experts being sought to help throughout the phases of claims and disputes evolution. The objective of this research is to highlight the roles played by such experts and map these roles along the internationally recognized standard claim and dispute administration timeline by the International Federation of Consulting Engineers (FIDIC). The followed methodology included (1) reviewing the relevant literature and case law on the subject, (2) highlighting the possible spectrum of expert roles while being informed by those numerous roles played by the first author on several project cases over three decades, (3) mapping the encountered expert roles onto a standard claim and dispute resolution timeline through conceptualizing the possible engagement scenarios in each of the concerned phases, and (4) synthesizing the classes of such played expert roles. The findings revealed a spectrum of roles that can be asked of experts by way of providing guidance, advice, substantiation, facts assertion, testimony, and/or assessment. The work outcome is of importance both to construction professionals who seek the appointments of experts and to those who act as experts in the resolution of construction claims and disputes. **DOI: 10.1061/JLADAH.LADR-930.**

Introduction

With the increase in the volume of construction claims in recent years, construction conflicts can no longer be avoided (Barakat et al. 2019). If not properly managed, such conflicts can easily result in disputes, which can be damaging in terms of time and cost, and can affect the productivity and performance of a project (Aryal and Dahal 2018). For this reason, standard forms of contract conditions, including the International Federation of Consulting Engineers (FIDIC), American Institute of Architects (AIA), ConsensusDocs, Engineers Joint Contract Documents Committee (EJCDC), Joint Contracts Tribunal (JCT), and New Engineering Contract (NEC), propose approaches for claim and dispute resolution constituted of multiple steps and phases, generally classified into the following groups: initial judgment, discussions, alternative dispute resolution (ADR), and amicable settlement (Barakat et al. 2019).

Under the latest edition of the FIDIC (2017) standard conditions, the following claim and dispute resolution mechanism is suggested: the claim shall first be initiated by submitting a notice of claim within 28 days from the date on which the claimant became or should have become aware of the event giving rise to the claim. An initial response by the engineer shall then be issued specifying if the notice of claim was submitted within the relevant time bar. If such response is not issued within 14 days, the notice of claim shall be deemed to be valid. After the claimant submits a fully detailed claim, with all its supporting particulars, the engineer shall, within 42 days, consult both contract parties, either jointly or separately, in an attempt to reach agreement. If no agreement is reached, the engineer shall give their determination within the next 42 days. The determination of the engineer shall become final and binding on the contract parties if no party objects to it. However, if a party objects, issues a notice of dissatisfaction, and refers the matter to adjudication within 42 days from the date of issuance of this notice, adjudication will be initiated. In that case, the dispute adjudication board (DAB) will have 84 days to render a decision. The dispute adjudication board's decision will become binding and final if no notice of dissatisfaction is issued within 28 days from the date on which the decision was given. Yet, in case a notice of dissatisfaction is issued, amicable settlement will be triggered and an ADR process (like expert determination or mediation) can take place. As a last resort, either party can commence arbitration on or after the 28th day of this amicable settlement period.

Nevertheless, for such construction claim and dispute resolution approach to happen, several participants, other than the parties in conflict, need to be involved, including the entity rendering the initial judgment on the claim and the ADR third party (if any), in addition to any expert retained during the process (Gould 2017).

Experts play major roles throughout the construction claim and dispute resolution process. Through the major roles they play, experts become part of the contractor, the owner, or the third party's

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Note. This manuscript was submitted on July 21, 2022; approved on January 21, 2023; published online on March 28, 2023. Discussion period open until August 28, 2023; separate discussions must be submitted for individual papers. This paper is part of the ***Journal of Legal Affairs and Dispute Resolution in Engineering and Construction***, © ASCE, ISSN 1943-4162.

team during the process (Horne and Mullen 2013). Yet, their conduct shall remain governed by principles of objectivity, professionalism, due diligence, and standard of care (Barakat et al. 2018) to avoid any subsequent consequences, even in cases of negligence.

In case of negligence, professional indemnity or liability insurance can be of great importance to experts, protecting them from liability as a result of negligence or "errors or omissions in the service provided as well as any alleged failure to perform on behalf of a client" (AEGIS 2020). In certain cases, limiting liability through the contract (putting a clause in the contract to cap liability) can also be of great importance (Pamplin 2014). Aside from the insurance and liability limitation safeguards, immunity against negligence liability could also be a source of coverage for some experts. There are cases where experts were shielded from liability by immunity (court-appointed expert witnesses in *S.T.J. v. P.M.*; party-appointed expert witnesses who testified adversely at trial in *Clark v. Grigson* and *Kahn v. Burman*), but conversely there were cases that did not grant experts immunity (appraisers in *Levine v. Wiss & Co.* and *Gammel v. Ernst & Ernst*; friendly expert witnesses in *Jones v. Kaney*, *Mattco Forge, Inc. v. Arthur Young & Co.*, *Murphy v. A. A. Mathews*, *LLMD of Michigan Inc. v. Jackson-Cross Co.*, *Pollock v. Panjabi*, *Boyes-Bogie v. Horvitz*, and *Ellison v. Campbell*). For example, in *S.T.J. v. P.M.*, the immunity of court-appointed expert witnesses, aiding the court in making a final decision, was addressed. The suit against the court-appointed psychologists in *S.T.J. v. P.M.* was dismissed, as the court stated: "appointed psychologists are non-judicial persons fulfilling quasi-judicial functions and are classified as officers of the court with functions intimately related to the judicial process. Hence, as in Meyers, supra, they are entitled to absolute immunity protecting them from having to litigate the manner in which they perform those functions." The court also mentioned that it finds "no merit to appellant's claim that further evaluation or investigation by them [as officers of the court], prior to that judgment, was unprotected by immunity." Therefore, immunity in this case prevailed for the court-appointed expert witnesses (whose duty is to fulfill "quasi-judicial functions").

Conversely, immunity did not prevail for the case of the party-appointed expert witness psychologist in the landmark case *Jones v. Kaney*. In the underlying case of *Jones v. Kaney*, a road traffic accident between a driver and a stationary motorcyclist (Jones) took place. The motorcyclist suffered from physical injuries and psychiatric consequences, and therefore issued a claim against the driver. Both parties (the driver and the motorcyclist) hired expert witnesses, who initially delivered different opinions and reports. In her report, Jones's expert witness (Kaney), a consultant clinical psychologist, first stated that Jones was suffering from posttraumatic stress disorder (PTSD) due to the accident. However, later when the district judge ordered the expert witnesses to come to a joint statement, Kaney agreed (in the joint statement) with the opposing party's expert witness that Jones had been "deceitful" (Hughes 2011), thus abandoning her original opinion. Later, Kaney admitted that she felt under pressure to agree to the joint statement. Nevertheless, because Jones was obliged to settle his damage claim for a significantly less amount than expected, he brought a negligence claim against Kaney. The claim was first dismissed by the High Court due to expert witness immunity, but then leapfrogged[1] the Court of Appeals to the Supreme Court. The Supreme Court, by a majority of 5 to 2, found that Kaney did not have an immunity against civil liability and considered that an expert witness should "perform his function as an expert with the reasonable skill and care." It is important to mention that such an immunity status, be it that of the expert witness psychologists in *S.T.J. v. P.M.* or that in *Jones v. Kaney*, can "apply to all sorts of experts" (Dyer 2011), including experts involved in construction claim and dispute resolution, and is not restricted to psychologists. Last, unlike court-appointed expert witnesses and other types of experts of striking immunities, "expert advisors have never had the protection of witness immunity" (Pamplin 2014). Therefore, the boundary of expert immunity is closely tied to the expert role classification and characterization.

Although the literature focuses on the classification of certain types of expert roles, it underemphasizes several others, especially the backstage or confidential roles played by experts. In this work, the authors aim to determine the full spectrum of roles that may be played by experts during the construction claim and dispute resolution process, along with their role requirements and involvement scenarios along the course of the process. The authors also intend to develop the complete mapping of expert roles onto the claim and dispute timeline. Such a mapping would mark all possible stations for experts' intervention along the timeline and assist in indicating when and according to what time frames each expert role would be played.

Research Scope and Methodology

The purpose of this paper is to characterize the different expert roles and examine the possible scenarios for their intervention during the process of construction claim and dispute resolution. The research also aims to highlight the stations along the claim and dispute timeline where experts can be engaged. This helps frame the various expert roles involved along the timeline. The methodology implemented included (1) reviewing the literature and the relevant case law and project cases, (2) identifying the main participants and different expert roles involved in the construction claim and dispute resolution process while being informed by those numerous roles played by the first author on several project cases over three decades, (3) determining the possible scenarios and characteristics for the involvement of experts during each phase on the claim and dispute timeline, and (4) mapping the encountered expert roles along the construction claim and dispute timeline to highlight the stations of experts' interventions along the claim and dispute timeline.

Participants Typically Engaged in Claim and Dispute Resolution

The major participants involved in the construction claim and dispute resolution process include the claimant, the respondent, and the entity rendering the initial judgment on the claim.

Claimant

The claimant is considered to be the party triggering the claim and dispute timeline (because it is the one submitting the claim). The claimant can be either the employer or the contractor, for "contract conditions typically stipulate that either the owner or the contractor may submit a claim with respect to an arisen conflict" (Barakat et al. 2019).

FIDIC includes likely scenarios in which the contractor becomes the claimant, like in the cases of late access or possession of site, adverse unforeseeable physical conditions, extensions of time for completion, variations to the contractor's scope of work, and contractor's entitlement to suspend work. Likewise, FIDIC also designates some scenarios in which the employer is likely to become the claimant. According to FIDIC, the employer is likely to

submit a claim for rejection and retesting of works, delay or liquidated damages, or the contractor's failure to remedy work within a reasonable additional time (Norman and Merwe 2019).

