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Admissibility of System Dynamics Evidence in Disruption and Delay Claims

On the Use of the System Dynamics
methodology in International Arbitration

Author: Sam Mattar and Alexander Voigt

(in consultation with Adam Clements (Lawyer, Innovare Consultants))

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System Dynamics as an Evidentiary Tool

- §1. This paper addresses the admission and acceptance of System Dynamics (“SD”) as expert evidence in a delay and disruption claim in international arbitration proceedings¹ and considers the following two questions.
- a) Will the tribunal agree to review expert evidence based on SD? (*Admissibility*)
 - b) Will the tribunal give weight to expert evidence based on SD? (*Acceptance*)
- §2. To answer the first question, this paper will demonstrate that SD analyses have the *same basis for admission* as any other technical expert evidence that a party may rely upon to support (or defend) their delay and disruption claims.
- §3. Regarding the question of ‘acceptance’, we will present the criteria that support the acceptance of expert evidence by a tribunal in arbitral proceedings, and show how *SD readily meets these acceptance criteria*.

The need for Expert Evidence

- §4. Let us first understand the general purpose of evidence (including ‘expert evidence’) in contractual and legal disputes: Evidence is used to prove the party’s case or to defend against the other party’s claim.
- §5. The common bases for pursuing a claim are pursuant to an express contractual provision or a breach of contract.
- §6. The contractual term will provide the elements to be established by the claimant party or challenged by the opposing party.
- §7. For example, a clause that provides for an extension of time may include enumerated grounds upon which the party claiming may assert an entitlement, such as “additional work” or “variations” and other common grounds.
- §8. A breach of contract claim generally requires a party to prove three elements:
- a) **Fault or breach** where one of the contracting parties does not carry out, or delays the performance of its contractual obligations;
 - b) A **demonstrable damage**; and
 - c) A **causal link** between (a) and (b) – i.e. that the fault caused the damages.
- §9. A contractual entitlement or a breach of contract will need to be proven by evidence. This evidence can be a mix of factual and expert evidence. Expert evidence is relied upon to assist the tribunal to understand a technical issue that is within the expertise of the expert.

¹ Please note that this opinion does not constitute legal advice.

§10. Allegations of disruption and delay are generally accepted as being a technical matter where tribunals are assisted by expert analysis. (For disruption and delay claims, this would include SD, CPM analysis, Measured Mile, etc., as advised by the Society of Construction Law (SCL) Protocol² or AACEI Recommended Practices³).

A party may introduce Expert Evidence to support its claim

§11. The procedural rules for the presentation of expert evidence in international arbitration are determined by the law of the judicial seat of the arbitration, the applicable arbitration rules, the terms of reference of the arbitration, and procedural orders. These procedural requirements almost invariably incorporate and rely upon international standards, such as the IBA Rules on the Taking of Evidence in International Arbitration⁴ (the “IBA Rules”).

§12. While each proceeding will differ, the common thread is that these rules provide ‘general rules for admissibility’ – with one primary ‘rule’ is that **a party may submit any evidence** to prove its claims. This includes both factual and expert (technical) evidence.

§13. The only general limitations regarding expert evidence is that it needs to be:

- a) **relevant** and **material** to the question in the proceedings; and
- b) within the **expertise of the expert**.

§14. The expert evidence can, therefore, be whatever the party intends to rely upon in order to prove (or defend) the three elements of (a) fault or breach, (b) damages, and (c) a causal link between said damages and the fault or breach. There is nothing that prescribes what form the expert evidence or analysis must take, or limit or preclude modern analytical techniques (such as SD) from being admitted and relied upon by parties in a dispute.

§15. For example, in an International Arbitration where the parties accept the IBA Rules, a party “...shall identify any Party-Appointed Expert on whose testimony it intends to rely and the subject-matter of such testimony...”⁵, and the Tribunal “...may appoint one or more independent Tribunal-Appointed Experts to report to it on specific issues designated by the Arbitral Tribunal...”⁶

§16. Accordingly, SD has the **same basis for admission** as any other form of expert evidence that analyses disruption and delay, e.g., Time Impact Analysis or Measured Mile analysis.

SD delivers acceptable evidence on disruption and delay claims

§17. Following from the general principle that a tribunal will **admit** the expert evidence upon which a party intends to rely, the more critical question is whether the tribunal will **accept** this expert

² Society of Construction Law (SCL): Delay and Disruption Protocol, 2nd Edition, February 2017

³ See, for example, AACEI International– TCM Framework: 6.4 – Forensic Performance Assessment: Recommended Practices No. 25R-03 (2004): Estimating Lost Labor Productivity in Construction Claims and Recommended Practice No. 29R-03 (2004): Forensic Schedule Analysis.