Respondent

"Respondent" refers to the party against whom the claim is made. Barakat et al. (2019), in their paper, referred to the party against whom the claim is made simply as "the other party." The term used by Barakat et al. might be more appropriate than "respondent" because the latter term is usually used in the context of proceedings only.

Entity Rendering the Initial Judgment

When it comes to the initial judgment given on the claim, the standard forms of contract conditions do not agree on a single entity to be the entity rendering such a judgment. Each standard form suggests a unique entity, for example, the initial decision maker (IDM) under AIA (2017), the owner under the ConsensusDocs (2017), the owner's own personnel under EJCDC (2013), the third party (the architect or contract administrator) under JCT (2016) conditions, and the project manager or supervisor under NEC (2013).

In FIDIC (2017), the engineer is the first to give a judgment regarding the alleged claim. The engineer's judgment would be in the form of a determination, which is born binding (upon both parties) and has the possibility of becoming final if no notice of dissatisfaction is issued within a period of 28 days from rendering of the determination.

Alternative Dispute Resolution Third Party

In addition to the previously mentioned participants, another participant of the construction claim and dispute resolution process is the ADR third party. The ADR third party is the entity to whom the dispute is referred during the ADR phase (facilitation, conciliation, mediation, expert determination, adjudication, or arbitration).

Expertise beyond Major Participants

Additional professional expertise may be required for the purpose of supporting, assisting, guiding, and/or advising the major participants of the construction claim and dispute resolution process. The types of experts that can be engaged during the construction claim and dispute resolution process include the expert adviser or consultant, the appraiser, the expert witness, and the assessor.

Expert Adviser or Consultant

The expert adviser or consultant, sometimes referred to as an "independent expert" (Buckley 2016) or a shadow expert (TAE 2020), is an expert appointed at any phase of the problem, claim, or dispute to provide advice on a technical or specialist matter (not to provide evidence to the court or tribunal). When a party privately retains such an expert, it does so at its own expense. In that case, the expert's advice, whether given before or after the commencement of the proceedings, is likely to stay confidential (CJC 2014).

Appraiser

The expert appraiser or valuer is an individual appointed by the court or tribunal due to their special knowledge, technical skill, and/or expertise. "The appraiser is expected to perform a discrete function involving only the ascertainment of particular facts. This function, which entails neither a hearing nor the exercise of judicial discretion, is not to be confused with the duty of the arbitrator" (*Levine v. Wiss & Co.*). The appraiser merely renders the "finding of fact"; they do not act quasi-judicially. The appraiser's role is to value goods or properties, or assess damages (Bouvier 1856).

When it comes to the appraiser's appointment, an appraiser can be "selected or appointed by a competent authority or an interested party to evaluate the financial worth of property" (Lehman and Ph 2008). Nevertheless, if the appraiser is appointed by a party, their role would probably be similar to that of an expert adviser (if they provide no evidence to the court or tribunal) or a party-appointed expert witness. Therefore, "appraiser" is only used in this paper in reference to the expert appointed by the court or tribunal to ascertain facts.

Expert Witness

The expert witness is appointed to provide an opinion. They voluntarily agree to perform their services, while utilizing their knowledge, skill, experience, training, and/or education, in return for compensation (De Fabrique 2011) or "reward under contract" (*Jones v. Kaney*).

The expert witness can be either involved in adjudication or arbitration. In adjudication, the expert witness could be retained by the DAB or the parties for support. Similarly, in arbitration, the expert witness can be appointed by the tribunal or by the parties in dispute. Yet, unlike in adjudication, the expert witness in arbitration could also be appointed jointly by the parties (rather than separately by each party).

Expert Witness in Adjudication

The expert witness in adjudication could be one of the following:

- DAB-appointed expert witness: The expert witness appointed by the dispute board is generally retained to assist on matters outside the expertise of board members. This witness only provides the DAB with an expert opinion, and does not join the DAB in making its decision. According to FIDIC, the terms of the remuneration of this expert (whom the DAB consults) shall be "mutually agreed upon by the parties when agreeing the terms of appointment" (FIDIC 2000).
- Party-appointed expert witness: Expert witnesses are commonly appointed by parties due to the several benefits of professional representation. However, it is necessary to differentiate in adjudication between the expert witness appointed by the referring party and the expert witness appointed by the responding party (mainly because their scopes of work differ).

If the expert witness in adjudication was appointed by the referring party, then "the expert may be required to act initially in an advisory capacity, exactly as in litigation, and then to produce an expert report" (Armes 2015). Thus, the referring party's expert witness would naturally have enough time to fully carry out the job. Whereas, if the expert witness was appointed by the responding party, they would probably have little time to react to the referral (including reports produced by the referring party's expert witness) and to produce their own expert report. Hence, experts appointed by the responding party might be at a disadvantage, unless they had been engaged at an earlier phase by the responding party in an advisory capacity. Besides, the responding party's expert witness, if appointed,[2] might not have enough time to properly investigate all the facts of the case themselves. They might be forced instead to rely on the evidence provided by the party instructing them or by the referring party (Armes 2015).

According to the FIDIC claim and dispute timeline, the expert witness appointed by the referring party has up to 70 days (28 days from the rendering of the determination plus 42 days from the date of issuance of notice of dissatisfaction) to refer the matter to

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adjudication and prepare the referral document. By that, that expert witness, unlike the one appointed by the responding party, would have plenty of time to prepare the case before adjudication even starts. After adjudication starts, both party-appointed expert witnesses would be expected to submit their reports, give evidence, and/or get questioned by the adjudicator at the hearing. There is usually no time for the experts to exchange reports.

Finally, there are no specific rules expressing and codifying the duties of these party-appointed expert witnesses in adjudication. Yet, the following can be considered as helpful guidance: "it is vital that an expert involved in adjudication retains his independence and is seen to do so at every stage of the process. It is also important that his report makes it clear that his overriding duty is to the Adjudicator, above that of the party instructing him. To the extent they are relevant, he should act in accordance with the main principles set out in CPR35. He should also comply with his own professional standards and with the requirements and membership rules of professional institutions such as the Academy of Experts, if applicable" (Farr 2006).

Expert Witness in Arbitration

The expert witness in arbitration could be one of the following:

- Tribunal-appointed expert witness: Moving on to the expert witness appointed by the arbitrators or arbitration tribunal, according to the international arbitration practice guideline, for the arbitrators to be satisfied about the appointed expert witness, the expert should have the required qualifications and expertise, be independent and impartial, and be able to dedicate the needed time for fulfilling their duties (CIArb 2015). Moreover, not only must the arbitrators be satisfied about the expert witness's appointment. It is also important to attain the parties' agreement to the expert "in order to reduce the risk of later challenges to the expert, their expert report and/or any award relying on it" (CIArb 2015). As for the fees for appointing the tribunal-appointed expert witness, they are added to the arbitrators' expenses. However, generally, appointing such an expert witness in particular is considered a cost-effective option.
- Single joint expert (SJE) (jointly appointed expert witness): The single joint expert (jointly appointed expert witness) is the expert witness the parties jointly agree to appoint. Parties mainly appoint such an expert jointly to avoid conflicting expert evidence and to save on costs and time. The SJE is appointed to deliver evidence on a matter on which both parties wish to provide expert evidence. In international arbitration, if it is decided that a single joint expert is to be appointed, parties will have to agree on the expert, the instructions to be given to the expert, and the remuneration of that expert. In case of a failure to agree, the arbitrators must determine just how to proceed. Even though this expert witness is appointed through joint agreement of the parties and owes an equal duty to the parties, the single joint expert's overriding duty must be to the tribunal.
- Party-appointed expert witness: As previously mentioned in adjudication, the party-appointed expert witness, who is retained by one party, voluntarily accepts to perform a professional duty in exchange for monetary remuneration. Nonetheless, even though the expert is appointed by a party, they have an overriding duty to the tribunal and play a role in guiding the tribunal. Sets of rules (like Part 35 Civil Procedure Rules, The Jurisdiction of England and Wales), protocols, and case law provide guidance for the expert witness on such a duty. Engaging party-appointed expert witnesses is a frequent practice in arbitration because the parties have the right to submit evidence and to be heard. Moreover, parties are encouraged to engage such experts in order to help make the case persuasive.

As mentioned in *Murphy v. A. A. Mathews* (a negligence case where a friendly expert witness was hired in a claim against a subcontractor), party-appointed expert witnesses "do not usually act solely as witnesses, but perform substantial pretrial work . . . They function as paid advisors and as paid advocates." For this reason, in practice, when appointing expert witnesses, parties do not usually appoint additional expert advisers (due to the duality of the role of party-appointed expert witnesses).

Last, with respect to the procedure of appointment of party-appointed experts in international arbitration, "each party is responsible for the selection and appointment of their own expert without the need to consult with the other party or the arbitrators" (CIArb 2015).

Expert Witnesses in Hot-Tubbing

Hot-tubbing, also known as expert conferencing or concurrent evidence, is a unique process with respect to the presentation of witness testimony in arbitration or litigation. Instead of having the expert witnesses testify sequentially or back to back, hot-tubbing allows the witnesses (whether fact or expert) to be questioned simultaneously on particular topics.

The goals of expert witness hot-tubbing include saving time during proceedings, saving costs during hearings, enhancing the quality and effectiveness of expert witness testimony and opinion, and assisting the court or tribunal in understanding complex technical issues in dispute (Zack 2019).

Expert Witness versus Fact Witness

Unlike an expert witness, the fact witness is not appointed to provide opinion, but to testify about facts. USlegal (2020) defines the fact witness as an individual with enough knowledge to testify about facts and/or events they observed or were involved in. A fact witness does not have to be an expert to testify. The fact witness's testimony may include an opinion only when the opinion is based on their actual perception or when the opinion is necessary for understanding their testimony (De Fabrique 2011). According to the International Criminal Court (ICC 2020), fact witnesses "can be crimes-based witnesses when they have suffered harm and testify as witnesses about what happened to them." Nevertheless, regardless if the testifying fact witness is crime based or not, they are court-ordered (LIA Administrators and Insurance Services 2019).

Assessor

Assessor in Adjudication

The adjudicator or adjudication board might need the assistance of an expert assessor, primarily to advise on issues that are not within the adjudicator or tribunal's knowledge (any report produced by the assessor must be served to parties to be commented on), review the evidence presented by the party-appointed expert witnesses, support the adjudicator in weighing the evidence (Armes 2015), conduct informal discussions with the parties on technical or legal issues (Horne and Mullen 2013), and conduct meetings with the party-appointed experts to narrow down issues.

Assessor in Arbitration

In certain jurisdictions, an assessor might be appointed in arbitration to explain any difficult issue and advise the tribunal, prepare the tribunal for evidence of party-appointed expert witnesses (ICC 2010), evaluate and interpret evidence, and/or assist in reviewing and assessing detailed data (CIArb 2015). Appointing such an assessor can save on time and costs.

Extent of Formality of Experts' Engagement

The level of formality of the expert roles mentioned previously varies depending on the type of expert. For example, privately retained expert advisers are hardly ever visible to other parties because they give their advice confidentially (Chelmick and Spalton 2018). These shadow experts can be considered an extension of the party appointing them. Tribunal-appointed expert witnesses or appraisers openly give impartial evidence or valuation to the tribunal. Additionally, as previously mentioned, these experts are usually known and approved by both parties.

On the other hand, the extent of formality is not clear for other expert roles, like a party-appointed expert witness and an expert assessor. Usually, the party-appointed expert witnesses do not solely act as witnesses, but as paid expert advisers. The duality in their roles makes it hard to evaluate the extent of formality of their engagement.

In international arbitration, some rules and protocols, like the International Bar Association (IBA) Rules on the Taking of Evidence and the Chartered Institute of Arbitrators (CIArb) Protocol, were introduced to control this role duality and ensure the independence of party-appointed experts. These rules and protocols encourage disclosure. For example, the IBA Rules request the submission of a statement of independence, declaring the party-appointed expert's past or present relationship with any of the parties, their legal advisers, and the arbitral tribunal. Thereby, such rules put the onus on the expert witnesses to assess the impact of particular connections (or relationships) on their impartiality. In addition, these rules use the disclosure tool to allow an opposing party to scrutinize the party-appointed expert's self-assessment of impartiality.

As for the extent of formality of the expert assessor role, it cannot be considered to be fixed. This is because at times the function of an assessor can be similar to that of an expert witness, particularly a tribunal-appointed expert witness (Horne and Mullen 2013), while at other times the assessor's function can simply be advisory. In the latter case, the assessor's advice may be taken in private without giving the parties a chance to comment. Hence, the level of formality of the expert assessor role depends on the scope of their functions.

Mapping of Expert Roles onto the Construction Claim and Dispute Resolution Timeline

This part of the paper furnishes the scenarios of experts' involvement during each phase of the construction claim and dispute resolution process. It will then be possible to extract, from the scenarios, all types of additional expertise typically or possibly engaged during each phase. Subsequently, the stations of experts' interventions along the claim and dispute timeline are highlighted.

Phases of FIDIC's Construction Claim and Dispute Resolution Timeline

The timeline adopted in this research denotes the construction claim and dispute resolution mechanism under the latest edition (2017) of the FIDIC standard conditions, because FIDIC conditions are widely used worldwide on international projects and encompass the major conflict resolution phases included in any other standard timeline. As shown in Fig. 1, FIDIC's construction claim and dispute mechanism constitutes of eight phases (preceding arbitration). In order, these eight phases are as follows:

1. Disclosure of claim phase, in which the claimant submits its claim.
2. Engineer's consultation phase, where the engineer consults the parties to try to reach an agreement (discussions may take place).
3. Engineer's determination phase, in which the engineer proceeds to give their determination.
4. First dissatisfaction phase, in which the party dissatisfied with the engineer's determination issues a notice of dissatisfaction.
5. Referral phase, wherein the dissatisfied party, who previously issued the notice of dissatisfaction, refers the matter to adjudication (informal discussions between the parties might sometimes take place during this phase).
6. Adjudication phase, in which the dispute adjudication board gives a decision.
7. Second dissatisfaction phase, in which the party objecting to the dispute adjudication board's decision issues a notice of dissatisfaction.
8. Amicable settlement phase, where the parties try to resolve disputes amicably.

Involvement Scenarios for Experts in the Construction Claim and Dispute Resolution Phases

There are several different scenarios for how each timeline phase can go. Scenarios differ with respect to the number of additional experts involved, their type, and the party appointing them. Examining the possible scenarios for each phase helps in developing a better understanding of the experts' involvement and intervention along the claim and dispute timeline. The following sections explore the various scenarios for each phase of the construction claim and dispute resolution process.

Scenarios of Phase 1: Disclosure of Claim

Two scenarios exist for the disclosure of claim phase. Fig. 2 represents these two scenarios in the form of models (referred to as Scenarios 1 and 2).

1. As represented in Fig. 2, under Scenario 1 of the disclosure of claim phase, no additional experts are retained by the claiming party (the claiming party could be either one of the parties).

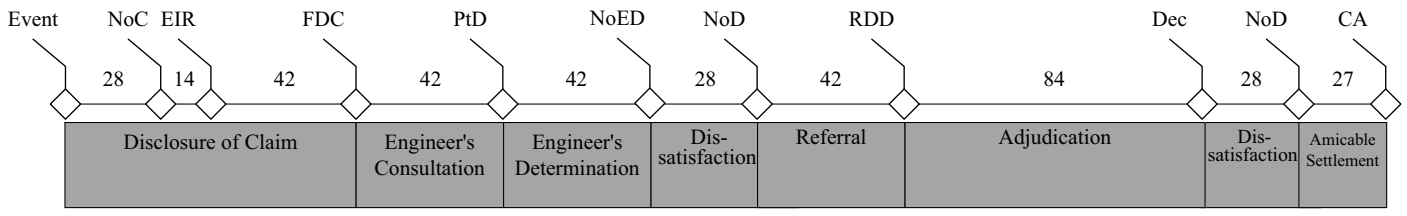

Fig. 1. FIDIC's claim and dispute resolution timeline. NoC = notice of claim; EIR = engineer's initial response; FDC = fully detailed claim; PtD = proceed to give determination; NoED = notice of engineer's determination; NoD = notice of dissatisfaction; RDD = refer dispute to dispute avoidance or adjudication board; Dec = dispute avoidance or adjudication board's decision; and CA = commencement of arbitration. (Adapted from Barakat et al. 2019.)

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Thus, under this scenario, the claiming party submits both the notice of claim and the fully detailed claim, within the relevant time limits, without receiving any help from an expert adviser or consultant. This scenario typically applies when the claiming party faces no difficulties in preparing and presenting the claim.

2. Under Scenario 2 of the disclosure of claim phase, for the purpose of preparing the claim, the claiming party retains an expert adviser or consultant in order to seek their advice on a specialist or technical issue that is within their expertise.[3] That advice can even be delivered in the form of signed reports. For example, under this scenario, the claiming party can retain the expert adviser or consultant to help it meet the defined time limits and notice requirements, establish the contractual or legal basis of the claim, prepare the contemporary records and claim particulars, and so on.

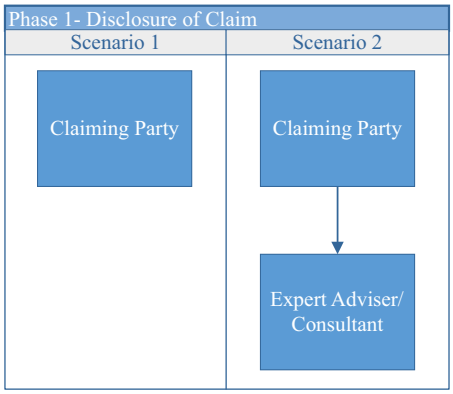

Fig. 2. Scenarios of Phase 1: Disclosure of claim.

Scenarios of Phase 2: Engineer's Consultation

As shown in Fig. 3, there are two scenarios for Phase 2 of the claim and dispute timeline: Scenarios 1 and 2. Under Scenario 1, no additional experts are engaged, while under Scenario 2, an expert adviser is retained by the engineer, the owner, and/or the contractor:

1. As per the FIDIC conditions, the engineer conducts consultations with the parties before giving their determination, either jointly or separately, in an attempt to reach agreement. Under this scenario, the engineer does so without appointing their own expert adviser or consultant, bearing in mind that they have what it takes to conduct the consultations on their own. Parties do not employ any independent expert or adviser under this scenario either.
2. Under Scenario 2 of the engineer's consultation phase, it is possible for the engineer, the owner, and/or the contractor to appoint an expert adviser or consultant. The adviser's support (e.g., technical support, contractual support, legal support) would be needed for the consultations and/or the discussions[4] of this phase. As Fig. 3 demonstrates, it is possible under this scenario for multiple advisers (serving different clients) to be