⁴ International Bar Association (2010): IBA Rules on the Taking of Evidence in International Arbitration.

⁵ IBA Rules, Article 5(1)

⁶ IBA Rules, Article 6(1)

evidence – i.e., whether the tribunal will actually rely upon the evidence to guide its rulings and decide the case in favour of one party or the other.

§18. The IBA Rules state that the Tribunal should base its test for acceptance on its opinion the “...*admissibility, relevance, materiality and weight of evidence...*”.

§19. *Admissibility* (and relevance) is discussed above: the general rule is that if the evidence is relevant and within the expertise of the expert, the evidence will be admitted.

§20. The *relevance* and *materiality* of the evidence will depend on the issue in question. For example, where the matter in dispute is the existence and cause of delay and disruption on a Project, expert evidence that is relevant and material to address this issue includes SD, along with other methodology such as CPM or measured mile or productivity analyses.

§21. The *weight* of the evidence is how much the expert evidence supports the claim (or undermines the other party’s claim). While this is ultimately a matter for the Tribunal, evidence that meets the following general criteria is much more likely to be afforded the necessary weight by the Tribunal. This is because such evidence will credibly support the claim. Therefore, evidence that is more likely to support the ‘hypothesis’ (i.e., the claim) will be:

- a) reliable and robust;
- b) credible and credibly based on documented data and information;
- c) testable and falsifiable;
- d) based on clear and credible academic and professional qualifications and experience;
- e) supported by academic and industry acceptance;
- f) useful to the tribunal, particularly in assisting in the assessment of the technical issues (e.g. of the cause and consequences of the disruption and delay); and
- g) as a practical matter, clearly explained and set out in reports and testimony.

§22. SD (as applied by CDS) fully complies with these general acceptance principles:⁷

- a) SD offers a credible and advantageous means to prove the elements of a claim: fault, damages, and the causal link explained in §8 above. Indeed, where a party wishes to prove the damages due to cumulative delay and/or disruptive effect over the course of a project using a comprehensive and robust methodology, the benefits that SD delivers make it preferable to historic/conventional methods such as CPM analysis or productivity analyses.
- b) SD simulation models are based on a comprehensive causal framework that has been successfully applied to analyse project performance on hundreds of projects worldwide,

⁷ Stephens, C.A., Graham, A.K. and Lyneis, J.M. (2005) *System Dynamics Modeling in the Legal Arena: Meeting the challenges of expert witness admissibility*; *System Dynamics Review* 21(2):95 – 122: “System dynamics models have been used in legal disputes since the late 1970s to prove and quantify damages. The most important challenge is establishing admissibility of expert testimony supported by system dynamics or other models is laid down by the US Supreme Court (Daubert standards) and these lean heavily on the scientific method. Best-practice system dynamics work adheres to the scientific method and, as such, should prove admissible.

including dozens of major disruption and delay claims. The data sources for SD simulation models are carefully checked and documented, and the models themselves act as comprehensive testbeds (platforms for conducting rigorous, transparent, and replicable testing of scientific hypotheses) that help us check the project data for correctness and for consistency.

- c) SD simulation models independently reproduce the actual performance of the project upon which the claim is based. The model calibration process follows the scientific method ('falsification'), identifying and correcting any deviations between the simulation and the data that remains 'external' to the model. A Monte Carlo analysis can be used to determine the confidence ranges surrounding the assumptions made and the resulting claim estimates.
- d) CDS has the necessary qualifications, as well as vast experience and expertise to be classified as "experts" in this field. Our team members have decades of experience in the construction world, producing expert evidence for disruption and delay claims for over twenty years. We participate in the activities and proceedings of the international System Dynamics Society, and we follow generally accepted analysis and documentation standards.
- e) There are over 200 universities teaching SD courses and programs, and there are peer review journals, extensive publications and textbooks on Systems Dynamics. SD has been used to support construction disruption and delay claims since 1978, and it was recently included in the Society of Construction Law Delay and Disruption Protocol ("**SCL Protocol**")⁸.
- f) SD supports tribunals by (i) comprehensively analysing and describing the causal links between fault and damages, and (ii) by particularising and quantifying the damages caused by each different claimable event.
- g) CDS has significant experience in preparing clear and concise Expert Reports that document and explain SD-based analyses. We collaborate with clients, project teams, lawyers and other consultants to ensure that reports are scrupulously prepared and comply with all legal, contractual and practical requirements.