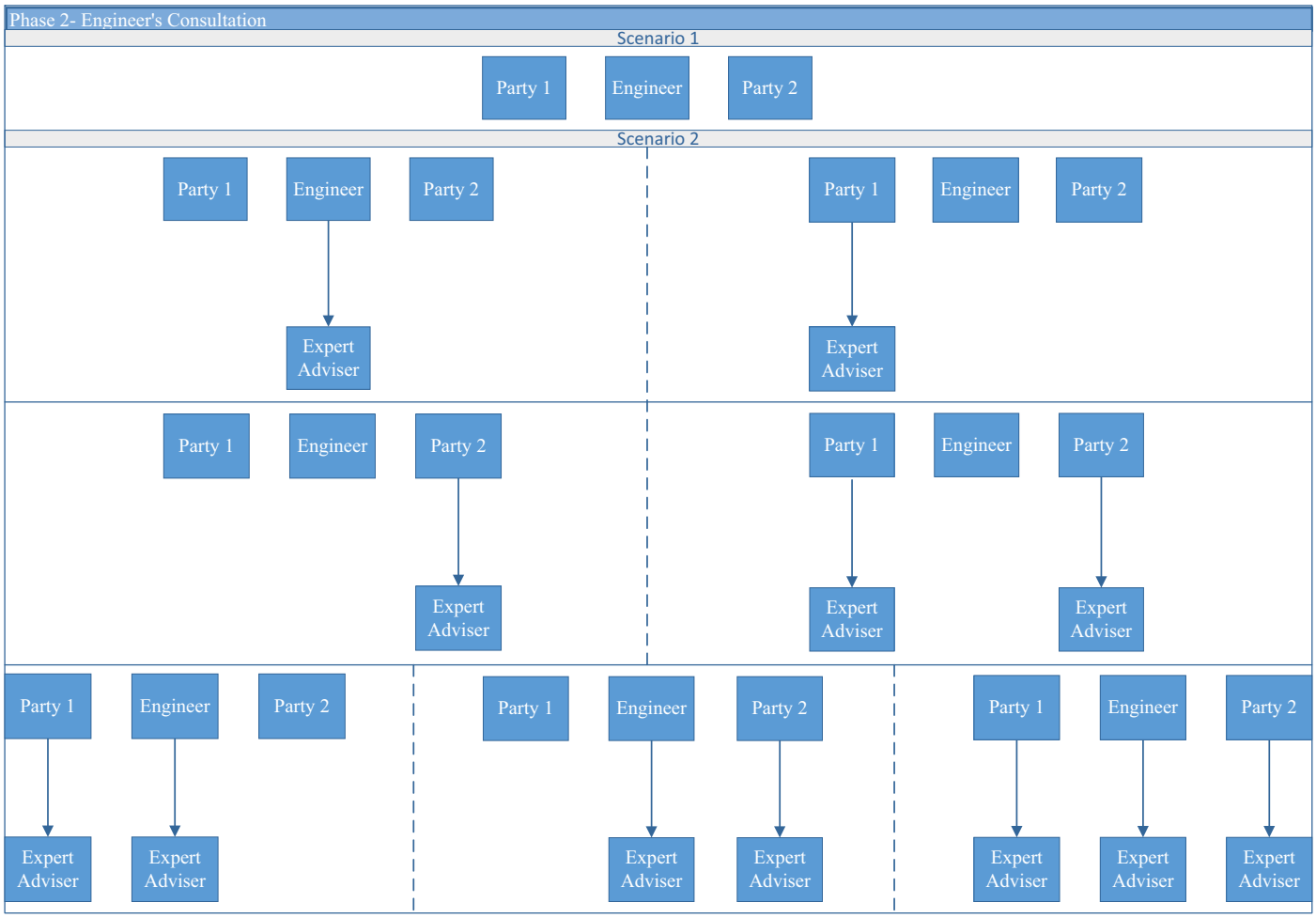

Fig. 3. Scenarios of Phase 2: Engineer's consultation. Party 1 = owner; and Party 2 = contractor.

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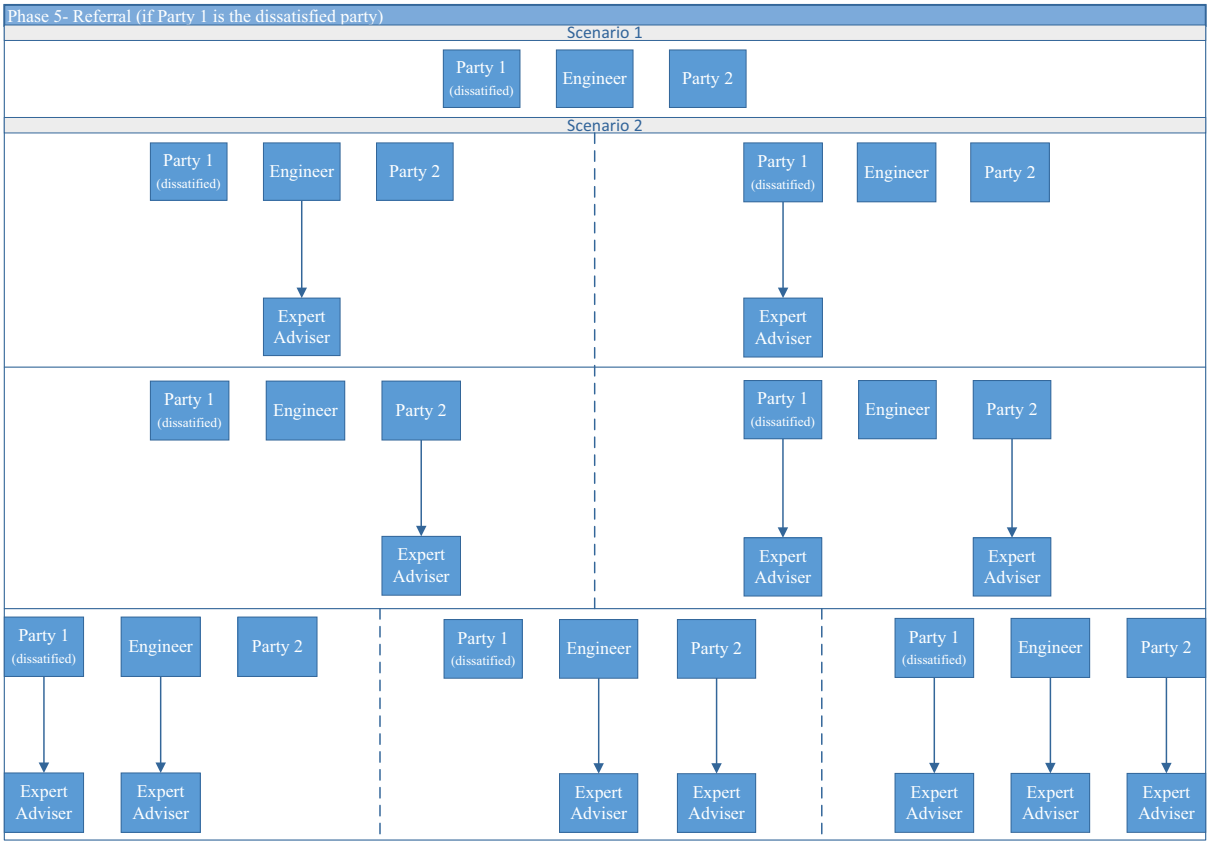

Fig. 4. Scenarios of Phase 5: Referral (when Party 1 is the dissatisfied party). Party 1 = owner; and Party 2 = contractor.

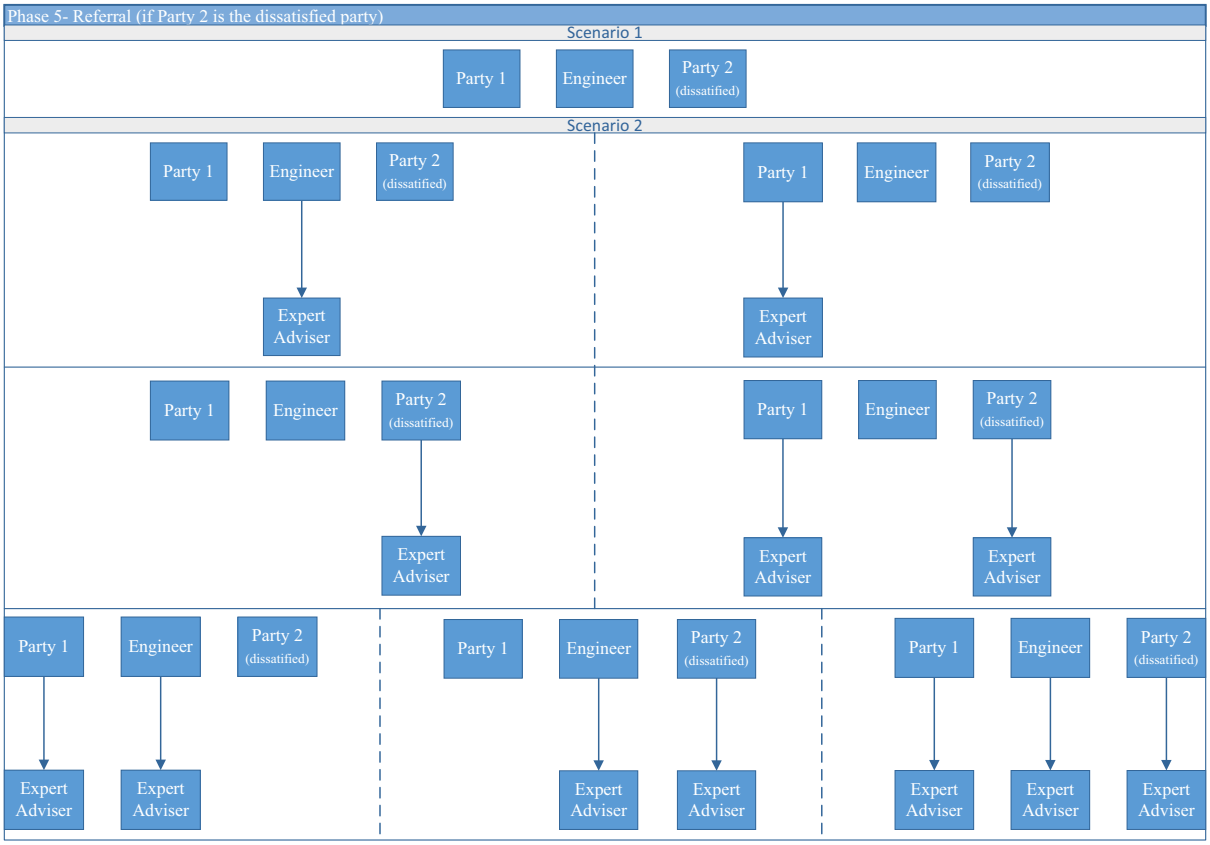

Fig. 5. Scenarios of Phase 5: Referral (when Party 2 is the dissatisfied party). Party 1 = owner; and Party 2 = contractor.

appointed at the same time. Fig. 6 shows that under this scenario, it can be that the engineer appoints their own expert adviser, either party appoints its own expert adviser, both parties appoint expert advisers at the same time, the engineer and one of the parties appoint expert advisers simultaneously, and finally the engineer and both parties appoint expert advisers at the same time.

Scenarios of Phase 3: Engineer's Determination

The two possible scenarios, in which the engineer proceeds to make a fair determination (after a failed attempt to reach an agreement during the previous phase), are as follows:

1. Under Scenario 1 of the engineer's determination phase, the engineer makes use of their qualified staff to prepare and give their determination, without having to receive help from any type of additional expertise.
2. Under Scenario 2 of the engineer's determination phase, the engineer receives assistance or advice from an expert adviser or consultant to be able to make their determination (that advice could be delivered in the form of signed advisory reports, or otherwise). The engineer, like the initial decision maker under AIA, has the right to request additional supporting data from "persons with special knowledge or expertise" when they "believe additional supporting information would be helpful" for their determination (AIA Risk Management Program 2020).

Scenarios of Phase 4: Dissatisfaction

There are two available scenarios for the party if it decides to go through with its objection to the determination (previously given by the engineer). Under the two scenarios, the party objecting to the engineer's determination (could be either the owner or the contractor) issues a notice of dissatisfaction within the relevant timeframe. However, unlike in Scenario 1, the dissatisfied party in Scenario 2 retains an expert adviser.

Scenarios of Phase 5: Referral

The dissatisfied party should not only issue a notice of dissatisfaction, but for adjudication to take place, the party must also refer the issue to adjudication. There are two scenarios for the referral phase. Scenario 1 is the scenario where neither the engineer, nor the parties, engage external expertise. Scenario 2 is contrary to Scenario 1. Figs. 4 and 5 display the scenarios in case the owner is the dissatisfied party and in case the contractor is the dissatisfied one, respectively.

Under the two scenarios of the referral phase, the party who previously issued the notice of dissatisfaction refers the matter

Phase 1- Disclosure of Claim

Claiming Party

Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser/Consultant	Claiming Party

Phase 2- Engineer's Consultation

Party 1 Engineer Party 2

Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser(s)	(Engineer; P1; P2; P1 and P2; P1 and Engineer; P2 and Engineer; Engineer and P1 and P2)

Phase 3- Engineer's Determination

Party 1 Engineer Party 2

Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser/Consultant	Engineer

Phase 4- Dissatisfaction

Party 1 (dissatified) Engineer Party 2 **OR** Party 1 Engineer Party 2 (dissatisfied)

Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser/Consultant	Dissatisfied Party

Phase 5- Referral

Party 1 (dissatified) Engineer Party 2 **OR** Party 1 Engineer Party 2 (dissatisfied)

Scenario	Scenario	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser(s)	(Engineer; Dissatisfied Party; Other Party; Dissatified Party and Other Party; Dissatisfied Party and Engineer; Other Party and Engineer; Engineer and Dissatisfied Party and Other Party)

Fig. 6. Summary of scenarios of Phases 1–5. P1 = Party 1 (owner); and P2 = Party 2 (contractor).

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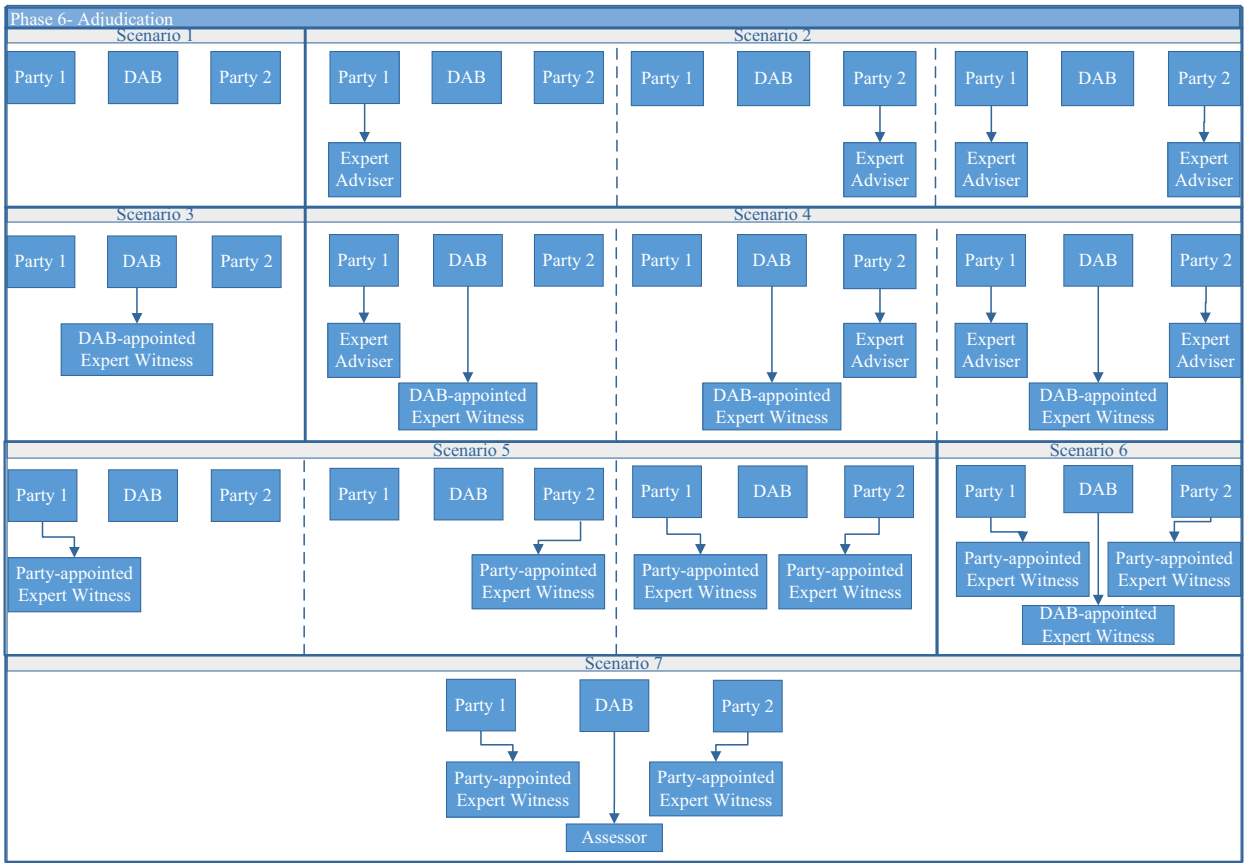

Fig. 7. Scenarios of Phase 6: Adjudication. Party 1 = owner; and Party 2 = contractor.

Phase 6- Adjudication		
Party 1 DAB Party 2		
Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser(s)	(P1; P2; P1 and P2)
Scenario 3	DAB-appointed Expert Witness	DAB
Scenario 4	Expert Adviser(s)	(P1; P2; P1 and P2)
	DAB-appointed Expert Witness	DAB
Scenario 5	Party-appointed Expert Witness(s)	(P1; P2; P1 and P2)
Scenario 6	DAB-appointed Expert Witness	DAB
	Party-appointed Expert Witnesses	P1 and P2
Scenario 7	Party-appointed Expert Witnesses	P1 and P2
	Assessor	DAB
Phase 7- Dissatisfaction		
Party 1 (dissatisfied) DAB Party 2 **OR** Party 1 DAB Party 2 (dissatisfied)		
Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser	Dissatisfied Party
Phase 8- Amicable Settlement: Expert Determination		
Party 1 Expert Party 2		
Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser(s)	(Expert; P1; P2; P1 and P2; P1 and Expert; P2 and Expert; Expert and P1 and P2)

Fig. 8. Summary of Scenarios of Phases 6–8. P1 = Party 1 (owner); and P2 = Party 2 (contractor).

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to adjudication within 42 days from the date of submitting the notice. Nevertheless, only Scenario 2 of the referral phase includes the appointment of expert adviser(s). As presented in Fig. 6, during the referral phase, it can be that the engineer appoints an expert adviser, either party appoints an expert adviser, both parties appoint expert advisers at the same time, the engineer and one of the parties appoint expert advisers at the same time, or all participants (the engineer and both parties) appoint expert advisers at the same time. The appointment of an adviser by the engineer or by the non-dissatisfied party is mainly for the purpose of supporting the informal discussions. However, these discussions do not necessarily take place during this phase.