§23. For all of these reasons, CDS-prepared SD analyses and reports meet all the requirements for **acceptance** as expert evidence by arbitral tribunals.

§24. Notwithstanding the above, an opposing party may still seek to challenge the acceptance of SD on the basis that it is a 'modern' modelling technology, and not a traditional or conventional method of disruption and delay analysis like CPM or Measured Mile. However, the fact that SD is a newer technology is not determinative; what is critical is whether SD is reliable and robust and meets admissibility and acceptance criteria, including being a sound scientific methodology.⁹ Any objective consideration shows that SD convincingly satisfies the criteria for acceptance as

⁸ *Society of Construction Law (SCL): Delay and Disruption Protocol, 2nd Edition dated February 2017*

⁹ *See, for example: Daubert v. Merrell Dow Pharmaceuticals, Inc. (1993) 509 U.S. 579, 589 and Kennedy v Cordia (Services) LLP [2016] UKSC 6.*

described above, and, in doing so, will compare favourably to other methodologies (like CPM or Measured Mile analysis).

§25. Indeed, this was the experience of the members of CDS in proceedings where SD analysis was accepted in International Arbitration proceedings. The 'Tuxedo Park'¹⁰ disruption claim is a very good example:

The 'Tuxedo Park' Disruption Claim

- The governing law was a civil law system from the MENA region.
- The SD model and the experts were challenged as a new methodology, and subject to review and cross examination by both opposing counsel and the arbitrators.
- An academic expert was asked to review and test the model using a large number of procedural and statistical tests.
- The Claimant submitted the SD model for review (and verification) by the Respondent who also had a team of SD experts.
- The tribunal accepted the SD model as expert evidence, as it was found to be robust and credible.
- The tribunal relied on the conclusions of the SD model in awarding the claimant 100% of the disruption it claimed.

In Conclusion

§26. SD is expert evidence and, as such, will be admitted in arbitral proceedings, like any other expert evidence.

§27. SD is reliable, robust, credible, and testable; and it is bolstered by significant academic and industry support. SD addresses all the requirements for acceptance as expert evidence in arbitral proceedings – and the members of CDS have been involved in proceedings where SD was accepted and 100% of the claimed disruption was recovered.

§28. CDS understands the requirements for admission and acceptance of expert evidence in arbitration proceedings. In developing our SD-based analysis method, we have relied on accepted standards and practices, so that our analyses will fully meet all these requirements.

¹⁰ The real name of the claim cannot be divulged for confidentiality reasons.

CDS: A world-class team, delivering solutions tailored to our clients' needs

Led by Dr Sam Mattar and Mr. Alexander Voigt, our dedicated team of experts offers clients a bespoke solution based on their multisectoral experience in the construction industry – from rapid initial assessments that will identify major disruption sources and determine the overall viability of a claim, to fully defensible expert evidence that will hold up in front of any tribunal.



Dr Sam Mattar

With over 40 years' experience in the construction industry, Dr Sam Mattar has been engaged as an engineer, project manager, professor, claims lead and arbitration support in North America, Europe and the MENA region. He has published over 40 papers in refereed journals and is the recipient of the Thomas Fitch Rowland Award (American Society of Civil Engineers) in 1985, and the Distinguished Service Award of the Project Management Institute in 1984.



We are proud to have been the first to successfully introduce 'System Dynamics' to construction claims in the Middle East... a decade ahead of its inclusion in the Delay and Disruption Protocol of the Society of Construction Law.

Mr. Alexander Voigt



Alexander has over 20 years' experience in dynamic simulation, having led consulting teams preparing over a dozen major claim analyses worldwide. Throughout his career he has developed and taught System Dynamics, Project Management, and Project Management Institute (PMI) accredited professional development programmes, and he is also a regular speaker at international conferences.



D3A fully represents and simulates all disruption and delay issues on major construction projects, providing full visibility to our clients, judges and arbitrators.

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Contact us on:

T +962 6551 8337 E info@constructiondynamics.global
www.constructiondynamics.global

Construction Dynamics Solutions L.L.C.

22 Nofan Al-Adwan Street, Abu Dahab Complex, Amman, 11185, Jordan