Scenarios of Phase 6: Adjudication

Seven possible scenarios of Phase 6 of the claim and dispute timeline can be deduced. Fig. 7 illustrates these scenarios in the form of models, whereas Fig. 8 provides a summary of the scenarios:

1. Under Scenario 1, adjudication takes place without employing any additional or external experts.
2. Under Scenario 2, one or both parties retain their own expert adviser. This scenario takes place when the DAB has chosen to take no expert witness evidence at all (Horne and Mullen 2013). As can be seen in Fig. 7, under Scenarios 1 and 2, the DAB engages no additional expertise (be it expert witness or not). The reason might be that under these scenarios, the DAB itself embodies the expertise needed "to understand complex technical or legal issues" (Armes 2015).
3. Under Scenario 3, the DAB decides to appoint an expert witness, most likely because it does not have the experience and/or expertise needed for the particular issue in dispute.
4. Under Scenario 4, the DAB appoints the expert witness, while one or both of the parties have expert adviser(s).
5. Under Scenario 5, the referring party, the responding party, or both bring in the services of an expert witness. In some cases, the responding party may not have the chance to appoint its own expert witness. However, if it does, that expert witness, as discussed previously, might be at a disadvantage.
6. Under Scenario 6 of adjudication, both the DAB and the parties appoint expert witnesses. This scenario can take place when the DAB chooses to appoint an expert witness, in addition to the party-appointed expert witnesses, in order to avoid the difficulties created by the party-appointed experts (such difficulties may include receiving conflicting opinions from the party-appointed expert witnesses).
7. Under Scenario 7, the DAB obtains the help of an expert assessor. The expert assessor is particularly needed under this scenario to aid in reviewing and weighing the evidence presented by the party-appointed expert witnesses.

Scenarios of Phase 7: Dissatisfaction

Again, there are two possible scenarios for the party that decides to go through with its objection to the DAB's decision.

Under the two scenarios, the party dissatisfied with the DAB's decision (could be either of the parties: the owner or the contractor)

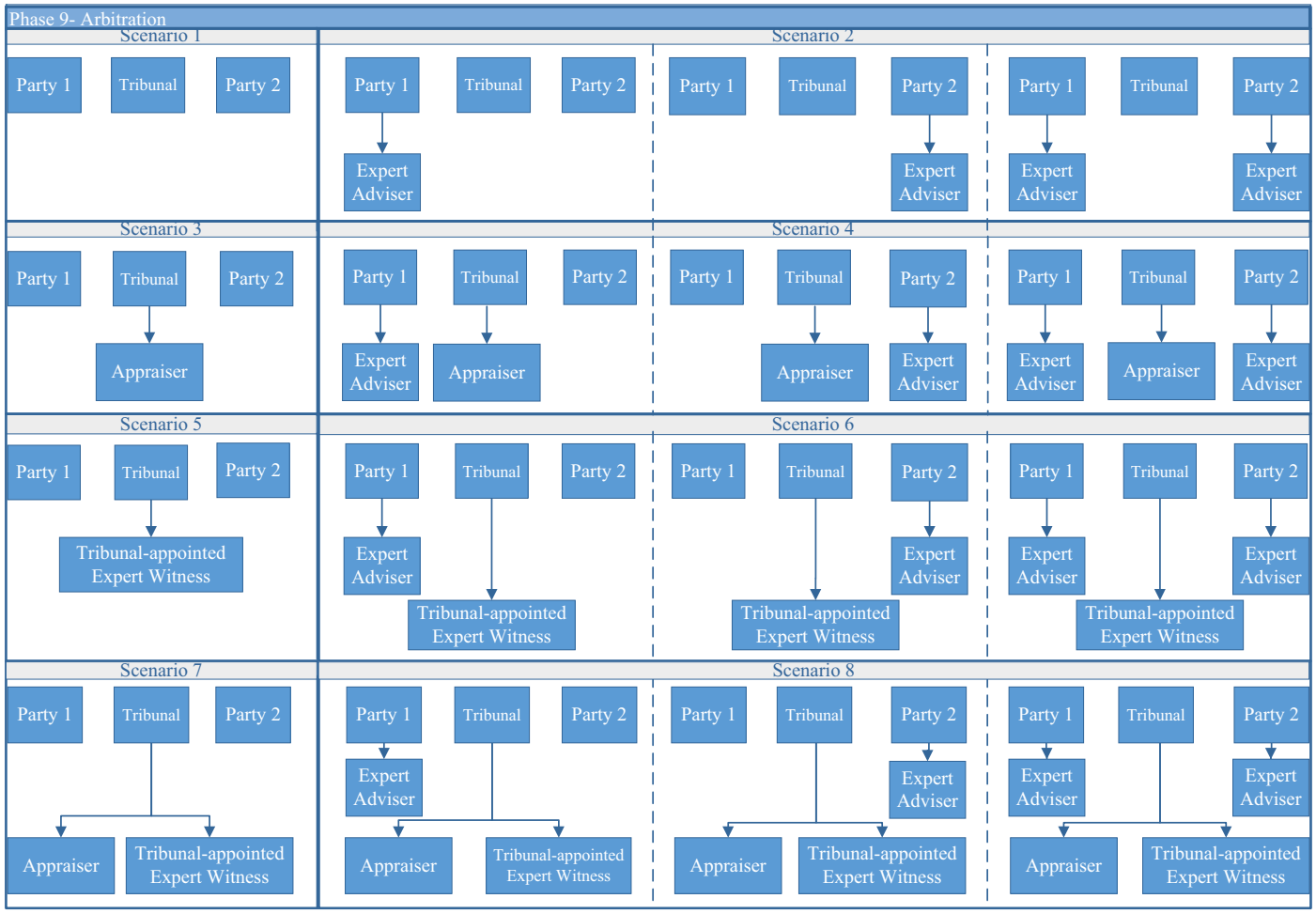

Fig. 9. Scenarios 1–8 of Phase 9: Arbitration. Party 1 = owner; and Party 2 = contractor.

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gives a notice of dissatisfaction within the relevant time bar. But, unlike in Scenario 1, the dissatisfied party in Scenario 2 receives assistance from an expert adviser. The dissatisfied party might, for example, ask for help in setting out the matter in dispute and the reason(s) for dissatisfaction.

Scenarios of Phase 8: Amicable Settlement: Expert Determination

With respect to expert determination, there are two possible scenarios: one that involves expert adviser(s)/consultant(s), and one that does not.

1. Under Scenario 1 of expert determination, the expert [expert determiner (ED)], being experienced in the subject matter or area of dispute, decides on the issue(s) in dispute without engaging any expert adviser or witness [expert witnesses usually have minimal or no role in the expert determination process (Horne and Mullen 2013)].[5]
2. Under Scenario 2, an expert adviser or consultant can be instructed by the expert (to assist in reaching the expert's determination) or by any party. As shown in Fig. 8, during this phase, it may be that the engineer appoints the expert adviser, either party appoints the expert adviser, both parties appoint expert advisers at the same time, the engineer and one of the parties appoint expert advisers at the same time, or all participants, the engineer and both parties, appoint expert advisers. Nevertheless, for the engineer to be able to appoint an adviser, the expert determination clauses or terms of reference need to allow it.

Scenarios of Phase 9: Arbitration

Fifteen possible scenarios of arbitration are presented in this section. Scenarios 1–8 are illustrated in Fig. 9, while Scenarios 9–15 are gathered in Fig. 10.

Details of the arbitration scenarios are as follows:

1. Under Scenario 1 of arbitration, no evidence is provided by expert witnesses.[6] This is mainly the case when parties agree to appoint arbitrator(s) having the expertise needed to decide complex technical issues.
2. Under Scenario 2, a party (or both parties) appoints an expert adviser, who does not have a duty to the tribunal, to advise it on issues in dispute requiring special knowledge and/or experience. For example, the expert adviser could be appointed to aid in exploring a claim or defending it from behind the scenes.
3. Under Scenario 3, the tribunal appoints an expert appraiser or valuer, of special knowledge, technical skill, or expertise, to perform the discrete function of ascertainment of facts.
4. Under Scenario 4, the tribunal appoints an appraiser and (one or both) parties appoint an expert adviser (to help them obtain their own valuations or assess the appraiser's work).
5. Under Scenario 5, the arbitration tribunal only appoints a tribunal-appointed expert witness. Scenario 5 might occur if the terms of the dispute resolution procedure do not allow for party-appointed expert witnesses; the tribunal rejects admitting the evidence of the party-appointed expert witnesses; or the parties do not want to provide the tribunal with evidence (rarely the case).

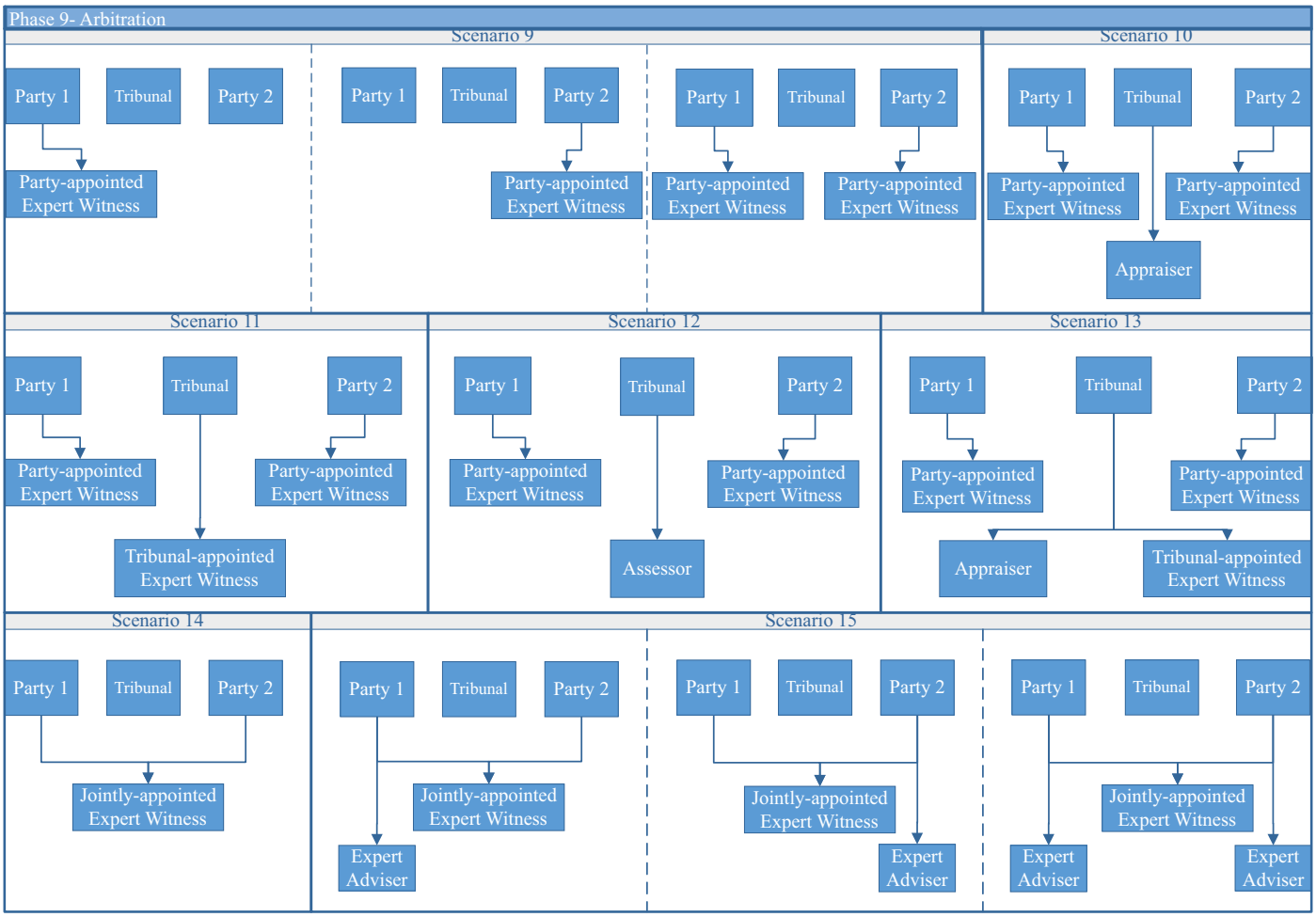

Fig. 10. Scenarios 9–15 of Phase 9: Arbitration. Party 1 = owner; and Party 2 = contractor.

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Phase 9- Arbitration		
		
Scenario	Additional Expertise	Appointed By
Scenario 1	-	-
Scenario 2	Expert Adviser(s)	(P1; P2; P1 and P2)
Scenario 3	Appraiser	Arbitration Tribunal
Scenario 4	Expert Adviser(s)	(P1; P2; P1 and P2)
	Appraiser	Arbitration Tribunal
Scenario 5	Tribunal-appointed Expert Witness	Arbitration Tribunal
Scenario 6	Expert Adviser(s)	(P1; P2; P1 and P2)
	Tribunal-appointed Expert Witness	Arbitration Tribunal
Scenario 7	Appraiser	Arbitration Tribunal
	Tribunal-appointed Expert Witness	Arbitration Tribunal
Scenario 8	Expert Adviser(s)	(P1; P2; P1 and P2)
	Appraiser	Arbitration Tribunal
	Tribunal-appointed Expert Witness	Arbitration Tribunal
Scenario 9	Party-appointed Expert Witness(s)	(P1; P2; P1 and P2)
Scenario 10	Appraiser	Arbitration Tribunal
	Party-appointed Expert Witnesses	P1 and P2
Scenario 11	Tribunal-appointed Expert Witness	Arbitration Tribunal
	Party-appointed Expert Witnesses	P1 and P2
Scenario 12	Party-appointed Expert Witnesses	P1 and P2
	Assessor	Arbitration Tribunal
Scenario 13	Appraiser	Arbitration Tribunal
	Tribunal-appointed Expert Witness	Arbitration Tribunal
	Party-appointed Expert Witnesses	P1 and P2
Scenario 14	Jointly-appointed Expert Witness	P1 and P2 Jointly
Scenario 15	Expert Adviser(s)	(P1; P2; P1 and P2)
	Jointly-appointed Expert Witness	P1 and P2 Jointly
Scenario 16 (hot-tubbing)	Party-appointed Expert Witnesses	P1 and P2
Scenario 17 (hot-tubbing)	Party-appointed Expert Witnesses	P1 and P2
	Assessor	Arbitration Tribunal

Fig. 11. Summary of scenarios of Phase 9. P1 = Party 1 (owner); and P2 = Party 2 (contractor).

6. Under Scenario 6, even when a tribunal-appointed expert witness is appointed, the parties have their own expert adviser(s). Yet, this scenario is costly.
7. Under Scenarios 7 and 8, along with the tribunal-appointed expert witness, other experts are appointed. The two scenarios are combinations of previous scenarios.
8. Under Scenario 9, evidence is taken from expert witnesses appointed by the parties. This is a common scenario, as previously mentioned.
9. Under Scenarios 10 and 13, expert witnesses are appointed in addition to the appraiser. These scenarios are combinations of previous scenarios.
10. Under Scenario 11, the tribunal appoints a tribunal-appointed expert witness, despite the appointment of the party-appointed expert witness(es). Doing so is particularly appropriate if the tribunal needs support in deciding between the opinions of the party-appointed expert witnesses (mainly on complex technical issues). However, going with such a scenario is costly and may delay the proceedings.
11. Under Scenario 12, an assessor is appointed by the tribunal to explain difficult issues, advise it, prepare it for evidence of party-appointed expert witnesses, and help it in reviewing, evaluating, and/or interpreting evidence or detailed data. Substantial time and costs can be saved through this scenario.
12. Under Scenario 14, parties agree to jointly appoint a single expert witness. This scenario is most appropriate "where the cost and delay of resolving competing expert opinions would be disproportionate to the sums in dispute" (CIArb 2015).
13. Under Scenario 15, appointing a single joint expert (jointly appointed expert witness) does not prohibit a party from appointing its own expert adviser. Yet, the role of that party-appointed expert adviser would be restricted to giving advice and/or comments. For example, the expert adviser under this scenario can comment on the single joint expert's report (Horne and Mullen 2013).

Scenarios of Hot-Tubbing

Under Scenario 16 of arbitration, the expert witnesses appointed by the parties are engaged in a hot-tubbing process. This scenario is not common in adjudication because "neither the procedure, nor the usual timetable of adjudication, allow experts to meet in order to narrow issues and agree facts" (Farr 2006).

Under Scenario 17, which is also a hot-tubbing scenario, the tribunal appoints an assessor. As per Reynolds and Russell (2001), if parties engage in hot-tubbing pursuant to civil procedure rules (CPR) Practice Direction 35, they may ask the court to appoint an assessor to preside over the discussions (between the parties' experts). Hence, in this scenario, the experts involved include the party-appointed expert witnesses and the assessor.

Stations for Experts' Intervention along the Claim and Dispute Resolution Timeline

The types of additional expertise typically involved during the claim and dispute resolution process are extracted from Figs. 6, 8, and 11 and summarized in Tables 1 and 2. Table 1 gives all types of additional expertise, possibly engaged during Phases 1–8 of the claim and dispute resolution process (along with their appointing party). Table 2 provides the same but for the arbitration phase.

Finally, the different expert roles mentioned in Table 1 are mapped onto the claim and dispute timeline in Fig. 12 to graphically highlight the stations of the experts' involvement along the timeline.

Requirements for the Different Expert Roles

As shown in Tables 1 and 2, there are several types of experts that can be involved during the construction claim and dispute resolution process. Nevertheless, the requirements are not the same for all expert roles. In other words, the required level of impartiality varies with respect to the type of expert.

To start, the expert adviser, according to the Academy of Experts, if appointed by a party, has an overriding duty to the party instructing them. By that, the expert adviser, being the party's agent, is not expected to act impartially.

Conversely, the expert witness's impartiality can be considered to be an overriding principle of expert evidence (Horne and Mullen 2013) (a failure to deliver evidence impartially is likely to be a source of challenge to the expert evidence).[7] This can be deduced from the Ikarian Reefer[8] and the Anglo Group cases.[9] In *Anglo Group plc v. Winther Brown and Co. Limited and BML (Office Computers) Limited*, Judge Toulmin identified specific duties for an expert witness (close to those set out in Ikarian Reefer) that

Table 1. Types of additional expertise involved in Phases 1–8

Additional expertise	Appointed by
Phase 1: Disclosure of claim	
Expert adviser/consultant	Claiming party (could be either P1 or P2)
Phase 2: Engineer's consultation	
Expert adviser(s)	Engineer; P1; P2; P1 and P2; P1 and engineer; P2 and engineer; engineer and P1 and P2
Phase 3: Engineer's determination	
Expert adviser/consultant	Engineer
Phase 4: Dissatisfaction	
Expert adviser	Dissatisfied party (could be either P1 or P2)
Phase 5: Referral	
Expert adviser(s)	Engineer; dissatisfied party; other party; dissatified party and Other Party; dissatisfied party and engineer; other party and engineer; engineer and dissatisfied party and other party
Phase 6: Adjudication	
Expert adviser(s)	P1; P2; P1 and P2
DAB-appointed expert witness	DAB
	P1; P2; P1 and P2
Assessor	DAB
Phase 7: Dissatisfaction	
Expert adviser	Dissatisfied party (could be either P1 or P2)
Phase 8: Amicable settlement: Expert determination	
Expert adviser(s)/consultant(s)	Expert; P1; P2; P1 and P2; P1 and expert; P2 and expert; expert and P1 and P2

Note: P1 = Party 1 (owner); and P2 = Party 2 (contractor).

Table 2. Types of additional expertise involved in Phase 9: Arbitration

Additional expertise	Appointed by
Expert adviser(s)	P1; P2; P1 and P2
Appraiser	Arbitration tribunal
Tribunal-appointed expert witness	Arbitration tribunal
Party-appointed expert witness(s)	P1; P2; P1 and P2
Assessor	Arbitration tribunal
Jointly appointed expert witness	P1 and P2 jointly

Note: P1 = Party 1 (owner); and P2 = Party 2 (contractor).

include providing "independent assistance to the court and the parties by way of objective unbiased opinion in relation to matters within his expertise. This applies as much to the initial meetings of experts as to the evidence at trial" (Horne and Mullen 2013). According to the judge, an expert witness "should never assume the role of an advocate." However, it remains a concern in some jurisdictions that expert witnesses favor the instructing party's position (through their opinion) instead of delivering their opinions professionally and impartially.

As stated by Horne and Mullen (2013), impartiality and independence, although distinct in meaning, are often tied to one another in practice, because it is unusual for an expert witness who is not independent from both parties to be appointed (as their appointment can raise questions on evidence). Hence, expert witnesses, even if party appointed, are expected to be impartial and independent.

Moving on to the requirements and duties of the assessor role. As previously mentioned, the role of the court or tribunal-appointed assessor could be simply advisory or could be similar to that of an expert witness. As mentioned in Menell et al. (2009), even the court's technical adviser's bias and partiality can be challenged by the parties. Hence, the assessor must act impartially in all cases.

Whereas to study the appraiser's impartiality, the *Levine v. Wiss & Co.* case can be analyzed. In *Levine v. Wiss & Co*, an accounting firm was hired in the Levines' divorce proceeding to value the husband's interest in Unified Components Corporation/Unicorp (Unicorp), and it was agreed by the parties that the valuation was to be binding. The appraiser in the case was selected by the litigants and appointed by the court to act as an "impartial expert" to begin with. Hence, the court-appointed appraiser, like the court-appointed assessor and witness, can, in the first place, be appointed to act impartially.

Finally, if the expert required to act impartially fails to be impartial, the consequences could be severe. For example, the failure of the expert witness to comply with their duties can affect the weight of their evidence (reduce it or cause its rejection), which can weaken the position of the party who appointed the expert witness. Also, the expert witness might end up receiving a negative judicial comment and having their credibility undermined.

Although such consequences may appear somehow strict, experts involved in the claim and dispute resolution process can be subject to other, more drastic, liabilities if they perform negligently. Some of these liabilities include having to pay damages and costs, being subject to disciplinary measures by their professional associations, and suffering harm to their professional reputation. Therefore, experts must not only avoid negligence, but also be aware of the current boundary of immunity from negligence liability (because the status of immunity depends on the role played by the expert).

Significance of the Research

This research can be of significant value to experts, who are paving their way in the claims and dispute resolution domain, as well as to practitioners and experts who wear multiple hats during the conflict resolution process. For the latter experts, the article provides a clear categorization of each expert role (which is closely tied to the boundary of expert immunity), draws the line between the responsibilities and requirements for the different roles, and illustrates the station on the timeline associated with each expert role.

In addition, the research clarifies possible existing confusion related to the various requirements of such expert roles, because these need to be understood by the claimants and respondents alike. Finally, the presented work paves the way for having a better understanding of the levels of immunity (against negligence) associated with these different expert roles.

Concluding Remarks

Construction conflicts are unavoidable, and they can lead to claims and disputes when not effectively managed. To this end, this research adopted the multistep claim and disputes administration timeline, offered by the FIDIC, for mapping the possible engagements of several classes of experts in the various involved phases. The highlighting of the shown engagement possibilities was informed by the hands-on

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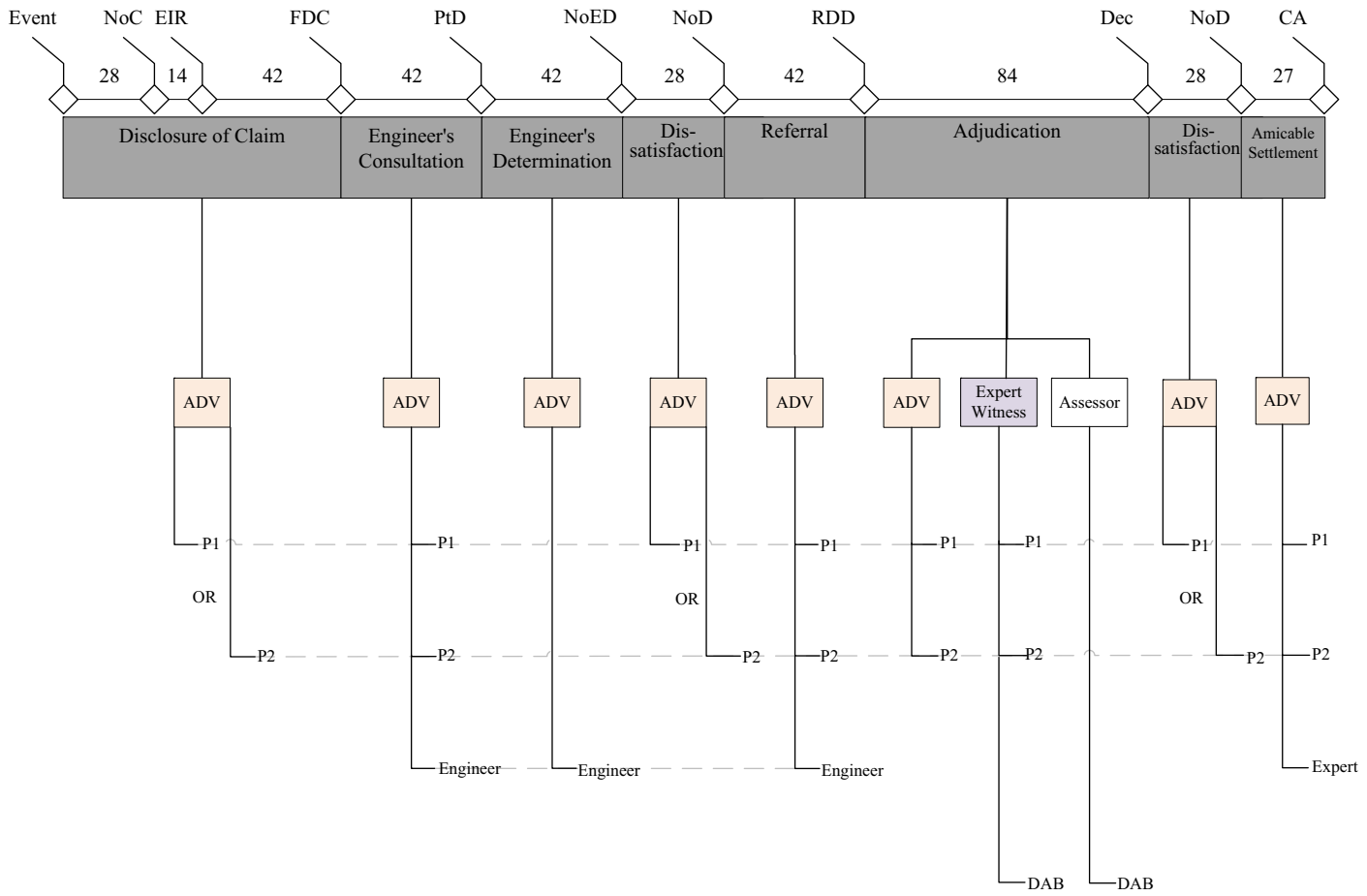

Fig. 12. Mapping of expert roles onto FIDIC's claim and dispute timeline. P1 = Party 1 (owner); P2 = Party 2 (contractor); and ADV = expert adviser.

exercising of the majority of these roles by the main author on numerous project cases over three decades of practicing claims and disputes resolution work, while also pointing to the requirements of the highlighted roles through the referenced literature and case law. The undertaken analysis allowed the conceptualization of the complete spectrum of possible expert engagement, together with the scenarios for their interventions along the claim and dispute timeline. Each scenario is unique with regard to the type and number of experts that may end up being involved. The research outcome can be of particular importance to those being appointed as experts as well as to the parties or entities who appoint these experts for the purpose of supporting, assisting, guiding, and/or advising the concerned participants during the construction claim and dispute resolution process.

Data Availability Statement

All data, models, and code generated or used during the study appear in the published article.

Acknowledgments

The authors would like to acknowledge the generous graduate assistantship funding granted by the Maroun Semaan Faculty of Engineering and Architecture at the American University of Beirut in support of this research.

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Endnotes

[1]A leapfrog appeal is a legal appeal that misses out the Court of Appeal and directly goes from the High Court to the Supreme Court.
[2]The responding party may be unable to react quickly and appoint its own expert witness.
[3]As it will be seen in later phases, the expert adviser can be involved "at any stage of the problem, dispute or claim" (Buckley 2016), not only during

the disclosure of claim phase, and will perform their duties as per the requirements of each stage.

[4]According to Subclause 3.7.1 in the 2017 Red Book, Yellow Book, and its corresponding clause in the 2017 Silver Book, the engineer, during consultation, "shall consult with both Parties jointly and/or separately, and shall encourage discussion between the Parties in an endeavour to reach agreement" (Gillion et al. 2018).

[5]The terms of engagement of the expert determines whether they are permitted to interview witnesses (or other experts in subfields if permitted) and take their testimony.

[6]In international arbitration, arbitrators should, in consultation with the parties, consider whether expert evidence is needed for any specific issue (CIArb 2015).

[7]Including a single joint expert, as is agreed on by both parties and is generally appointed to provide an impartial opinion.

[8]A 1993 case that presents the duties and responsibilities of expert witnesses, which have been used by courts in other cases, Lloyd's Rep 68.

[9]The essential principles of Ikarian Reefer were reconsidered by the Technology and Construction Court in the case of *Anglo Group plc v. Winther Brown and Co. Limited and BML (Office Computers) Limited*.

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